

# The Association of Medical Conditions and Presenteeism

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*A self-reported measure of four domains of work impairment based on the Work Limitations Questionnaire was completed by 16,651 employees of a large financial services corporation. Using a multivariate model to control for coexisting conditions, age, and gender, significant relationships were observed between medical conditions and patterns of impaired work performance. Depression was highly associated with work limitations in time management (odds ratio [OR] = 2.05), interpersonal/mental functioning (OR = 2.50), and overall output (OR = 2.24). Arthritis (OR = 1.56) and low back pain (OR = 1.32) were associated with physical function limitations. These same two conditions were associated with limitations in mental/interpersonal functioning but with low back pain having the higher odds ratio (OR = 1.54 vs. 1.22). These results suggest that worksite interventions (eg, disease management programs) should be tailored to the unique effects observed with specific medical conditions. More targeted programs could have important benefits for productivity in the workplace. (J Occup Environ Med. 2004;46:S38–S45)*

**C**hronic health problems have a significant impact on work and productivity and increase health care costs. The escalating cost of care, accrued in part by employers as medical insurance premiums and claims paid for medical benefit plans, is increasingly borne by employees through health insurance premiums, deductibles, copayments, and out-of-pocket expenses. Additionally, employers incur indirect costs connected to their employees' illness that include the productivity lost while the employee is absent from the job as well as the productivity lost while the employee is still at work but impaired due to the health problem (presenteeism).

Measuring direct medical costs is relatively straightforward because premium and claims costs can be accurately tabulated. The cost of missed workdays (absenteeism) is also relatively easy to quantify when absences are recorded. However, the construct of presenteeism is yet to be fully defined or operationalized and is thus difficult to measure.<sup>1</sup>

Recording health-related decrements in productivity is problematic when few workplaces have readily available, objective productivity measures that are collected in a consistent and unbiased manner. Objective productivity measures have been studied in a limited number of occupation groups: insurance claims processing,<sup>2</sup> telephone customer service operations,<sup>3</sup> and loom operations.<sup>4</sup> Contributing to the challenge of finding jobs with easily interpreted, objective measures of job productivity has been the growth in the number of

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“knowledge workers” performing complex tasks which defy discrete task measurement. Consequently several self-report instruments have been developed to quantify decrements in worker productivity associated with health problems.<sup>5,6</sup>

Many of the medical conditions that are common in the workforce<sup>7</sup> have an impact on productivity and especially presenteeism. For example, migraine headaches are responsible for an estimated 12 billion dollars of lost productivity annually in the United States, with 60 to 70% of this cost the result of impaired performance while at work.<sup>8</sup> Seasonal allergies cost U.S. employers an estimated \$2.8 billion per year because of decreased productivity, but lost workdays account for only 10% of these costs.<sup>9</sup> Depressive illness is widely recognized to negatively affect work-related function, with studies reporting substantial correlations between symptom severity and impairment in work functioning.<sup>3,10–13</sup> Thus, compared with presenteeism, absenteeism may represent a smaller percent of the total indirect workplace cost of these medical conditions than previously thought.

It seems reasonable to assume that various medical conditions have varying impact on workplace performance. Different health problems affect different job skills or competencies in different ways or to different degrees. Information on the type of impact associated with a particular medical condition could be useful in designing interventions tailored to the unique impact of a particular condition.

Unfortunately, comparative data across various conditions are not generally available.<sup>14</sup> One recent study highlighted differences among conditions with respect to absenteeism and medical claims costs, but did not address actual work performance.<sup>15</sup> In another study, a nationwide survey was used to provide comparative data on disease-related days of work loss or work cutback, but did not provide details on the

type of work impairments that occurred.<sup>16</sup> Different health risks and diseases have been associated with variations in patterns of health-related productivity impairment including presenteeism, but again, there has been no examination of the type or relative importance of work impairments.<sup>3</sup> And while several studies have described the impact of a single illness on work performance, their lack of a common metric of impact prevents cross-comparison.<sup>17–20</sup>

The current investigation was conducted to compare patterns and severity of self-reported productivity impairment associated with several common medical conditions, using a common metric to enable comparisons across different conditions. It was hypothesized that each medical condition would have a distinct pattern of impact on each of four domains of work performance.

