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Morbidity Ranking of U.S. Workers Employed in 206 Occupations: The National Health Interview Survey (NHIS) 1986–1994

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Learning Objectives

- Identify the morbidity indicators which comprise the Morbidity Summary Score used to rank worker groups.
- Identify those occupations associated with the highest and the lowest Morbidity Summary Scores.
- Describe how the unadjusted and adjusted Morbidity Summary Scores differ and identify occupations that have the largest discrepancies between these two measures.

Abstract

Objective: *The objective of this study was to rank U.S. occupations by worker morbidity.* ***Methods:*** *From 1986 through 1994, morbidity information was collected on over 410,000 U.S. workers who participated in the National Health Interview Survey, an annual household survey representative of the U.S. civilian noninstitutionalized population. A multivariate adjusted logistic regression morbidity summary score was created for each worker group based on seven indicators: days of restricted activity, bedrest, and missed work in the previous 2 weeks; doctor visits and hospitalizations in the previous 12 months; reported health conditions; and health status.* ***Results:*** *Worker groups reporting the greatest morbidity included social workers, inspectors, postal clerks, psychologists, and grinding machine operators; worker groups reporting the least morbidity included dentists, pilots, physicians, pharmacists, and dietitians.* ***Conclusions:*** *These findings aid in the identification of worker groups that require increased attention for morbidity research and prevention.* (J Occup Environ Med. *2006;48:117–134*)

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The authors have no financial interest associated with this research.

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DOI: 10.1097/01.jom.0000199520.23232.26

The availability of large linked databases in European countries has provided an opportunity to examine a limited range of morbidity indicators such as hospitalization and cancer risk in worker groups.[1–3] However, these studies have been limited by a lack of individual-level morbidity indicators on large, diverse, and representative worker groups. In the United States, nationwide comparisons of the morbidity status of adults employed in occupational groups have been difficult to undertake due to the lack of large and nationally representative samples of workers. There has been no published comparative survey of morbidity among a representative sample of U.S. workers since reports based on data collected in 1969 to 1974[4] and in 1982 to 1985.[5,6]

The National Health Interview Survey (NHIS) is a multipurpose household survey of the U.S. civilian noninstitutionalized population conducted yearly since 1957 by the National Center for Health Statistics (NCHS). The 1986 to 1994 NHIS collected detailed information on job and occupational characteristics on all adult household members. This information allowed for the classification of workers using the U.S. Census Occupational Code system.[7] From 1986 to 1994, over 460,000 U.S. workers, age 18 years and older, participated in the NHIS. Although the 1986 to 1994 NHIS has enabled investigators to examine the morbidity status of selected occupational groups,[8–12] to date, a comparative analysis of the morbidity

of U.S. worker groups has not been undertaken. Starting in 1995, the NCHS stopped providing to investigators these detailed occupational codes, and in 1997, the NHIS underwent substantial modifications that further limited comparison with previous survey years. Thus, the 1986 to 1994 survey period represents the most current and only appropriate U.S. occupational database to undertake a comparative analysis of the morbidity status of a large representative sample of U.S. workers by occupation.

Materials and Methods

In the survey period 1986 to 1994, each week, all adults in a probability sample of households were interviewed by trained personnel to obtain information about the characteristics of each member of the household.[13] In the majority of cases (63%), the participants themselves answered all the questions; for the remaining participants, the responses were obtained from their relatives or other proxies. For simplicity, in the present study, both self-reported and proxy-reported data are referred to as "reported." In the period 1986 to 1994, annual NHIS household survey response rates ranged from 94% to 97%.[14–22]

Occupational Classification

Information on employment during the 2 weeks before the interview was collected for all persons aged 18 years or older to determine the person's current employment status. Although labeled "SOC" codes in their documentation,[23] the NHIS actually uses the U.S. Census Occupational Codes to classify workers. In 1992, the NHIS began using the 1990 version of the U.S. Census Occupational Codes.[7] Before 1992, the 1980 U.S. Census codes were used. There were differences in 26 of the occupational categories between the 1980 version and the 1990 version; these categories were programmatically recoded in the 1986 to 1991 datasets to categories compatible with the 1990 version using online lists available from the Census Bureau, the Integrated Public Use Mircodata Series, and other public domain sources. Detailed information on these recodes is available on the study web site (http://www.rsmas.miami.edu/groups/niehs/niosh/datadocs.htm#occupation). We restricted the analyses to occupational groups with an estimated employment of 100,000 persons or more. This restriction was necessary to ensure reasonably stable estimates and is an approach consistent with that taken in previous NHIS occupational analyses.[24,25]

Morbidity Measures

Information for the 2 weeks and for the 12 months before the interview was collected on restricted activity days, bed days, work loss days due to illness or injury, doctor visits, and hospital stays.[26] Health status indicators included a general question assessing health status (as excellent, very good, good, fair, or poor) and acute and chronic conditions. In the NHIS, details related to any reported acute or chronic condition (eg, onset, severity, duration) were collected and used by trained medical condition coders to assign International Classification of Diseases, 9th Revision codes for these conditions.[27,28]

Because several variable distributions were highly skewed, we dichotomized each of these morbidity indicators for use as dependent variables in separate logistic regression analyses as follows: restricted activity days in the previous two weeks (0 vs $\geq$1); restricted bed days in the previous 2 weeks (0 vs $\geq$1); work loss days due to illness or injury in the previous 2 weeks (0 vs $\geq$1); doctor visits in prior 12 months (0–3 vs $\geq$4); hospitalizations in prior 12 months (0 vs $\geq$1); the presence of acute or chronic conditions (0 vs $\geq$1); and self-rated health (0 = excellent, very good, or good versus 1 = fair or poor).[29]

Covariates

The covariates for each logistic model included age (18–44, 45–64, 65 years or older), gender, race, ethnicity, and educational status. Race was coded as: 1) black, 2) white, and 3) all other races; ethnicity was coded as Hispanic and non-Hispanic origin. Educational status was coded as: less than the 12th grade, completion of high school (or GED equivalent), and more than a 12th grade education.

Statistical Analysis

Because of the multistage sampling design, all logistic regression analyses were performed with adjustment for sample weights and design effects using the Software for Survey Data Analysis (SUDAAN) statistical package.[30] The sample weights used were those required for the analysis of NHIS data from combined survey years and were calculated as specified by Botman and Jack.[31] A series of seven separate multivariate logistic regression analyses controlling for survey design and the previously mentioned covariates compared workers in each occupational group with the remaining employed workforce with respect to each of the seven morbidity measures. Of note, due to the high covariance of race and ethnicity in the multivariate models (associated with the high percentage of white Hispanics), only the "race" variable was used in the final multivariate models.

A weighted average of the seven covariate-adjusted odds ratios was used to create a covariate-adjusted morbidity summary score for each occupational group. The weight used for each of the odds ratios was the inverse of its variance. This approach took into account the relative contribution of each odds ratio to the morbidity summary score because the distribution of the dependent variables varied (eg, restricted activity days were more common than hospitalizations). Furthermore, because each odds ratio was adjusted for sociodemographic characteristics, the resulting ranking based on this morbidity summary score better reflected the variation in morbidity more likely attributable to job-based characteristics (eg, workplace stress, physical demands). Covariate-ad-

justed morbidity summary scores that exceeded 1.0 indicated that the aggregate morbidity was greater for the corresponding occupation than for workers employed in the other 205 occupations; conversely, a covariate-adjusted morbidity summary score below 1.0 indicated that morbidity was lower in a particular occupational group.

