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Prevalence rates for depression by industry: a claims database analysis

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Abstract

Purpose—To estimate and interpret differences in depression prevalence rates among industries, using a large, group medical claims database.

Methods—Depression cases were identified by ICD-9 diagnosis code in a population of 214,413 individuals employed during 2002–2005 by employers based in western Pennsylvania. Data were provided by Highmark, Inc. (Pittsburgh and Camp Hill, PA). Rates were adjusted for age, gender, and employee share of health care costs. National industry measures of psychological distress, work stress, and physical activity at work were also compiled from other data sources.

Results—Rates for clinical depression in 55 industries ranged from 6.9 to 16.2 %, (population rate = 10.45 %). Industries with the highest rates tended to be those which, on the national level, require frequent or difficult interactions with the public or clients, and have high levels of stress and low levels of physical activity.

Conclusions—Additional research is needed to help identify industries with relatively high rates of depression in other regions and on the national level, and to determine whether these differences are due in part to specific work stress exposures and physical inactivity at work.

Clinical significance—Claims database analyses may provide a cost-effective way to identify priorities for depression treatment and prevention in the workplace.

Keywords

Depression; Occupation; Industry; Group medical insurance claims; Work stress; Prevalence rates

Introduction

The relationship between industry or occupation classification and risk for depression has been explored only to a limited extent. There appears to be little precedent for calculation of depression rates by industry classification, and no publication of estimates based on claims databases from a large range of industries. A few reports suggest that some occupations are associated with higher rates of clinical depression than others [20, 37]. We know little about which factors account for the associations between occupation and depression [29], although the literature on occupational risk for depression is rich and varied, and has addressed the potential relationship of a number of work characteristics to depression [12, 18, 20, 31, 33, 39, 46, 52, 53]. A recent systematic review [6] of 16 studies of psychosocial factors at work and the risk of clinical depression found that associations were strongest (adjusted relative risk up to 1.5) and most consistent for job strain defined as high demand and low decision latitude. Researchers have also found some support for and recommend further studies on the potential role of work–family imbalance and effort–reward imbalance [47, 49].

In most industries, depression contributes substantially to rates of absenteeism, presenteeism, disability, and unemployment [19, 45]. If only because clinical depression is both common and costly, it represents an important occupational health priority. One of the best studies of the annual cost of depression in the US yielded an estimate of $83 billion in 2000 [24]. This study attributed the largest proportion of costs (62 %) to workplace costs, providing a substantial incentive to seek preventive measures and to implement disease management programs for depression which have proven to be effective for patients as well as a sound business investment [23, 49]. For these reasons, clarification of the relationship between industry or occupation and depression could contribute to better targeting and support for disease management of depression, improvements in occupational health, and reductions in the societal costs of depression [14, 30]. We focus in this report on claims for clinical depression because, among the various types of distress and mental illness, clinical depression accounts for the most disability and the greatest costs to industry [24, 34].

The first objective of this paper is to estimate depression rates by industry using group medical claims for a large group of employers based in western Pennsylvania. The second objective is to examine whether industries with higher depression rates from this claims database also have higher rates of psychological outcomes related to depression on the national level as determined from other national data sources. The third objective is to examine whether industries with higher depression rates from this claims database tend also

be those industries on the national level, that have higher levels of work exposures thought to contribute to depression.

Methods

The multi-year Highmark database

Researchers with the National Institute for Occupational Safety and Health worked with Highmark, Inc. to assemble a multi-year database for the purpose of calculating industry-specific, prevalence rates of 15 diseases. Highmark is a Blue Cross Blue Shield insurer providing health insurance for the majority of the working population in western Pennsylvania as well as other areas not covered by this data (eastern Pennsylvania, West Virginia, and Delaware). The data and the methods used for calculation of rates are described in greater detail in Bushnell et al. [8]. All data received were "limited data sets" as defined under the Health Insurance Portability and Accountability Act [10, 42]. No personal identifiers were included in the data provided to NIOSH researchers, although unique "dummy identifiers" were used to link claim and enrollment records of individuals. Members of the NIOSH Human Subjects Review Board determined that, because of the nature of the data and the project's classification as public health practice rather than research, the project was not subject to the board's review.

The database contains enrollment information and medical claims data for individuals who received or purchased health insurance through their employer during 2002–2005. Enrollment information included birth year, gender, months of insurance coverage, and employer industry. Claims information consists of number and cost of claims for each disease in each year, as well as total annual health care cost and share of cost paid by the employee. This data set was limited to the employees alone, and excluded family members of employees.

Individuals with at least 44 out of 48 possible months of enrollment during 2002–2005 and classified in the same 2-digit SIC in all four years were included in the analysis. This requirement increased the share of long-term employees in the data, which was considered desirable, because depression may often develop only with long-term exposure to risk factors.

To maintain confidentiality and prevent attribution of industry disease rates to any single employer, the largest employer within each industry was limited to less than one-third of the total industry sample. This was accomplished through random deletion of employees of the largest employer in some industries.

Preferred case definition—The ICD-9-CM diagnosis codes used to identify cases of depression are listed in Table 1. The list includes all ICD-9 codes commonly used for depression, or conditions that include depression such as bipolar disorder or adjustment disorder (see Table 1). The list also includes codes that refer to conditions for which depression is a secondary or mildly symptomatic element. The inclusion of all of these codes was meant, in part, to accommodate the variation in code assignment patterns among physicians, most notably between specialists and general practitioners. (For example, in the

more detailed claims data described below, code 311, the most general, non-specific code for depression represented 7 % of the depression codes assigned by psychiatrists and psychologists, whereas it represented 71 % of the depression codes assigned by internists and general and family practitioners). The case definition is two or more claims during 2002–2005 that contain at least one of the ICD-9 diagnosis codes for depression. Primary and secondary diagnosis codes were considered equally valid. The third column of Table 1 gives the distribution of diagnosis codes among the individuals with at least two depression claims (again, using the more detailed claims data described below).

Calculation of industry disease rates—Depression prevalence rates were calculated at both the broad industry sector level and the more detailed 2-digit industry level. Industry disease prevalence rates were estimated with logistic regression, adjusting for age and gender. The regression includes a quadratic age term and interactions between gender and age in order to increase model flexibility to reflect true relationships among variables. The purpose of the age and gender adjustment was to compare industry rates in a way that would provide better clues to the possible influence of workplace factors. We also adjusted for differences between industries in employee share of medical claims costs, because higher employee cost is expected to reduce the seeking of treatment and the number of observed cases. For each employer, the employee share of cost was estimated for employees with total claims costs equal to the median for the database population [8]. Both linear and quadratic terms for share of cost were included in the model. An additional confounder, "behavioral carve-out", was also included in the model. Employees with a behavioral care "carve-out" have their behavioral claims processed by a separate organization, and thus, many of their claims with depression codes do not appear in the claims data available from Highmark.

