Health, Absence, Disability, and Presenteeism Cost Estimates of Certain Physical and Mental Health Conditions Affecting U.S. Employers

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Evidence about the total cost of health, absence, short-term disability, and productivity losses was synthesized for 10 health conditions. Cost estimates from a large medical/absence database were combined with findings from several published productivity surveys. Ranges of condition prevalence and associated absenteeism and presenteeism (on-the-job-productivity) losses were used to estimate condition-related costs. Based on average impairment and prevalence estimates, the overall economic burden of illness was highest for hypertension ($392 per eligible employee per year), heart disease ($368), depression and other mental illnesses ($348), and arthritis ($327). Presenteeism costs were higher than medical costs in most cases, and represented 18% to 60% of all costs for the 10 conditions. Caution is advised when interpreting any particular source of data, and the need for standardization in future research is noted. (J Occup Environ Med. *2004;46: 398–412*)

Business leaders are becoming increasingly aware of the productivity-related cost burden imposed by certain health and disease conditions, manifested by employee absence and on-the-job productivity losses.[1–4] Several investigators have developed innovative methods to quantify productivity losses and to translate those losses into dollar terms for specific health and disease categories[5–12] or across multiple health conditions.[13,14] The tools used in such studies, and the results obtained, vary significantly from 1 researcher to another. As Sennett has noted, "Productivity is particularly difficult to calculate, due in part to the lack of standard metrics."[15] Nonetheless, there is growing interest on the part of employers and insurers to generate estimates of productivity decrements related to common health and disease conditions found in the workplace. (See, for example, the effort by the Washington Business Group on Health [WBGH] and the Integrated Benefits Institute [IBI] to establish standard metrics for the Council on Employee Health and Productivity, web address: http://www.wbgh.org [date of most recent access: 8/03]).

This article compiles data from various approaches to measuring productivity losses in the workplace related to certain prevalent and costly health conditions. Using a standard yardstick that quantifies absence and on-the-job productivity loss, we examine various studies that attempt to quantify productivity im-

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pacts associated with multiple health conditions common to employees. We then comment about the state of knowledge in the field of productivity assessments and implications for occupational medicine professionals.

Background

Previous research identified the top10 most costly physical and mental health conditions for which direct medical expenditures were highest for U.S. employers.[16] That research has been used by employers to identify health and disease conditions that account for a large portion of an organization's medical cost burden. More recently, administrative data comprising absenteeism records and short-term disability claims have been linked to the medical experience of employees for some large employers to improve estimates of the financial consequences of the top10 most costly and prevalent conditions.[14] In both studies, cardiovascular disease, musculoskeletal disorders, ear, nose and throat conditions, hypertension, diabetes, and depression-related illness were found to be costly conditions affecting employers.

Armed with this information, employers could develop or implement targeted health and disease management programs with the aim of improving health and saving money for their organizations. There is some evidence that well-designed and properly implemented health and disease management programs can improve the quality of health care delivered to workers, improve their day-to-day functioning, and lower their health risks.[17,18] In addition, there is a growing body of evidence indicating that well-designed and well-implemented programs have the potential to save money and produce a positive return on investment.[19,20]

In documenting the cost burden of health and disease conditions, research has progressed through several stages. Early studies examined inpatient and outpatient insurance claims.[16] However, several investigators have noted that medical costs represent only a portion of total expenditures. For example, Goetzel et al. found that medical costs accounted for less than half of the total health- and productivity-related expenditures that employers face.[21] Their estimate was based on an analysis of several broad health and productivity benefit programs, including those directed at health insurance, short-term disability, workers' compensation, incidental absence, and employee turnover.

In a more recent, focused, and in-depth analysis of medical, pharmacy, absence, and disability data by Goetzel and colleagues,[14] the authors concluded that employee absence and disability associated with certain health and disease conditions constituted 29% of the health- and productivity-related expenditures for particular physical health conditions and 47% of the expenditures for mental health conditions. This study did not include other categories such as workers' compensation, turnover, and other human resource expenditures. Independently, others have investigated on-the-job productivity losses, or "presenteeism," another missing piece in the Goetzel et al. analyses, but thus far, these studies have not been aggregated using common metrics.

Finally, no studies have attempted to combine information from administrative claims databases and self-report measures of presenteeism into a cohesive view of the total and component-based cost burden of certain physical and mental illness conditions. This information would be useful to employers, because it would allow them to better coordinate services overseen by various human resource and benefit program managers (eg, those in charge of group health benefits, absence management, short-term disability, occupational medicine, health promotion, employee assistance, prescription drug management, behavioral health, and so on). Also, such information would help employers evaluate whether health and disease management programs are likely to achieve a positive financial impact when considering their multiple expenditure components. Consequently, more accurate return-on-investment calculations could be generated.

This study compares and contrasts the different estimates of absence and presenteeism costs imposed by certain disease conditions. The analysis combines data from administrative records of medical treatment (ie, inpatient and outpatient medical records and drug claims), administrative data related to employee absence and disability, and estimates of absence and presenteeism losses obtained from a variety of self-report instruments and surveys. Because very few employers currently collect and combine individual-level health and productivity data (with notable exception of such companies as Dow Chemical and Bank One), an approach that integrates multiple estimates of productivity losses for several common disease conditions was developed. Methods and results are described subsequently.

Data Sources

Health and Productivity Management Administrative Claims Database

The Medstat MarketScan Health and Productivity Management (HPM) database was used to generate metrics from administrative claims for this study. The HPM database contains person-level information on 374,799 employees over the 3-year period from 1997 to 1999. It includes information about benefit plan enrollment, inpatient and outpatient healthcare services, pharmaceutical claims, absence records, and short-term disability (STD) claims for workers at 6 large corporations with locations in 43 states. A more complete description of the database is provided in Goetzel et al.[14]

The HPM database was used to identify high-prevalence and high-cost physical and mental health conditions affecting large U.S. em-

ployers, considering medical, pharmaceutical, absence, and disability expenses associated with these conditions.[14] The top 10 physical health conditions identified were: 1) angina pectoris, chronic maintenance; 2) essential hypertension; 3) diabetes mellitus; 4) mechanical low back pain; 5) acute myocardial infarction; 6) chronic obstructive pulmonary disease; 7) back disorders not specified as low back; 8) trauma to spine and spinal cord; 9) sinusitis; and 10) diseases of the ear, nose and throat or mastoid process, not elsewhere classified.

Similarly, the top 10 mental health conditions identified were: 1) bipolar disorder, chronic maintenance; 2) depression; 3) depressive episode in bipolar disease; 4) neurotic, personality and nonpsychotic disorders; 5) alcoholism; 6) anxiety disorders; 7) schizophrenia, acute phase; 8) bipolar disorders, severe mania; 9) nonspecific neurotic, personality and nonpsychotic disorders; and 10) psychoses.

To enlarge the number and variety of conditions examined, the top 20 physical health conditions were also examined and then combined into composite health conditions that included several subcategories of disease. These combined conditions included cardiovascular disease; musculoskeletal disorders; arthritis; ear, nose and throat conditions; cancers; and depression-related mental health conditions.

Survey-Based Estimates of Absenteeism and Presenteeism Losses

Recently, there have been several independent efforts to quantify on-the-job productivity losses resulting from poor health.[22] For example, the Health Limitations Questionnaire (HLQ), developed at the Erasmus University Rotterdam Institute for Medical Technology, is designed to collect data on the relationship among illness, treatment, and work performance.[23] The 23-item instrument has been used on several study populations, including a representative sample of the general population, migraine patients, and patients with hip or knee problems.

