AMERICAN JOURNAL OF INDUSTRIAL MEDICINE 33:197–211 (1998)

Job-Related Diseases and Occupations Within a Large Workers' Compensation Data Set

J. Paul Leigh, PhD,[1,2]* and Ted R. Miller, PhD[3]

The objective of this report is to describe workers' job-related diseases and the occupations associated with those diseases. The methods include aggregation and analysis of job-related disease and occupation data from the Bureau of Labor Statistics' Supplementary Data System (SDS) for 1985 and 1986—the last years of data available with workers' compensation categories: death, permanent total, permanent partial, and temporary total and partial. Diseases are ranked according to their contribution to the four workers' compensation (WC) categories and also ranked within occupations according to the number of cases. Occupations are ranked according to their contribution to specific diseases within one of the four categories.

The following diseases comprise the greatest numbers of deaths: heart attacks, asbestosis, silicosis, and stroke. Within the permanent total category, the diseases with the greatest contributions are heart attack, silicosis, strokes, and inflammation of the joints. For the permanent partial category, they are hearing loss, inflammation of joints, carpal tunnel syndrome, and heart attacks. For the temporary total and partial category, they are: inflammation of joints, carpal tunnel syndrome, dermatitis, and toxic poisoning. Hearing loss or inflammation of joints are associated with more than 300 occupations. Circulatory diseases comprise a larger share of job-related diseases than is generally acknowledged. Occupations contributing the most heart attack deaths are truck drivers, managers, janitors, supervisors, firefighters, and laborers. Ratios of numbers of deaths to numbers of disabilities are far higher for illnesses than injuries. Occupations that are consistent in their high ranking on most lists involving a variety of conditions include nonconstruction laborers, janitors and construction laborers.

The large SDS, though dated, provides a tentative national look at the broad spectrum of occupational diseases as defined by WC and the occupations associated with those diseases in 1985 and 1986. Some description of the spectrum of diseases encountered today is possible especially for occupations, such as those mentioned above for which employment has expanded in the 1990s. Am. J. Ind. Med. 33:197–211, 1998. *© 1998 Wiley-Liss, Inc.*

KEY WORDS: deaths; illnesses; jobs; supplementary data system; workers compensation

INTRODUCTION

The practice of occupational medicine encompasses a wide range of diseases. While this observation may seem commonplace, rarely have any studies attempted to assess the relative distribution of these diseases or the relative contributions of various occupations to these diseases. Little is known, for example, about the national burden of all

[1]Department of Economics, San Jose State University, San Jose, California
[2]Department of Medicine, Stanford Medical Center, Palo Alto, California
[3]National Public Services Research Institute, Landover, Maryland

Contract grant sponsor: National Institute for Occupational Safety and Health; Contract grant number: 1 RO1/CCR 312179-01

*Correspondence to: Paul Leigh, Department of Economics, San Jose State University, San Jose, CA 95192

Accepted 9 September 1997

occupational illnesses. Government reports regularly contain data on, for example, all deaths due to circulatory diseases, cancers, acquired immunodeficiency syndrome (AIDS), and injuries [U.S. National Center for Health Statistics, 1995]. But when government statistics on occupational illnesses are published, they are limited to a handful of diseases, and the records pertain only to men: coal miners' pneumoconioses, asbestosis, silicosis, and mesothelioma. But these four are not the only occupational diseases afflicting male workers, and women are afflicted as well.

This lack of information is not due to lack of interest. In 1987, a National Research Council panel of scientists lamented our poor understanding of the volume of occupational illnesses and called for greater research attention to these illnesses. One reason that so little is known is because few large data sets are available to study job-related diseases [Leigh et al., 1997].

Our study analyzes one of the few data sets available: the Supplementary Data System (SDS). The SDS has numerous limitations. For example, the most recent years with available information on diseases and workers' compensation (WC) categories are 1985 and 1986. Nevertheless, the SDS data were drawn from 11 states, and the Bureau of Labor Statistics (BLS) relies on the data to describe the kinds of illnesses and injuries that characterize certain industries as compared to others, i.e., studies of relative magnitudes [Personick, 1992a,b]. Our study will continue that line of investigation into relative magnitudes. We will compare the relative numbers of persons stricken by various diseases compared to others and we will differentiate frequency by occupation.

Studies of relative magnitudes are important for at least three reasons. First, they may help policymakers direct scarce research dollars to the diseases generating the greatest burden. Second, they may help employees and employers improve working conditions in an efficient, cost-effective manner. Finally, if the relative numbers can be expressed in categories familiar to economists and sociologists—such as WC categories and U.S. Census occupational definitions—these studies can aid economic and social science research.

METHODS

The SDS was created in 1976 by the BLS to provide more national information on occupational injuries and illnesses [Root and Sebastian, 1981; U.S. Bureau of Labor Statistics, 1982, 1989]. The SDS data, in turn, were drawn from various states' WC records. Not all states in all years provided the SDS with information on job-related deaths as well as the three WC nonfatal categories. As a result, only seven states have data for 1985–1986: Arkansas, Delaware, Iowa, New York, North Carolina, Oregon, and Wisconsin, and one, Colorado, for 1985 only. These states contributed roughly 16–17% of the total national employment, depending on the year.

The most recent documented year with available WC disability categories (File B in the SDS) is 1986. The BLS ended the SDS effort in 1988.

The following are the SDS and WC definitions for coding extent of disability:

Permanent total disability (PT): Any injury or illness other than death that permanently and totally incapacitates the employee from employment or that results in the loss, or the complete loss of use, of any of the following: (1) both eyes; (2) one eye, and one hand, arm, leg, or foot; (3) both hands, arms, feet, or legs; or (4) any combination of two or more or the following not on the same limb: hand, arm, foot, or leg.

Permanent partial disability (PP): Any permanent injury or illness other than death or permanent total disability that (1) results in the complete or partial loss, or loss of use, of a member or part of the body, or portion(s) thereof, including vision or hearing; or (2) involves any permanent impairment of any function(s) or part(s) of the body or portion(s) thereof; or (3) partially reduces the employee's ability to perform his or her regular job or an equivalent one, regardless of any pre-existing condition.

Temporary (total or partial) disability (TTP): Any injury or illness other than death or permanent disability that results in a minimum number of days (3–7) specified for each State during which the person is unable to perform any work for pay and from which he or she can be expected to recover fully, or any injury or illness that results in a temporary loss of wages or impairment of wage-earning capability.

Our methods involved aggregation of the data within various combined categories, i.e., number of heart attacks listed as deaths and cross-tabulated with occupations. Our definitions of occupations were the same as those identified in the 1980 U.S. Census. The illnesses were categorized into American National Standard Institute (ANSI) codes as amended by the BLS. One problem with the descriptions of these categories is that they were long. For example, code 510 reads: ''Cerebrovascular and other conditions of circulatory system—includes strokes and varicose veins (nontoxic). Excludes the heart and hemorrhoids.'' We developed short descriptions of each category so as to minimize confusion in the tables. Our short descriptions and corresponding complete ANSI codes are listed in Appendix A (available from authors). For example, we shortened 510 to ''Cerebrovascular and other conditions of the circulatory system, includes stroke and varicose veins.'' We did not conduct any statistical tests, since our sole objective was to present these unpublished SDS data.

RESULTS

Table I presents data within the four WC categories: death, PT, PP, and TTP disability. Under each WC category, we list the diseases, illnesses or conditions that contribute cases to that category, ranked according to the number of cases.

Each disease, illness, or condition carries three numbers with it. The first (in parentheses) represents the corresponding ANSI category definition. The second, under the n column, represents the number of cases. The third represents the percentage of the total number of cases that this disease or illness or condition contributes.