Estimates of model-adjusted prevalence were obtained, following the method of Lane and Nelder [28], by calculating average marginal predictions for each industry, from the fitted logistic regression model $E(\text{logit}(P_j = 1)) = a_i + \beta'X_j$, where a_i is the regression coefficient for the ith industry, $i = 1, 2,…, R$, and X_j is a vector of the variables described above for the

jth individual and $j = 1, 2,…, n$. The prediction for industry r, $\frac{1}{n}\sum_{1}^{n}\frac{\exp(\hat{\alpha}_r+\hat{\beta}'X_{ij})}{1+\exp(\hat{\alpha}_r+\hat{\beta}'X_{ij})}$ is an estimator of the predicted prevalence having all the individuals in the population been from the same industry r. A one-sample z test was used for testing each adjusted rate against the population rate. To properly account for the hierarchical nature of our data, we used multilevel modeling, treating employer as a cluster variable. This allowed us to assume correlation among individuals from the same employer, which can arise from having similar workplace exposure, insurance plan, socioeconomic status, and so on. The generalized estimating equation approach was used for parameter and standard error estimation.

Because the chance of false positive findings is high, when many tests of statistical significance are performed simultaneously (total tests = 55), we calculated adaptive false discovery rate (FDR) p values [4, 5] to test the statistical significance of the difference between industry rates and the database population rate.

Additional detailed data on a subset of the study population—Two data files with additional, detailed claims information were also available from Highmark. These two files were linked together and used for a separate analysis of alternative case definitions. The first data file has information on each individual depression claim for a subset of the population in the main data set described above. This subset includes all individuals in selected industries with rates significantly above or below the population rate (19 two-digit and 17 four-digit SICs), plus a random sample of individuals in other SICs. We used this data file to compute the distribution of specific diagnosis codes in the claims of individuals who met the preferred case definition, as reported in Table 1. The second data file contains information on each individual drug claim for an antidepressant for the entire population in the main data set described above (see "Appendix 2" for the list of antidepressants included).

Alternative case definitions—We recognized the possibility that the preferred case definition described above might be considered too broad, and that alternative cased definitions have been used in the literature. Accordingly, three additional case definitions were formulated. The first of the alternative case definitions limited the list of codes to those denoting major depression (296.2 and 296.3) and a general code for depression "not otherwise specified" (311). By this definition a case is any individual with two or more claims with any of these three codes as a primary or secondary diagnosis. The second alternative case definition specified that an individual must have at least one claim with one of these three codes, plus a filled prescription for an antidepressant (see "Appendix 2"). The third alternative case definition defined a case as an individual whose claims satisfy either of these two alternative criteria.

Analysis of impact of alternative case definitions on industry prevalence—Using the two additional detailed data files described above, overall prevalence rates and rates for 62 two-digit SIC industries were calculated using each of the three alternative depression case definitions, as well the preferred case definition. We do not report these additional detailed industry results. However, to test the robustness of our industry results based on our preferred case definition, we calculated, for each alternative case definition, Pearson correlation coefficients between industry rates based on the alternative case definition, and industry rates based on the preferred case definition. Industry rates were weighted by the mean of the standard errors of the two industry prevalence estimates.

Industry sector measures of related categories of psychological outcomes

In other national data sets, outcome measures of psychological distress are available only on the broad sector level. We obtained the prevalence of having at least one day of poor mental health in the past 30 days from a question in the 2002 and 2006 NIOSH Quality of Work Life Survey, which is a module of the General Social Survey, a nationally representative survey of the non-institutionalized adult population [35]. The QWL was developed by NIOSH with contributions and advice from a panel of experts in occupational safety and health, organizational behavior, human resources, psychology and sociology [25, 40, 50]. The rate of occupational anxiety, stress, and neurotic disorders (which disorders are acknowledged as greatly under-recognized and under-counted) were compiled from 2003 to 2007 data from the Annual Survey of Occupational Injuries and Illnesses [7]. The survey is

based on logs of work-related injuries and illnesses that most employers are required to keep. (See Additional details in table footnotes in "Results" section).

Industry level measures of workplace exposures relevant to depression

It would be ideal to examine rates of depression and measures of relevant workplace exposures on the detailed industry level. However, some of the best exposure measures are available only on the broad sector level. Therefore, we assembled information on exposures related to depression on both the broad sector and detailed industry (two-digit) levels. One sector-level source of measures of work organization and psychosocial work characteristics is the NIOSH Quality of Work Life (QWL) Survey [9, 25, 42, 50, 51]. We used 2002 and 2006 data to examine three factors that are key to popular models of job stress [6, 36, 47] job control [17, 27, 43, 44, 48] work–family imbalance [11, 22, 47–49] and effort–reward imbalance [16, 38]. The decision latitude or job control model uses two main dimensions: job demands and decision latitude. To address job control (otherwise known as decision latitude) we calculated the percent of respondents responding "not too true" or "not at all true" to the statement in the QWL "I am given a lot of freedom to decide how to do my own work." Because the QWL did not contain a question on job demands, we also computed a general, sector-level measure of overall stress, based on a question from the O*Net surveys about the level of stress tolerance needed to do one's job (see O*Net discussion below). The effort–reward model was examined by calculating percent of respondents with affirmative responses ("true" or "mostly true") to the QWL survey statement "what I earn on the job is somewhat or much less than I deserve."

Measures of work exposures relevant to depression on the more detailed two-digit industry level were computed using data from the Occupational Information Network (O*NET) (http://www.onetcenter.org) based on surveys of job holders and occupation experts on the characteristics of detailed occupations sponsored by the US Department of Labor. The O*NET has been used in the literature by a number of researchers to impute industry and occupation characteristics [1, 13, 32]. Results for individual occupations were aggregated to estimate mean scores by industry, using data on distribution of occupations by two-digit SIC industry from the Occupational Employment Statistics program of the Bureau of Labor Statistics. Measures for 70 two-digit industries were computed, for the responses to each of four questions from O*NET. The first was used as a general measure of job stress that can be viewed as related to the job control model: "How important is stress tolerance to the performance of your current job?" There was a 5-point response scale with 5 indicating "extremely important." Two questions were selected relating to the concept of emotional labor, which has been associated with work stress and depression [52, 53]. Emotional labor can be defined as the effort, planning and control to express organizationally desired emotion during interpersonal transactions. Jobs with strong emotional labor components require face-to-face or voice-to-voice contact with the public, require the worker to produce an emotional state in a client or customer, and allow employers to exercise control over employees' emotional activities [2, 15]. The two selected O*NET questions asked about (1) the frequency of conflict situations and (2) dealing with unpleasant, angry, or discourteous people at work. The 5-point scales for these questions were converted to figures representing number of times per month. Because physical activity is a factor known to reduce depression

symptoms [3], we also computed a measure based on an O*NET question about level of physical activities needed for a job. The response scale had 7 points, with 6 defined as equivalent to "climb up and down poles to install electricity."

Analysis of relationship between national industry measures of psychological outcomes and work stress, and industry prevalence of depression in the Highmark data—Given the small number of major sectors (six), we simply determined, given any statistically significant differences between sector depression rates, whether the higher and lower rate sectors appear to have correspondingly higher and lower rates of psychological distress and work stress. On the two-digit industry level, we ranked industries separately on each work stress measure, based on mean scores. This ranking procedure helps preserve the ordinal nature of the underlying survey data. Next, we compile both mean scores and ranks for two sets of industries in the Highmark data (Table 2): those whose depression rates were above the rate for the overall population by more than 15 % (with FDR $p < 0.10$) and those whose depression rates were below the population rate by more than 15 % (with FDR $p < 0.10$). Finally, we compared the mean work stress rankings of the industries with the highest and lowest depression rates.