## Materials and Methods

### The Worksite and Study Population

The worksite, headquartered in the Midwestern United States, is one of the nation’s largest financial services companies with employees located in 29 states. During the third quarter of 2002, this corporation employed approximately 73,500 people, of whom approximately 70% were female. The average age of the workforce was approximately 38 years. The majority of employees perform clerical activities, including accounting, receiving and sorting financial documents, telephone and in-person customer service, and a variety of other banking functions.

### Determining Health Problems

In July 2002, a Health Risk Assessment (HRA) questionnaire was sent to all employees from the corporation’s Health Management unit. The HRA used was based on *Healthier People, Version 4.0* (The Carter Center of Emory University, Atlanta GA, 1991) and enhanced in cooper-

ation with the University of Michigan’s Health Management Research Center (Ann Arbor, MI). In addition to asking respondents about the presence of biological and lifestyle health risks, this HRA includes questions about the presence of various chronic diseases. Employees who complete the HRA are provided with an individualized report regarding their health risks and suggestions for health improvement. As an incentive for completing the HRA, a Mayo Clinic self-care book (retail value \$16.95) was offered with the mailing to employees.

With regard to defining the presence of chronic diseases, the HRA asks respondents whether they are either being treated by a physician or currently taking medications for each of several chronic medical conditions including: heart disease, diabetes mellitus, cancer (any type), hypertension, depression, back pain, heartburn, irritable bowel syndrome, kidney disease, osteoporosis, asthma, seasonal allergies and menopause.

### Assessing Work Limitations

An eight-item version of the Work Limitations Questionnaire (WLQ)<sup>21,22</sup> was included in the HRA to assess health-related impacts on work performance. These questions evaluated the percentage of time at work that an emotional or physical problem interfered with one or more of the following four work domains: time management (eg, work the required number of hours, start work on time), physical work activities (eg, repeat the same hand motions, use work equipment), mental/interpersonal activities (eg, concentration, teamwork), and overall output (eg, complete required amount of work, worked to capability). Employees were asked to base their responses on their previous 2 weeks of work and to rate any impairment on a five-point scale of “all of the time (100%),” “most of the time,” “half of the time (50%),” “some of the time,” and “none of the time (0%).” The response option “does not apply to my job” also was provided.

The WLQ was scored as four subscales that represented the four work domains. A separate, dichotomous score for each subscale (yes/no) indicated whether or not any work limitations were noted for either of the two items that made up each subscale (ie, amount of limitation >0 for either item). The response for each subscale was judged to be valid if a rating was provided for at least one of the two items in each scale. A multivariate logistic regression model was constructed for each WLQ subscale, with age, gender and each medical condition as independent variables. Variables were entered into the model in order of significance. All analyses were conducted using SAS 8.0 software (SAS Institute Inc., Cary, NC).

## Results

In July 2002, an HRA was sent to 73,456 employees; of these, 17,685

were returned. To be included in the study, the respondents had to be listed in the corporation's personnel database, be younger than the age of 65, and have completed all the WLQ questions. As a result of these selection criteria, 1034 (1%) questionnaires were dropped from the study leaving a total of 16,651 employees (23%). The 23% response rate is typical of those reported for HRAs in the research literature.<sup>23,24</sup>

The average age of the respondents included in the study was 38.9 years, and 76% were female. Forty-seven percent of the respondents reported that they were receiving treatment or taking medications for at least one medical condition listed in the survey; 22.5% reported two or more conditions. The prevalence, gender and age distribution, and mean number of conditions reported are listed in Table 1.

## Work Limitations

Almost half (47%) of all respondents indicated having at least one health condition for which they were currently being treated by a physician and/or currently taking medication (see Table 1). In this same group, 25.4% reported experiencing limitations in time management due to their health; 21.7% reported impairment in physical work activities due to their health, 40.6% reported health-related limitations in mental/interpersonal activities, and 31.9% reported health-related limitations in their overall output. The percent of employees who reported limitations on each of the WLQ subscales was directly related to the number of medical conditions reported. In general, each additional self-reported health condition, after age and gender adjustment, was associated with 4–5% more reported work limitations in each measured work domain.