An additional weighted average was created for each occupational group based on odds ratios *not* adjusted for covariates (ie, an unadjusted morbidity summary score). The ranking of this measure reflected, in absolute terms, the level of morbidity in each worker group in comparison to all other workers without considering demographic and socioeconomic characteristics of each worker group. The occupational health community can use this measure to identify which occupations are in the greatest need of targeted interventions.

Results

There were a total of 462,975 persons age 18 years and older who reported working within the 2 weeks before their participation in the 1986 to 1994 NHIS surveys. Retained in the analysis were workers employed in occupations with an estimated size of 100,000 workers or greater and who had complete covariate and morbidity data ($n = 410{,}420$). Among these U.S. workers, 196,030 (47.8%) were women. The overall mean age ± standard deviation was 38.9 ± 12.9 years. The racial distribution of the sample was 12.2% black, 84.3% white, and 3.4% for all other races; 7.4% reported their ethnicity as Hispanic. Within this Hispanic designation, 93.7% of the participants reported their race as "white."

Table 1 presents the 206 worker groups (each with at least 100,000 U.S. workers) ranked according to the covariate-adjusted morbidity summary score. Each row in the table contains the NHIS participant sample size, the estimated U.S. workforce size, occupation name, and corresponding census occupational code (in parentheses); the unadjusted and covariate-adjusted morbidity summary score; and the individual multivariate-adjusted odds ratios for the seven morbidity measures. Bolded odds ratios have corresponding 95% confidence intervals that do not include one (ie, significantly different morbidity from all other listed occupations after adjustment for covariates).

Twelve occupational groups had covariate-adjusted morbidity summary scores that exceeded 1.20, whereas 13 groups had summary scores below 0.80. With an adjusted morbidity summary score of 1.42, social workers were ranked as the most disabled occupational group of the 206 occupations examined. Social workers were also the only worker group that had statistically significant elevations in each of the seven individual multivariate-adjusted odds ratio models (range of odds ratios, 1.28–1.53). Other occupations reporting relatively high levels of morbidity based on covariate-adjusted morbidity summary scores included: inspectors, testers and graders (no. 2); postal clerks [except mail carriers] (no. 3); psychologists (no. 4); grinding/abrading/buffing/polishing machine operators (no. 5); nursing aids, orderlies, and attendants (no. 6); specified mechanics and repairers (no. 7); inspectors/compliance officers [except construction] (no. 8); correctional institutional officers (no. 9); and licensed practical nurses (no. 10).

With a covariate-adjusted morbidity summary score of 0.53, dentists were ranked as the least disabled occupational group of the 206 examined. Other occupations that reported comparatively less morbidity based on adjusted morbidity summary scores included: pilots (no. 205); other healthcare professionals, including physicians (no. 204); pharmacists (no. 203); and dietitians (no. 202); as well as driver–sales workers (no. 201); farm workers (no. 200); apparel sales workers (no. 199); sales counter clerks (no. 198); and tool and die makers (no. 197).

The correlation between the occupation-specific unadjusted and covariate-adjusted morbidity summary scores indicated a fair degree of correspondence between these two measures ($r = 0.73$; $P < 0.001$). There were four occupations that had unadjusted and covariate-adjusted morbidity scores, which differed by 0.25 units or more. These occupations, along with their unadjusted and adjusted morbidity scores, included: child care workers (1.26 and 1.01), child care workers, private household (1.27 and 1.01), private household cleaners and servants (1.18 and 0.91), and roofers (0.63 and 0.89).

There were some notable differences when comparing occupational rankings based on these two measures. Using the unadjusted morbidity summary score, the top five disabling occupations, along with their adjusted morbidity summary score rankings in parentheses, were: nursing aids, orderlies, and attendants (no. 6); social workers (no. 1); licensed practical nurses (no. 10); telephone operators (no. 19); and street and door-to-door sales workers (no. 16). Other worker groups which had unadjusted morbidity summary scores 1.20 or greater, but who did not rank in the top 30 occupations based on their covariate-adjusted morbidity summary scores, included: child care workers (Table 1 adjusted morbidity summary score ranking no. 93); private household child care workers (ranking no. 98); health aids, except nursing (ranking no. 45); and bus drivers (ranking no. 32).

Discussion

The occupational health community can use these findings to identify worker groups that require increased attention with respect to morbidity research and prevention. Some of these occupations such as the nursing professions have been studied fairly extensively with respect to the physical job-specific tasks thought to increase the risk of morbidity (eg, back strain due to lifting). However, some

TABLE 1
The 206 Largest Occupational Groups in the United States Ranked by a Multivariate-Adjusted Morbidity Summary Score: The 1986–1994 National Health Interview Survey

						Odds Ratios Adjusted for Age, Gender, Race, and Educational Status‡						
Ranking*	Sample Size	Estimated U.S. Workforce†	Occupation (Census Occupational Code)	Weighted Average of the Unadjusted Odds Ratios	Weighted Average of the Adjusted Odds Ratios	2-Wk Restricted Activity Days ≥1 vs 0	2-Wk Restricted Bed Days ≥1 vs 0	2-Wk Work Loss Days ≥1 vs 0	12-Mo Dr. Visits ≥4 vs 0–3	12-Mo Hospitalizations ≥1 vs 0	Health Status Poor/Fair vs Other	Chronic Conditions ≥1 vs 0
1	2351	569,851	Social workers (174)	1.48	1.42	**1.40**	**1.46**	**1.53**	**1.44**	**1.28**	**1.40**	**1.42**
2	542	137,766	Inspectors, testers, and graders (689)	1.28	1.39	**1.51**	1.49	1.43	**1.57**	1.16	**1.49**	**1.26**
3	1317	310,003	Postal clerks, except mail carriers (354)	1.26	1.32	**1.44**	**1.62**	**1.66**	**1.48**	0.92	1.11	**1.30**
4	754	190,497	Psychologists (167)	1.28	1.30	1.18	1.14	1.11	**1.62**	1.24	0.99	**1.37**
5	493	121,344	Grinding/abrading/buffing/polishing machine operators (709)	1.11	1.28	**1.34**	1.05	1.38	**1.34**	1.42	1.39	1.22
6	6447	1,477,561	Nursing aides, orderlies, and attendants (447)	1.51	1.28	**1.47**	**1.39**	**1.57**	1.07	**1.39**	**1.46**	**1.25**
7	994	257,127	Specified mechanics and repairers (547)	1.02	1.23	1.26	1.32	**1.38**	1.17	1.15	**1.40**	**1.20**
8	713	183,364	Inspectors/compliance officers, except construction (36)	1.16	1.23	1.26	1.27	**1.41**	**1.32**	1.30	0.99	1.16
9	853	219,927	Correctional institution officers (424)	1.02	1.22	**1.45**	1.15	**1.49**	**1.26**	**1.31**	1.04	1.13
10	1851	433,437	Licensed practical nurses (207)	1.46	1.22	**1.32**	**1.41**	**1.58**	0.99	**1.58**	**1.31**	**1.22**
11	503	126,355	Punching and stamping press machine operators (706)	1.14	1.21	1.13	1.07	1.31	**1.31**	1.46	0.99	1.23
12	1216	303,415	Mail carriers, postal service (355)	1.09	1.21	**1.34**	1.17	**1.56**	**1.30**	1.10	0.81	**1.25**
13	397	103,368	Actors and directors (187)	1.10	1.20	1.27	1.23	1.11	**1.35**	0.84	1.12	1.19
14	2571	650,456	Guards and police, except public service (426)	1.05	1.19	1.02	1.01	1.02	**1.35**	**1.25**	**1.36**	**1.21**
15	519	133,916	Bill and account collectors (378)	1.23	1.19	1.47	1.69	**1.83**	1.06	**1.78**	1.16	1.12
16	1084	276,408	Street and door-to-door sales workers (277)	1.36	1.19	**1.29**	**1.34**	0.98	1.14	1.00	**1.34**	**1.25**
17	4153	1,026,023	Assemblers (785)	1.14	1.18	**1.25**	1.10	**1.37**	**1.24**	**1.25**	**1.16**	1.07
18	479	122,582	Purchasing managers (9)	1.03	1.17	1.29	1.00	**1.44**	**1.49**	1.20	0.72	1.14