Results

After deletion of records to limit the share of individual employers to less than one-third of the sample for their industry, and all other adjustments, there were 214,413 records in the database used for analysis. This population was 61 % male and had a mean age of 41, exceeding the 54 % male representation and mean age of 41 in the US working population in the same period [8]. Just 3.9 % of the database population had a behavioral health carve-out for at least 1 year. The distribution of the population by industry was as follows: services 49.1 %, manufacturing 24.2 %, wholesale and retail trade 8.6 %, health care and social assistance 7.9 %, transportation, warehousing and utilities 5.6 %, construction 3.0 %, mining 1.4 %, and agriculture 0.2 %. Additional details are available in a previous publication [8]. There were a total of 55 two-digit SIC industries with samples of at least 200 (11 with samples of 200–499, 44 with samples of 500 or more) out of a total of 82 two-digit industries in the SIC system. A total of 8,235 employers were represented in these 55 industries.

Table 2 shows the adjusted prevalence rates for clinical depression claims by two-digit SIC industry, in order of prevalence from highest to lowest. Seven industries had rates at least 25 % above the database population prevalence of 10.45 % (i.e. over 13.1 %) with FDR p 0.10.

Table 3 summarizes results for alternative case definitions, using the more detailed Highmark data on a study population subset. All three of the alternative definitions yielded lower prevalence rates than the chosen case definition that was used as the basis of the main set of results presented in Table 2. Correlation of industry rates calculated with the case definition of Table 2 and industry rates calculated with each of the three alternative case definitions ranged from 0.77 to 0.93.

Variation in treated depression rates by broad industry sector (Table 4) is not as great as that on the more detailed industry level. However, the rate of depression was highest in the health care and social assistance sector and lowest in the manufacturing sector; and the differences between these sectors' rates and the overall database population rate were both statistically significant. Thus, it is most important to focus on differences between these two sectors for the other measures reported in Table 4.

Table 4 also presents data on other available sectoral measures of psychological distress from national government surveys. The healthcare and social assistance sector had the highest prevalence of having at least one day of poor mental health in the past 30 days (43.3), while the manufacturing sector had the second lowest prevalence (33.3), just above that for the transportation, warehousing, and utilities sector (31.9). The rate of occupational anxiety, stress, and neurotic disorders is highest in the transportation, warehousing, and utilities sector (0.59) but also relatively high in health care/social assistance (0.40) and is lowest in manufacturing (0.12). Thus, the sector differences in these national measures of psychological distress, both occupational and non-occupational, align in large part, with the observed sector differences in depression in the Highmark western Pennsylvania data.

Table 4 also presents national measures of work stress on the sector level. Prevalence of low decision latitude was highest among those in transportation, warehousing and utilities (17.6 %), followed by manufacturing (16.9 %) and wholesale and retail trade (16.5 %), but was distinctly lower in healthcare and social assistance (11.3 %). Thus, relative levels of job control on the national level do not align with the high rate of depression in health care/ social assistance, or the low rate in manufacturing in the Highmark Pennsylvania data. Scores for level of stress tolerance needed for the job did not vary greatly by sector on the national level; although health care/social assistance had one of the highest scores (3.9), and manufacturing had a more average score (3.7). There was no clear difference between health care/social assistance and manufacturing in prevalence of interference of work with family, with the mean score actually higher in manufacturing.

On the other hand, the healthcare and social assistance sector clearly had the highest prevalence of earnings perceived as lower than deserved (48.3 %), while manufacturing had one of the lowest rates (36.3 %), somewhat above the rate for construction (32.1 %).

Tables 5 and 6 report national-level industry measures of work stress, conflict, and physical activity for industries with the nine highest and nine lowest prevalence rates of claims for depression in the Highmark data. Four of the top nine industries ranked in the top ten nationally for the importance of stress tolerance needed for their job based on a ranking of 70 industries: legal services (rank 1), local and interurban transport (rank 2), securities and commodities (rank 7), and social services (rank 9). Only two industries had a rank below the median (rank 35), and average rank for all nine industries was 25. In contrast, the highest stress ranking among the nine industries with the lowest depression rates was 26. Seven of nine industries had a ranking below the median, and average rank for all seven was 45. Three of the top nine industries with the highest prevalence of depression in the Highmark data ranked in the top ten nationally for frequency of conflict situations: securities and commodities (rank 2), social services (rank 4), and legal services (rank 6). In addition, three

of the top nine industries had a ranking below the median, and the average rank was 27. The highest conflict ranking among the nine industries with the lowest depression rates was 14. Seven of these nine industries had rankings below the median, and average rank for all seven was 46.

While none of the industries with the highest prevalence for depression in the Highmrk data were ranked in the top ten nationally for dealing with unpleasant, angry, or discourteous people, the average rank of the top nine industries on this measure was 31, as compared to the average rank of 46 among the nine industries with the lowest rate of depression.

The national-level difference in level of physical activity between high and low rate industries in the Highmark data was larger. Two of the highest rate industries were ranked in the bottom ten in physical activity and the average rank of these industries was 50. None of the nine lowest rate industries ranked in the bottom ten in physical activity, while three of them ranked in the top ten, with an average rank for the group of 19.

Discussion

Choice of case definition for depression

The industry rate results of Table 2 appear reasonably robust to choice of case definition. This is indicated by the correlation of 0.93 reported in Table 3 between the results of Table 2 and those based on the narrower, 3-code case definition (alternative #1). What this translates into in terms of industry ranking (in results not shown) is that eight industries were among the top ten in both sets of rates, and 17 industries were among the top 20 in both sets of rates. The correlation is almost as high (0.89) between the Table 2 results and those based on a case definition that includes those with only one depression claim plus an antidepressant claim (alternative #3).

The correlation of Table 2 results with results based on alternative case definition #2 was lower (0.77), and thus this alternative definition would give a somewhat different perspective on relative industry rates. However, it seems warranted to exclude individuals with only one claim with one of the codes in Table 1 plus an antidepressant, since diagnosis based on a single claim is somewhat uncertain, and antidepressants are sometimes prescribed for other conditions. In addition, the case definition of Table 2 is relatively simple to implement, and yields higher prevalence rates, thus facilitating the ascertainment of statistical differences among industries.

General pattern of findings

Perhaps the most salient pattern in the results is that, among those industries with the greatest, statistically significant elevations of rate over the population rate, service industries which require frequent or complex interactions with the public or clients are disproportionately represented, while among industries with the lowest rates that are statistically different from the population, manufacturing industries are disproportionately represented (although many service industries have low rates, and some manufacturing industries have relatively high rates). This supports the theory that the stress of emotional labor could contribute to depression. We also saw that industries with the highest depression

rates in the Highmark data tended to be industries that, on the national level, had more interpersonal conflict and encounters with difficult people than industries with the lowest depression rates. However, these variables may be far from complete measures of emotional labor, as personal services ranked near the bottom in conflict.