The Work Limitations Questionnaire (WLQ), developed at the New England Medical Center, is a 25-item instrument that measures the impact of chronic health problems or treatment on job performance. An acute illness version of the instrument also is available. The WLQ questionnaire has undergone extensive validity and reliability testing.[24] The questionnaire has been implemented across a variety of conditions, including rheumatoid arthritis, headache, epilepsy, and osteoarthritis.[25]

The Work Productivity and Activity Impairment Questionnaire (WPAI) is a presenteeism instrument developed by Reilly Associates, in partnership with University of Texas Medical Branch at Galveston and Marion Merrell Dow.[26] Two versions of the WPAI exist; 1 covers general health and the other can address a specific health problem of interest. The 2 versions can be combined to capture the effect of both types of problems on work. The instrument has undergone predictive and concurrent validation, but little work has been done to show the construct validity of the instrument. A recent study examined productivity in reflux disorder patients using the specific health problem version of the WPAI.[27]

A common feature of these instruments is that they measure the general notion of productivity loss in the workplace as affected by health. They are designed to assess overall productivity losses related to health status or the effects of a particular health condition on productivity decrements. Recently, studies by Kessler et al.,[28] Stewart,[29] Borden et al.,[30] Goetzel et al.,[31] Ozminkowski et al.,[32] and Burton[33] have used large-scale survey methods to quantify financial losses related to several health conditions measured simultaneously.

We identified 5 examples of large-scale presenteeism studies performed by the previously mentioned investigators in which surveys were administered to employee populations and in which estimates for absence and presenteeism losses were derived for multiple health and diseases conditions, not just 1. The rationale for only considering studies that asked about multiple health and disease conditions was that we were interested in conducting side-by-side comparisons of these conditions. In principle, respondents could weigh their productivity loss estimates for any given health condition against any other condition simultaneously, thus providing a more complete assessment of the relative losses associated for any given condition.

The 5 multicondition studies included in the analysis are described subsequently.

The Employer Health Coalition of Tampa, Florida, Healthy People/Productive Community Survey

The Employer Health Coalition (EHC) administered the Healthy People/Productive Community Survey in 1998 and 1999 to employees of 8 large employer members of the coalition (a ninth company joined in 1999).[30] (This analysis focuses on the 1999 results.) In 1998, 10 health conditions were selected for the study based on their high prevalence and cost as determined by the employer participants. In 1999, 7 additional health conditions were included in the survey. The conditions of interest included: allergy, arthritis, asthma, breast cancer, colon cancer, depression, diabetes, heart disease, hepatitis, high-risk pregnancy/cesarean section, hypertension, lower back pain/sciatica, migraine, neck/upper back/spine conditions, other respiratory conditions, peptic ulcer/acid reflux disease, and prostate cancer.

The survey was administered by mail to employees in 2 waves. The first wave included a general health

and productivity questionnaire containing approximately 200 items. The second wave of questionnaires was sent to individuals to inquire about specific conditions. In the report prepared by EHC, the researchers report mailing 23,389 employee packets, of which 22,772 were delivered. Of those delivered, 6003 were returned, yielding a response rate of 26%. In wave 2, 3910 surveys were completed out of 13,056 surveys mailed and delivered, yielding a 28% response rte.

Key questions on the surveys that are relevant to the current study include a dichotomous screening question asking whether the respondent experienced a given condition within the previous month (operationally defined as the previous 20 workdays), whether the respondent was absent from work because of the condition, and, if so, for how many days, and how much time was lost as a result of impairment at work (presenteeism) because of the condition. Work impairment was measured using a Likert scale for questions relating to interpersonal communication, work quality, and overall productivity. Information on the reliability and validity of this survey is provided in Loeppke et al.[34]; evidence of reliability was noted as moderate, and validity has been assessed (but not published in much detail) for several diseases.

The American Productivity Audit

AdvancePCS administered a 15-minute telephone survey over a 10-month period to more than 25,000 randomly selected U.S. workers and a random subsample of those who were not working for pay.[29] The American Productivity Audit (APA) survey was designed to measure lost productive time related to the following health conditions: allergies, asthma/skin allergies, cold/flu, dental problems, fatigue, gastrointestinal problems, headache/pain, menstrual pain, prescription drug side effects, and feeling sad/blue.[35] The recall period for the survey was 2 weeks when asking about the prevalence of any given condition and 1 week when asking about absence and presenteeism losses. Additionally, the survey asked about presenteeism losses on any given day when the individual was affected by the condition of interest.

Specifically, the survey consisted of various modules. A job visualization module asked about the tasks and activities performed at work. A lost productive time module captured information about the number of full days missed from work in the past two weeks and whether the missed days were the result of a medical condition. Absence was also recorded for late starts at work, early departure, or missing time during the middle of the workday. Additionally, questions were asked about the number of days when the employee was at work but not feeling well, missed hours at work, and how performance was reduced because of health problems. Performance decrements included losing concentration, repeating a job, working more slowly than usual, feeling fatigued, or generally "doing nothing." Participants were asked to rate their performance on a scale that quantified presenteeism as follows: all the time (100%), most of the time (75%), half of the time (50%), some of the time (25%), and none of the time (0%).

The McArthur Foundation Midlife Development in the United States Survey

The research team headed by Dr Ron Kessler at Harvard University administered the McArthur Foundation Midlife Development in the United States (MIDUS) presenteeism instrument to 2074 adults, aged 25 to 54.[28] The survey focused on work impairment related to several commonly occurring chronic conditions: arthritis, asthma, autoimmune disease, cancer, diabetes, general anxiety disorder, heart disease, hypertension, major depression, panic, substance dependence, and ulcer. The survey asked about condition-related absenteeism from work (work-loss days) and presenteeism (work cutback days) defined as being half as productive as on a normal workday. The recall period for the survey was the previous month, or 20 workdays.

The survey first inquired about 12-month prevalence of the previously listed conditions (ie, "in the past 12 months have you experienced or been treated for any of the following?"). Questions were then asked about work-loss days and work cutback days (ie, how many days were you . . . totally unable to work, cutback on your work, or unable to carry out normal household work activities because of physical health or mental health problems?). Information on work loss and work cutback was combined to form a summary work impairment measure in which work cutback was counted as half a lost workday. (Unfortunately, because of the way data were collected and reported by the investigators, productivity losses associated with absenteeism and STD could not be distinguished from on-the-job losses, or presenteeism.)

A current version of the MIDUS survey is named the Health and Performance Questionnaire (HPQ) and is described in a recent review of health and productivity measures by Loeppke et al.[34] Work performance impairment is measured on a Likert scale along the following dimensions: workload, health problems, and actual performance. Loeppke et al. classify the evidence of reliability for the HPQ as "moderate." Recent validation of the instrument produced strong correlations between self-reported absences and actual absences. Furthermore, poor scores on global questions about ability to perform one's job were significantly correlated with business performance scores, including supervisor ratings, 360 evaluations, and call center worker performance.[36]

The Bank One Worker Productivity Index

Bank One recorded absence, STD, and presenteeism data for telephone customer service operator employees at its Elgin, Illinois, location in 1995.[33] Absence and disability records were used to measure actual time away from work. On-the-job productivity losses were calculated based on an electronic time-keeping system that measured the time spent away from the employee's workstation. Of the 1039 employees at the site, 564 completed a health risk appraisal (HRA) instrument that recorded feelings of distress and risks for diabetes, hypertension, high cholesterol, and being overweight. Absence and disability records were used to record the presence of certain disease states, including mental illness problems, respiratory disease, digestive disorders, musculoskeletal problems, and cancer. Absence, STD, and presenteeism losses were recorded over a 1-week period. The data collected using multiple methods were combined into a standard measure referred to as the Work Productivity Index (WPI).