(*Continued*)

TABLE 1
(Continued)

Ranking*	Sample Size	Estimated U.S. Workforce†	Occupation (Census Occupational Code)	Weighted Average of the Unadjusted Odds Ratios	Weighted Average of the Adjusted Odds Ratios	Odds Ratios Adjusted for Age, Gender, Race, and Educational Status‡						
						2-Wk Restricted Activity Days ≥1 vs 0	2-Wk Restricted Bed Days ≥1 vs 0	2-Wk Work Loss Days ≥1 vs 0	12-Mo Dr. Visits ≥4 vs 0–3	12-Mo Hospitalizations ≥1 vs 0	Health Status Poor/Fair vs Other	Chronic Conditions ≥1 vs 0
19	795	195,396	Telephone operators (348)	1.37	1.16	1.23	**1.36**	1.25	1.14	1.19	1.14	1.10
20	593	149,560	Stationary engineers (696)	1.00	1.16	1.24	1.27	1.21	**1.30**	0.98	1.14	1.11
21	724	180,789	Dispatchers (359)	1.14	1.16	1.28	**1.51**	1.30	1.01	**1.34**	1.22	**1.16**
22	894	222,426	Personal service occupations, not elsewhere classified (469)	1.28	1.16	1.25	1.27	1.10	1.14	1.00	**1.33**	1.15
23	1737	434,916	Administrators/officials, public administration (5)	1.16	1.16	1.07	1.01	1.17	**1.33**	1.02	0.91	**1.19**
24	8601	2,067,101	Janitors and cleaners (453)	1.11	1.16	**1.21**	**1.21**	**1.19**	**1.08**	1.00	**1.30**	**1.17**
25	1017	252,519	Teachers, special education (158)	1.19	1.15	1.13	1.05	1.15	**1.34**	0.96	0.77	**1.18**
26	452	115,384	Aerospace engineer (44)	0.95	1.15	1.42	0.90	1.22	1.21	0.87	1.11	1.19
27	2168	564,743	Computer systems analysts and scientists (64)	0.96	1.14	**1.32**	**1.30**	**1.25**	**1.21**	**0.70**	0.87	**1.21**
28	549	143,964	Sheet metal workers (653)	0.96	1.14	1.07	1.02	1.23	1.18	1.21	1.16	1.13
29	1026	262,756	Counselors, educational and vocational (163)	1.19	1.14	1.00	1.07	1.09	1.13	0.97	1.06	**1.38**
30	487	123,316	Messengers (357)	1.07	1.14	1.22	1.24	1.01	1.20	1.02	1.07	1.16
31	1314	330,504	Health technologists and technicians (208)	1.17	1.14	**1.29**	1.21	**1.25**	1.07	**1.43**	1.03	1.10
32	1845	437,321	Bus drivers (808)	1.20	1.13	1.05	1.03	1.02	**1.26**	**1.24**	1.09	**1.13**
33	2306	571,665	Production inspectors, checkers, and examiners (796)	1.18	1.12	1.11	1.04	1.13	**1.20**	1.09	**1.22**	1.06
34	2049	522,513	Machinists (637)	0.93	1.12	**1.22**	1.18	**1.35**	**1.19**	1.04	1.15	1.02
35	1961	515,413	Computer programmers (229)	0.92	1.12	**1.22**	**1.27**	1.14	**1.17**	0.83	0.80	**1.14**
36	1842	481,710	Police and detectives, public service (418)	0.89	1.12	**1.28**	1.11	**1.52**	**1.30**	1.10	**0.67**	1.02
37	1780	462,626	Technicians (235)	0.97	1.11	**1.25**	1.20	1.21	**1.14**	1.02	0.82	**1.13**
38	2341	597,287	Welders and cutters (783)	0.89	1.11	**1.22**	**1.27**	**1.31**	1.01	0.96	1.11	**1.13**

(*Continued*)

TABLE 1
(Continued)

Ranking*	Sample Size	Estimated U.S. Workforce†	Occupation (Census Occupational Code)	Weighted Average of the Unadjusted Odds Ratios	Weighted Average of the Adjusted Odds Ratios	Odds Ratios Adjusted for Age, Gender, Race, and Educational Status‡						
						2-Wk Restricted Activity Days ≥1 vs 0	2-Wk Restricted Bed Days ≥1 vs 0	2-Wk Work Loss Days ≥1 vs 0	12-Mo Dr. Visits ≥4 vs 0–3	12-Mo Hospitalizations ≥1 vs 0	Health Status Poor/Fair vs Other	Chronic Conditions ≥1 vs 0
39	412	103,758	Molding and casting machine operators (719)	0.97	1.11	**1.45**	1.30	**1.62**	0.99	1.35	1.39	0.96
40	735	183,515	Order clerks (327)	1.18	1.11	1.06	1.05	1.01	**1.28**	**1.47**	1.37	1.01
41	1208	312,281	Bus, truck, and stationary engine mechanics (507)	0.89	1.11	1.04	0.93	1.05	1.10	**1.43**	**1.44**	1.07
42	662	169,750	Construction trades, not elsewhere classified (599)	0.87	1.10	1.29	**1.67**	1.30	1.12	0.83	1.04	1.06
43	848	225,091	Heating, air conditioning, and refrigeration mechanics (534)	0.87	1.10	**1.32**	1.21	1.33	1.01	1.07	1.34	1.04
44	823	207,706	Management analysts (26)	1.03	1.10	1.25	1.03	1.03	**1.20**	0.90	0.80	**1.16**
45	1368	333,037	Health aides, except nursing (446)	1.25	1.10	**1.24**	**1.35**	**1.25**	0.97	1.26	1.06	1.10
46	456	117,109	Miscellaneous material moving equipment operators (859)	0.95	1.10	1.23	1.03	1.44	1.11	1.43	0.85	1.05
47	2007	485,635	Data-entry keyers (385)	1.18	1.10	1.14	1.16	1.17	**1.13**	0.96	1.12	1.05
48	526	139,849	Aircraft engine mechanics (508)	0.87	1.09	**1.52**	**1.56**	**1.72**	1.23	1.37	**0.62**	1.06
49	1023	261,701	Engineering technicians (216)	0.97	1.09	1.11	1.06	1.22	1.15	0.92	0.80	**1.13**
50	736	191,990	Buyers, wholesale/retail trade except farm product (29)	1.12	1.09	1.05	1.22	1.17	1.08	0.99	0.99	1.11
51	2303	585,833	Stock and inventory clerks (365)	1.04	1.09	1.06	0.97	**1.20**	1.12	**1.33**	1.03	1.05
52	491	123,593	Mixing and blending machine operators (756)	0.93	1.08	1.16	1.19	1.23	1.11	1.43	0.65	1.13
53	933	247,967	Editors and reporters (195)	1.02	1.08	1.09	1.04	1.10	**1.23**	1.02	0.77	1.08
54	1345	330,405	Clergy (176)	0.98	1.08	1.11	1.11	0.83	1.06	**1.40**	1.05	1.09
55	777	198,640	Taxicab drivers and chauffeurs (809)	0.91	1.07	1.08	1.00	1.01	1.07	1.20	**1.75**	1.01

