

Motion-related wrist disorders traced to industries, occupational groups

Jobs that involve repetitive motions of the hand contribute disproportionately to a number of injuries and illnesses; analysis of workers' compensation claims data shows workers in manufacturing, construction, and agriculture to be most at risk

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Tasks which require workers to perform certain repetitive motions have been reported to contribute to the incidence of a variety of occupational diseases.¹ The Bureau of Labor Statistics 1979 annual survey of occupational injuries and illness found 21,900 cases that were associated with work activities involving repeated motions, vibrations, or pressure.² But while this statistic may help one to appreciate the magnitude of the problem, the annual survey does not obtain data pertaining to body part involved, which would permit the identification of anatomical areas most frequently affected by the stress of repetitive motions; nor does it permit identification of jobs most associated with repetitive motion disorders.

Fortunately, the Bureau has developed an alternate database, the Supplementary Data System (SDS), that does make such analysis possible. The following discussion demonstrates the use of the SDS, which is derived from State records of workers' compensation claims, in investigating the occurrence of one group of motion-related disorders—those involving the soft tissues of the wrist and hand. Such disorders are of interest because many industrial tasks re-

quire repetitive motions that subject the soft tissues of the wrist and hand to a low level, high frequency form of trauma.³ Earlier studies, on a more limited scale, have shown that several disorders of the wrist (including carpal tunnel syndrome, tendinitis, and tenosynovitis) have a larger incidence among workers whose occupations entail frequent, repetitive hand movements.⁴

The database

The BLS Supplementary Data System was the primary information source for this investigation. The SDS program became functional in 1976 as a Federal-State cooperative

Table 1. Industrial work force by major industrial group, total and for the 26 sds States combined, 1979

[Numbers in thousands]

Industrial group	Total U.S. work force	Workers in 26 SDS States	Industry-specific percent of work force represented by 26 SDS States
Total	74,564.6	32,070.7	43.0
Agriculture	1,414.0	677.0	47.9
Construction	4,528.4	1,964.2	43.4
Manufacturing	21,069.0	8,871.4	42.1
Transportation	5,110.2	2,166.7	42.4
Trade	20,308.9	8,956.3	44.1
Finance	4,980.5	2,063.6	41.4
Services	17,153.6	7,371.5	43.0

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system to provide information about occupational injury and illness.⁵ The States participating in the SDS program classify workers' compensation information according to a uniform format⁶ and submit the data to BLS on an annual basis. Data from 26 States which reported current cases for the year 1979 were used for this assessment.⁷ To be included in the analysis, a wrist compensation claim had to relate to inflammation or irritation of joints, tendons, or muscles; or diseases of the nerves and peripheral ganglia. The disorder also had to be attributable to one of the following types of accident or exposure: repetitive pressure; voluntary motions; overexertions; lifting objects; pulling objects; throwing objects; or nonspecific overexertion.⁸ The claims which met these criteria are hereinafter referred to as "nonimpact wrist disorders."

Employment data by industry were obtained from BLS for each of the 50 States.⁹ These data allowed for the calculation of the percentage of industrial work force represented by the 26 States (see table 1, page 13), and provided a means for comparing the number of workers' compensation claims in an industry to the number of workers employed.¹⁰ The 26 States represented 43 percent of the total U.S. work force employed in the seven major industry groups.

Differences among State workers' compensation coverage and reporting requirements have been cited as limitations of the SDS program.¹¹ Furthermore, it must be emphasized that compensation claim data reflect the likelihood of a worker filing a claim for a specific injury or illness and do not directly indicate the incidence of the injury or illness. With these differences acknowledged, it is our view that the SDS program is the most comprehensive data source available for making comparative assessments of serious and moderately serious injuries and illnesses across industries and occupations.

High-risk groups isolated

Data in table 2 show that there were 3,027 workers' compensation claims reported in 1979 for nonimpact wrist disorders in the 26 States included in this analysis. These account for more than 6 percent of all compensable cases involving the wrist, and are most important in the manufacturing industries, where they account for more than 10

Table 2. Distribution of nonimpact wrist disorder claims and total wrist injury or illness claims in 26 SDS States combined, by industry, 1979

Industrial group	Number of nonimpact wrist disorder claims	Total wrist injury claims	Nonimpact claims as a percent of total wrist injury claims
Total	3,019	48,299	6.2
Agriculture	65	1,216	5.4
Construction	198	5,769	3.4
Manufacturing	2,107	20,013	10.5
Transportation	56	2,925	1.9
Trade	367	9,899	3.7
Finance	22	674	3.3
Services	204	7,803	2.6

Table 3. Mean indemnity compensation and medical payments for selected types of workers' compensation claims closed in 1979, seven SDS States

Nature of illness or injury ¹	Indemnity compensation	
	Number of cases reporting cost data	Mean cost per case
Fractures	3,116	\$2,688
Cuts, lacerations, or punctures	763	1,206
Nonimpact wrist disorders	762	1,026
Sprains or strains	2,953	985
Contusions, crushing, or bruises	581	910
	Medical payments	
Nonimpact wrist disorders	202	618
Fractures	937	567
Cuts, lacerations, or punctures	328	312
Sprains or strains	770	190
Contusions, crushing, or bruises	207	186

¹ Table lists only those categories with cost data reported for more than 100 cases.

percent of all wrist injury claims.