The WPI composite measure was based on time away from work because of illness and STD absence, as well as time lost because of an employee's failure to maintain productivity standards established by the Bank, referred to by the authors as a presenteeism measure. The methods used to create the presenteeism component of the WPI index were described in detail by Burton et al.[33] In short, presenteeism was based on call center operators' ability to provide correct information to customers with good interpersonal skills. In addition, time spent servicing customers was tracked by a computerized system linked to the customer service employees' workstations, which recorded time "logged off" or time spent putting customers on hold. What distinguishes the presenteeism assessment as measured by the WPI is that administrative and computerized records were used to record productivity losses rather than relying on individual self-report.

The Work Productivity Short Inventory

The Work Productivity Short Inventory (WPSI) was developed to estimate decrements in employee productivity associated with 15 common disease conditions.[31] Eleven of these conditions pertain directly to employees, and 4 pertain to caregiving provided by employees to their spouses, dependents, or elders. The 11 employee-specific conditions include allergies, respiratory infections, arthritis, asthma, anxiety disorder, depression and bipolar disorder, stress, diabetes, hypertension, migraine and other major headaches, and coronary heart disease/high cholesterol. The 4 conditions pertaining to the care of spouses, elders, or dependents include Alzheimer's disease; and pediatric allergies, otitis media, and respiratory infections.

Three versions of the WPSI were developed that differed according to the length of the recall period (12 months, 3 months, or 2 weeks). Reliability and content, predictive, and construct validity metrics generated from the WPSI were assessed to estimate the degree to which the WPSI can meet its intended purpose.[32] The instrument was designed to measure the absence or presence of certain disease conditions, absence associated with those conditions, and presenteeism losses experienced when suffering from the conditions. In addition to asking respondents to note basic demographic information, the WPSI asks respondents to note their perceived health status and the amount of absenteeism resulting from 15 medical conditions (in days). It also asks about the amount of unproductive time (in hours) spent at work when affected by these conditions (ie, presenteeism).

What distinguishes the WPSI from some of the other instruments described here is that it compels the respondent to make a finite calculation of days and hours when a given condition affected the respondent's time away from work or their productivity at the workstation. The construction of the WPSI allows for the possibility that an individual could suffer from a given condition but have no absenteeism or presenteeism problems associated with that condition. Thus, by design, a more conservative assessment of productivity losses could be ascertained using this instrument when compared with instruments that assume that, when an individual reports having a given health condition, all absence and presenteeism losses would occur as a result of that condition.

The data used for this analysis were generated from a March 2003 administration of the WPSI survey to employees from a regional office of a large telecommunications company (n = 619).

Methods

The HPM database[14] provided the initial list of prevalent and costly conditions considered for this study. As noted previously, we identified physical and mental illnesses that were prevalent and costly for employers, using that database. We then examined the results of multicondition surveys performed by investigators using the instruments described here. Some of the surveys reported results in the form of days absent from work or hours lost as a result of presenteeism during the recall period, whereas others presented findings in terms of the percent of time absent or impaired. In some cases, productivity losses were reported for only those individuals experiencing a given condition, whereas in other cases, the data were presented across all persons surveyed. To deal with variations found in survey and reporting methods, we developed standard metrics to compare absenteeism and presenteeism rates across instruments. As shown subsequently, we calculated the absenteeism and presenteeism losses as the percent of

eligible work time available per year among all employees in the survey.

The formula used for the standard absenteeism metric was:

$$\left(\frac{\bar{x}_{absdaysw/condition} * N_{condition}}{n*240}\right)*100$$

where:

$\bar{x}_{absdaysw/condition}$ = mean absence days per year per person among those affected by the condition

$N_{condition}$ = number of persons reporting being affected by the condition

n = total sample size queried

240 = total days eligible to work per year

The formula for the presenteeism metric was:

$$\left(\frac{\left[\frac{\bar{x}_{imphoursduetocondition} * N_{condition}}{8}\right] * \bar{y}_{daysw/condition}}{n*240}\right)*100$$

where:

$\bar{x}_{imphoursduetocondition}$ = mean hours per day per person impaired by the condition

$N_{condition}$ = number of persons reporting being affected by the condition

8 = total hours worked per day

$\bar{y}_{daysw/condition}$ = mean days per year per person affected by the condition (from WPSI survey)

n = total sample size queried

240 = total days eligible to work per year

It should be noted that a year was used as a reference point because most employers analyze their health and productivity data within an annual time framework.

Health and disease conditions that were common across 2 or more of the surveys were selected for analysis. In some cases, related diseases were combined into one category. For example, the EHC, MIDUS, WPI, and WPSI surveys asked about depression and/or bipolar disorder, whereas the APA inquired about the extent to which employees experienced feelings of being sad or blue. Thus, we combined these conditions together into a category called depression/sadness/mental illness. (The term mental illness was used by Burton et al., although very few employees fell into that broad category in their analysis; most reported being depressed.) Similarly, cold/flu and respiratory conditions were combined into a single category; and different types of cancer were aggregated into an "any cancer" category.

Our analysis focused on a top 10 list of conditions that were common across surveys and highlighted in Goetzel et al.'s[14] analysis of administrative claims. The top 10 conditions common across surveys were: 1) allergy, 2) arthritis, 3) asthma, 4) any cancer, 5) depression/sadness, 6) diabetes, 7) heart disease, 8) hypertension, 9) migraine/headache, and 10) respiratory infections.

After converting all of the absenteeism and presenteeism rates for these diseases into standard percentage metrics, the average, low, and high values were examined. Differences between the low and high rates were categorized as being high (greater than 20% points), medium (between 11% and 19% points), and low (10 or fewer percentage points). Condition prevalence estimates were also compared across the data sources, using this same classification system. In addition, we considered prevalence rates of the target conditions for adults aged18 and above from the National Health Interview Survey (NHIS) conducted by the National Center for Health Statistics. The NHIS is a general survey of health status among Americans, whether employed or not.[37]

To monetize the absenteeism and presenteeism rates, we multiplied number of unproductive hours by $23.15, which represents the year-2001 average hourly wages and benefits for all U.S. companies, as reported by the Bureau of Labor Statistics.[38]

Next, we added the direct medical costs for the 10 diseases to the indirect (absenteeism and STD) cost information, all of which were derived from the HPM analyses described previously. These were then added to the costs associated with presenteeism that were obtained by manipulating the results from the published presenteeism survey analyses described previously. The result was an estimate of the total economic burden associated with certain physical and mental illness conditions.

Two sets of numbers are presented in the *Results* section subsequently; 1 set is based on the average presenteeism cost estimates, and the other uses the lowest presenteeism cost estimates across the available survey instruments. The lower-bound condition-specific amounts present more conservative estimates of presenteeism losses. Both sets of numbers are reported in per-capita terms to provide payment figures that most employers and financial analysts would be familiar with. Thus, the medical, drug, and productivity dollar values were summed for all employees with each condition. Those dollars form the numerator for the per-capita figures. The denominator was cast as all employees covered by the health plan to make the numbers comparable across studies.