(*Continued*)

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(Continued)

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56	921	230,284	Electrical/electronic equipment assemblers (683)	1.11	1.07	1.19	1.09	**1.43**	1.03	1.17	1.13	0.94
57	1106	282,895	Supervisors, mechanics, and repairers (503)	0.89	1.07	0.99	1.18	0.90	1.11	1.02	0.96	**1.15**
58	661	159,703	Supervisors, cleaning and building service workers (448)	1.04	1.07	1.00	0.87	1.12	1.00	1.17	1.11	1.16
59	992	265,437	Drafting occupations (217)	0.90	1.07	1.13	1.16	1.04	1.01	0.93	1.01	1.12
60	626	162,026	Heavy equipment mechanics (516)	0.85	1.06	0.84	0.90	0.88	1.14	**1.48**	1.06	1.13
61	2162	545,219	Teachers (159)	1.11	1.06	1.05	1.02	0.90	**1.25**	0.97	0.96	1.06
62	982	254,196	Not specified mechanics and repairers (549)	0.89	1.06	1.11	1.10	1.24	1.06	0.87	1.08	1.06
63	2037	526,843	Designers (185)	1.07	1.06	**1.17**	1.20	1.19	1.05	0.91	0.97	1.04
64	813	204,210	Production coordinators (363)	1.05	1.06	0.95	0.98	1.01	**1.20**	0.98	0.94	1.09
65	635	166,170	Economists (166)	0.91	1.05	1.17	0.93	0.97	**1.38**	0.85	0.71	1.04
66	1664	423,173	Industrial machinery repairers (518)	0.86	1.05	1.01	0.94	1.11	1.03	1.14	1.00	1.09
67	547	142,145	Advertising and related sales occupations (256)	0.98	1.05	1.11	**1.54**	1.33	1.15	0.79	0.78	1.02
68	2890	717,172	Administrative support occupations (389)	1.14	1.05	0.99	1.02	1.02	**1.10**	1.05	0.83	**1.11**
69	487	127,159	Sheriffs/bailiffs/other law enforcement officers (423)	0.92	1.05	1.07	1.19	1.10	1.13	0.80	1.17	1.01
70	645	159,184	Records clerks (336)	1.13	1.05	1.07	1.09	1.14	1.06	0.93	0.95	1.05
71	1707	429,136	Personnel/training/labor relations specialists (27)	1.05	1.05	0.91	0.81	1.07	**1.19**	1.10	0.83	**1.13**
72	1500	393,028	Sales occupations, other business services (257)	0.99	1.04	1.09	1.22	1.18	1.03	1.07	1.09	0.99
73	1807	456,019	Supervisors, general office (303)	1.16	1.04	1.05	1.09	1.06	1.01	1.13	0.99	1.05

(*Continued*)

TABLE 1
(Continued)

Ranking*	Sample Size	Estimated U.S. Workforce†	Occupation (Census Occupational Code)	Weighted Average of the Unadjusted Odds Ratios	Weighted Average of the Adjusted Odds Ratios	Odds Ratios Adjusted for Age, Gender, Race, and Educational Status‡						
						2-Wk Restricted Activity Days ≥1 vs 0	2-Wk Restricted Bed Days ≥1 vs 0	2-Wk Work Loss Days ≥1 vs 0	12-Mo Dr. Visits ≥4 vs 0–3	12-Mo Hospitalizations ≥1 vs 0	Health Status Poor/Fair vs Other	Chronic Conditions ≥1 vs 0
74	1476	371,203	Management-related occupations (37)	1.09	1.04	1.02	0.99	1.14	**1.19**	0.94	**0.59**	**1.19**
75	5004	1,250,422	Laborers, except construction (889)	0.90	1.04	**1.15**	0.99	**1.20**	0.97	1.07	1.12	1.01
76	3648	912,207	Miscellaneous machine operators (777)	0.95	1.04	1.00	0.95	1.11	1.07	1.11	1.08	1.00
77	1228	304,227	Insurance adjusters, examiners, and investigators (375)	1.03	1.04	1.03	1.13	1.04	1.14	1.20	0.74	1.02
78	581	146,720	Interviewers (316)	1.18	1.04	0.88	1.00	0.88	1.13	1.27	0.95	1.09
79	1816	450,241	Industrial truck and tractor equipment operators (856)	0.83	1.03	1.12	1.10	**1.27**	1.05	**1.27**	1.00	0.96
80	1009	257,406	Managers, medicine and health (15)	1.13	1.03	0.91	0.85	1.01	1.04	1.13	1.06	1.09
81	1650	408,944	Teachers, pre-K and K (155)	1.15	1.03	1.03	1.07	0.97	**1.14**	0.93	1.05	0.99
82	657	165,608	Billing clerks (339)	1.17	1.03	1.02	1.14	1.06	1.13	1.09	0.98	0.94
83	887	225,123	Postsecondary teachers, subject unspecified (154)	0.96	1.03	1.02	0.90	0.75	**1.26**	0.79	1.15	1.09
84	2629	659,841	Computer operators (308)	1.05	1.03	1.06	1.10	1.11	1.01	1.18	0.93	1.00
85	3010	747,566	Receptionists (319)	1.20	1.03	1.04	1.07	1.06	1.07	1.06	0.98	0.98
86	2131	532,733	Administrators, education and related fields (14)	1.03	1.03	1.04	1.01	0.94	**1.14**	1.09	**0.66**	1.08
87	7300	1,799,165	Registered nurses (95)	1.16	1.02	1.05	0.99	**1.12**	0.95	**1.33**	**0.84**	1.05
88	945	245,025	Legal assistants (234)	1.06	1.02	0.97	0.96	0.92	**1.22**	0.89	0.78	1.02
89	1655	424,823	Managers, properties and real estate (18)	1.10	1.02	1.00	1.05	0.86	0.99	1.21	**1.25**	1.02
90	442	120,428	Attendants, amusement and recreation facilities (459)	0.95	1.02	0.92	1.15	0.77	1.09	0.94	1.07	1.14
91	928	243,308	Painters/sculptors/craft artists/artist printmaker (188)	1.02	1.02	1.02	1.14	1.05	1.03	0.72	0.87	**1.24**

(*Continued*)

TABLE 1
(Continued)