Comparison of results to other studies

No other study computes the rate of depression in a closely comparable way, but the NSDUH survey is perhaps the closest [37]. That survey found that 7 % of full-time US workers reported a major depressive episode in the last year, as compared to the 10.45 % rate of treated depression that we found over a 4-year period. While we could identify no other study that reported depression rates by industry, the results of several studies of variation in depression by occupation can be broadly compared to the results of this study. Eaton and colleagues [20] compared rates of depression across 104 occupations using a diagnostic interview survey. After adjusting for sociodemographic factors, including current employment status, the occupations with the highest rates, compared with employed persons generally, were lawyers (OR = 3.6), teachers and counselors (OR = 2.8), and secretaries (OR = 1.9). This report was among the first to identify service sector occupations as associated with elevated risk for clinical depression, and the high rate among lawyers corresponds with the high rate for legal services found here.

Grosch and Murphy [26] examined 1987 data on 9,281 stably employed citizens from the National Medical Expenditure Study, a national probability household interview survey. Five questions from the Medical Outcomes Study's General Mental Health Scale were used to assess depressive symptoms in the prior 30 days. In contrast to our results, occupations involving operation of machines and transportation reported the highest rates of depressive symptoms. Professional and managerial occupations reported less depression. These findings may differ from ours due to inclusion of untreated cases, or differences in the measures of depression (self-report of symptoms over 30 days vs. billable diagnosis over 4 years).

In the recent (2004–2006) NSDUH survey of depression [37] the highest rates of self-reported major depressive episodes in the previous year were found among the personal care and service occupations (10.8 %), and the lowest rates were found among the life, physical, and social science occupations (4.4 %). The former finding parallels some of the findings in this study.

In an analysis of 20 occupational groups using 2006 and 2008, data from the population-based BRFSS survey in Washington State, truck drivers; machine operators, assemblers and inspectors; and health services aides were found to have the most elevated rates of current depression, after adjusting for age and sex [21]. These findings on truckers and manufacturing workers contrast with the findings above, which could be partly due to the inclusion of a variety of occupations in the trucking and warehousing and manufacturing industries, but which may also suggest an unusually high rate of under-treatment among truckers and manufacturing workers. The high rate among health aides may be partly reflected in the high rate in the healthcare and social services sector that we observed in medical claims, and this high rate may have been masked by aggregation of health service

aides with other, higher-level employees within the health services industry, which had a rate near the population average.

Limitations and strengths

The limitations are described in more detail elsewhere [8]. The generalizability of this study's results is limited by geography (western PA employers), time period (2002–2005), and restrictions of the sample to those insured through work. Some industry samples may also be biased because of deletion of random samples of employees from the largest employers.

There are also some inaccuracies in industry and case classification. With few exceptions, all employees of an employer were classed in the same industry, and there are some errors in industry coding that appear more likely in the public sector. There are also inherent limitations to industry analysis, since exposures usually vary widely within industries by occupation, task, and individual employer. The case definition did not use information on treatments or self-report of symptoms (survey or diagnostic interview), relying instead on diagnosis codes assigned in treatment. However, results based on alternative definitions incorporating antidepressant use were similar.

Relative industry rates could be affected by differences in the tendency to seek medical care. Only some of these differences could be adjusted for with an employee share-of-cost variable calculated on the employer level. Industry rates also could not be adjusted for some important factors that are at least partially independent of work, such as smoking, BMI, education, race and ethnicity, family history, or household income. Differences in rates between industries could also have been affected by any greater tendency of those with depression to leave the workforce or change industry of employment.

It is a strength of this study that it uses clinical diagnosis of depression, an independent measure of mental health that is lacking in much of the literature on depression or psychological distress and work. Although some studies have used insurance claims with clinical diagnoses in a single industry [17], or antidepressant use [44], most studies have relied upon self-reported depressive symptoms over short intervals. This study also makes use of a data source that includes a very large number of records, enabling determination of statistical differences among detailed industry categories. Matching the results with other information about industries can provide indirect evidence for hypotheses on the sources of industry differences and help steer both prevention and research.

Conclusions

This report adds to the literature on occupational risks for depression using a large, administrative, claims database to provide the first comparison of rates of clinically diagnosed depression across a wide range of industries in the US The highest depression rates were found for Local and Suburban Transit and Interurban Highway Passenger Transportation (SIC 41). This industry contains bus drivers who have frequently been observed to have elevated rates of heart disease, hypertension, or stroke, often attributed in part to work stress [41]. The second highest depression rate was found in real estate for

which there appears to be little occupational health literature. Some of the high-rate industries identified (legal services and personal services) correspond to high-rate occupations found in previous surveys. We also observed that the difference between the highest rate sector (healthcare and social assistance) and the lowest rate sector (manufacturing) was paralleled by a distinct difference in other available, national-level measures of psychological distress: rate of having at least one day of poor mental health in the past 30 days and rate of employer-reported occupational anxiety, stress, and neurotic disorders.

Replications of this analysis using other claims databases in other regions are necessary to confirm the patterns observed, and to produce rates for more specific industries and a greater number of industries. Claims databases complement population survey data in providing additional information to define clinical depression, and can be used to document the duration and costs of the disorder, potentially providing insurers and employers with a more robust profile of the burden of depression on their industry. Additional work is needed to understand how best to apply these types of findings to target and improve case finding, disease management, and risk prevention in the workplace.

This study also suggests targets for further research with respect to work factors that may contribute to elevated depression rates. Comparison of the highest and lowest rate industries with respect to work stress and its sources showed clear differences that suggest that work stress may be a contributing factor. More specifically, the highest depression rate industries in the western Pennsylvania data appear on the national level generally to have greater effort–reward imbalance, emotional labor, and lack of physical activity at work, although no lower levels of job control or higher levels of work/family conflict. Clearly, multivariate and longitudinal analysis of these factors, along with other economic and health variables is needed to explore their relative roles in depression.

Acknowledgments

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Appendix 1

Sample definitions of SIC two-digit industries.

Source: United States Department of Labor (http://www.osha.gov/pls/imis/sic_manual.html).

Industries with high prevalence of depression

41: Local and suburban transit and interurban highway passenger transportation

This major group includes establishments primarily engaged in furnishing local and suburban passenger transportation, such as those providing passenger transportation within a single municipality, contiguous municipalities, or a municipality and its suburban areas, by bus, rail, or subway, either separately or in combination, and establishments engaged in furnishing transportation to local scenic features. Also included are establishments primarily engaged in furnishing highway passenger.

Transportation and establishments furnishing highway passenger terminal or maintenance facilities. Intercity bus lines are included in this major group, but interurban railways are classified in Major Group 40.

65: Real estate

This major group includes real estate operators, and owners and lessors of real property, as well as buyers, sellers, developers, agents, and brokers. Establishments primarily engaged in the construction of buildings for sale (operative builders) are classified in Industry 1531.