Within the Deaths (Panel A) column, the category ''heart conditions— includes heart attack,'' ranks first. ''Heart conditions—includes heart attack,'' corresponds to ANSI code number 991. ''Heart conditions—including heart attack,'' contribute 72.6% of all deaths.

Asbestosis, which contributes 32 deaths or 6% of the total cases of deaths, is the next most frequently reported disease. Silicosis ranks third with 25 deaths and 4.8% of the total.

Table I, Panel A, also indicates ranks, numbers, and percentages for 14 other diseases or conditions, including cerebrovascular conditions, poisoning, pneumoconiosis, tumors, asthma, effects of environmental heat, respiratory system conditions, hepatitis, other infective diseases, freezing, and blood diseases. In total, the SDS counts 525 deaths for 1985 and 1986.

Table I, Panel B, indicates PT disabilities. Again, ''heart conditions—includes heart attack'' is the first most frequently reported category, claiming 27 cases and 24% of the total. Silicosis ranks second with 14 cases and 12.6% of the total.

The SDS counts 111 PT disabilities in 1985 and 1986. This is a small number compared to the 525 deaths. WC boards apparently rarely declare that an illness can be permanently and totally disabling. For every one PT, five deaths are recorded. This is in sharp contrast to injuries for which WC boards find more PT cases than death cases [Leigh et al., 1996].

Table I, Panel C, represents PP disabilities. ''Hearing loss or impairment'' generates 47.2% of all cases in this category. Overall, the SDS records 12,063 permanent partial disabilities. For every illness death, roughly 23 permanent partial disabilities are recorded by WC authorities. Again, this is in contrast to injuries: for every injury death, there are 117 PP injuries [Leigh et al., 1996].

TTP disabilities are included in Panel D. ''Inflammation or irritation of joints, tendons, or muscles'' contribute 44%; 24% is contributed by ''diseases of the nerves, including carpal tunnel syndrome.'' ''Dermatitis'' and ''toxic systemic poisoning'' contribute 10.7% and 5.6%, respectively.

The SDS records a total of 19,203 TTP disabilities. For every illness death, roughly 37 TTPs are recorded. Again, there is a wide disparity between illnesses and injuries. For injuries, the TTP to death ratio is 289 : 1 [Leigh et al., 1996].

Table II expands Panel A of Table I by providing information on the occupations of decedents associated with each category of disease, illness, or condition. The categories and occupations are ranked in order of their contribution to total deaths.

The number one killer is ''heart conditions, includes heart attacks.'' The occupation reporting more than any other is heavy truck drivers, contributing 7.6% of all deaths. The next three occupations are managers and administrators (6.8%), janitors and cleaners (6.8%), and sales supervisors and proprietors (5.2%).

Not only do these four occupations contribute a high number of deaths in total, their death rates are also high. To estimate death rates, we divide percentage of deaths by percentage of employment [U.S. Bureau of Labor Statistics, 1988]. For example, truck drivers contribute 1.9% of total civilian employment in 1985 and 1986. The truck driver rate estimate is then 7.61/1.9, or 4.0. This 4.0 indicates that truck drivers are contributing four times the number of deaths than their contribution to employment would suggest. The corresponding employment percentages and rates (in parentheses) for the three other occupations are: managers (3.5%, 1.9), janitors (2.0%, 3.4), supervisors (1.7%, 3.1). Of these four occupations, the two blue-collar occupations—truck drivers and janitors—had higher rates than the white-collar ones—managers and supervisors.

A catchall category—Occupations not classified—occupies position 5.

Other notable occupations and their number of heart attack deaths (in parentheses) include retail sales workers (16), firefighters (16), laborers, except construction (15), and construction occupations (12), taxicab drivers (8), construction laborers (7), cooks (5), carpenters (5), butchers (4), painters (4), lawyers (3), garbage collectors (3), physicians (2), post secondary teachers (2), public police officers (2), stock handlers and baggers (2), bartenders (2), auto mechanics (2), dry clean machine operators (2), and teachers (2).

The disease responsible for the second greatest number of reported deaths is asbestosis. It is not surprising that insulation workers, plumbers, electricians, and brick and stone masons should be at the top of the asbestosis list. The fact that many stationary engineers must operate stoke furnaces explains their high ranking. Two managers were apparently also exposed to asbestos.

The third leading cause of deaths is silicosis. Occupations generating the greatest numbers of deaths include molding machine operators, construction laborers, brickmasons, earth drillers, and machine operators, not specified.

In the interest of brevity, we do not continue our item-by-item list in the text. Rather, we mention some

TABLE I. Occupational Illnesses by Workers' Compensation Death and Disability Categories*

	Panel A	n	%		Panel B	n	%
	Occupational deaths				Permanent total disability		
1.	Heart condition—includes heart attack (991)	381	72.57	1.	Heart condition—includes heart attack (991)	27	24.32
2.	Asbestosis (283)	32	6.00	2.	Silicosis (286)	14	12.61
3.	Silicosis (286)	25	4.80	3.	Cerebrovascular and other conditions of the circulatory system (510)	12	10.81
4.	Cerebrovascular and other conditions of the circulatory system (510)	15	2.90	4. (tie)	Inflammation or irritation of joints, tendons, muscles (260)	10	9.01
5. (tie)	Toxic systemic poisoning (270)	10	1.90	5. (tie)	Asbestosis (283)	10	9.01
6. (tie)	Pneumoconiosis (280)	10	1.90	6.	Mental disorders (540)	7	6.31
7.	Influenza, pneumonia, bronchitis, asthma, due to toxic exposure (274)	8	1.50	7.	Toxic systemic poisoning (270)	5	4.50
8. (tie)	Malignant tumor, includes cancer and leukemia (551)	6	1.10	8.	Influenza, pneumonia, bronchitis, asthma, due to toxic exposure (274)	4	3.60
9. (tie)	Influenza, pneumonia, bronchitis, asthma, due to non-toxic exposure (572)	6	1.10	9. (tie)	Pneumoconiosis (280)	3	2.70
10. (tie)	Effects of environmental heat (240)	5	1.00	10. (tie)	Influenza, pneumonia, bronchitis, asthma, due to non-toxic exposure (572)	3	2.70
11. (tie)	Other respiratory conditions (570)	5	1.00	11. (tie)	Poisoning, other toxic effects on only one system (279)	2	1.80
12.	Hepatitis (330)	4	0.80	12. (tie)	Malignant tumor, includes cancer and leukemia (551)	2	1.80
13.	Other infective or parasitic diseases (159)	3	0.60	13. (tie)	Diseases of the central nervous system (561)	2	1.80
14. (tie)	Effect of exposure to low temperature (220)	2	0.40	14.	All others	10	9.01
15. (tie)	Poisoning, other toxic effects on only one system (279)	2	0.40				
16. (tie)	Diseases of the blood and blood forming organs (272)	2	0.40				
17.	Other pneumoconioses (287)	2	0.40				
19–26.	All other	7	1.30				
	Total	525			Total	111	