**TABLE 1**  
Medical Conditions, Demographics and WLQ Subscale Scores > 0 (N = 16,651, Age 18–64)

Medical Conditions	N	%	% Male	Avg. Age	Avg. Number Reported	% With Multiple	Work Limitations Subscales			
							Time (%)	Physical (%)	Mental (%)	Output (%)
Allergy	3700	22.2	19.2%	39.24	2.1	57.3%	28.3	24.8	44.2	34.7
Arthritis	986	5.9	13.5%	47.44	3.2	85.9%	30.8	34.4	47.0	41.0
Asthma	909	5.5	17.1%	37.51	2.8	82.0%	32.8	26.7	45.7	35.6
Back pain	1123	6.7	16.7%	40.71	2.9	79.2%	35.8	31.9	54.3	43.3
Cancer	273	1.6	18.3%	47.49	2.7	74.4%	20.9	20.5	36.3	31.1
Depression	1491	9.0	12.5%	40.44	2.5	69.3%	41.5	31.9	62.0	51.1
Diabetes	479	2.9	24.2%	46.63	2.7	76.8%	30.5	29.4	43.2	35.3
Heart disease	229	1.4	36.7%	50.41	3.1	77.7%	31.0	28.4	41.1	36.7
Heartburn	1424	8.6	18.5%	43.42	2.9	80.5%	31.1	28.7	46.1	38.2
Hypertension	1808	10.9	22.1%	48.22	2.5	69.3%	25.9	25.3	39.4	33.4
Irritable bowel	429	2.6	9.3%	40.47	3.2	82.8%	38.2	33.6	53.4	45.9
Kidney disease	52	0.3	25.0%	42.37	3.0	84.6%	30.8	30.8	48.1	42.3
Menopause	1340	10.5*	0.0%	52.03	2.7	74.2%	25.6	28.2	39.6	35.1
Osteoporosis	228	1.4	3.5%	53.95	3.4	84.2%	24.6	30.3	39.0	34.2
All respondents	16651		23.8%	38.88	0.9	22.5%	25.4	21.7	40.6	31.9
Total number of medical conditions										
0	8809	52.9	28.0%	36.30	0.0	0.0%	22.9	19.1	37.4	28.7
1	4104	24.6	22.5%	39.61	1.0	0.0%	26.1	21.3	42.4	32.9
2	2111	12.7	18.4%	42.50	2.0	100.0%	27.6	24.4	43.3	34.8
3	918	5.5	13.9%	45.12	3.0	100.0%	32.1	29.3	47.2	39.1
4	364	2.2	8.5%	46.41	4.0	100.0%	37.4	37.4	51.4	45.9
5	208	1.2	7.2%	49.32	5.0	100.0%	36.1	38.9	49.5	42.8
6+	137	0.8	7.3%	49.45	6.5	100.0%	43.8	46.0	62.0	54.7

\* Menopause prevalence in female employees only.

Table 2 displays the results of the multivariate logistic models as odds ratios and lists 95% confidence intervals for each health condition, age and gender. To better illustrate the differences in limitation patterns for certain conditions, a graph was constructed (Fig. 1) using odds ratios and depicting the differences between each condition. The four data points for each condition represent the four WLQ subscales. In an effort to prioritize the conditions producing work limitations, only those conditions with significantly increased odds ratios (above 1.25 in at least one of the subscales) were selected for inclusion in this graph. Additionally, Figs. 2 through 5 have been constructed using the odds ratios and confidence intervals of these conditions for each of the WLQ subscales.

**Discussion**

In a large sample of predominantly female financial services employees,

47% reported having at least one health condition at a sufficient level of severity that medical care or medications were required. More than one out of five in the sample reported having at least two such conditions. Responses to questions about health-related work limitations indicated that several common conditions (allergies, asthma, cancer, and osteoporosis) were not associated with a significantly increased likelihood of any of the four types of productivity impairment as measured by the eight-item WLQ. Kidney disease, a much less common condition, was also not associated with any significant self-reported impairment at work.

Controlling for all other conditions, depression, heart disease, and back pain were associated with the highest odds of limitations in time-related components of work (Fig. 2). Arthritis, depression and diabetes

were associated with the highest odds of problems with physical tasks (Fig. 3). Depression, back pain, and irritable bowel syndrome (IBS) were associated with the highest odds of problems with mental tasks and with overall output (Figs. 4 and 5).