Another index of the impact of an occupational injury or illness is the mean compensation cost per case. Data in table 3 indicate that, compared to other common kinds of cases, nonimpact wrist disorders are important with reference to both medical payments and indemnity compensation; on average, they cost \$618 in medical payments and \$1,026 in indemnity compensation per case.¹²

With reference to gender differences for nonimpact wrist disorders, the percentages of claims submitted by men (50.6 percent) and by women (49.4 percent) were similar. However, gender-specific employment figures for 1979 show that the combined work force in the SDS States was 58.6 percent male and 41.4 percent female.¹³ The mean age of claimants in the two groups revealed women (33.7 years) to be 3.8 years older than men (29.9 years). (This difference in age between genders was found to be statistically significant at the .0001 level.)

Industry. The number of nonimpact wrist injury compensation claims across the 26 States used in this analysis reveals that manufacturing produced the largest number of claims (2,107), representing 69.6 percent of the total. Table 4 shows an incidence rating for nonimpact wrist compensation claims for each of the seven industrial groups. This ratio was calculated by dividing the industry-specific number of claims for the 26 SDS States by the respective industry-specific number of workers employed in these States, and multiplying by 100,000. Again, manufacturing led the seven industries with a ratio of 23.8 claims per 100,000 workers. Construction, which reported the fourth largest number of claims, had the second largest incidence ratio (10.1 claims per 100,000 workers), followed by agriculture (9.6 claims per 100,000 workers).

In an effort to more accurately identify the specific industries with the most nonimpact wrist disorder claims, the major industrial categories (agriculture, construction, and so forth) were broken down according to four-digit Standard

Industrial Classification (SIC) codes.¹⁴ As shown in table 5, meatpacking plants accounted for the largest number of claims (245), some 8 percent of all compensation claims filed for nonimpact wrist disorders in the 26 SDS States.

Occupation. Coding of worker job titles by the SDS program allowed for the retrieval of figures on compensation claims according to general occupation (table 6). Meatcutters and butchers (manufacturing) were, by far, at largest risk of filing nonimpact wrist disorder claims, with 498.8 claims per 100,000 workers.

Interpreting the results

It must be stressed that the number of workers' compensation claims for nonimpact wrist disorders understates the incidence of such cases. The use of workers' compensation claim data restricts the focus of analysis to employees seeking medical attention for the condition or filing for compensation benefits, or both, which is not synonymous with the number of workers experiencing this occupational disorder. For example, in a study of one large manufacturing operation, it was found that, out of 30 workers with a diagnosed case of carpal tunnel syndrome, only 16 became workers' compensation cases.¹⁵

Several factors may contribute to the discrepancy between the occupational incidence of nonimpact wrist disorders and the incidence of compensation claims reported by State compensation agencies. First, many workers, such as farm owners and their families, railroad employees, maritime workers, and Federal employees, are not covered by State workers' compensation programs. Second, some of the States included in this analysis provide information which is limited to cases in which the worker was unable to work for a specified length of time, depending on State law. Thus, some workers who actually suffer from the disorder but are able to continue working are not identified from compensation data. In addition, such workers may be reassigned to other jobs which reduce their symptoms to the point where it is unnecessary to file a claim. Finally, because repetitive motion disorders occur without an easily recognizable traumatic incident, many workers may not file a claim because they fail to recognize the causative relationship between the repetitive activity and their symptoms.

Table 4. Industry-specific incidence ratios for nonimpact wrist disorders in the 26 SDS States, 1979

Industry	Claims per 100,000 workers
Manufacturing	23.8
Construction	10.1
Agriculture	9.6
Average	9.4
Trade	4.1
Services	2.9
Transportation	2.6
Finance	1.1

Table 5. Nonimpact wrist compensation claims by four-digit sic code, 1979

SIC code	Industry	Division	Number of claims	Percent of all nonimpact wrist claims
2011	Meatpacking plants	Manufacturing	245	8.0
3714	Motor vehicle parts and accessories	Manufacturing	116	3.8
3711	Motor vehicle and passenger car bodies	Manufacturing	102	3.3
2421	Sawmills and planing mills	Manufacturing	83	2.7
2016	Poultry dressing plants	Manufacturing	77	2.5
5812	Eating places	Retail trade	51	1.7
5411	Grocery stores	Retail trade	51	1.7
3519	Internal combustion engines	Manufacturing	46	1.5
3079	Miscellaneous plastics products	Manufacturing	43	1.4

We are unable to ascribe much significance to our findings on the gender and age of claimants because of inadequate information on the diagnosis of each compensation claim, and lack of data on the gender and age distributions of workers who perform repetitive motion tasks. We acknowledge the multitude of etiological factors which can contribute to the incidence of such conditions as carpal tunnel syndrome, and believe that the effects of age and gender can be better addressed by population-based epidemiological studies.