Total costs and a breakdown of the component-level (eg, inpatient, outpatient, pharmaceutical, absenteeism, STD, presenteeism) costs were also examined and reported subsequently.

Results

Table 1 presents the prevalence estimates for each selected condition as reported by the 5 surveys, as well as from the HPM and NHIS databases. Of the top 10 conditions examined in which more than 1 prevalence estimate was recorded, allergy and migraine/headache conditions were found to be most prevalent, with average values of 25.8% and 25.6%, respectively. However, we found relatively high variability

TABLE 1
Comparison of Condition Prevalence Rates Across Studies and Databases

Condition	EHC	APA	MIDUS	WPI	WPSI	HPM Database	NHIS	Average	Low	High	Range	Measures	Range (0–10 = low, 11–19 = med, 20+ = hi)
Allergy	25.8%	27.5%			41.0%		9.0%	25.8%	9.0%	41.0%	32.0%	4	Hi
Arthritis	15.4%		12.6%		10.5%	3.5%	20.0%	12.4%	3.5%	20.0%	16.5%	5	Med
Asthma	4.2%	11.0%	14.6%		8.7%	2.4%	9.0%	8.3%	2.4%	14.6%	12.2%	6	Med
Autoimmune disease			4.3%					4.3%	4.3%	4.3%	0.0%	1	N/A
Any cancer	2.0%		0.5%	0.6%		0.8%	6.2%	2.0%	0.5%	6.2%	5.7%	5	Low
Breast cancer	0.9%						0.1%	0.5%	0.1%	0.9%	0.8%	2	Low
Colon cancer	0.4%							0.4%	0.4%	0.4%	0.0%	1	N/A
Dental problems		9.0%						9.0%	9.0%	9.0%	0.0%	1	N/A
Depression/sadness mental illness	10.3%	26.5%	16.5%		17.4%	4.9%	3.4%	13.2%	3.4%	26.5%	23.1%	6	Hi
Diabetes	5.0%		3.7%	2.7%	2.1%	4.9%	5.3%	3.9%	2.7%	5.3%	2.6%	6	Low
Gastrointestinal/digestive				1.3%				1.3%	1.3%	1.3%	0.0%	1	N/A
General anxiety dis.			4.0%		13.6%			8.8%	4.0%	13.6%	9.6%	2	Low
Heart disease	3.8%		3.4%		2.0%	16.9%	5.9%	6.4%	2.0%	16.9%	14.9%	5	Med
Hepatitis	1.1%							1.1%	1.1%	1.1%	0.0%	1	N/A
High cholesterol				4.6%				4.6%	4.6%	4.6%	0.0%	1	N/A
High risk pregnancy	2.8%							2.8%	2.8%	2.8%	0.0%	1	N/A
Hypertension	17.2%		12.4%	8.5%	4.8%	12.4%	19.0%	12.4%	8.5%	19.0%	10.5%	6	Med
Menstrual problems		23.7%						23.7%	23.7%	23.7%	0.0%	1	N/A
Migraine/headache	7.9%	51.7%			27.0%		15.7%	25.6%	7.9%	51.7%	43.8%	4	Hi
Muskuloskeletal, neck, back, spine	36.5%			1.2%		20.1%		19.3%	1.2%	36.5%	35.3%	3	Hi
Obesity				29.8%				29.8%	29.8%	29.8%	0.0%	1	N/A
Respiratory disorders (except asthma)	7.8%	6.1%		1.3%	16.5%	22.6%		10.9%	1.3%	22.6%	21.3%	5	Hi

across the survey instruments in the reported condition prevalence rates. For example, the prevalence estimates for allergies ranged from a low of 9% reported in the NHIS to a high of 41% in the WPSI surveyed population. Only prevalence estimates for all cancers (average 2.0%) and diabetes (average 3.9%) were considered somewhat stable across survey tools, with less than a 10 percentage-point difference between the highest and lowest prevalence estimates for these conditions. Seasonal or cyclical conditions (eg, allergies, depression, migraine headaches, and respiratory disorders) tended to have the highest variability in prevalence estimates.

Using our standardized metric of percent of work time lost, condition-specific absenteeism rates for the top 10 conditions are summarized in Table 2 for employees who reported having these conditions. In contrast to the prevalence estimates, there was less variability across surveys with regard to reported absenteeism. Although the APA survey reported rates of absenteeism consistently higher than those observed in most of the other surveys, rates within the conditions among the other surveys, as well as the findings from Medstat's HPM administrative database, were relatively consistent. An exception, however, was the depression/sadness/mental illness category. In this disease category, absence rates ranged from 0.9% of available workdays (2.2 days/year) in the WPSI survey to 23.7% of available workdays (56.9 days) in the Bank One WPI study.

Next, we examined findings on presenteeism for individuals with any given condition, a key measure of interest for this analysis (Table 3). In most cases, estimates of presenteeism were available from 3 or more survey tools for each of the selected conditions. After standardizing the estimates of presenteeism from days or hours of impairment during the study observation windows across the instruments to the common metric of percent of daily work time impaired, we found the rates of reported presenteeism within each disease area were relatively similar across the survey tools for most conditions. One exception was migraine headache, in which the range of presenteeism loss was between 8.3% and 28.5%. The APA mean presenteeism loss was reported as 8.3% and the WPSI and EHC reported rates of 24.8% and 28.5%, respectively. Patients with migraine/headache, respiratory disorders, and depression/sadness/mental illness reported the largest presenteeism losses of the 10 conditions examined in this analysis.

Figure 1 summarizes the estimated per-employee-per-year presenteeism cost estimate for each of the 10 targeted conditions. The costs were calculated assuming an average annual salary and benefits of $44,448

TABLE 2A
Comparison of Top 10 Conditions—Pct Productivity Losses Due to Absence and/or STD Per Employee Per Year—For Employees Who Have the Condition Over a Multi-day or Multi-week Period

Condition	EHC	APA	MIDUS	WPI	HPM Database	WPSI	Average	Low	High	Range	Range (0–10 = low, 11–19 = med, 20+ = hi)
Allergy	1.0%	9.0%	N/A	N/A	N/A	0.3%	3.4%	0.3%	9.0%	8.7%	Low
Arthritis	1.0%	N/A	N/A	N/A	5.7%	0.7%	2.5%	0.7%	5.7%	5.0%	Low
Asthma	1.0%	17.5%	N/A	N/A	1.1%	0.4%	5.0%	0.4%	17.5%	17.1%	Med
Any cancer	2.5%	N/A	N/A	14.6%	4.0%	N/A	7.0%	2.5%	14.6%	12.1%	Med
Depression/sadness/mental illness	2.0%	15.0%	N/A	23.7%	11.7%	0.9%	10.7%	0.9%	23.7%	22.8%	Hi
Diabetes	0.5%	N/A	N/A	1.1%	1.2%	0.5%	0.8%	0.5%	1.2%	0.7%	Low
Heart disease	0.5%	N/A	N/A	N/A	7.4%	0.6%	2.8%	0.5%	7.4%	6.9%	Low
Hypertension	0.0%	N/A	N/A	0.4%	0.9%	0.3%	0.4%	0.0%	0.9%	0.9%	Low
Migraine/headache	1.5%	11.0%	N/A	N/A	N/A	0.9%	4.5%	0.9%	11.0%	10.1%	Low
Respiratory disorders	2.5%	17.5%	N/A	8.5%	1.0%	1.2%	6.1%	1.0%	17.5%	16.5%	Med
Average Loss	1.3%	14.0%	N/A	9.7%	4.1%	0.6%	4.3%	0.8%	10.8%	10.1%	Low