	Panel C	n	%		Panel D	n	%
	Permanent partial disability				Temporary total and partial disability		
1.	Hearing loss or impairment (230)	5,595	46.38	1.	Inflammation or irritation of joints (260)	5,929	30.88
2.	Inflammation or irritation of joints (260)	2,604	21.59	2.	Decreases of the nerves—including carpal tunnel syndrome (562)	4,577	23.83
3.	Diseases of the nerves including carpal tunnel syndrome (562)	1,878	15.57	3.	Dermatitis (180)	2,050	10.68
4.	Heart condition, includes heart attack (991)	557	4.62	4.	Toxic systemic poisoning (271)	1,073	5.59
5.	Symptoms and ill-defined conditions (580)	190	1.58	5.	Ill-defined condition (580)	828	4.31
6.	Dermatitis (180)	170	1.41	6.	Heart condition, includes heart attack (991)	547	2.85
7.	Mental disorders (540)	131	1.09	7.	Mental disorders (540)	493	2.57
8.	Byssinosis (284)	111	0.92	8.	Other infective diseases or parasitic (159)	457	2.38
9.	Toxic poisoning resulting in influenza, pneumonia, bronchitis, or asthma (274)	93	0.77	9.	Occupational diseases, n.e.c. (990)	353	1.84
10.	Toxic systemic poisoning (271)	76	0.63	10. (tie)	Toxic poisoning resulting in influenza, pneumonia, bronchitis, or asthma (274)	323	1.68
11.	Occupational diseases, n.e.c. (990)	67	0.56	11. (tie)	Cerebrovascular and circulatory system—includes strokes and varicose veins (510)	323	1.68
12.	Cerebrovascular and other conditions of circulatory system—includes stroke and varicose veins (510)	63	0.52	12.	Hepatitis (330)	252	1.31

(continued)

TABLE I. Occupational Illnesses by Workers' Compensation Death and Disability Categories* (continued)

	Panel C	n	%		Panel D	n	%
	Permanent partial disability				Temporary total and partial disability		
13.	Asbestosis (283)	59	0.49	13.	Eye, other diseases of the eye (530)	216	1.12
14.	Silicosis (286)	59	0.49	14.	Poisoning, systemic, uns. (270)	192	1.00
15.	Nontoxic exposure, influenza, pneumonia, bronchitis, or asthma (572)	52	0.43	15.	Influenza, pneumonia, bronchitis, asthma, not due to toxic exposure (572)	185	0.96
16.	Diseases of the eye (530)	43	0.36	16.	Effects of cold exposure, includes freezing (220)	146	0.76
17.	Effects of exposure to low temperature (220)	38	0.32	17.	Changes in atmospheric pressure (500)	144	0.75
18.	Conditions of nervous system (560)	33	0.27	18.	Toxic effects, one system only (279)	118	0.61
19.	Poisoning systemic uns. (270)	22	0.18	19.	Welder's flash (295)	112	0.58
20.	Pneumoconiosis (280)	16	0.13	20.	Hemorrhoids (320)	105	0.55
21.	All others	106	0.39	21.	All others	864	4.50
	Total	12,063			Total	19,287	

*See Appendix, available from authors, for complete description of numerical codes.

notable findings. Under the ''malignant tumor, cancer, and leukemia'' category, each of the following occupations contribute one death: physicians, janitors, electricians, welders, and production inspectors.

Two deaths for bakers are reported in the ''influenza, pneumonia, bronchitis, asthma'' category. Two nurses, one physician, and one maid die of hepatitis (rank 12). Tuberculosis claims the life of one nursing aide (rank 18). One personnel manager dies of a mental disorder (rank 22).

A table available from the authors expands Panel B of Table I by presenting information on occupations contributing to PT disabilities, again ranked according to number of cases. ''Heart conditions—includes heart attack'' is the leading category for PT disabilities. Sheriffs, prison guards, janitors, and truck drivers each contribute two cases, comprising 37% of the total.

The second leading cause of PT disability is silicosis. Construction laborers contribute eight cases, and earth drillers generate two cases.

Nonconstruction and nursing aides contribute one case in the ''inflammation or irritation of joints, tendons or muscles'' category. Construction laborers generate one-half of the PT cases involving asbestosis. Brickmasons and electricians each contributed one asbestosis case. A number of occupations are responsible for PTs for mental disorders: public administration administrators, insurance adjusters, office clerks, prison guards, health aides, construction workers, and butchers. ''Tumors, cancer, or leukemia'' claim one case apiece among grinding operators and filtering machine operators. A janitor is responsible for the only PT case of dermatitis. A stevedore contributes the only eye disease case. The only toxic hepatitis case involves a licensed practical nurse.

Table III expands Panel C in Table I by presenting information on occupations within the PP disabilities. PPs are especially important to analyze. They account for roughly 60–70% of all WC costs [Leigh et al., 1996; Berkowitz and Burton, 1987]. The leading category is ''hearing loss.'' Occupations with the highest contribution include machine operators, nonconstruction laborers, welders, production supervisors, assemblers, production inspectors, millwrights, grinding machine operators, machinists, crane operators, freight handlers, truck drivers, punch press operators, and tool and die makers.

There are two remarkable findings pertaining to ''hearing loss.'' First, machine operators of all stripes appear to be the occupations most at risk. Second, as the unabridged table (available from the authors) involving fewer than 50 cases per category illustrates, a wide variety of occupations are responsible for ''hearing loss.'' In all, 218 occupations have at least one ''hearing loss'' case. These occupations range from the obvious (e.g., machine operators and explosives workers) to the surprising (e.g., lawyers, editors, and reporters). Few diseases, illnesses, or conditions are responsible for as many cases or involve more occupations in any of our death, PT, or PP tables as those associated with hearing loss.

The second leading cause of PP disability is ''inflammation of joints, tendons, or muscles.'' Occupations at the top of the list include assemblers, machine operators, nonconstruction laborers, truck drivers, nursing aides, janitors and cleaners, butchers, retail sales workers, freight handlers, packagers, not specified mechanics, carpenters, textile machine operators, construction laborers, and welders. Among the notable occupations in the unabridged table (available from the authors) involving fewer than 30 cases per category are electricians (28 cases), bus drivers (28 cases), registered nurses (19 cases), police officers (17), guards (14), secretaries (10), dancers (5), secondary school teachers (3), editors and reporters (3), roofers (3), and dentists (2).

TABLE II. Male and Female Fatalities Ranked in Descending Order by Number of Diseases, Illnesses, and Conditions For 1985 to 1986

	Nature of illness			Occupation			
Rank	Code	Definition	No. of illnesses	Code	Definition	No. of illnesses	%
1	991	Heart conditions—includes heart attack	381	804	Truck drivers, heavy	29	7.61
				19	Managers and administrators, n.e.c.	26	6.82
				453	Janitors and cleaners	26	6.82
				243	Supervisors and proprietors, sles	20	5.25
				999	Occupations not classified	17	4.46
				260	Sales workers, retail, n.e.c.	16	4.20
				417	Firefighting occupations	16	4.20
				889	Laborers, except construction	15	3.94
				550	Construction occupations, n.e.c.	12	3.15
				806	Driver-sales workers	11	2.89
				258	Sales engineers	9	2.36
				809	Taxicab drivers and chauffeurs	8	2.10
				633	Supervisors, production occupations	7	1.84
				869	Construction laborers	7	1.84
				883	Freight, stock, and material handlers, n.e.c.	7	1.84
				20	Management related occupation, n.e.c.	6	1.57
				549	Not specified mechanics and repairers	6	1.57
				436	Cooks, except short order	5	1.31
				567	Carpenters	5	1.31
					All other occupations with fewer than 5 deaths	133	34.90
2	283	Asbestosis	32	593	Insulation workers	5	15.63
				585	Plumbers, pipefitters and steamfitters	4	12.50
				999	Occupations not classified	4	12.50
				575	Electricians	3	9.38
				696	Stationary engineers	3	9.38
				19	Managers and administrators, n.e.c.	2	6.25
				563	Brickmasons and stonemasons	2	6.25
					All other occupations with fewer than 2 deaths	9	28.13
3	286	Silicosis	25	719	Molding and casting machine operators	4	16.00
				869	Construction laborers	3	12.00
				563	Brickmasons and stonemasons	2	8.00
				598	Drillers, earth	2	8.00
				779	Machine operators, not specified	2	8.00
					All other occupations with fewer than 2 deaths	12	48.00
4	510	Cerebrovascular and circulatory system—includes strokes and varicose veins	15	19	Managers and administrators, n.e.c.	2	13.33
				20	Management related occupations, n.e.c.	2	13.33
				505	Automobile mechanics	2	13.33
				804	Truck drivers, heavy	2	13.33
					All other occupations with fewer than 2 deaths	7	46.67
5 (tie)	271	Toxic systemic poisoning	10	889	Laborers, except construction	3	30.00
					All other occupations with fewer than 2 deaths	7	70.00
6 (tie)	280	Pneumoconiosis, uns.	10	616	Mining machine operators	2	20.00
				783	Welders and cutters	2	20.00
					All other occupations with fewer than 2 deaths	6	60.00
7	274	Influenza, pneumonia, bronchitis, asthma, pneumonitis, and emphysema from toxic exposure	8	734	Printing machine operators	2	25.00
					All other occupations with fewer than 2 deaths	6	75.00
8 (tie)	551	Malignant tumor—includes cancer and leukemia	6	84	Physicians	1	16.67