83: Social services

This major group includes establishments providing social services and rehabilitation services to those persons with social or personal problems requiring special services and to the handicapped and the disadvantaged. Also included are organizations soliciting funds to be used directly for these and related services. Establishments primarily engaged in providing health services are classified in Major Group 80; those providing legal services are classified in Industry 8111; and those providing educational services are classified in Major Group 82.

39: Miscellaneous manufacturing industries

This major group includes establishments primarily engaged in manufacturing products not classified in any other manufacturing major group. Industries in this group fall into the following categories: jewelry, silverware, and plated ware; musical instruments; dolls, toys, games, and sporting and athletic goods; pens, pencils, and artists' materials; buttons, costume novelties, miscellaneous notions; brooms and brushes; caskets; and other miscellaneous manufacturing industries.

72: Personal services

This major group includes establishments primarily engaged in providing services generally to individuals, such as laundries, dry cleaning plants, portrait photographic studios, and beauty and barber shops. Also included are establishments operating as industrial launderers and those primarily engaged in providing linen supply services to commercial and business establishments.

81: Legal services

This major group includes establishments which are headed by members of the bar and are engaged in offering legal advice or legal services.

86: Membership organizations

This major group includes organizations operating on a membership basis for the promotion of the interests of their members. Included are organizations such as trade associations; professional membership organizations; labor unions and similar labor organizations; and political and religious organizations. This major group does not include business establishments operated by membership organizations, which are classified according to their primary activity.

62: Securities and commodities

This major group includes establishments engaged in the underwriting, purchase, sale, or brokerage of securities and other financial contracts on their own account or for the account

of others; and exchanges, exchange clearing-houses, and other services allied with the exchange of securities and commodities.

27: Publishing and printing

This major group includes establishments engaged in printing by one or more common processes, such as letterpress; lithography (including offset), gravure, or screen; and those establishments which perform services for the printing trade, such as bookbinding and platemaking. This major group also includes establishments engaged in publishing newspapers, books, and periodicals, regardless of whether or not they do their own printing. News syndicates are classified in Services, Industry 7383. Establishments primarily engaged in textile printing and finishing fabrics are classified in Major Group 22, and those engaged in printing and stamping on fabric articles are classified in Industry 2396. Establishments manufacturing products that contain incidental printing, such as advertising or instructions, are classified according to the nature of the products for example, as cartons, bags, plastics film, or paper.

Industries with low prevalence of depression

79: Amusement and recreation services

This major group includes establishments engaged in providing amusement or entertainment services, not elsewhere classified. Establishments primarily engaged in operating motion picture theaters are classified in Industry Group 783, and those operating museums, art galleries, arboreta, and botanical and zoological gardens are classified in Major Group 84.

32: Stone, clay, and glass products

This major group includes establishments engaged in manufacturing flat glass and other glass products, cement, structural clay products, pottery, concrete and gypsum products, cut stone, abrasive and asbestos products, and other products from materials taken principally from the earth in the form of stone, clay, and sand. When separate reports are available for mines and quarries operated by manufacturing establishments classified in this major group, the mining and quarrying activities are classified in Division B, Mining. When separate reports are not available, the mining and quarrying activities, other than those of Industry 3295, are classified herein with the manufacturing operations.

16: Heavy construction other than building construction contractors

This major group includes general contractors primarily engaged in heavy construction other than building, such as highways and streets, bridges, sewers, railroads, irrigation projects, flood control projects and marine construction, and special trade contractors primarily engaged in activities of a type that are clearly specialized to such heavy construction and are not normally performed on buildings or building-related projects. Specialized activities that are covered here include grading for highways and airport runways; guardrail construction; installation of highway signs; trenching; underwater rock removal; and asphalt and concrete construction of roads, highways, streets and public sidewalks. Establishments primarily engaged in specialized activities that may be performed on buildings or on other heavy construction projects are classified in Major Group 17. These include contractors primarily

engaged in painting (including bridge painting and traffic lane painting), electrical work (including work on bridges, power lines, and power plants), and carpentry work.

12: Coal mining

This major group includes establishments primarily engaged in producing bituminous coal, anthracite, and lignite. Included are mining operations and preparation plants (also known as cleaning plants and washeries), whether or not such plants are operated in conjunction with mine sites. The production of coal fuel briquettes and packaged fuel is classified in Manufacturing, Industry 2999. Establishments primarily engaged in the production of gas and hydrocarbon liquids from coal at the mine site are classified in Major Group 13.

37: Transportation equipment

This major group includes establishments engaged in manufacturing equipment for transportation of passengers and cargo by land, air, and water. Important products produced by establishments classified in this major group include motor vehicles, aircraft, guided missiles and space vehicles, ships, boats, railroad equipment, and miscellaneous transportation equipment, such as motorcycles, bicycles, and snowmobiles. Establishments primarily engaged in manufacturing mobile homes are classified in Industry 2451. Establishments primarily engaged in manufacturing equipment used for moving materials on farms; in mines and on construction sites; in individual plants; in airports; or on other locations off the highway are classified in Major Group 35.

33: Primary metal industries

This major group includes establishments engaged in smelting and refining ferrous and nonferrous metals from ore, pig, or scrap; in rolling, drawing, and alloying metals; in manufacturing castings and other basic metal products; and in manufacturing nails, spikes, and insulated wire and cable. This major group includes the production of coke. Establishments primarily engaged in manufacturing metal forgings or stampings are classified in Industry Group 346.

45: Transportation by air

This major group includes establishments engaged in furnishing domestic and foreign transportation by air and also those operating airports and flying fields and furnishing terminal services. Establishments primarily engaged in performing services which may incidentally use airplanes (e.g., crop dusting and aerial photography) are classified according to the service performed.

34: Fabricated metal products

This major group includes establishments engaged in manufacturing industrial and commercial machinery and equipment and computers. Included are the manufacture of engines and turbines; farm and garden machinery; construction, mining, and oil field machinery; elevators and conveying equipment; hoists, cranes, monorails, and industrial trucks and tractors; metalworking machinery; special industry machinery; general industrial machinery; computer and peripheral equipment and office machinery; and refrigeration and

service industry machinery. Machines powered by built-in or detachable motors ordinarily are included in this major group, with the exception of electrical household appliances. Power-driven hand tools are included in this major group, whether electric or otherwise driven. Establishments primarily engaged in manufacturing electrical equipment are classified in Major Group 36, and those manufacturing hand tools, except powered, are classified in Major Group 34.

35: Industrial and commercial machinery and computer equipment

This major group includes establishments engaged in manufacturing industrial and commercial machinery and equipment and computers. Included are the manufacture of engines and turbines; farm and garden machinery; construction, mining, and oil field machinery; elevators and conveying equipment; hoists, cranes, monorails, and industrial trucks and tractors; metalworking machinery; special industry machinery; general industrial machinery; computer and peripheral equipment and office machinery; and refrigeration and service industry machinery. Machines powered by built-in or detachable motors ordinarily are included in this major group, with the exception of electrical household appliances. Power-driven hand tools are included in this major group, whether electric or otherwise driven. Establishments primarily engaged in manufacturing electrical equipment are classified in Major Group 36, and those manufacturing hand tools, except powered, are classified in Major Group 34.

Appendix 2

Antidepressant drug names used for alternative case definitions for depression.