TABLE 2B

Condition	Average Days/yr Absent (avg. loss * 240 days)	Average Annual Dollar Impact (Days * $185.20)	Low Days/yr Absent (low loss * 240 days)	Low Annual Dollar Impact (Days * $185.20)	High Days/yr Absent (high loss * 240 days)	High Annual Dollar Impact (Days * $185.20)
Allergy	8.2	$1,521	0.6	$ 118	21.6	$ 4,000
Arthritis	5.9	$1,089	1.6	$ 293	13.7	$ 2,530
Asthma	12.0	$2,221	1.0	$ 189	42.0	$ 7,778
Any cancer	16.9	$3,133	6.0	$1,111	35.0	$ 6,489
Depression/sadness/mental illness	25.6	$4,741	2.2	$ 413	56.9	$10,534
Diabetes	2.0	$ 365	1.2	$ 222	2.8	$ 519
Heart disease	6.8	$1,257	1.2	$ 222	17.8	$ 3,301
Hypertension	0.9	$ 170	0.0	$ –	2.1	$ 380
Migraine/headache	10.7	$1,988	2.2	$ 409	26.4	$ 4,889
Respiratory disorders	14.7	$2,727	2.4	$ 440	42.0	$ 7,778
Average Loss	10.4	$1,921	1.8	$ 342	26.0	$ 4,820

TABLE 3A
Comparison of Top 10 Conditions—Pct Productivity Losses Due to Presenteeism Per Employee Per Year—For Employees Who Have the Condition Over a Multi-day or Multi-week Period

Condition	EHC	APQA	MIDUS	WPI	HPM Database	WPSI	Average	Low	High	Range
Allergy	14.5%	8.3%	N/A	N/A	N/A	9.8%	10.9%	8.3%	14.5%	6.2%
Arthritis	16.0%	N/A	N/A	N/A	N/A	6.3%	11.2%	6.3%	16.0%	9.7%
Asthma	14.0%	11.0%	N/A	N/A	N/A	7.9%	11.0%	7.9%	14.0%	6.1%
Any cancer	15.0%	N/A	N/A	1.9%	N/A	N/A	8.5%	1.9%	15.0%	13.1%
Depression/sadness/mental illness	24.5%	11.5%	N/A	9.3%	N/A	16.0%	15.3%	9.3%	24.5%	15.2%
Diabetes	10.5%	N/A	N/A	21.8%	N/A	1.9%	11.4%	1.9%	21.8%	19.9%
Heart disease	13.5%	N/A	N/A	N/A	N/A	0.0%	6.8%	0.0%	13.5%	13.5%
Hypertension	0.6%	N/A	N/A	9.8%	N/A	10.4%	6.9%	0.6%	10.4%	9.8%
Migraine/headache	28.5%	8.3%	N/A	N/A	N/A	24.8%	20.5%	8.3%	28.5%	20.2%
Respiratory disorders	20.5%	12.9%	N/A	14.6%	N/A	20.7%	17.2%	12.9%	20.7%	7.8%
Average Loss	15.8%	10.4%	N/A	11.5%	N/A	10.9%	12.0%	5.7%	17.9%	12.1%

(based on $23.15/hour for wages and benefits and 1920 available work hours per year per person). Figure 1 is also based on the average condition prevalence rates presented in Table 1 and the average presenteeism impairment rates (using our standardized metric) presented in Table 3. Of the 10 selected conditions, 4 conditions had annual per-employee presenteeism costs greater than $200 per year: arthritis (approximately

TABLE 3B

Condition	Range (0–10 = low, 11–19 = med, 20+ = hi)	Avg hours lost per day (assuming 8 hr day)	Average Daily Dollar Impact (Pct Prod Loss * 8 hrs * $23.15)	Low hours lost per day (assuming 8 hr day)	Low Daily Dollar Impact (Pct Prod Loss * 8 hrs * $23.15)	High hours lost per day (assuming 8 hr day)	High Daily Dollar Impact (Pct Prod Loss * 8 hrs * $23.15)
Allergy	Low	0.9	$20	0.7	$15	1.2	$27
Arthritis	Low	0.9	$21	0.5	$12	1.3	$30
Asthma	Low	0.9	$20	0.6	$15	1.1	$26
Any Cancer	Med	0.7	$16	0.2	$ 4	1.2	$28
Depression/sadness/ mental illness	Med	1.2	$28	0.7	$17	2.0	$45
Diabetes	Med	0.9	$21	0.2	$ 4	1.7	$40
Heart disease	Med	0.5	$13	0.0	$ –	1.1	$25
Hypertension	Low	0.6	$13	0.0	$ 1	0.8	$19
Migraine/headache	Hi	1.6	$38	0.7	$15	2.3	$53
Respiratory disorders	Low	1.4	$32	1.0	$24	1.7	$38
Average Loss	Med	1.0	$22	0.5	$11	1.4	$33

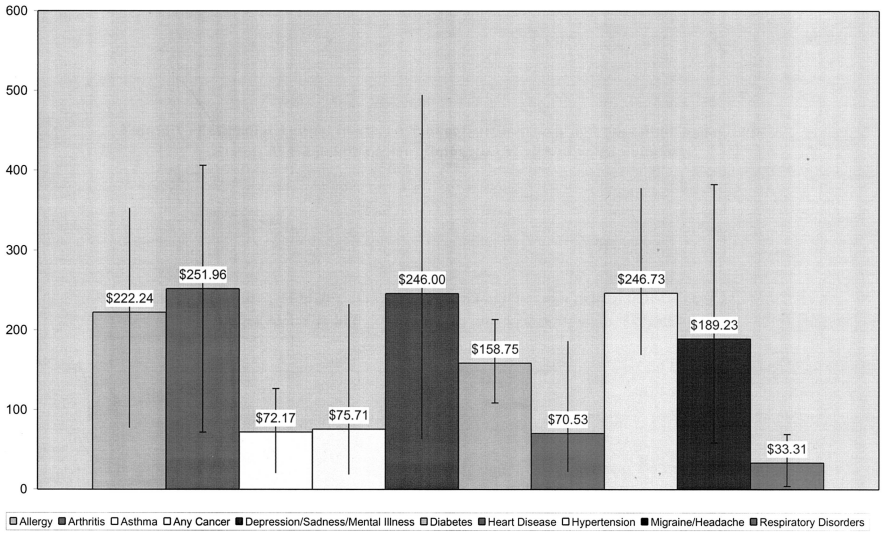

Fig. 1. Estimated annual costs* of presenteeism in overall population, by condition (using average impairment rates and $23.15/hr wage estimate). (*Ranges are presented based on highest and lowest prevalence rates found across survey instruments.)

$252), hypertension ($247), depression/sadness/mental illness ($246), and allergy ($222). Asthma, any cancer, heart disease, and respiratory disorders were estimated to have the lowest annual presenteeism-related costs per employee per year.

Because of the considerable variation found in prevalence estimates across the various survey tools, Figure 1 also shows the ranges for each condition based on the highest and lowest reported prevalence estimates. Regardless of the prevalence estimate used, the conditions that continued to have the greatest impact on presenteeism costs were arthritis, hypertension, depression/sadness/mental illness, allergy, migraine/headache, and diabetes.