The remarkably large association of depression with self-reported work limitation was consistent with previous studies of depression's impact on work.<sup>10-13,15</sup> However, there is the strong possibility that the self-appraisal of those affected by depression may be biased toward the negative given the cognitive set common to the mood disorder.<sup>25,26</sup> Previous research based on objective measures of productivity did not show a higher impact of depression with respect to presenteeism compared to other diagnostic groups.<sup>3</sup> However, the previous study used a cohort of employees who had experienced a psychiatric short-term disability epi-

**TABLE 2**  
Odds Ratios and 95% Confidence Intervals Associated with Work Limitations from WLQ Subscales

Independent Variables	Dependent Variables							
	Time Odds Ratio	95% CI	Physical Odds Ratio	95% CI	Mental Odds Ratio	95% CI	Output Odds Ratio	95% CI
Age	<b>0.969*</b>	(0.96, 0.97)	<b>0.991*</b>	(0.99, 0.99)	<b>0.974*</b>	(0.97, 0.98)	<b>0.985*</b>	(0.98, 0.99)
Sex (Female)	<b>1.426*</b>	(1.30, 1.56)	<b>1.596*</b>	(1.45, 1.76)	<b>1.191*</b>	(1.10, 1.29)	<b>1.091</b>	(1.01, 1.18)
Allergy*	1.037	(0.95, 1.13)	1.066	(0.97, 1.17)	1.073	(0.99, 1.16)	1.040	(0.96, 1.13)
Arthritis**	<b>1.225</b>	(1.05, 1.44)	<b>1.562*</b>	(1.34, 1.82)	<b>1.216*</b>	(1.05, 1.40)	<b>1.312*</b>	(1.13, 1.52)
Asthma	1.143	(0.98, 1.33)	1.057	(0.90, 1.24)	0.972	(0.84, 1.12)	0.962	(0.83, 1.12)
Back Pain**	<b>1.397*</b>	(1.22, 1.60)	<b>1.322*</b>	(1.15, 1.52)	<b>1.539*</b>	(1.35, 1.76)	<b>1.370*</b>	(1.20, 1.56)
Cancer	0.786	(0.58, 1.07)	0.784	(0.58, 1.06)	0.853	(0.66, 1.11)	0.904	(0.69, 1.18)
Depression**	<b>2.053*</b>	(1.83, 2.30)	<b>1.488*</b>	(1.32, 1.68)	<b>2.459*</b>	(2.20, 2.76)	<b>2.238*</b>	(2.00, 2.50)
Diabetes*	<b>1.401*</b>	(1.14, 1.73)	<b>1.415*</b>	(1.15, 1.75)	<b>1.233</b>	(1.02, 1.50)	1.158	(0.95, 1.42)
Heart disease	<b>1.507*</b>	(1.12, 2.04)	1.280	(0.94, 1.74)	1.141	(0.86, 1.51)	1.205	(0.91, 1.60)
Heartburn**	<b>1.166</b>	(1.02, 1.33)	<b>1.175</b>	(1.03, 1.34)	1.107	(0.98, 1.25)	1.109	(0.98, 1.25)
Hypertension	<b>1.156</b>	(1.02, 1.31)	1.106	(0.98, 1.25)	1.051	(0.94, 1.18)	1.067	(0.95, 1.20)
Irritable Bowel*	<b>1.366*</b>	(1.11, 1.68)	<b>1.324</b>	(1.07, 1.64)	<b>1.286</b>	(1.05, 1.58)	<b>1.401*</b>	(1.14, 1.72)
Kidney disease	1.145	(0.62, 2.10)	1.313	(0.72, 2.41)	1.260	(0.72, 2.21)	1.377	(0.78, 2.42)
Menopause	<b>1.163</b>	(1.00, 1.35)	<b>1.202</b>	(1.04, 1.39)	1.080	(0.95, 1.23)	<b>1.157</b>	(1.10, 1.32)
Osteoporosis	1.038	(0.75, 1.43)	1.167	(0.86, 1.58)	1.019	(0.77, 1.36)	1.010	(0.75, 1.35)
<b>Model Fit</b>								
-2 Log Likelihood	18220.1378		17067.2328		21790.6842		20412.9878	
R-square	0.039		0.022		0.041		0.025	
Max-rescaled R-square	0.057		0.033		0.055		0.035	
Likelihood Ratio Test								
Chi-square	657.375		362.108		697.955		424.671	
Pr > $\chi^2$	<0.0001		<0.0001		<0.0001		<0.0001	

Independent Variables: \*  $P < 0.05$ ; \*\*  $P < 0.01$ .