Amitriptyline, Amoxapine, Budeprion SR, Bupropion, Buproprion SR, Celexa, Citalopram, Cymbalta, Desipramine, Desyrel, Doxepin, Effexor, Effexor XR, Elavil, Eskalith, Eskalith CR, Fluoxetine, Fluvoxamine, Imipramine, Lexapro, Lithium carbonate, Lithium citrate, Lithobid, Luvox, Maprotiline, Mirtazapine, Nefazodone, Norpramin, Nortriptyline, Pamelor, Paroxetine, Paxil, Paxil CR, Prozac, Prozac-Weekly, Remeron, Sarafem, Serentil, Sertraline, Sinequan, Serzone, Tofranil, Tofranil-PM, Wellbutrin, Wellbutrin SR, Wellbutrin XL, Zoloft.

Table 1

Depression diagnoses and billing codes included in case definition

ICD-9 Code	Diagnosis	Percent[b]
296	Episodic mood disorders	0.0
296.2 And all subcodes[a]	Major depressive disorder, single episode	12.5
296.3 And all subcodes	Major depressive disorder, recurrent episode	26.0
296.5 And all subcodes	Bipolar affective disorder, depressed	1.4
296.6 And all subcodes	Bipolar I disorder, mixed	1.0
296.7 And all subcodes	Bipolar I disorder, unspecified	0.9
296.8 And all subcodes	Other and unspecified bipolar disorders	2.1
296.9 And all subcodes	Other and unspecified episodic mood disorder	1.4
300.4	Dysthymic disorder	13.6
301.1 And all subcodes	Affective personality disorder	0.2
309.0	Adjustment disorder with depressed mood	6.2
309.1	Prolonged depressive reaction	0.2
309.28	Adjustment reaction with mixed anxiety and depressed mood	15.7
311 And all subcodes	Depression, depressive disorder or state, NOS	18.8

[a] Subcodes are the codes that begin with the same digits, but have additional digits as well

[b] Percent of all depression codes appearing in claims from individuals meeting the preferred case definition. Data are from a supplementary, detailed data set on a subset of the study population. The detailed data set included information on depression claims from industries with depression rates significantly above and below the population rate, and a random sample of claims from other industries. See "Methods" section. The distribution of diagnosis codes in all depression claims, including those from individuals with only one claim, was not materially different

Table 2

Adjusted prevalence of depression by two-digit SIC Industry (Highmark data) (overall prevalence 10.45 %)

SIC	NORA industry sector	N	Number of cases	Adjusted prevalence 95 % CI (%)[a]	p value[b]	FDR p value[c]
Local and interurban passenger transit (41)	Transportation, warehousing, utilities	383	61	16.19 (14.03, 18.34)	<0.001	<0.001
Real estate (65)	Services	881	129	15.65 (13.18, 18.12)	<0.001	<0.001
Social services (83)	Health care and social assistance	1,924	332	14.60 (12.85, 16.34)	<0.001	<0.001
Misc. manufacturing industries (39)	Manufacturing	1,312	177	14.25 (12.16, 16.34)	<0.001	0.002
Personal services (72)	Services	497	66	14.25 (10.91, 17.58)	0.026	0.059
Legal services (81)	Services	3,660	529	13.44 (12.22, 14.66)	<0.001	<0.001
Environmental quality and housing (95)	Services	290	44	13.42 (9.98, 16.87)	0.091	0.151
Membership organizations (86)	Services	7,744	994	13.28 (11.62, 14.93)	<0.001	0.004
Security and commodity Brokers (62)	Services	1,600	202	12.60 (10.74, 14.46)	0.024	0.059
Printing and publishing (27)	Manufacturing	3,400	418	12.43 (11.00, 13.86)	0.007	0.020
Agricultural services (07)	Agriculture, forestry, fishing/services	400	54	12.11 (8.72, 15.50)	0.338	0.386
Miscellaneous retail (59)	Trade	1,697	191	11.84 (10.26, 13.41)	0.085	0.146
Electric, gas, and sanitary services (49)	Transportation, warehousing, utilities	2,906	288	11.83 (9.47, 14.19)	0.253	0.331
Special trade contractors (17)	Construction	4,408	406	11.68 (10.18, 13.19)	0.109	0.172
Petroleum and coal products (29)	Manufacturing	493	48	11.55 (8.24, 14.85)	0.517	0.517
General merchandise stores (53)	Trade	337	42	11.54 (8.50, 14.57)	0.484	0.484
Auto repair, services, and parking (75)	Services	426	43	11.49 (7.89, 15.09)	0.574	0.574
Rubber and misc. plastics products (30)	Manufacturing	1,079	109	11.44 (9.59, 13.29)	0.296	0.363
Health services (80)	Health care and social assistance	20,107	2,892	11.42 (10.73, 12.11)	0.006	0.020
Holding and other investment offices (67)	Services	490	46	11.39 (9.46, 13.33)	0.342	0.386
Engineering and management services (87)	Services	5,087	494	10.89 (9.79, 11.99)	0.434	0.444
Furniture and home furnishings stores (57)	Trade	550	50	10.68 (7.78, 13.58)	0.880	0.880
Executive, legislative, and general (91)	Services	15,227	1,645	10.67 (8.40, 12.94)	0.849	0.849
Depository institutions (60)	Services	8,866	966	10.64 (9.59, 11.70)	0.725	0.725
Lumber and wood products (24)	Manufacturing	701	64	10.63 (8.40, 12.85)	0.879	0.879
Chemicals and allied products (28)	Manufacturing	2,825	269	10.49 (9.02, 11.95)	0.963	0.963
All industries (overall prevalence)				10.45		
Business services (73)	Services	5,653	600	10.44 (9.34, 11.55)	0.982	0.982