Ranking*	Sample Size	Estimated U.S. Workforce†	Occupation (Census Occupational Code)	Weighted Average of the Unadjusted Odds Ratios	Weighted Average of the Adjusted Odds Ratios	Odds Ratios Adjusted for Age, Gender, Race, and Educational Status‡						
						2-Wk Restricted Activity Days ≥1 vs 0	2-Wk Restricted Bed Days ≥1 vs 0	2-Wk Work Loss Days ≥1 vs 0	12-Mo Dr. Visits ≥4 vs 0–3	12-Mo Hospitalizations ≥1 vs 0	Health Status Poor/Fair vs Other	Chronic Conditions ≥1 vs 0
92	790	193,069	File clerks (335)	1.09	1.02	0.93	1.01	1.09	1.11	0.72	1.05	1.06
93	3537	855,757	Child care workers (468)	1.26	1.01	1.00	1.04	**0.70**	1.05	0.93	**1.22**	**1.19**
94	2109	515,090	Typists (315)	1.14	1.01	1.07	1.00	1.06	1.09	0.90	**0.79**	1.02
95	476	124,271	Chemists, except biochemists (73)	0.89	1.01	0.92	0.92	1.02	0.90	1.01	0.97	1.20
96	2122	528,820	Machine operators, not specified (779)	0.93	1.01	1.06	1.04	1.19	0.97	0.93	1.09	1.00
97	1277	344,383	Bartenders (434)	1.02	1.01	1.10	1.24	1.00	0.85	1.04	1.16	1.07
98	735	184,736	Child care workers, private household (406)	1.27	1.01	0.88	0.89	**0.59**	1.07	1.09	**1.47**	**1.20**
99	2527	636,942	Investigators and adjusters, except insurance (376)	1.05	1.01	1.05	1.03	1.06	1.08	0.90	**0.77**	1.02
100	2576	654,951	Insurance sales occupations (253)	0.98	1.01	1.03	1.06	0.98	1.01	1.14	1.00	0.98
101	10449	2,640,585	Truck drivers (804)	0.85	1.00	1.00	0.91	1.05	1.06	**1.11**	1.04	0.95
102	2235	571,810	Freight, stock, and material handlers, not elsewhere classified (883)	0.81	1.00	1.15	1.06	1.18	1.01	1.04	0.96	0.93
103	569	145,879	Personnel and labor relations managers (8)	0.98	1.00	0.89	0.98	0.91	1.13	1.04	0.69	1.05
104	2034	531,212	Traffic, shipping, and receiving clerks (364)	0.90	1.00	1.09	1.07	1.10	1.01	0.81	0.97	0.99
105	2416	626,998	Electricians (575)	0.80	1.00	1.05	1.05	1.07	0.94	0.85	0.98	1.02
106	4792	1,207,921	Teachers, secondary school (157)	0.96	0.99	0.98	1.00	0.95	1.05	0.97	**0.72**	**1.07**
107	529	125,068	Graders and sorters, except agricultural (799)	1.03	0.99	0.84	0.84	0.99	1.00	1.21	1.07	1.04
108	1006	259,072	Supervisors, food preparation and service occupations (433)	1.02	0.99	1.16	1.12	1.09	0.87	0.97	0.98	1.03
109	715	178,110	Mail clerks, except postal service (356)	0.98	0.99	1.02	0.86	0.94	1.13	0.84	0.84	1.07
110	680	176,710	Architects (43)	0.84	0.99	1.23	**1.45**	1.14	0.91	**0.64**	0.82	1.05
111	3553	924,831	Automobile mechanics (505)	0.77	0.99	1.06	**1.21**	1.00	**0.89**	0.88	1.16	1.01
112	4708	1,187,412	General office clerks (379)	1.14	0.99	1.01	1.02	1.07	0.97	0.97	0.99	0.97

(*Continued*)

TABLE 1
(Continued)

Ranking*	Sample Size	Estimated U.S. Workforce†	Occupation (Census Occupational Code)	Weighted Average of the Unadjusted Odds Ratios	Weighted Average of the Adjusted Odds Ratios	Odds Ratios Adjusted for Age, Gender, Race, and Educational Status‡						
						2-Wk Restricted Activity Days ≥1 vs 0	2-Wk Restricted Bed Days ≥1 vs 0	2-Wk Work Loss Days ≥1 vs 0	12-Mo Dr. Visits ≥4 vs 0–3	12-Mo Hospitalizations ≥1 vs 0	Health Status Poor/Fair vs Other	Chronic Conditions ≥1 vs 0
113	2366	551,376	Maids and housemen (449)	1.13	0.99	1.00	1.00	1.03	**0.87**	0.89	**1.16**	1.04
114	605	150,511	Payroll and timekeeping clerks (338)	1.09	0.99	1.00	1.10	1.19	1.18	0.84	0.74	0.93
115	6236	1,524,602	Teachers, elementary school (156)	1.09	0.98	0.97	0.90	0.94	1.06	0.92	**0.81**	1.01
116	1447	378,968	Electrical and electronic technicians (213)	0.81	0.98	0.95	1.21	1.08	0.90	0.83	0.82	1.07
117	666	169,140	Expediters (373)	1.04	0.98	1.00	0.99	0.97	1.02	0.84	1.24	0.92
118	734	184,736	Painting and paint-spraying machine operators (759)	0.80	0.98	0.96	0.93	1.07	0.91	0.95	1.10	0.99
119	1007	260,021	Purchasing agents and buyers (33)	0.94	0.98	0.92	1.11	1.04	1.14	0.85	**0.63**	1.04
120	737	185,788	Librarians (164)	1.01	0.98	1.03	1.07	0.98	1.08	0.97	**0.45**	**1.18**
121	1623	419,839	Plumbers, pipefitters, and steamfitters (585)	0.78	0.97	1.11	0.89	1.09	0.98	0.97	1.04	0.92
122	503	134,989	Photographers (189)	0.84	0.97	1.15	1.08	0.78	1.08	0.79	0.74	1.04
123	1625	388,785	Teachers aides (387)	1.13	0.97	0.96	0.88	0.96	0.98	0.86	1.07	1.01
124	2502	637,557	Managers/marketing/advertising/public relations (13)	0.85	0.97	0.93	1.07	0.95	1.02	1.06	**0.67**	0.99
125	1082	279,844	Operations/systems researchers and analysts (65)	0.84	0.97	1.10	1.05	1.12	**1.22**	**0.44**	0.78	1.06
126	2037	501,893	Miscellaneous food preparation occupations (444)	1.02	0.96	1.07	1.10	0.93	**0.85**	**0.81**	1.12	1.06
127	8164	2,043,195	Cashiers (276)	1.05	0.96	0.98	0.95	0.98	**0.93**	1.01	**1.19**	**0.92**
128	4834	1,243,450	Waiters and waitresses (435)	1.05	0.96	1.10	**1.18**	1.04	0.93	0.88	1.15	**0.90**
129	491	125,725	Library clerks (329)	1.03	0.95	1.09	1.17	0.97	0.95	0.56	0.64	1.17
130	920	234,775	Industrial (56)	0.79	0.95	0.92	0.88	0.81	1.05	0.96	**0.60**	1.08
131	5647	1,449,425	Accountants and auditors (23)	0.92	0.95	0.94	0.97	0.97	1.02	1.03	0.91	**0.91**
132	647	171,362	Musicians and composers (186)	0.91	0.95	1.06	1.29	**0.43**	1.16	0.99	1.31	1.07

(*Continued*)

TABLE 1
(Continued)