Dependent Variables: **Bold** = Significant at  $P < 0.05$ ; \* = significant at  $P < 0.01$ .

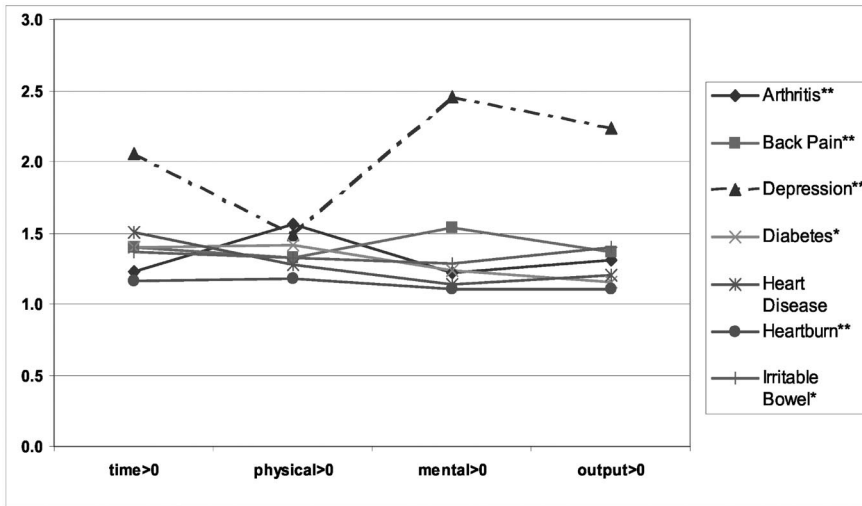


Fig. 1. Odds ratios profiles of work limitations for selected medical conditions.

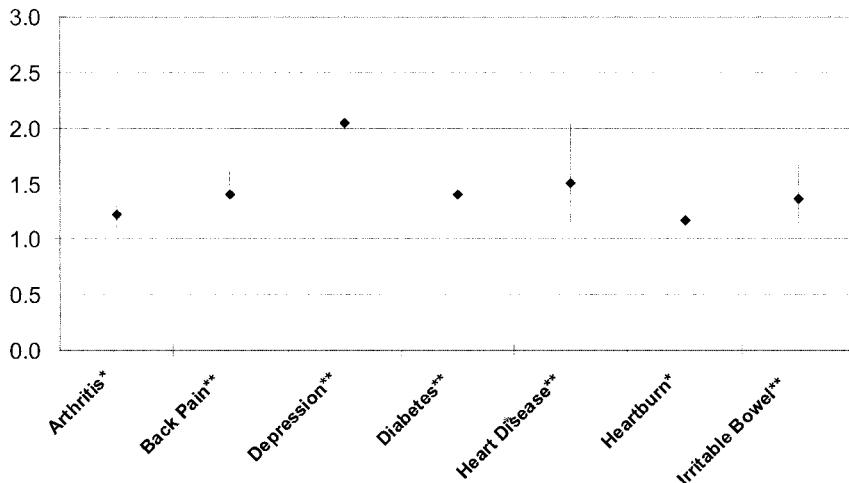


Fig. 2. Odds of having any time limitation by disease.