SIC	NORA industry sector	N	Number of cases	Adjusted prevalence 95 % CI (%)[a]	p value[b]	FDR p value[c]
Automotive dealers and service station (55)	Trade	2,478	208	10.27 (8.86, 11.68)	0.799	0.799
Wholesale trade-nondurable goods (51)	Trade	2,430	220	10.20 (8.78, 11.62)	0.727	0.727
Food stores (54)	Trade	6,212	603	10.18 (9.10, 11.26)	0.624	0.624
Transportation services (47)	Transportation, warehousing, utilities	1,699	139	10.16 (7.96, 12.37)	0.795	0.795
Educational services (82)	Services	40,844	5,201	10.13 (9.00, 11.25)	0.569	0.569
Textile mill products (22)	Manufacturing	740	68	10.00 (5.30, 14.70)	0.851	0.851
Food and kindred products (20)	Manufacturing	1,717	163	9.89 (8.44, 11.34)	0.444	0.444
Wholesale trade-durable goods (50)	Trade	6,129	486	9.83 (8.26, 11.39)	0.433	0.444
General building contractors (15)	Construction	1,978	154	9.73 (8.11, 11.35)	0.382	0.414
Communications (48)	Services	388	36	9.67 (5.64, 13.70)	0.705	0.705
Electronic and other electric equip. (36)	Manufacturing	4,490	393	9.60 (8.36, 10.84)	0.176	0.250
Eating and drinking places (58)	Services	1,201	113	9.49 (7.50, 11.49)	0.345	0.386
Administration of human resources (94)	Services	983	96	9.46 (6.06, 12.86)	0.566	0.566
Trucking and warehousing (42)	Transportation, warehousing, utilities	3,301	241	8.91 (7.55, 10.27)	0.026	0.059
Industrial machinery and equipment (35)	Manufacturing	6,173	431	8.83 (8.10, 9.56)	<0.001	<0.001
Fabricated metal products (34)	Manufacturing	4,701	355	8.79 (7.60, 9.99)	0.007	0.020
Transportation by air (45)	Transportation, warehousing, utilities	571	39	8.52 (6.76, 10.27)	0.031	0.062
Instruments and related products (38)	Manufacturing	3,947	270	8.48 (5.03, 11.93)	0.261	0.331
Primary metal industries (33)	Manufacturing	14,201	907	8.45 (6.59, 10.30)	0.034	0.065
Building materials and garden supplies (52)	Trade	690	46	8.22 (4.97, 11.47)	0.177	0.250
Transportation equipment (37)	Manufacturing	2,036	129	8.14 (6.03, 10.24)	0.031	0.062
Administration of economic programs (96)	Services	1,455	98	8.09 (4.15, 12.03)	0.240	0.326
Coal mining (12)	Mining	2,446	129	7.86 (6.28, 9.43)	0.001	0.005
heavy construction, ex. building (16)	Construction	1,043	59	7.54 (5.43, 9.64)	0.007	0.020
Stone, clay, and glass products (32)	Manufacturing	5,378	303	7.39 (5.88, 8.90)	<0.001	<0.001
Misc. repair services (76)	Services	206	12	7.21 (3.60, 10.82)	0.078	0.141
Oil and gas extraction (13)	Mining	201	12	7.13 (2.55, 11.72)	0.156	0.236
Amusement and recreation services (79)	Services	1,607	91	6.87 (3.88, 9.87)	0.019	0.052

Rates calculated for 55 SICs for which a sample of 200 or more was available, out of a total 82 two-digit SICs in the SIC system. Rates adjusted for gender, age, share of cost paid by insured, and behavioral health coverage carve-out. See text for model

[a] 95 % confidence interval does not include multiple testing adjustments

[b] Test of difference between industry rate and database population rate

[c] False discovery rate *p* value takes account of multiple testing

Table 3

Comparison of preferred and alternative case definitions of depression: overall prevalence and correlation of industry prevalence rates (Highmark data)

Case definition	Overall prevalence rate	Correlation of industry rates with industry rates based on preferred definition[a]
(Preferred definition)	10.38[b]	N/A
2 claims during 2002–2005, listing any of the ICD-9 diagnosis codes in Table 1		
(Alternative case definition #1)	7.11	0.93
2 claims for depression during 2002–2005, listing any of three ICD-9 codes (296.2, 296.3, 311)		
(Alternative case definition #2)	6.56	0.77
1 claim listing any of three ICD-9 codes (296.2, 296.3, 311) plus at least one claim for an antidepressant medication		
(Alternative case definition #3)	8.98	0.89
Satisfaction of the criteria for case definition #1, or the criteria for case definition #2, or both		

Based on data on individual depression claims and drug claims for a subset of the population in the main data set (described in "Methods" section in text)

[a]Pearson correlation coefficients. Industry prevalence rates weighted by $1/\mathrm{sqrt}(\mathrm{SE}_A^2 + \mathrm{SE}_B^2), \cdots$ where SE_A is the standard error of the prevalence estimate based on the preferred case definition and SE_B is the standard error of the prevalence estimate based on the alternative case definition. Rates were calculated for 62 two-digit SIC industries using methods described in "Methods" section (number of industries greater than in analysis of main data set, because rates also calculated for industries with samples under 200)

[b]Prevalence is slightly different than in Table 2 because of difference in data set. See note above

Table 4

Adjusted prevalence and 95 % confidence intervals of depression by NORA industry sector (Highmark data), and sector measures of psychological distress and psychosocial work characteristics (other data sources)

	Construction	Manufacturing	Wholesale and retail trade	Transportation, warehousing and utilities	Services[a]	Healthcare and social assistance
Depression (adjusted prevalence)[b]	10.6 (9.2, 11.9)	8.9 (7.9, 9.9)	10.2 (9.5, 10.9)	10.2 (8.8, 11.6)	10.6 (9.5, 11.6)	11.5 (10.7, 12.3)
Comorbid conditions						
At least 1 day of poor mental health in the past 30 days (percent)[d]	36.36 (29.84, 42.89)	33.33 (28.71, 37.96)	40.53 (36.01, 45.04)	31.90 (25.95, 38.31)	39.47 (37.12, 41.87)	43.25 (38.39, 48.11)
Anxiety, stress, and neurotic disorders (cases per 10,000 FTEs)[c]	0.15	0.12	0.41	0.59	0.35	0.40
Psychosocial characteristics of work						
Job control						
Lack of freedom to decide how to do job (percent)[e]	10.05 (5.97,14.12)	16.92 (13.25,20.58)	16.52 (13.10,19.94)	17.60 (12.71,22.49)	11.21 (9.69,12.73)	11.28 (8.17,14.38)
Overall stress						
Need for stress tolerance to do job (mean score)[f]	3.67 (0.003)	3.72 (0.003)	3.53 (0.001)	3.91 (0.003)	3.84 (0.001)	3.89 (0.000)
Work–family imbalance						
Job sometimes or often interferes with family life (percent)[e]	35.55 (29.02,42.00)	43.14 (38.29,48.15)	38.60 (34.13,43.06)	45.26 (38.85,51.66)	40.91 (38.55,43.27)	40.05 (35.26,44.84)
Effort–reward imbalance						
What I earn on the job is somewhat or much less than I deserve (percent)[e]	32.06 (25.73,38.38)	36.27 (31.54,41.00)	44.29 (39.64,48.94)	40.79 (34.41,47.17)	42.0 (39.60,44.39)	48.35 (43.41,53.29)

[a] NORA (National Occupational Research Agenda) industry sectors defined by the National Institute for Occupational Safety and Health. (See http://www.cdc.gov/niosh/nora/sector.html). NORA sectors are defined on the basis of NAICS industry codes. Where NAICS codes were unavailable, as with Highmark medical claims data, SIC industry codes were used to define sectors. See Table 2 in Bushnell 2011. The 95 % confidence intervals are in parentheses, except stress tolerance, standard error in parentheses

[b] Rates adjusted for gender, age, share of cost paid by insured, and behavioral health coverage carve-out. Based on Highmark claims data

[c] Days away from work cases recorded by employers on required OSHA logs, per 10,000 FTEs (full-time equivalent). Mean of annual rates, 2003–2007, except construction, mean of rates for 2006–2007 (confidence intervals not available). Bureau of Labor Statistics, US Department of Labor, Annual Survey of Occupational Injuries and Illnesses. Detailed data received by NIOSH from BLS in 2008. Some of this data reported in annual supplemental Table R72, available from: http://www.bls.gov/iif/oshcdnew.htm (website for Case and Demographic Characteristics for Work-related Injuries and Illnesses Involving Days Away From Work). Rates for other services, trade, and transportation, warehousing and utilities sectors derived from subsector rates, weighted by average annual subsector employment for 2003–2007, reported in annual BLS news releases entitled Workplace Injuries and Illnesses. Table 1. Accessed November 2009: http://www.bls.gov/schedule/archives/all_nr.htm#OSH

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[d] Calculated using 2002 and 2006 data from Quality of Worklife Survey, a module of the General Social Survey. See a description of the QWL module at http://www.cdc.gov/niosh/topics/stress/qwlquest.html. See full documentation and data at http://www3.norc.org/gss+website/. Percent of people indicating having at least 1 day of poor mental health for question "Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?"