(continued)

TABLE II. Male and Female Fatalities Ranked in Descending Order by Number of Diseases, Illnesses, and Conditions For 1985 to 1986 (continued)

	Nature of illness			Occupation			
Rank	Code	Definition	No. of illnesses	Code	Definition	No. of illnesses	%
				453	Janitors and cleaners	1	16.67
				575	Electricians	1	16.67
				783	Welders and cutters	1	16.67
				796	Production inspectors, checkers, and examiners	1	16.67
				999	Occupations not classified	1	16.67
9 (tie)	572	Influenza, pneumonia, bronchitis, asthma, includes pneumothorax or ''collapsed lung,'' non-toxic exposure	6	687	Bakers	2	33.33
				633	Supervisors, production occupations	1	16.67
				759	Painting and paint-spraying machine operators	1	16.67
				785	Assemblers	1	16.67
				869	Construction laborers	1	16.67
10	240	Effects of heat exposure—includes heat stroke, sunstroke, heat cramps, and heat exhaustion	5	496	Timber cutting and logging operations	1	20.00
				783	Welders and cutters	1	20.00
				795	Miscellaneous hand working occupations	1	20.00
				804	Truck drivers, heavy	1	20.00
				889	Laborers, except construction	1	20.00
11	570	Conditions of respiratory system, uns.	5	260	Sales workers, retail, n.e.c.	1	20.00
				479	Farm workers	1	20.00
				783	Welders and cutters	1	20.00
				804	Truck drivers, heavy	1	20.00
				889	Laborers, except construction	1	20.00
12	330	Hepatitis (serum and infective)	4	95	Registered nurses	2	50.00
				84	Physicians	1	25.00
				449	Maids and housemen	1	25.00
13		All other categories	18			18	100.00
		Total	525		Total	525	

uns., unspecified; n.e.c., not elsewhere classified.

In all, 267 occupations report one or more cases. These joint conditions spread across more occupations than any other category of illness, disease, or condition in the PP list.

Diseases of the nerves, including carpal tunnel syndrome, are the third leading cause of PP disability. Occupations at the top of the list include assemblers, machine operators (not specified), butchers, nonconstruction laborers, janitors and cleaners, packagers, retail sales workers, freight handlers. Notable occupations with fewer than 10 cases in the unabridged table include production inspectors (29 cases), truck drivers (29), textile machine operators (27), construction laborers (27), nursing aides (26), carpenters (22), loggers (17), cooks (15), automobile mechanics (14), secretaries (13), registered nurses (9), bus drivers (7), dental hygienists (4), clergy (3), judges (2), and geologists (1).

In all, cases of ''diseases of the nerves, including carpal tunnel syndrome,'' are spread across 216 occupations. ''Heart conditions, includes heart attack,'' is the fourth leading cause of PP disability. The occupations associated with the greatest number of cases include truck drivers, managers, janitors and cleaners, nonconstruction laborers, and sales supervisors. Notable occupations in the unabridged table include construction laborers (18), driver-sales workers (17), plumbers (13), carpenters (12), cooks (11), retail sales workers (10), shipping and receiving clerks (10), firefighters (9), electricians (9), meat cutters (9), automobile mechanics (8), taxi drivers (8), maids (4), waiters and waitresses (2), garbage collectors (2), social workers (1), and crossing guards (1). Another catchall category, ''symptoms and ill-defined conditions,'' ranks fifth.

Dermatitis ranks sixth in Table III. Occupations contributing the most cases include machine operators, and hairdressers. Other occupations in the unabridged version of Table IV are registered nurses (4 cases), auto mechanics (4), licensed practical nurses (3), and chemical technicians (2).

TABLE III. Male and Female Permanent Partial Disability Ranked in Descending Order by Numbers of Diseases, Illnesses, and Conditions for 1985–1986

	Nature of illness			Occupation			
Rank	Code	Definition	No. of illnesses	Code	Definition	No. of illnesses	%
1	230	Hearing loss or impairment	5,695	779	Machine operators, not specified	987	17.33
				777	Miscellaneous machine operators, n.e.c.	572	10.04
				889	Laborers, except construction	306	5.37
				783	Welders and cutters	201	3.53
				633	Supervisors, production occupation	185	3.25
				999	Occupations not classified	171	3.00
				785	Assemblers	166	2.91
				796	Production inspector, checkers and examiners	136	2.39
				544	Millwrights	131	2.30
				709	Grinding, buffing, polishing machine operators	119	2.09
				637	Machinists	105	1.84
				849	Crane and tower operators	100	1.76
				883	Freight, stock, and material handlers, n.e.c.	93	1.63
				804	Truck drivers, heavy	91	1.60
				706	Punching, stamping press machine operators	80	1.40
					All other occupations with fewer than 80 cases	2,252	40.12
2	260	Inflammation or irritation of joints, tendons, or muscles—including bursitis, synovitis, tenosynovitis, and tendinitis	2,604	785	Assemblers	181	6.95
				779	Machine operators, not specified	153	5.89
				889	Laborers, except construction	103	3.96
				804	Truck drivers, heavy and steamfitters	101	3.88
				447	Nursing aides, orderlies, and attendants	74	2.84
				777	Miscellaneous machine operators, n.e.c.	74	2.84
				999	Occupations not classified	74	2.84
				453	Janitors and cleaners	73	2.80
				686	Butchers and meat cutters	63	2.42
				260	Sales workers, retail n.e.c.	59	2.27
				883	Freight, stock, and material handlers, n.e.c.	59	2.23
				888	Hand packers and packagers	47	1.80
				549	Not specified mechanics and repairers	43	1.65
				567	Carpenters	39	1.50
				744	Textile sewing machine operators	38	1.46
				869	Construction laborers	37	1.42
					All other occupations with fewer than 37 cases	1,387	53.26
3	562	Diseases of the nerves and peripheral ganglia—includes Bell's palsy and carpal tunnel syndrome	1,878	785	Assemblers	231	12.30
				779	Machine operators, not specified	208	11.08
				686	Butchers and meat cutters	88	4.69
				889	Laborers, except construction	84	4.47
				777	Miscellaneous machine operators, n.e.c.	62	3.30
3				493	Janitors and cleaners	46	2.45
				888	Hand packers and packagers	41	2.18
					All other occupations with fewer than 41 cases	1109	59.05
4	991	Heart conditions—includes heart attack	557	804	Truck drivers, heavy	48	8.62
				19	Managers and administrators, n.e.c.	29	5.21
				453	Janitors and cleaners	28	5.03
				889	Laborers, except construction	23	4.13
					All other occupations with fewer than 23 cases	429	77.02