Ranking*	Sample Size	Estimated U.S. Workforce†	Occupation (Census Occupational Code)	Weighted Average of the Unadjusted Odds Ratios	Weighted Average of the Adjusted Odds Ratios	Odds Ratios Adjusted for Age, Gender, Race, and Educational Status‡						
						2-Wk Restricted Activity Days ≥1 vs 0	2-Wk Restricted Bed Days ≥1 vs 0	2-Wk Work Loss Days ≥1 vs 0	12-Mo Dr. Visits ≥4 vs 0–3	12-Mo Hospitalizations ≥1 vs 0	Health Status Poor/Fair vs Other	Chronic Conditions ≥1 vs 0
133	1970	509,017	Supervisors, construction (558)	0.77	0.95	0.87	0.93	0.86	0.90	0.96	0.97	1.03
134	734	174,095	Laundering and dry cleaning machine operators (748)	1.02	0.95	0.90	0.93	0.94	0.85	0.85	**1.26**	1.02
135	1093	288,542	Securities and financial services sales occupations (255)	0.84	0.95	0.97	0.96	1.02	1.07	1.16	0.68	0.89
136	644	162,838	Telephone installers and repairers (529)	0.79	0.95	0.84	1.00	0.95	1.00	0.84	0.67	1.05
137	649	168,127	Public relations specialists (197)	0.94	0.94	0.98	0.73	1.00	**1.22**	0.67	0.74	0.96
138	402	105,818	Sales workers, furniture and home furnishings (266)	0.94	0.94	0.79	0.76	0.85	0.92	1.38	0.92	1.02
139	2856	727,887	Other financial officers (25)	0.89	0.93	0.93	0.88	0.88	1.07	0.86	**0.64**	0.95
140	770	198,277	Firefighting occupations (417)	0.71	0.93	**1.33**	1.07	**1.44**	1.21	1.21	**0.38**	0.93
141	991	255,606	Sales workers, motor vehicles and boats (263)	0.79	0.93	0.93	0.82	0.97	0.87	**1.55**	1.32	0.88
142	33553	8,609,388	Managers and administrators (22)	0.88	0.93	**0.85**	**0.90**	**0.79**	**0.94**	**0.93**	**0.82**	0.98
143	1009	245,670	Hand packers and packagers (888)	0.97	0.93	0.96	0.83	1.11	0.89	1.26	1.22	**0.85**
144	986	253,326	Operating engineers (844)	0.76	0.93	0.82	1.00	0.81	0.88	0.85	0.84	1.09
145	6414	1,587,227	Cooks (436)	0.91	0.93	0.92	0.97	0.91	**0.84**	0.95	**1.21**	**0.93**
146	1326	328,584	Clinical lab technologists and technicians (203)	0.98	0.92	0.87	0.82	0.92	0.95	**1.39**	1.00	0.88
147	499	123,787	Dressmakers (666)	1.16	0.92	0.99	0.75	0.77	0.82	0.92	1.27	1.05
148	1556	381,818	Packaging and filling machine operators (754)	0.95	0.92	0.91	0.79	0.97	**0.88**	1.11	1.11	**0.87**
149	844	213,405	Butchers and meat cutters (686)	0.78	0.92	0.91	0.88	1.13	0.89	1.12	1.01	0.87

(*Continued*)

TABLE 1
(Continued)

Ranking*	Sample Size	Estimated U.S. Workforce†	Occupation (Census Occupational Code)	Weighted Average of the Unadjusted Odds Ratios	Weighted Average of the Adjusted Odds Ratios	Odds Ratios Adjusted for Age, Gender, Race, and Educational Status‡						
						2-Wk Restricted Activity Days ≥1 vs 0	2-Wk Restricted Bed Days ≥1 vs 0	2-Wk Work Loss Days ≥1 vs 0	12-Mo Dr. Visits ≥4 vs 0–3	12-Mo Hospitalizations ≥1 vs 0	Health Status Poor/Fair vs Other	Chronic Conditions ≥1 vs 0
150	2502	632,818	Groundskeepers and gardeners, except farm (486)	0.74	0.92	0.92	0.90	0.98	**0.84**	**0.78**	**1.20**	0.95
151	5112	1,336,839	Carpenters (567)	0.73	0.92	1.03	1.01	1.13	**0.84**	**0.82**	0.91	**0.92**
152	821	204,112	Slicing and cutting machine operators (769)	0.83	0.92	0.92	0.91	1.02	0.99	0.81	0.95	0.87
153	2854	747,311	Lawyers (178)	0.80	0.92	**0.82**	0.86	0.80	**1.21**	0.84	0.82	0.95
154	2307	515,168	Private household cleaners and servants (407)	1.18	0.91	0.94	0.87	**0.71**	**0.84**	**0.65**	**1.37**	**1.14**
155	7239	1,817,127	Bookkeepers, accounting, and auditing clerks (337)	1.10	0.91	**0.86**	0.92	**0.86**	0.95	0.96	**0.82**	**0.93**
156	4333	1,092,668	Supervisors, production occupations (628)	0.80	0.91	**0.84**	0.88	**0.81**	0.92	1.16	**0.84**	0.94
157	5013	1,305,211	Sales representatives, mining/manufacturing/wholesale (259)	0.82	0.91	**0.86**	0.85	**0.80**	0.96	0.96	**0.76**	0.96
158	543	137,287	Radiologic technicians (206)	0.95	0.91	0.83	0.85	0.87	0.92	1.29	0.82	0.93
159	1081	285,379	Engineers (59)	0.74	0.91	0.85	1.01	0.87	1.01	**0.61**	**0.64**	0.99
160	2274	592,715	Electrical and electronic (55)	0.72	0.91	0.90	0.78	0.82	1.00	**0.79**	**0.71**	1.00
161	15276	3,828,302	Secretaries (313)	1.07	0.91	0.97	1.02	1.00	**0.93**	0.97	**0.67**	**0.91**
162	695	176,859	Food counter/fountain/related occupations (438)	0.95	0.91	0.92	1.18	0.94	0.86	0.68	1.01	0.94
163	1015	264,614	Civil engineer (53)	0.75	0.90	0.89	0.83	0.88	1.04	1.03	0.78	**0.86**
164	676	167,519	Vehicle washers and equipment cleaners (887)	0.70	0.90	0.96	0.97	0.88	**0.77**	1.15	1.30	0.89
165	452	119,117	Sales workers, radio, TV, stereo, and appliances (267)	0.78	0.90	1.25	0.84	1.08	0.81	0.96	0.87	0.89
166	398	104,819	Timber cutting and logging occupations (496)	0.74	0.90	0.98	1.28	1.10	0.77	0.58	1.37	0.99
167	692	167,631	Managers, farms, except horticultural (475)	0.81	0.90	0.95	1.03	0.86	**0.78**	1.33	1.09	0.93

(*Continued*)

TABLE 1
(Continued)

Ranking*	Sample Size	Estimated U.S. Workforce†	Occupation (Census Occupational Code)	Weighted Average of the Unadjusted Odds Ratios	Weighted Average of the Adjusted Odds Ratios	Odds Ratios Adjusted for Age, Gender, Race, and Educational Status‡						
						2-Wk Restricted Activity Days ≥1 vs 0	2-Wk Restricted Bed Days ≥1 vs 0	2-Wk Work Loss Days ≥1 vs 0	12-Mo Dr. Visits ≥4 vs 0–3	12-Mo Hospitalizations ≥1 vs 0	Health Status Poor/Fair vs Other	Chronic Conditions ≥1 vs 0
168	568	131,707	Pressing machine operators (747)	0.95	0.89	0.87	0.68	0.89	0.78	0.92	1.20	1.02
169	2972	741,546	Hairdressers and cosmetologists (458)	1.04	0.89	**0.76**	0.88	**0.71**	0.95	0.99	0.98	0.95
170	4899	1,166,644	Farmers, except horticultural (473)	0.80	0.89	**0.80**	**0.69**	**0.67**	**0.89**	1.08	1.10	0.98
171	3071	788,281	Real estate sales occupations (254)	0.96	0.89	0.87	0.81	**0.76**	**0.86**	0.84	1.02	0.97
172	613	158,847	Roofers (595)	0.63	0.89	0.97	1.06	1.06	**0.68**	0.97	**1.56**	0.89
173	611	158,092	Garage and service station-related occupations (885)	0.71	0.89	0.87	0.94	0.91	0.79	1.09	1.00	0.90
174	647	169,027	Electronic repairers, communication/industrial equipment (523)	0.74	0.88	1.05	1.01	0.97	0.89	0.70	**0.66**	0.93
175	8281	2,118,672	Sales workers, other commodities (274)	0.96	0.88	**0.91**	0.96	0.90	**0.82**	0.89	1.00	**0.88**
176	1233	323,661	Printing press operators (734)	0.76	0.88	**0.71**	0.77	0.77	0.99	0.98	0.78	0.95
177	2534	650,044	Stock handlers and baggers (877)	0.80	0.88	0.91	0.92	0.92	0.92	0.81	**0.80**	**0.86**
178	706	177,953	Supervisors, distribution, scheduling, and adjusting (307)	0.82	0.87	0.79	0.83	0.88	1.00	0.87	0.83	0.86
179	385	100,868	Supervisors, related agricultural occupations (485)	0.73	0.87	0.92	0.74	0.89	0.93	0.72	0.88	0.88
180	1255	330,773	Mechanical (57)	0.70	0.87	0.80	0.84	0.84	0.92	0.86	0.71	0.89
181	699	179,883	Brickmasons and stonemasons (563)	0.70	0.87	0.91	0.73	0.91	0.82	0.97	0.80	0.90
182	499	128,093	Bakers (687)	0.86	0.87	0.89	0.74	0.91	0.94	0.82	0.91	0.84
183	642	164,670	Transportation ticket and reservation agents (318)	0.88	0.86	0.73	0.72	0.85	1.11	0.91	0.79	**0.80**
184	693	176,208	Dental assistants (445)	0.93	0.86	0.77	0.76	0.71	1.03	1.11	**0.42**	0.99
185	2707	697,191	Construction laborers (869)	0.66	0.86	0.91	**0.78**	0.99	**0.80**	0.84	1.14	**0.81**