[e] Those responding "not too true" or "not at all true" to the statement—I am given a lot of freedom to decide how to do my own work. Quality of Worklife Survey 2002 and 2006 combined: Quality of Worklife Survey, General Social Survey http://www.cdc.gov/niosh/topics/stress/qwlquest.html

[f] Based on O*NET survey results by occupation (Employment and Training Administration, DOL). Mean scores for industry sectors calculated with data on distribution of occupations by sector from BLS, Occupational Employment Statistics program

Table 5

Work stress and physical activity measures for two-digit SIC industries with highest rates of depression

Industry	Importance of stress tolerance[a]		Frequency of conflict situations[b]		Frequency of dealing with unpleasant angry or discourteous people[c]		Level of physical activity needed[d]	
	Mean (SD)	Rank	Mean (SD)	Rank	Mean (SD)	Rank	Mean (SD)	Rank
Local and interurban transit (41)	4.13 (0.10)	2	6.6 (0.99)	18	7.2 (1.06)	22	3.13 (0.18)	23
Real estate (65)	3.76 (0.04)	23	5.71 (0.56)	33	6.03 (0.54)	32	2.47 (0.06)	51
Social services (83)	3.93 (0.04)	9	8.18 (0.59)	4	7.65 (0.60)	17	2.58 (0.08)	46
Misc. manufacturing (39)	3.35 (0.03)	60	5.1 (0.35)	43	5.31 (0.37)	49	2.8 (0.06)	35
Personal services (72)	3.73 (0.07)	27	4.4 (0.72)	65	5.81 (1.09)	37	2.55 (0.14)	47
Legal services (81)	4.15 (0.08)	1	7.7 (1.15)	6	6.42 (1.25)	30	1.07 (0.13)	69
Membership organizations (86)	3.36 (0.02)	58	5.85 (0.33)	31	5.93 (0.32)	34	2.11 (0.05)	60
Securities and commodities (62)	3.96 (0.04)	7	9.54 (2.33)	2	8.0 (2.01)	14	1.16 (0.10)	67
Printing and publishing (27)	3.62 (0.03)	34	5.4 (0.41)	39	5.63 (0.40)	40	2.33 (0.06)	56
Mean of industries above	3.78	25	6.50	27	6.44	31	2.24	50

Based on O*NET data for the US (Employment and Training Administration). Rankings of mean scores for 70 two-digit SIC industries. Industries listed are those with statistically significant (FDR $p <$ 0.10) elevation of rate over database population rate of more than 15 %

[a] Work styles question #9: How important is stress tolerance to the performance of your current job? Response scale: 1 (not important)–5 (extremely important); Highest mean score (highest stress industry) is assigned a rank of 1

[b] Work context question #12: How often are conflict situations a part of your current job? Response scale: 1(never), 2(once a year or more but not every month), 3 (once a month or more but not every week), 4 (once a week or more but not every day), 5 (every day); Responses converted to mid-point of implied range of number of conflict situations per month: 0 = 0; 2 = 0.5; 3 = 2; 4 = 10; 5 = 20

[c] Work context question #13: How often is dealing with unpleasant, angry, or discourteous people a part of your current job? Response scale: same as for question #12 above. Responses converted to frequency per month as above

[d] Generalized work activities question #15. What level of performing general physical activities is needed to perform your current job? Response scale: 1 (walk between work stations in a small office–4 (paint the outside of a house)–6 (climb up and down poles to install electricity)–7 (highest numerical response possible, but no example activity given)

Table 6

Work stress and physical activity measures for two-digit SIC industries with lowest rates of depression

Industry	Importance of stress tolerance[a]		Frequency of conflict situations[b]		Frequency of dealing with unpleasant, angry or discourteous people[c]		Level of physical activity needed[d]	
	Mean (SD)	Rank	Mean (SD)	Rank	Mean (SD)	Rank	Mean (SD)	Rank
Amusement and recreation services (79)	3.56 (0.03)	38	5.94 (0.54)	29	6.82 (0.55)	29	3.07 (26)	26
Stone, clay, and glass (32)	3.54 (0.03)	39	5.09 (0.43)	44	5.93 (0.46)	34	3.55 (0.09)	8
Heavy construction ex. building (16)	3.72 (0.06)	28	4.73 (0.61)	55	4.69 (0.55)	64	3.97 (0.15)	2
Coal mining (12)	3.41 (0.04)	51	4.9 (0.50)	49	5.55 (0.52)	44	3.8 (0.07)	6
Transportation equipment (37)	2.99 (0.03)	69	4.3 (0.28)	67	4.29 (0.31)	69	2.69 (0.05)	43
Primary metal industries (33)	3.36 (0.03)	58	4.64 (0.28)	58	5.09 (0.32)	53	3.34 (0.06)	15
Transportation by air (45)	3.75 (0.07)	26	6.91 (0.84)	14	7.82 (0.97)	16	3.2 (0.17)	21
Fabricated metal products (34)	3.41 (0.04)	51	5.02 (0.36)	45	5.25 (0.41)	51	3.28 (0.07)	17
Industrial machinery equip (35)	3.46 (0.03)	46	4.85 (0.31)	52	4.99 (0.38)	56	2.85 (0.06)	30
Mean for industries above	3.47	45	5.15	46	5.60	46	3.31	19

Based on O*NET data for the US (Employment and Training Administration). Rankings of mean scores for 70 two-digit SIC industries. Industries listed are those with statistically significant (FDR p <0.10) difference of rate from database population rate, with rate less than 85 % of population rate

[a] Work styles question #9: How important is stress tolerance to the performance of your current job? Response scale: 1 (not important)–5 (extremely important); rank among 70 industries

[b] Work context question #12: How often are conflict situations a part of your current job? Response scale: 1 (never), 2 (once a year or more but not every month), 3 (once a month or more but not every week), 4 (once a week or more but not every day), 5 (every day); Responses converted to mid-point of implied range of number of conflict situations per month: 0 = 0; 2 = 0.5; 3 = 2; 4 = 10; 5 = 20

[c] Work context question #13: How often is dealing with unpleasant, angry, or discourteous people a part of your current job? Response scale: same as for question #12 above. Responses converted to frequency per month as above

[d] Generalized work activities question #15. What level of performing general physical activities is needed to perform your current job? Response scale: 1 (walk between work stations in a small office–4 (paint the outside of a house)–6 (climb up and down poles to install electricity)–7 (highest numerical response possible, but no example activity given)