As a sensitivity analysis, presenteeism costs were also estimated for each condition using the lowest productivity impairment estimates reported across the survey tools. Arthritis, depression/sadness/mental illness, allergy, and migraine/headache remained as the most costly diseases with respect to presenteeism expenditures, although the cost per employee ranged from $0 per year for heart disease up to $170 per year as a result of allergies (Fig. 2).

The next step in our analysis was to estimate the annual cost burden per employee per year associated with each of the 10 conditions, by component (ie, inpatient, outpatient, absenteeism, STD, and presenteeism). The results are noted in Table 4 and are presented pictorially in Figure 3. Dollar estimates for inpatient, outpatient, prescription drug, absenteeism, and STD expenditures were derived from the HPM administrative claims database. Presenteeism monetary estimates originated from the analytic work described previously. Based on *average* impairment and prevalence estimates, the overall economic burden of illness was highest for chronic conditions such as hypertension (approximately $392 per employee per year), depression/sadness/mental illness ($348), heart disease ($368), and arthritis ($327). Across all 10 conditions, presenteeism represented the largest component and leading driver of overall costs—averaging 61% of the total costs (Table 4, bottom row).

Table 4 shows that presenteeism-related costs were most pronounced in patients with migraine/headache, allergies, and arthritis: 89%, 82%, and 77%, respectively, of the total costs for these conditions costs were

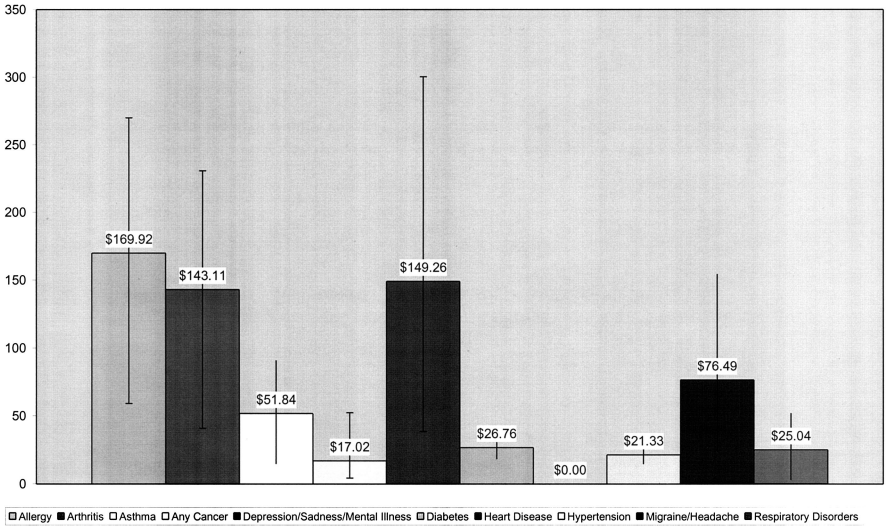

Fig. 2. Estimated annual costs* of presenteeism in overall population, by condition (using lowest reported impairment rates and $23.15/hour wage estimate). (*Ranges are presented based on highest and lowest prevalence rates found across survey instruments.)

attributable to presenteeism. On the other hand, presenteeism costs had the lowest effect on total costs attributable to heart disease (19%) and respiratory infections (25%).

A sensitivity analysis was conducted using the lower-bound productivity loss estimates reported in the 5 surveys, providing a more conservative estimate of the costs associated with presenteeism. The findings from this analysis are presented in the last column of Table 4. Using the lowest reported presenteeism estimates for each condition, we found that presenteeism accounted for 18% of total costs, with roughly half of migraine/headache and allergy costs resulting from presenteeism losses (49% and 55%, respectively).

Because the conditions considered in this analysis are typically chronic and managed primarily in the outpatient setting, we calculated the amount of outpatient prescription drug expenditures as a proportion of total medical and HPM dollars. As such, outpatient expenditures and related expenditures on prescription drugs are more significant for these conditions than for health care overall. Using the data reported in the last row of Table 4, we found that outpatient prescription drug spending ($20.26 on average) accounted for approximately 28% of total medical expenditures ($72.07 on average) but only approximately 8% of total HPM costs ($255.47 on average) for the conditions studied here.

Again manipulating the data in Table 4, one can see that, as a proportion of total medical expenditures, pharmaceuticals accounted for the majority of treatment costs associated with hypertension (ie, $60.08/$91.44, or 66%) and diabetes ($40.42/$74.75, or 54%). However, when average HPM costs were considered for that condition, prescription drug expenditures accounted for approximately 15% and 16% of the total, respectively. Even when lower-bound HPM expenditures were examined, prescription drugs accounted for approximately one third of diabetes and hypertension expenditures (35% and 37%, respectively).

Finally, Table 5 shows outpatient and prescription drug expenditures as the proportion of total medical dollars, and as a proportion of either average health and productivity management (HPM) dollars or as a proportion of HPM dollars when evaluated at their lower-bound. As shown, outpatient expenditures constituted approximately 40% of medical expenditures, 11% of average total HPM expenditures, and 24% of lower-bound HPM expenditures. Viewed in the same way, prescription drug expenditures represented approximately 28% of medical expenditures, 8% of average total HPM expenditures, and 17% of lower-bound HPM expenditures.

Discussion

Recent studies have shown that medical costs account for only a portion of the total health- and productivity-related expenditures that employers face.[14,16,21] The analyses described here yield productivity loss estimates for 10 conditions that commonly affect employees. These analyses combined information from administrative data sources (insurance claims relating to medical care, employee absenteeism, and STD payments), along with self-report data on presenteeism that were collected using a variety of methods. Similar work has not been done in the past, largely as a result of the difficulty in gathering the full range of data on direct and indirect costs across multiple conditions.

Aggregating medical, absence, STD, and average presenteeism costs, the conditions considered accounted for the following total expenditures, per eligible employee per year: 1) hypertension ($392), 2) heart disease ($368), 3) depression/sadness/mental illness ($348), 4) arthritis ($327), 5) allergy ($271), 6) diabetes ($257), 7) migraine, headaches ($214), 8) any cancer ($144), 9) respiratory disorders ($134), and 10) asthma ($100). Using lower-bound estimates of presenteeism costs, total expenses for all conditions except heart disease were less than $150. Heart disease was estimated to cost $298 per employee per year, using the lower-bound estimate of presenteeism costs.

Presenteeism losses represented 61% of total costs associated with the 10 selected conditions using average presenteeism estimates derived from the various instruments examined. Generally, presenteeism costs accounted for a greater portion of

TABLE 4A
Comparison of Top 10 Conditions—Estimate of Dollar Impact Due to Medical and Productivity Losses Per Employee Per Year—Across Entire Population (Not Just Those With Disease)

Condition	Inpatient	Outpatient	ER	Rx	Total Medical	Absence	STD	Total Absence STD
Allergy*	$ 0.70	$18.88	$0.64	$ 9.08	$ 29.29	$13.93	$ 5.58	$19.51
Arthritis	$ 19.69	$15.87	$0.25	$10.38	$ 46.20	$15.54	$13.19	$28.73
Asthma	$ 3.99	$11.43	$0.09	$ 3.30	$ 18.82	$ 2.13	$ 6.43	$ 8.56
Any cancer	$ 19.21	$38.04	$0.13	$ 4.01	$ 61.38	$ 4.46	$ 2.45	$ 6.91
Depression/sadness/mental illness	$ 7.61	$25.47	$0.15	$20.95	$ 54.19	$33.41	$14.44	$47.85
Diabetes	$ 7.31	$26.41	$0.62	$40.42	$ 74.75	$19.24	$ 4.17	$23.41
Heart disease	$152.75	$77.49	$3.77	$31.70	$265.71	$19.21	$12.88	$32.09
Hypertension	$ 4.33	$26.38	$0.65	$60.08	$ 91.44	$46.70	$ 7.45	$54.15
Migraine/headache	$ 1.22	$11.36	$1.53	$ 2.98	$ 17.08	$ 4.04	$ 3.43	$ 7.47
Respiratory infections	$ 1.35	$39.73	$1.09	$19.70	$ 61.86	$27.47	$11.20	$38.67
Average	$ 21.82	$29.11	$0.89	$20.26	$ 72.07	$18.23	$ 8.12	$26.35

* Disease of ENT or Mastoid Process NEC for healthcare expenditures, absence, and STD estimates.