(*Continued*)

TABLE 1
(Continued)

Ranking*	Sample Size	Estimated U.S. Workforce†	Occupation (Census Occupational Code)	Weighted Average of the Unadjusted Odds Ratios	Weighted Average of the Adjusted Odds Ratios	Odds Ratios Adjusted for Age, Gender, Race, and Educational Status‡						
						2-Wk Restricted Activity Days ≥1 vs 0	2-Wk Restricted Bed Days ≥1 vs 0	2-Wk Work Loss Days ≥1 vs 0	12-Mo Dr. Visits ≥4 vs 0–3	12-Mo Hospitalizations ≥1 vs 0	Health Status Poor/Fair vs Other	Chronic Conditions ≥1 vs 0
186	13986	3,596,023	Supervisors/proprietors, sales occupations (243)	0.83	0.86	**0.80**	**0.87**	**0.74**	**0.84**	0.93	**0.88**	**0.89**
187	1918	495,214	Painters, construction and maintenance (579)	0.67	0.85	0.97	0.98	0.99	**0.68**	0.85	1.20	**0.89**
188	1045	264,739	Waiters/waitresses assistants (443)	0.81	0.85	1.00	1.01	0.91	**0.76**	**0.71**	1.03	**0.84**
189	2050	516,489	Financial managers (7)	0.78	0.85	**0.81**	0.84	0.80	0.96	0.89	**0.56**	**0.87**
190	789	192,563	Kitchen workers, food preparation (439)	0.93	0.84	**0.67**	0.66	**0.57**	0.99	0.96	1.10	0.91
191	444	116,569	Sales workers, hardware and building supplies (268)	0.77	0.84	0.79	0.84	0.84	0.80	1.20	1.12	0.79
192	2719	656,092	Textile sewing machine operators (744)	0.97	0.82	**0.79**	**0.70**	**0.80**	**0.83**	0.97	1.11	**0.79**
193	751	194,183	Automobile body and related repairers (514)	0.62	0.81	0.96	1.04	0.90	**0.68**	0.93	1.03	**0.78**
194	512	137,655	Drywall installers (573)	0.59	0.79	1.00	0.92	1.08	**0.64**	**0.57**	1.11	0.83
195	1791	452,802	Bank tellers (383)	0.85	0.79	0.84	0.88	0.88	**0.85**	0.89	**0.64**	**0.74**
196	525	138,870	Sales workers, parts (269)	0.65	0.79	0.80	0.75	0.94	0.80	0.82	0.73	**0.77**
197	551	143,231	Tool and die makers (634)	0.66	0.78	**0.61**	**0.48**	**0.55**	1.09	1.08	0.68	0.91
198	715	182,795	Sales counter clerks (275)	0.84	0.77	0.79	0.87	0.75	**0.76**	0.80	0.86	**0.75**
199	1169	296,930	Sales workers, apparel (264)	0.89	0.77	0.83	0.97	0.79	**0.73**	**0.70**	0.87	**0.76**
200	2811	686,987	Farm workers (479)	0.65	0.75	**0.67**	**0.63**	**0.68**	**0.67**	0.98	**1.21**	**0.80**
201	570	146,319	Driver–sales workers (806)	0.62	0.74	0.67	**0.44**	**0.46**	0.83	1.20	1.13	0.83
202	426	105,770	Dietitians (97)	0.81	0.74	0.84	0.73	0.69	0.95	**0.46**	0.60	**0.72**
203	640	164,795	Pharmacists (96)	0.70	0.72	0.80	0.78	0.71	**0.58**	0.69	1.02	**0.78**
204	2193	564,555	Physicians (84)	0.59	0.68	**0.70**	**0.57**	**0.56**	**0.57**	0.93	**0.64**	**0.77**
205	407	107,936	Airplane pilots and navigators (226)	0.50	0.61	0.73	**0.54**	0.74	**0.63**	**0.44**	**0.37**	**0.65**
206	557	139,120	Dentists (85)	0.44	0.53	**0.39**	**0.35**	**0.35**	**0.58**	0.73	**0.35**	**0.65**

*Ranking based on the weighted average of the multivariate odds ratios.

†Calculated from total employment estimates derived from annual NHIS sampling.

‡Odds ratio estimates in bold have corresponding 95% confidence intervals that do not include 1.

occupations have not previously been associated with increased morbidity: social workers and psychologists occupied the no. 1 and no. 4 rankings, respectively. Because these are both sedentary professions, research into potential occupational stress-related factors influencing the health of these professions is needed.[32–36] Furthermore, there are surprisingly few well-controlled studies designed to mitigate stress and burnout in these professions, yet existing research does suggest that beneficial treatment effects are achievable.[37–39]

Nursing aids and licensed practical nurses were in the top 10 morbidity rankings based both on the unadjusted and covariate-adjusted morbidity summary scores. High levels of occupational stress, including restructuring within the healthcare industry, and rates of musculoskeletal injury are likely contributors to these high rankings.[40–42] Female nursing aids, orderlies, and attendants, and licensed practical nurses ranked eighth and 11th, respectively, on a musculoskeletal-based disability measure available for 61 worker group participants of the National Health and Nutrition Examination I Epidemiologic Follow-up Survey (NHEFS).[6] Ergonomic modifications (eg, mechanical lifts) and stress management interventions are promising preventive approaches to address this high rate of morbidity,[43,44] but additional research is needed, especially given the essential role that nursing plays in the delivery of health care.