(continued)

TABLE III. Male and Female Permanent Partial Disability Ranked in Descending Order by Numbers of Diseases, Illnesses, and Conditions for 1985–1986 (continued)

	Nature of illness			Occupation			
Rank	Code	Definition	No. of illnesses	Code	Definition	No. of illnesses	%
5	580	Symptoms and ill-defined conditions	190	779	Machine operators, not specified	24	12.63
				785	Assemblers	13	6.84
				889	Laborers, except construction	12	6.02
					All other occupations with fewer than 12 cases	141	74.21
6	181	Dermatitis	176	779	Machine operators, not specified	15	8.82
				458	Hairdressers and cosmetologists	12	7.06
				447	Nursing aides, orderlies, and attendants	7	4.12
				453	Janitors and cleaners	7	4.12
					All other occupations with fewer than 7 cases	129	75.88
7	540	Mental disorders—includes acute anxiety, neurosis, and depression	131	418	Police and detectives, public service	8	6.11
				19	Managers and administrators, n.e.c.	7	5.34
				260	Sales workers, retail, n.e.c.	7	5.34
				804	Truck drivers, heavy	7	5.34
				174	Social workers	5	3.82
				313	Secretaries	5	3.82
				389	Administrative support occupations, n.e.c.	5	3.82
				447	Nursing aides, orderlies, and attendants	5	3.82
				889	Laborers, except construction	5	3.82
					All other occupations with fewer than 5 cases	77	58.78
8	284	Byssinosis	111	738	Winding and twisting machine operators	42	37.84
					All other occupations with fewer than 41 cases	69	62.16
9	274	Influenza, pneumonia, bronchitis, asthma, pneumonitis, and emphysema, due to toxic exposure	93	779	Machine operators, not specified	9	9.68
					All other occupations with fewer than 9 cases	84	90.33
10	271	Toxic systemic poisoning	76	779	Machine operators, not specified	17	22.37
					All other occupations with fewer than 17 cases	59	77.62
		Total	12,004		Total	12,004	

n.e.c., not elsewhere classified; uns., unspecified.

Mental disorders rank seventh. This is an interesting category, since it might suggest which jobs are the most psychologically stressful. Occupations with the most cases are police and detectives, managers, retail sales workers, truck drivers, social workers, secretaries, administrative support occupations, nursing aides, and nonconstruction laborers. Additional occupations and (corresponding cases) include sheriffs (4), guards (3), secondary school teachers (2), janitors (2), welfare service aides (2), bus drivers (2), financial managers (1), registered nurses (1), editors and reporters (1), prison guards (1).

Social workers and welfare service aides are noteworthy in this mental disorders category. These occupations employ far fewer people than others on the list (e.g., police, managers, truck drivers). This suggests that the rate for social workers and aides would be quite high, implying that these jobs are especially psychologically stressful.

Again in the interest of brevity, we now end our item-by-item description of Table III. But there are notable findings in the unabridged version of Table III. Byssinosis places eighth. Only 16 occupations report cases and they are concentrated into the top three: winding and twisting machine operators, industrial machine repairers, and miscellaneous textile machine operators. Asbestosis is most frequently reported by plumber and insulation workers. Frostbite is most frequently reported by laborers, truck drivers and garbage collectors. Registered nurses report the most infective or parasitic diseases and hepatitis (serum and infective). Finally one physician files a successful claim for nonionizing radiation exposure.

Table IV expands Panel D of Table I by cross-tabulating TTP disabilities with occupations. At the top of the list is ''inflammation or irritation of joints, tendons or muscles.'' Occupations with the greatest number of cases include

TABLE IV. Male and Female Temporary Disability Ranked in Descending Order by Number of Diseases, Illnesses, and Conditions for 1985–1986

	Nature of illness			Occupation			
Rank	Code	Definition	No. of illnesses	Code	Definition	No. of illnesses	%
1	260	Inflammation or irritation of joints (260)	5,929	785	Assemblers	553	9.33
				686	Butchers and meat cutters	420	7.08
				889	Laborers, except construction	418	7.05
				779	Machine operators, not specified	398	6.71
				777	Miscellaneous machin operators, n.e.c.	172	2.90
				883	Freight, stock, and material handlers, n.e.c.	161	2.72
				8888	Hand packers and packagers	152	2.56
				804	Truck drivers, heavy	139	2.34
				744	Sales workers, retail, n.e.c.	120	2.02
				447	Nursing aides, orderlies, and attendants	110	1.86
				453	Janitors and cleaners	107	1.80
				999	Occupations not classified	106	1.79
					All others occupations with fewer than 100 cases	2,917	49.20
2	526	Diseases of the nerves and peripheral ganglia—includes Bell's palsy and carpal tunnel syndrome	4,577	785	Assemblers	464	10.14
				779	Machine operators, not specified	406	8.87
				686	Butchers and meat cutters	249	5.44
				889	Laborers, except construction	247	5.40
					All other occupations with fewer than 240 cases	3,211	70.16
3	180	Dermatitis	2,050	779	Machine operators, not specified	110	5.37
				889	Laborers, except construction	90	4.39
				453	Janitors and cleaners	85	4.15
				447	Nursing aides, orderlies, and attendants	78	3.80
					All other occupations with fewer than 77 cases	1,687	79.87
4	271	Toxic systemic poisoning	1,073	417	Firefighting occupations	108	10.07
				889	Laborers, except construction	56	5.22
				779	Machine operators, not specified	48	4.47
				453	Janitors and cleaners	44	4.10
				785	Assemblers	32	2.98
				804	Truck drivers, heavy	31	2.89
					All other occupations with fewer than 30 cases	754	70.27
		Total[a]	18,318		Total[a]	18,318	

n.e.c., not elsewhere classified; uns., unspecified.

[a]Diseases not listed did not have occupations with 20 or more cases. See Table I, Panel D. Complete results available in the unabridged version of table.

assemblers, meat cutters, nonconstruction laborers, machine operators, freight handlers, packagers, truck drivers, textile sewing machine operators, retail sales workers, nursing aides, and janitors.

Although Table IV ends with ''toxic system poisoning,'' the unabridged table contains complete findings. Several of these are notable. Fifth on the TTP list is the catch-all category: ''symptoms and ill-defined conditions.'' High-ranking occupations include machine operators, nonconstruction laborers, meat cutters, assemblers, truck drivers, nursing aides, occupations not classified, retail sales workers, and welders. ''Heart conditions–includes heart attack,'' ranks sixth. Occupations high on the list include truck drivers, janitors, firefighters, and managers. These occupations are also high on the death, PT, and PP lists (Tables II and III) under ''heart conditions–includes heart attack.'' Mental disorders are in the seventh position. Retail sales workers, social workers, and managers are responsible for the greatest number of cases. Social workers are also found to be very high on the PP list under mental disorders. ''Other infective or parasitic disease'' ranks eighth. High-ranking occupations include registered nurses, nursing aides, licensed practical nurses, and cooks. The noninformative category ''occupational diseases not elsewhere classified'' is found in position

9. Machine operators and assemblers are high on this list. ''Influenza and pneumonia due to toxic exposures'' ranks tenth. Nonconstruction laborers generate the greatest number of claims. Hepatitis (serum and infective) is in position eleven. Registered nurses and nursing aides claim the greatest number of cases. In the seventeenth position, we find ''changes in atmospheric pressure.'' The highest-ranking occupation, head and shoulders above all the others, is public transportation attendants which includes flight attendants. Welders' flash ranks nineteenth, with welders in the lead for all occupations.