TABLE 4B

Condition	Survey Based Productivity Losses (Average Estimate)	Survey Based Productivity Losses (Low Estimate)	Total (Using Average Presenteeism Estimate)	Total (Using Low Presenteeism Estimate)	% of total expenditures due to presenteeism (Avg)	% of total expenditures due to presenteeism (Low estimate)
Allergy*	$222.24	$59.20	$271.04	$108.00	82%	55%
Arthritis	$251.96	$40.83	$326.88	$115.75	77%	35%
Asthma	$ 72.17	$14.69	$ 99.55	$ 42.07	72%	35%
Any cancer	$ 75.71	$ 4.22	$144.01	$ 72.52	53%	6%
Depression/sadness/ mental illness	$246.00	$38.53	$348.04	$140.57	71%	27%
Diabetes	$158.75	$18.33	$256.91	$116.50	62%	16%
Heart disease	$ 70.53	$ 0.00	$368.34	$297.81	19%	0%
Hypertension	$246.73	$14.64	$392.31	$160.22	63%	9%
Migraine/headache	$189.23	$23.63	$213.78	$ 48.19	89%	49%
Respiratory infections	$ 33.31	$ 3.00	$133.84	$103.52	25%	3%
Average	$156.66	$21.71	$255.08	$120.13	61%	18%

total costs in seasonal conditions such as allergies and in conditions prone to symptomatic "flare-ups" such as migraine/headache, depression, arthritis, and asthma compared with chronic conditions such as diabetes, cancer, and heart disease. A lower-bound estimate of the proportion of total costs resulting from presenteeism, using the most conservative estimate of presenteeism losses, was 18%. This implies that anywhere from approximately one fifth to approximately three fifths of the total dollars attributable to common health conditions faced by employers could be a result of on-the-job productivity losses. Thus, this analysis points to a potentially large category of expenses as-yet unaccounted for by many employers who are concerned about their health-related liabilities.

The analysis also highlights the enormous variability found in estimating on-the-job productivity losses, as shown by the wide range of estimates attributable to certain disease categories. The amount of variation is somewhat disconcerting when trying to get a clear sense of the "big picture." This variation is probably the result of the many ways in which diseases are defined and productivity is addressed among the various surveys used. In some cases, overall productivity is assessed, whereas in other cases, respondents are asked to estimate productivity losses related to specific health conditions.

What is meant by productivity loss also varies widely. Studies could focus on the ability to concentrate, the quality of interpersonal communication, the need to repeat a job, working more slowly, or a comparison of work output to certain predefined performance measures. In the case of the WPI, electronic monitoring of productivity losses was used instead of self-report methods.[5] Thus, given the variability in measurement tools, one would expect highly variable presenteeism estimates. Nonetheless, it is noteworthy that migraine/ headaches, depression/sadness/mental ill-

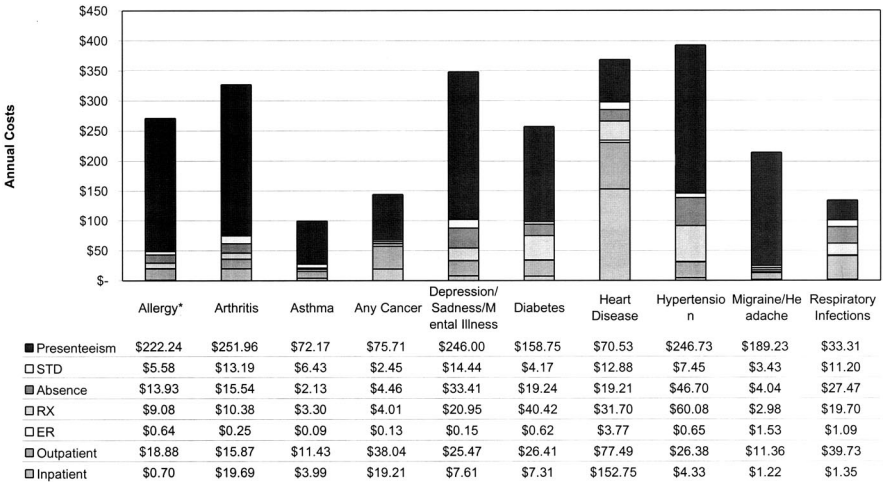

Fig. 3. Direct and indirect burden of illness, by condition and service and area (using average impairment and prevalence rates for presenteeism component and $23.15/hour wage estimate).

ness, and respiratory disorders most often appear as the top-ranked conditions associated with on-the-job productivity loss.

Finally, our analysis revealed that outpatient costs and prescription drug costs accounted for approximately 40% and 28% of total medical expenditures, respectively. When adding the average productivity-related costs to the mix, the share of dollars attributable to outpatient care declined to 11%, and the share of drug dollars declined to 8% of all HPM expenditures. Drug expenditures were highest in the treatment of hypertension and diabetes, 2 chronic conditions treated mostly on an outpatient basis with medication. When treated appropriately, these conditions were managed with prescription drugs that, at most, accounted for one third of the total health and productivity bill. What was not clear from our analysis was whether increased spending on drugs improved the total cost picture when considering productivity outcomes in addition to outcomes related to medical care. Unfortunately, the instruments currently used to assess productivity decrements associated with certain disease conditions do not generally separate productivity gains or losses associated with appropriate or inappropriate medical treatment.

We suspect, however, that a productivity dividend could be found if more focused research is initiated that examines the productivity consequences associated with appropriate versus inappropriate pharmacotherapy in the treatment of many of the conditions examined in our study. To our knowledge, this assumption has not been tested directly, but several studies imply a relationship between medical care and presenteeism outcomes. For example, in a study based at an insurance company, Cockburn et al.[39] linked employees' healthcare expenditures to their productivity when processing insurance claims to compare the impact of treatment with sedating versus nonsedating antihistamines for allergy patients. They found that productivity measures for those taking nonsedating antihistamines were 13% higher. Claxton et al.[40] found that absenteeism increased in each of the 6 months before a depression diagnosis and then decreased in each of the 6

TABLE 5
Outpatient and Pharmaceutical Expenditures as a Percentage of Medical and Health and Productivity Management (HPM)-Related Expenditures. HPM Dollars Estimated at Either Average or Lower Bound Figures