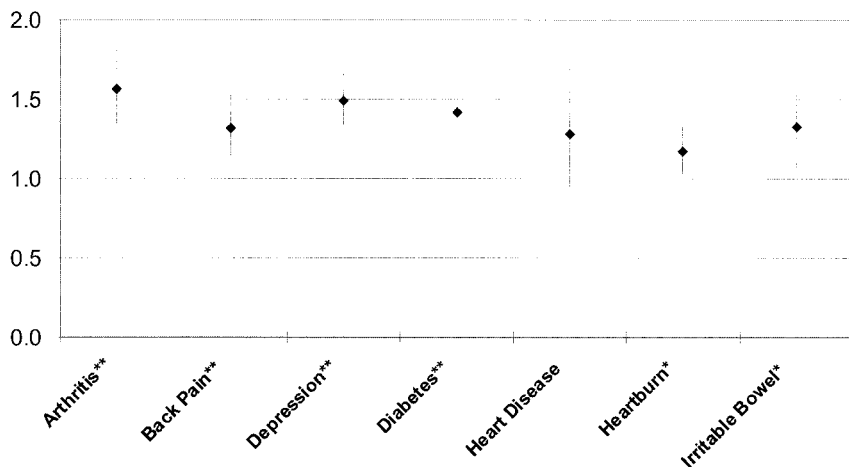


Fig. 3. Odds of having any physical limitation by diseases.

sode. It may have been that this cohort had a lower threshold (in terms of effect on work) to leave the workplace and/or that a significant subset of employees existed who used short-term disability as a means to take leave for a personal crisis not associated with a well-established diagnosis of depression. Nevertheless, the distinct pattern of impairment reported by the depressed group in the current study has face validity in that these employees rate themselves as most impaired in the work domain of mental/interpersonal functioning (eg, concentration, teamwork).

In a parallel and expected<sup>27</sup> manner, those employees with active treatment or medication use for arthritis reported that the work domain most affected by their condition was physical—those tasks requiring repetitive hand motions and the manipulation of work equipment were reported as receiving the greatest negative impact. A similar limitation of diabetes on physical tasks is also understandable given previous research showing that the poor control of diabetes is not uncommon in a workforce<sup>28</sup> and that poorly controlled diabetes can result in problems with vision, peripheral neuropathy and an overall sense of well-being.<sup>29,30</sup>

With back pain, the pattern of odds across the four domains is interesting in its similarity to the profile seen with depression. Previous research has suggested a significant prevalence of comorbid depression for many back pain patients.<sup>31,32</sup> As with the employees suffering with depression, employees identifying themselves as back pain patients in this study reported that their disorder affected most the mental/interpersonal aspects of their job.

For the IBS group, the greatest independent risk of impairment was found in their ability to handle the time and general production demands of their jobs. Many (84%) respondents with IBS had other conditions, and depression was a frequent coexisting illness.<sup>33,34</sup> Thus,

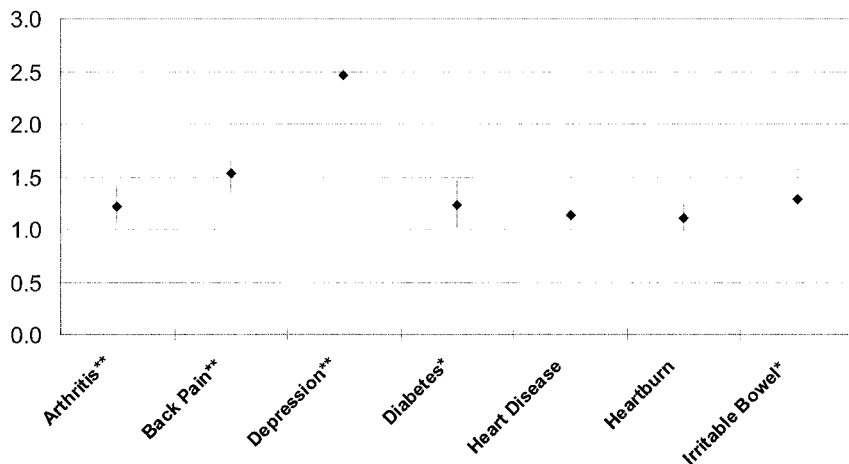


Fig. 4. Odds of having any mental/interpersonal limitation by diseases.