DISCUSSION

Limitations of the Supplementary Data System

The SDS, File B, has a number of advantages and disadvantages. The SDS ''closed cases'' File B is described elsewhere [Leigh, 1995]. One advantage of the ''closed cases'' file is that all cases are final, not under appeal; thus, all legal issues have been resolved.

A disadvantage of the SDS ''closed cases'' file is that it was discontinued in 1986. The ''open cases'' file was discontinued in 1988. However, extent of disability was required on only the ''closed cases'' file; i.e., the BLS required that participating states provide this information. Extent of disability was optional on the ''open cases'' file. But most importantly, the ''open cases'' file does not include the PT, PP, or TTP categories.

An advantage of both the ''open'' and ''closed'' cases files is that the SDS also includes diseases, illnesses and conditions, unlike the Census of Fatal Occupational Injuries (CFOI) [Toscano and Windau, 1994] or the National Traumatic Occupational Fatality Study [Jenkins et al., 1993], which were designed to capture only injuries.

The SDS data were drawn from only seven states. Nevertheless, due to the geographic and industrial diversity of those states, the BLS investigators who organized the SDS believed that their data were representative of the U.S. [Root and Sebastian, 1981; U.S. Bureau of Labor Statistics, 1982, 1989].

A disadvantage of the SDS is that it relies on WC data primarily from the private sector. This creates several limitations. First, most government workers are underreported. As a result, when, for example, social workers, who are frequently government workers, are found to rank highly in the ''mental disorder'' category, it is likely that the true incidence is far higher than these SDS numbers would suggest. The same comment would apply to teachers. Second, WC coverage and reporting requirements reflect the differences in state WC laws. Complete descriptions of these state differences in WC laws are available [U.S. Chamber of Commerce, 1985, 1986]. Third, the SDS suffers from the WC legal structure that does not allow payments to retirees who develop occupational illnesses. Yet a great number of occupational illnesses (pneumoconioses, asbestosis, and cancer) do not develop until retirement.

This exclusive reliance on WC is the most serious limitation to the SDS. The CFOI suggest that WC ignores as many as 60% of all on-the-job injury deaths [Toscano and Windau, 1994]. This limitation severely restricts any attempt to use the SDS data to describe the total burden of occupational illnesses facing the nation. On the other hand, as we have argued, the SDS may be useful in providing insights into the relative size of one condition or illness compared to another (both required by WC authorities) either in total or within occupations.

Additional limitations concern the many diseases and conditions that would not likely be included in WC statistics. First, job-related injuries to joints early in life could result in osteoarthritis in those joints late in life. With roughly 13 million injuries occurring each year [Leigh et al., 1997], the potential for eventual osteoarthritis is great. Second, child care workers and preschool teachers are among the fastest-growing occupations in our economy. These workers and teachers have high incidence of colds and flu due to their continuous exposure to small children [Pearson et al., 1996]. Third, some jobs probably encourage smoking and/or drinking [Leigh and Jiang, 1993; Stellman et al., 1988; Leigh, 1996]. Not only does this have a direct effect on those who smoke or drink but, in the case of smoking, it has an indirect effect in terms of side smoke. Fourth, growing use of personal computers is rapidly raising the risk of musculoskeletal disorders.

A final limitation concerns the age of the data–1985 and 1986–and whether they reflect current conditions. Changes have occurred in the workforce and in incidence of disease. An appreciation of these changes allows us to better describe disease characteristics today. First, four broad trends in occupational employment have occurred and continue to occur in our economy: (1) the service sector is rapidly expanding; (2) the construction industry is moderately expanding; (3) manufacturing, mining, and agriculture are declining; and (4) computers are being used in an increasing number of jobs [Kaufman, 1994; Mishel and Bernstein, 1995].

Many of the occupations that rank at the top of the lists in Tables II–IV are occupations for which employment growth was strong from 1985 to 1996 and is expected to be strong through 2005. Examination of the abridged and unabridged versions of these tables shows that a number of service and construction occupations frequently rank at the top of most lists. These occupations include heavy truck driving, managers and administrators, janitors, construction laborers, nonconstruction laborers, plumbers, carpenters, cooks, electricians, sales workers, mechanics, nursing

aides, police officers, registered nurses, licensed practical nurses, and secretaries. Each has been singled out as occupations that expanded during the past 10 years and are expected to expand into the future [Silvestri, 1995]. Wherever these occupations appear on our list, and when they appear together, it is likely that the corresponding categories of illnesses or conditions will expand in numbers. We would thus expect the following categories to expand: ''heart conditions–includes heart attack,'' ''inflammation and irritation of joints,'' ''cerebrovascular and circulatory diseases,'' ''effects of heat exposure,'' ''infective and parasitic disease,'' ''hepatitis,'' ''dermatitis,'' and ''mental disorders.''

Other occupations that sometimes appear at the top of the lists decreased their numbers over the past 10 years. Again, those are likely to be in the manufacturing, mining or agricultural sectors. They include: mechanical operators for mining, printing, stamping, milling, filtering, grinding and lathe machines; welders; machinists; millwrights; industrial machine repairers; farm workers; and sheet metal workers. Any disease for which these occupations generate a great number of cases would be expected to decrease in significance. Thus, hearing loss may become less common today than in the mid-1980s.

Given the gradual effects of regulations over the past 40 years pertaining to coal dust and silica combined with the reductions in employment in mining and stone cutting, we would expect reductions in coal workers' pneumoconioses and silicosis. Given the regulations placed on cotton dust in the early 1980s, we would expect a decline in byssinosis. Opposing effects operate on asbestosis. On the one hand, regulations should decrease the incidence in the long run. On the other hand, increased recognition should increase the incidence in the short-run. National deaths due to coal workers' pneumoconiosis and silicosis have, in fact, declined from 1985 to 1995. Byssinosis has virtually disappeared [Yodaiken, 1997]. Asbestosis deaths, on the other hand, have increased during the same period [National Center for Health Statistics, 1996].

National trends in circulatory disease and cancer will likely affect our comparisons between the mid-1980s and today. Deaths from circulatory diseases have been decreasing, while deaths from all cancers have been increasing [National Center for Health Statistics, 1996]. But, as we mention above, there was an increase in employment in occupations associated with circulatory disease. Consequently, we cannot predict whether job-related circulatory disease increased or decreased from the mid 1980s until today.

A final response to the limitation involving old data is this: it is useful to have an historic record so that progress against diseases and conditions can be measured. Historical data are also useful in suggesting when and which regulations are effective.

Comments on Important Findings and Comparisons to other Studies

One important finding pertains to the following occupations: laborers (both in and out of construction), janitors, nursing aides, truck drivers, and general machine operatives (''not elsewhere classified'' or ''not specified''). These occupations are highly ranked in total numbers of cases and in terms of rates, i.e. cases to number of workers employed in the occupation. These results are consistent with those on (predominantly) injury death rates indicating high rates for janitors, machine operatives (''not elsewhere classified''), and especially laborers in and out of construction [Leigh, 1995; Toscano and Windau, 1994; Meng, 1991]. They are also consistent with an influential early study using the SDS by Root and Sebastian [1981] who calculated a hazard index reflecting primarily nonfatal injuries. Occupations with the highest indexes were, in order, warehouse laborers, other laborers, structural metal crafts workers (iron workers), roofers, sheetmetal workers and apprentices, construction laborers, freight handlers, millwrights, and truck drivers. Root and Sebastian also found that, overall, blue-collar work was twice to eight times as hazardous as white-collar work, depending on the industry examined. Finally, they found that more than 99% of injuries were nonfatal.