	Outpatient Expenditures				Prescription Drug Expenditures			
Condition	Outpatient Per EE Per Yr. $	Outpatient $ as % of Total Medical $	Outpatient $ as % of Avg. HPM $	Outpatient $ as % of Lower-Bound HPM $	RX Per EE Per Yr. $	Rx $ as % of Total Medical $	Rx $ as % of Avg. HPM $	Rx $ as % of Lower-Bound HPM $
Allergy*	$18.88	64.5%	7.0%	17.5%	$ 9.08	31.0%	3.3%	8.4%
Arthritis	$15.87	34.4%	4.9%	13.7%	$10.38	22.5%	3.2%	9.0%
Asthma	$11.43	60.8%	11.5%	27.2%	$ 3.30	17.5%	3.3%	7.8%
Any cancer	$38.04	62.0%	26.4%	52.5%	$ 4.01	6.5%	2.8%	5.5%
Depression/sadness/ mental health	$25.47	47.0%	7.3%	18.1%	$20.95	38.7%	6.0%	14.9%
Diabetes	$26.41	35.3%	10.3%	22.7%	$40.42	54.1%	15.7%	34.7%
Heart disease	$77.49	29.2%	21.0%	26.0%	$31.70	11.9%	8.6%	10.6%
Hypertension	$26.38	28.8%	6.7%	16.5%	$60.08	65.7%	15.3%	37.5%
Migraine/headache	$11.36	66.5%	5.3%	23.6%	$ 2.98	17.4%	1.4%	6.2%
Respiratory infections	$39.73	64.2%	29.7%	38.4%	$19.70	31.8%	14.7%	19.0%
Average	$29.11	40.4%	11.4%	24.2%	$20.26	28.1%	7.9%	16.9%

months after the onset of drug treatment for depression. In an earlier analysis, Rizzo et al.[41] used National Medical Expenditure Survey data and showed that treatment for hypertension, heart disease, and depression led to substantial reductions in absenteeism-related expenditures. A study of 35 employers by the Institute for Health and Productivity Management[42] showed a correlation between medical expenditures and absenteeism and presenteeism for musculoskeletal, mental health, respiratory, and gastrointestinal health problems.

Many other studies imply correlations between medical expenditures and absenteeism, short-term disability, or presenteeism. Examples include studies of depression by Druss et al.[43] and Kessler et al.,[44] and studies of migraine that were conducted by Fishman and Black[45] and Schulman et al.[46] Greenberg et al.[47] focused on posttraumatic stress disorder and anxiety disorder, noting that approximately 10% of the total costs for these were related to workplace costs. Burton et al.[48] and Kessler et al.[28] noted differences in absenteeism and lower productivity at work for patients with several chronic conditions, many of which are among the ones we studies. This line of research is still in its early development but it seems promising.

Limitations

Several limitations should be noted as the estimates in this article are reviewed. For example, the absenteeism and STD figures that were obtained from the HPM database came from the same employers, but not always the same employees. The reality of the workplace is that absenteeism records either tend to be missing for exempt staff or tend to be decentralized; it was not feasible for employers to collect this information for all employees, so we used the data that were more readily available. STD data were available for many more employees, but not all employees have STD coverage. Thus, we have medical data for more employees than those for whom absenteeism or STD data were available. This could yield some measurement error, but we have shown elsewhere that the magnitude of this error is likely to be small.[14] Productivity data availability is a problem that most large employers have and is not one that can be solved easily by waiting for more complete data.

Another limitation worth noting has to do with monetizing the absenteeism and STD time loss. For this article, we multiplied time losses by an average hourly wage and benefit figure of $23.15 that was provided by the Bureau of Labor Statistics. This could have led to a conservative estimate of the cost of lost time, however. As Pauly and others note,[49] using wages to approximate the value of lost time could be too conservative in team environments or for more senior employees whose work loss affects others substantially.

Another challenge in conducting this analysis was the lack of a standard metric for reporting presenteeism across the survey tools. Hence, the tools considered might not have been measuring exactly the same thing. Despite this problem, we were able to construct a common method for measuring absenteeism and presenteeism across survey instruments. We calculated the percent of eligible work time available per year in which the employee was absent as a result of the condition of interest, and the percent of eligible work time available per year in which the employee's work was impaired on the job as a result of the condition of interest. These metrics relied on accurate reporting of prevalence estimates, and unfortunately, we found substantial variability in the condition prevalence estimates across the surveys. Without a large number of surveys to draw from, it was difficult to infer outliers that could be dropped to stabilize prevalence estimates for our analysis. To address the variability in the prevalence estimates, we performed sensitivity analyses and examined how presenteeism associated with each of the conditions would vary when lower-bound estimates were used.

We also discovered a great deal of variability in how conditions were defined and presented to respondents. For example, employees could have been asked how often they felt sad or blue, were depressed, suffered from major depression, or had mental illness. It stands to reason that the lack of consistency in defining the conditions of interest led to much of the variability in responses that was observed.

Next, we found that the timeframe for assessing productivity losses varied depending on the instrument used. Some researchers used a 2-week time window, others used 4 weeks, and still others examined reactions over a longer time period, up to 1 year. Because our intent was to examine data on a level playing field, we converted the estimates to annual rates. Annual figures are most often used by employers when examining their human resources data and in planning and budgeting exercises. However, extrapolating values from a shorter time period to ones that extend over 1 year is problematic and is likely to overestimate time losses resulting from any given condition that could be short-lived.[31]

On average, we found that dollar estimates associated with presenteeism were quite large, in many instances dwarfing the medical expenses. This is why we elected to show average presenteeism dollar estimates as well as lower-bound estimates, which were more conservative. Currently, there is very little uniformity in how presenteeism is assessed across instruments. The analysis presented here could highlight some of the problems associated with estimating on-the-job presenteeism losses and could prompt researchers to establish common metrics and approaches to measuring this important attribute relevant to all workers and their employers.

Further research should be conducted to update the findings we present in this article. Results from additional survey instruments should assist in stabilizing the estimates for prevalence and presenteeism. Ideally, direct medical costs, absenteeism, disability, and presenteeism costs would be estimated for the same population of interest to avoid the biases inherent in combining data from several studies.

Conclusions

The study of health and its effect on absence, disability, and productivity loss is still in its infancy. Researchers have been working hard over the past few years to develop valid and reliable measures of presenteeism. However, to date, little effort has been directed at linking self-report measures with administrative records that capture healthcare expenditures and absence and disability data. This analysis has highlighted the potential for assessing health-related productivity losses, as well as many of the challenges associated with such an undertaking.

Some could argue that the instruments examined in this analysis were developed with different objectives in mind and were applied to different study populations, suggesting that one-to-one comparisons across these tools could be somewhat inappropriate. We might agree with these objections. In real-world settings, where human resources executives and their occupational medicine counterparts face significant programmatic and budgetary decisions each day, there is a need for accurate, objective, and reliable tools that measure productivity impacts associated with treatment of various health and disease conditions. Business executives need to determine what their potential liability might be and where programs designed to improve health and workforce productivity should be directed. For that to happen, good tools and measures of worker health and productivity are needed. The profession is moving closer to defining these tools and measures and determining when and where to use them. Once achieved, we will be better able to define whether interventions work in improving employee health and productivity.

However, what should we do until better tools are developed? In our view, there is value in describing what is known so far, characterizing and highlighting that variation, hypothesizing about the reasons for that variation, identifying limitations so as not to mislead the audience, and identifying needs for future investigation. That is what we tried to do in this article. Until better estimates of the total burden of illness can be generated, the preliminary estimates presented here suggest where employers can direct their attention to help solve the most pressing health- and productivity-related problems.

Acknowledgment

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