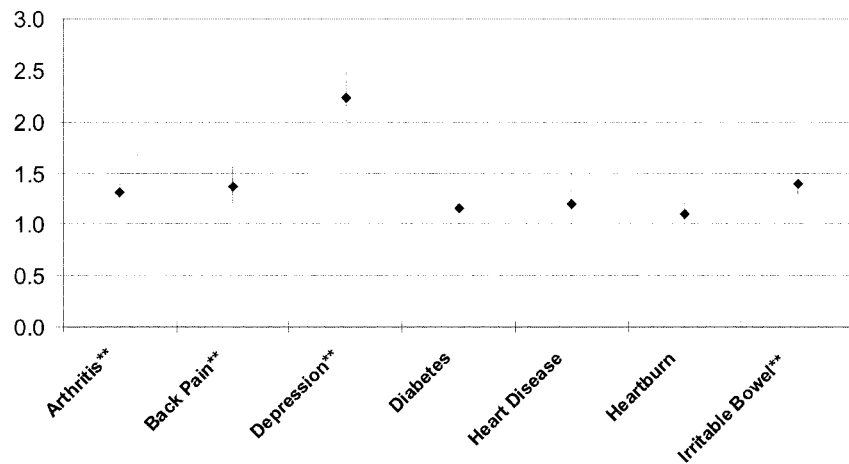


Fig. 5. Odds of having any output limitation by diseases.

although the results of this study demonstrate a limitations profile that appeared substantially different from the depressed group, the high rate of coexisting illness implies that odds ratios for both conditions should be considered in order to estimate the impact of IBS.

The absence of significant work limitations reported by those with allergies and asthma mentioned earlier is probably attributable to the time period in which the survey was conducted. Previous research conducted during the height of allergy season using objective productivity measures showed that allergy sufferers produced less when pollen levels

increased.<sup>35</sup> The timing of this survey took place before the start of the peak ragweed allergy season.

The absence of significant productivity impairment reported by those receiving treatment for cancer is surprising; particularly in light of the results published in the MIDUS study of work loss and work cutback in the chronically ill.<sup>16</sup> However, other previous research using an objective measure of employee productivity demonstrated a minimal impact of cancer on productivity.<sup>3</sup> In the MIDUS study, individuals suffering from cancer reported the greatest amount of productivity impairment. However, the current study was con-

ducted with active employees as opposed to the mix of employees, homemakers, and other occupational statuses (mostly unemployed) in the MIDUS study, which did find significantly less reported impairment among the employed.

As with the MIDUS study, however, there was clear “dose-response relationship” between the number of conditions and the probability of any work impairment. Forty-four percent of those who reported having no chronic medical conditions for which they were being treated reported a work limitation while 76% of those who reported 6 or more medical conditions reported experiencing a work limitation (data not shown).

Cautions must be expressed concerning the interpretation of study results. The cognitive bias toward unrealistically poor self-appraisal in depressives has already been mentioned. Additionally, self-report (and in this particular study a non-anonymous self-report) is subject to intentional and unintentional bias. Recall of performance over even a two-week period is subject to inaccuracy and may be influenced by the current mood of the respondent. Moreover, fear of stigma may operate to decrease the truthful report of medical conditions while inflating self-reports of productivity.

Nonetheless, the current study has several unique strengths. The large numbers of respondents and variations in patterns of coexisting conditions provided an opportunity to construct robust models that effectively isolated condition-specific effects. In contrast to previous studies<sup>15</sup> that attempted to compare across conditions, this investigation relies upon self-report to establish diagnosis, rather than inferences based on medical billing data, where those with multiple conditions may be mistakenly assigned to having only one condition.

These results illustrate that different medical conditions are associated with different amounts and patterns of work limitations. While depres-

sion may seriously interfere with a worker's ability to meet mental and interpersonal job demands, pain syndromes such as arthritis interfere with the physical demands present even in jobs not seen as traditionally "blue-collar." Thus, a more proactive ergonomics approach for employees with arthritis may be indicated, even in jobs with relatively low levels of physical effort. Chronic illnesses that are not ordinarily considered to have a strong mental or emotional component, such as back pain, may indeed be well served by psychological interventions aimed at improving coping strategies.

Planning for interventions or the allotment of scarce benefit resources should take into account the nature of the work and the workforce, the prevalence of specific conditions, and the relationship of limitation patterns to work requirements. Further research linking these measures to objective performance data will be necessary to monetize these self-reported decrements in performance. Although many would prefer more concrete and objective measures of employee productivity, it should be noted that the inherent difficulties in building objective measures that span different jobs is not easily addressed. Therefore self-report will continue to provide information that cannot be obtained in any other way.

In conclusion, this study demonstrates an association between employees' medical conditions and a self-reported, negative impact on their productivity while on the job (presenteeism). The robust sample size in this study allowed comparisons across medical conditions and four different work domains demonstrating that differing patterns of work decrement result from different medical conditions.

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