Many factors might contribute to high illness (and injury) rates among these occupations. Laborers, operatives, and janitors do not require much training, are easily replaced in the labor market, and are frequently populated by new and young employees. Employees in these jobs may also be less likely to receive proper safety and health training than in other jobs. Firms will invest in safety and health training if it is profitable. But if employees are prone to turnover, as new and especially young employees are, and if laborers, operatives, and janitors are easy to replace, as they are, then firms may not invest in the training. It may be less costly to accept a given number of illnesses and pay the corresponding WC premiums than pay for the additional training.

Job tasks may explain these illnesses. Machine operatives must conduct many repetitive tasks and sometimes work at the machine's pace, not their own. Laborers, janitors, truck drivers and nursing aides are required to do sporadic heavy lifting, which puts damaging strain on joints as well as on hearts. Janitors, nursing aides and laborers can come into contact with chemicals and solvents which result in dermatitis. Nursing aides are likely to come into contact with infective and parasitic agents. Finally, truck drivers report high levels of stress that might be associated with heart disease [Orris et al., 1997].

If, in fact, laborers, machine operatives, janitors, nursing aides and truck drivers hold especially hazardous jobs, at least two conclusions can be drawn. First, some research ought to be directed toward these occupations. Second, an important economic mechanism for improving working

conditions is being undermined. The mechanism is the Compensating Wage Hypothesis. The Compensating Wage Hypothesis asserts that labor markets will create an incentive for employers to provide a safe and healthy work environment. If a firm does not, it will have to pay a wage to induce (compensate) workers into taking a risky job. The labor market thus punishes firms that do not provide a safe and healthy workplace. But labor markets will not always generate the compensating wage. If people who work as laborers, machine operatives, janitors, nursing aides and truck drivers are not aware of the hazards or believe they are impervious to them, or do not have alternative means of making a living, then this important free market force will disappear. This free market force should not be minimized. Viscusi [1992] has argued that it has been more important in improving working conditions than OSHA regulations.

Two related findings that invite comment pertain to the heart disease category which appears high on the death and permanent disability lists. First, the collective decisions of WC boards suggest that heart disease is the disease that accounts for more occupational deaths than any other. There is support for this ranking for heart disease in separate BLS data sets. During the 1980s, the BLS used to publish data on job-related heart disease deaths that were gleaned from the Annual Survey of Occupational Injuries and Illnesses and OSHA Form 200 reports. The BLS estimated that heart attacks were responsible for more deaths than any other occupational disease [U.S. Bureau of Labor Statistics, 1991]. But in the 1990s the BLS judged these data to be so fragmented and unreliable that they are no longer published. However, the BLS continues to rely on the Annual Survey for nonfatal cases.

Second, managers and supervisors were high on the heart condition lists. Yet there were some notable white-collar occupations that reported one or zero occupational heart attack deaths: financial managers, accountants, management analysts, and computer systems analysts. These white-collar occupations are to be contrasted with the many blue-collar occupations at the top of the occupational heart condition lists (truck drivers, janitors, firefighters, laborers, taxi drivers, cooks, guards, and butchers). These data are consistent with findings elsewhere that white-collar professionals, in general, experience fewer job-related heart attacks, strokes and hypertension than persons in other jobs [Karasek and Theorell, 1990; Leigh, 1991]. This is a noteworthy finding since it is drawn from WC records. Apparently WC boards acknowledge the disparity between white and blue-collar job-related heart attacks. Yet, nonmedical opinion continues to hold that white-collar professionals experience more occupational heart and cerebrovascular disease than occurs in any other occupational group [Krantz, 1995].

Other findings pertain to ratios of deaths to PT, PP, and TTP disabilities. Reported job-related diseases and conditions have a higher percentage of deaths than job-related injuries in these WC data. The ratios of PTs, PPs, and TTPs to disease deaths are 0.2, 23, and 20 to one, while the same ratios for injuries are 1.4, 117, and 289 to one [Leigh et al., 1996]. This could be due to either the relative severity of diseases or a reporting and recognition problem. First, it could be that as a group, occupational diseases are more deadly than occupational injuries. The study that counts all injuries suggests this is partially true. Deaths from injury and new cases of injury were estimated to be roughly 6,000 and 13 million, respectively [Leigh et al., 1996]. Fatal and nonfatal or (not yet fatal) diseases were estimated to be roughly 60,000 and 800,000, respectively. On the other hand, this disparity may also be partly a reporting and recognition problem. WC authorities may be more willing to accept that a nonfatal injury was job-related than that a nonfatal disease was job-related. That is, job-related factors may be more scientifically defensible for injuries than diseases.

An additional finding pertains to ''Occupations not classified''–a curious category. It is associated to 4.5% of heart attacks and 12.5% of asbestosis deaths. It ranks high in several diseases for deaths, as well as for PTs, PPs, and TTPs. It is tempting to ignore this category since we cannot know with certainty which jobs are responsible for these deaths. But these high rankings for ''Occupations not classified'' merit two comments. First, these results underscore the lack of attention to links between occupations and diseases. That is, many WC administrators may not feel the need to carefully assess and record the decedent's occupation. Second, it is plausible that many of the decedents were general laborers or operatives since both perform many tasks. The variety of tasks could easily confuse an administrator attempting to categorize a decedent. If this is true, the numbers of decedents in the laborers and operatives categories would be even greater than these SDS data suggest.

The fifth most frequent PP disability and TTP disability is ''symptoms and ill-defined conditions.'' That this category would place so high on the lists, again, is evidence of either how poorly some occupational diseases are understood or how little care and attention is paid to proper filing of WC reports for some occupations.

Another set of notable findings pertain to the two categories ''inflammation or irritation of joints, tendons, or muscles,'' and ''disease of the nerves, including carpal tunnel syndrome.'' In both the PP list and the TTP disability list many of the same occupations appear near the top for both categories: assemblers, nonconstruction laborers, machine operators, truck drivers, packagers, textile machine operators, nursing aides, and janitors. The fact that the occupation lists for both disease categories is so similar suggests that occupational risk factors must be similar for ''inflammation or irritation of joints, tendons, or muscles,'' and ''disease of the nerves, including carpal tunnel syndrome.''

Registered nurses and licensed practical nurses as well as nursing aides and cooks are high on the occupation lists for ''other infective or parasitic disease.'' This is not surprising: iatrogenic disease is a well-known hazard for hospital personnel; cooks likely encounter infective and parasitic agents in the raw meat they prepare.

''Mental disorders'' rank sixth on the PT list and seventh on both the PP and TTP lists. This is a relatively high ranking. In the PP list, ''mental disorders'' rank higher than byssinosis, toxic poisoning, asbestosis, silicosis, diseases of the eye, and many others. In the TTP list, ''mental disorders'' rank above toxic poisoning, hepatitis, heat stroke, cerebrovascular and circulatory systems, and many others. ''Mental disorders'' might be a relatively underappreciated job-related health problem. This high ranking is consistent with other studies on all causes (whether job-related or not) of medical payments among samples of employees. McClellan and Wise [1995] obtained longitudinal data from a large company on roughly 300,000 employees and their dependents for 1989–1991. Surprisingly, for the ''top six'' diagnoses generating the most expenditures, three were for mental problems: substance abuse, acute psychotic disorders, and neurotic disorders.