Postal clerks were also in the top 10 rankings based both on the unadjusted and covariate-adjusted morbidity summary scores, and this occupational group is similar to nurses in that occupational stress and possibly musculoskeletal injury risk are likely contributors to their high ranking.[45,46] Of note, postal clerks were among the least disabled male worker groups examined in the NEHFS (approximately 35th of 41 examined worker groups).[6] Strained labor management relations have been suggested as a contributor to stress levels in this occupational group.[45,47] In the 1980s, there was an increase in the number of worksite homicides committed by U.S. postal workers and former postal workers.[48] Recently added to the risks this occupational group faces is the threat of bioterrorist attacks such as the *Bacillus anthracis* exposures, which occurred in 2001.[49] Finally, the literature on effective interventions focusing on job stress and the prevention of musculoskeletal injury in postal workers are limited and mixed in terms of effectiveness.[50,51]

The "low-risk" occupations identified in the present analysis may be due, in part, to a healthy worker effect (eg, pilots). Nevertheless, the study of selected low-risk professions from a morbidity perspective may identify specific job or worker characteristics, which may be protective.[52] It is interesting to note that morbidity rankings were lowest among several of the health professions (eg, dentists, pharmacists, physicians, and dietitians). These low rankings could reflect health behavior-related lifestyle differences. For example, with the exception of dietitians, these health professionals have some of the lowest smoking rates among the major U.S. occupational groups.[24] Among worker groups, physicians and dentists have among the lowest rates of mortality due to liver cirrhosis, likely reflecting lower rates of abusive alcohol consumption patterns.[53] Workers employed in the health diagnosing, assessment, and treatment occupations also have the lowest depression rates found in any worker group.[54] Finally, it should be noted that many of these occupations are associated with high pay and occupational prestige within society; these socioeconomic indicators are independently associated with reduced mortality risk in the United States.[55,56]

Another use of the morbidity rankings is the selection of occupational groups for targeted worksite interventions. Meta-analysis of worksite interventions indicate that a variety of cognitive–behavioral and multimodal approaches are effective in lowering somatic and psychologic symptomatology.[57] These interventions are typically undertaken within a single occupation group or a workplace, and thus, a comparison of intervention effectiveness in a variety of occupational groups is rarely undertaken. The Table 1 rankings could be used to select, a priori, occupational groups for targeted interventions. For example, an intervention targeting the medical profession might consider including occupational groups that ranked both high (eg, nursing aids, no. 6; licensed practical nurses, no. 10) and low (dietitians, no. 202; pharmacists, no. 203) with respect to their covariate-adjusted morbidity summary score.

Identification of worksites for targeted interventions could also benefit by cross-referencing Table 1 rankings with those obtained for other occupational outcomes of interest. For example, two of the top 10 Table 1 occupations, grinding/abrading/buffing/polishing machine operators (no. 5) and correctional institution officers (no. 9), also ranked in the top 10 occupations with the highest average workers' compensation costs in the United States.[58] Targeted interventions in these occupational groups could not only lower morbidity rates, but also lower employer costs.

Table 1 rankings might also be used, in part, to consider the degree to which a healthy worker effect might be present for a particular occupational group, particularly because the NHIS occupational data are collected in a cross-sectional fashion. For example, it is not surprising that airplane pilots are among the least disabled worker groups (ranking no. 205) because commercial licensing requires passing regular physical examinations.[59] Researchers concerned that their research findings for a particular occupational group may be due to a healthy worker effect may want to consult the morbidity summary scores to determine its relative ranking. For example,

firefighting requires constant good health and fitness levels that exceed the requirements for many other occupations. Despite documented musculoskeletal, thermal, and other injury risks,[8,60,61] firefighters ranked only no. 140 on Table 1; furthermore, compared with the other 205 occupations, only pilots and dentists were less likely to rate their health status as fair or poor. These rankings indirectly support the notion that occupational health studies of firefighters may underestimate occupational risks because continued employment in this occupation requires good health.

In addition to the issue of the healthy worker effect, several potential study limitations should be noted. First, it is possible that the morbidity rankings are influenced by differential self-reporting in response to these morbidity questions. For example, social workers, which occupy the number one ranking in Table 1, may either be a more "accurate" reporter or may over report morbidity relative to other occupational groups. We could find no evidence in the published literature available on social workers to support either of these possibilities, although social workers reported one of the lowest rates of insomnia in one comparative study of Scandinavian worker groups.[62]

Although research in this area is often contradictory, validation studies conducted by the NCHS and others suggest that proxy reports lead to slightly lower prevalence estimates of chronic conditions and ambulatory medical visits compared with reports obtained directly from respondents.[63–65] To address this potential bias, we repeated our morbidity analyses, including only the 63% of NHIS participants who were interviewed directly in the 1986 to 1994 NHIS surveys. With only four exceptions, the covariate-adjusted morbidity summary score findings based on nonproxy data were within 0.1 units of the Table 1 summary scores for each of the occupations, suggesting that no systematic bias was introduced by the inclusion of proxy responses. This finding is also consistent with our previous examination of possible proxy-reporting bias for each of the seven morbidity indicators that comprise our morbidity summary score.[29]

A potentially more important study limitation is the mix of health indicators used to create the morbidity summary score rankings. First, it is important to note that a different mix of health indicators would have yielded different occupational morbidity rankings. For example, an index reflecting musculoskeletal disability would have likely yielded higher rankings for some of the manual occupations, which ranked relatively low on the current index such as farm workers (no. 200) and laborers except construction workers (no. 75).[66,67] Workers in these occupations were ranked among the most disabled based on a musculoskeletal disability measure used in the NHEFS.[6] Work loss days in the 2 weeks before the household interview and the number of doctor visits in the previous 12 months are two elements of the morbidity summary score, which could potentially be influenced by the availability of worker healthcare coverage and worker sick leave policies. Nonunionized and blue-collar workers who often lack such benefits may be more likely to report to work even if sick and may be less likely to visit a doctor for acute or chronic illness episodes.[68,69]

Finally, although these analyses attempted to control for socioeconomic and demographic factors, complete control (particularly in subgroup-dominated professions) was not possible. For example, using the same NHIS database and morbidity measures, Gómez-Marín et al[12] found that older female uneducated workers were at significantly higher risk of reporting chronic morbidity and poor health status compared with all other U.S. workers. Additional information (including exportable data tables) on the demographic and race–ethnicity subgroup distributions for the different U.S. occupations can be found at the study web site (http://www.rsmas.miami.edu/groups/niehs/niosh/) in the Disability/Morbidity Monograph by Fleming et al.[29]

Conclusions

The NHIS database represents a probability sample of the entire U.S. population with the ability to compare both morbidity and mortality among U.S. workers. Furthermore, as noted by the NIOSH,[70] and the British Registrar General's decennial reports,[71] databases such as the National Health Interview Survey can be used not only to target studies of work-related conditions and to add to the body of evidence generated from epidemiologic studies, but also to provide surveillance data for establishing priorities and for tracking progress toward the elimination of preventable diseases. In our current study of occupational morbidity, social workers, inspectors, postal clerks, psychologists, and grinding machine operators were among the most disabled worker groups in the United States among occupations with annual employment of at least 100,000 workers. These findings aid in the identification of worker groups that require increased attention for morbidity research and prevention, whereas "low-risk" occupations may be used to identify protective job or worker characteristics, which could be adopted for use in high-risk worker groups.

Main Messages

1. Worker groups reporting the greatest morbidity in the United States include social workers, inspectors, postal clerks, and psychologists.
2. Ranking of occupations has led to the identification of worker groups that require increased attention for morbidity research and prevention.
3. This ranking may also be used to identify low-risk occupations that have job or worker characteristics, which could be targeted for

enhancement in high-risk worker groups.

Acknowledgments

The data used in this publication were made available in part by the Inter-University Consortium for Political and Social Research. Data for the NHIS were originally collected and prepared by the U.S. Department of Health and Human Services and the National Center for Health Statistics. Neither the collector of the original data nor the Consortium bears any responsibility for the analyses or interpretations presented in this publication. This study was funded in part through the National Institute for Occupational Safety and Health (grant R01 OH03915).

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