Social workers and welfare service aides are noteworthy in this ''mental disorders'' category. These occupations employ far fewer people than others on the ''mental disorders'' lists (police, managers, and truck drivers). This suggests that the rate for social workers and aides would be high.

CONCLUSION

This brief review has sought to demonstrate that data from the Bureau of Labor Statistics' SDS can provide insights into the relative magnitude of various occupational diseases in total and as they occur across occupations. There are defects associated with the SDS: the data are old and they are drawn only from WC records. For example, WC records grossly underestimate pneumoconioses. Yet the fact that our knowledge of relative magnitudes is so minimal suggests that even these data are useful to analyze.

Investigations of relative magnitudes can aid economic research. It could be, for example, that illnesses are related to wages or productivity. Knowledge of which illnesses occur within which occupations would aid researchers analyzing OSHA and productivity issues.

These investigations provide clues as to which occupations generate the greatest number of various diseases. Working as laborers, janitors, nursing aides, and a variety of machine operatives appears to generate a high and disproportionate number of a variety of diseases. Assemblers, laborers, machine operators, truck drivers, packagers, textile machine operators, nursing aides, and janitors contribute a high and disproportionate share in the top categories of ''inflammation and irritation of joints, tendons, and muscles'' and ''diseases of the nerves, including carpal tunnel syndrome.'' These occupations deserve more scientific scrutiny. The fact that those occupations pay low wages has implications for economic tests of the Compensating Wage Hypothesis.

Contrary to popular, nonscientific opinion, we found that circulatory diseases were more likely to be reported among blue-collar and service workers than white-collar professionals. We also found that social workers reported a high number of mental disorders.

Finally, some measure is made of the overall contribution of various diseases. We found, for example, that circulatory disease may be more significant than any other disease in its contribution to deaths and permanent disabilities. We also found that mental disorders generated a moderately high number of cases in the PT, PP and TTP categories.

Our most important conclusion, however, pertains to what the SDS or any other government data set cannot tell us. What are the relative magnitudes of these diseases and the size of the overall burden of occupational disease regardless whether or not WC boards recognize them as job-related? To answer these questions the federal government should undertake a Census of Occupational Diseases, similar to the Census of Fatal Occupational Injuries [Toscano and Windau, 1994].

REFERENCES

Berkowitz M, Burton JF (1987): ''Permanent Disability Benefits in Workers' Compensation.'' Kalamazoo, MI: W.E. Upjohn Institute.

Jenkins FL, Kisner SM, Fosbroke DE, Layne LA, Stout NA, Castillo DN, Cutlip PM, Cianfrocco J. (1993): ''Fatal Injuries to Workers in the U.S., 1980–1989. A Decade of Surveillance.'' Publ. No. 93-108. Cincinnati, OH: National Institute for Occupational Safety and Health.

Karasek R, Therorell T (1990): ''Healthy Work: Stress, Productivity, and the Reconstruction of Working Life.'' NY: Basic Books.

Kaufman BE (1995): ''The Economics of Labor Markets.'' The Dryen Press, Orlando, Florida.

Krantz L (1995): ''Jobs Rated Almanac.'' New York: John Wiley & Sons.

Leigh JP (1991): A ranking of jobs based upon the blood pressures of incumbents. J Occup Med 33:853–861.

Leigh JP (1995): ''Causes of Death in the Workplace.'' Westport, CT: Quorum Books.

Leigh JP (1996): Occupations, cigarette smoking and lung cancer in the Epidemiological Follow-up to the NHANES I and the California Occupational Mortality Study. Bull NY Acad Med 73:370–397.

Leigh JP, Jiang WY (1993): Liver cirrhosis deaths within occupations and industries in the California occupational mortality study. Addiction 88:707–779.

Leigh JP, Markowitz SB, Fahs MC, Shin CG, Landrigan PJ (1996): ''Costs of Occupational Injuries and Illnesses, 1992.'' Final Report for Cooperative Agreement with E.R.C. Inc., U60/C.C.U. 902886. Atlanta: NIOSH.

Leigh JP, Markowitz SB, Fahs MC, Shin C, Landrigan PJ (1997): Occupational injury and illness: Estimates of costs, morbidity and mortality. Arch Intern Med 157:1557–1568.

Lofgren D (1989): ''Dangerous Premises: An Insiders View of OSHA Enforcement.'' Industrial and Labor Relations Review Press. Cornell University. Ithaca, N.Y.

McClellan MB, Wise DA (1995): Where the money goes: Medical expenditures in a large corporation. Working Paper number 5294. Cambridge, MA: National Bureau of Economics Research.

Meng R (1991): How dangerous is work in Canada? Estimates of job related fatalities in 482 occupations. J Occup Med 33:1084–1091.

Mishel L, Bernstien J (1995): ''The State of Working America.'' Armonk, NY: M.E. Sharpe.

National Center for Health Statistics (1995): ''Health, U.S. 1994.'' Hyattsville, MD: U.S. Public Health Service.

National Center for Health Statistics (1996): ''Health, United States, 1995.'' Hyattsville, MD: U.S. Public Health Service.

National Research Council (1987): ''Counting Injuries and Illnesses in the Workplace: Proposals for a Better System.'' Washington, DC: National Academy Press.

Orris P, Hartman DE, Straus P, Anderson RJ, Collins J, Knopp C, Xu Y, Melius J (1997): Stress among package truck drivers. Am J Ind Med 31:202–210.

Pearson JK, Rosenstock L, Salvaggio JE, Weida TJ (1996): We're all practicing occupational medicine. Patient Care 30(3):42–67.

Personick ME (1992a): Injury and illness experience in logging. Compensation Working Conditions 44(8):1–3.

Personick ME (1992b): Safety and health conditions in poultry plants. Compensation Work Conditions 44(10):1–3.

Root N, Sebastian D (1981): BLS develops measures of job risk by occupation. Monthly Labor Rev 104(101):26–30.

Ruser JW (1991): Workers' compensation and occupational injuries and illness. J Labor Econ 9:325–350.

Silvestri GT (1995) Occupational employment to 2005. Monthly Labor Rev 118(11):60–87.

Smith RB (1995): In other news. Occup Health Safety 64(6):21.

Stellman S, Boffetta P, Garfinkel L (1988): Smoking habits of 800,000 American men and women in relation to their occupations. Am J Ind Med 13:43–58.

Toscano G, Windau J (1994): The changing character of fatal work injuries. Monthly Labor Rev 117(10):17–28.

U.S. Bureau of Labor Statistics (1982): ''Supplementary Data System, Microdata Files User's Guide.'' 1980 Edition. PB83-B3553. Springfield, VA: National Technical Information Service.

U.S. Bureau of Labor Statistics (1988): ''Employment and Earnings.'' Washington, DC: U.S. Department of Labor.

U.S. Bureau of Labor Statistics (1989): ''Supplementary Data System, Data Files User's Guide.'' 1985 Edition. PB89-121529. Springfield, VA: National Technical Information Service.

U.S. Bureau of Labor Statistics (1991): ''Occupational Injuries and Illnesses in the U.S. By Industry, 1989.'' Bulletin 2379. Washington, DC: U.S. Department of Labor, U.S. Government Printing Office.

U.S. Chamber of Commerce (1985–86): ''Analysis of Workers Compensation Laws.'' Washington, DC: U.S. Chamber of Commerce, U.S. Government Printing Office.

Viscusi WK (1992): ''Fatal Tradeoffs: Public and Private Responsibilities for Risk.'' New York: Oxford University Press.

Yodaiken RE (1997): Annotation: Evaluating OSHA's ethylene oxide standard and evaluating OSHA. Am J Public Health 87:1096–1097.