The manufacturing industries accounted for 69.6 percent of the reported compensation claims secondary to nonimpact wrist disorder, a ratio of 23.8 claims per 100,000 workers. Further breakdown of this information according to specific industrial category revealed the largest number of reported claims to be from the meatpacking and the motor-vehicle manufacturing industries. However, the assessment of specific risk factors is not possible with these data because we lack information on the types of tasks performed and the length of exposure to specific tasks.

The agricultural industries produced the third largest incidence ratio for nonimpact wrist disorders (9.6 claims per 100,000 workers), even though employment tends to be

Table 6. Number and incidence ratio of nonimpact wrist disorder claims in 26 SDS States, high-risk occupations, 1979

Occupation	Number of claims	Estimated employment	Claims per 100,000 workers
Meatcutters and butchers (manufacturing)	222	44,509	498.8
Miscellaneous laborers	171	102,387	167.0
Bottling, canning operatives	33	32,416	101.8
Fillers, polishers, sanders, and buffers	47	60,069	78.2
Meat wrappers (retail trade)	15	21,984	68.2
Shoemaking machine operators	19	31,631	60.1
Nonspecified laborers	127	212,709	59.7
Sawyers	35	58,764	59.6
Assemblers	326	550,242	59.3
Punch and stamping press operatives	52	91,175	57.0
Freight and materials handlers	136	257,299	52.9
Packers and wrappers, except meat and produce	124	247,574	50.1

seasonal and performed, to some extent, by migrant workers who may not file claims as often as other wage workers. Further investigation into the occurrence of nonimpact wrist disorders in agriculture appears warranted.

Finally, with regard to occupation, we found that meat-cutters and butchers, miscellaneous laborers, and bottling and canning operators accounted for the largest numbers of nonimpact wrist disorders. Again, however, these observations should be interpreted cautiously, because our analysis is based on data which are available for only very general occupational groups.

RESEARCH PERFORMED IN A VARIETY OF industrial settings has supported a positive association between repetitive hand

motions and the incidence of various wrist disorders.¹⁶ Our analysis of workers' compensation claims provides further evidence of this association by showing large differences in claim ratios (claims per 100,000 employees) for different occupations, with the largest ratios occurring in occupations that entail repeated motions and exertions of the hand. Our study, and similar studies of other job-related disorders, should also be useful in the establishment of priorities for both research and regulatory activities in the field of occupational safety and health. However, the etiological components, including the role of specific hand motions, must be more thoroughly assessed if the factors contributing to the incidence of nonimpact wrist disorders are to be identified and altered. □

—FOOTNOTES—

¹Leo Hymovich and Miriam Lindholm, "Hand, wrist and forearm injuries, the result of repetitive motions," *Journal of Occupational Medicine*, November 1966, pp. 573-77; and Norman M. Hadler, "Industrial rheumatology: clinical investigations into the influence of the pattern of usage on the pattern of regional musculo-skeletal disease," *Arthritis and Rheumatism*, May 1977, pp. 1019-25.

²Data are from *Occupational Injuries and Illnesses in 1979: Summary*, Bulletin 2097 (Bureau of Labor Statistics, 1981), p. 29.

³Thomas J. Armstrong, "Carpal tunnel syndrome and the female worker," *Transactions of the Forty-third Annual Meeting of the American Conference of Governmental Industrial Hygienists* (Cincinnati, Ohio, American Conference of Governmental Industrial Hygienists, Inc., 1982), pp. 26-35.

⁴Lawrence J. Cannon, Edward J. Bernacki, and Stephen D. Walter, "Personal and occupational factors associated with carpal tunnel syndrome," *Journal of Occupational Medicine*, April 1981, pp. 255-58; Tuulikki Lupopajarvi, Ilkka Kuorinka, Markku Virolainen, and Mia Holmberg, "Prevalence of tenosynovitis and other injuries of the upper extremities in repetitive work," *Scandinavian Journal of Work, Environment and Health*, 1979, Suppl. 3, pp. 48-55; M.Q. Birkbeck and T.C. Beer, "Occupation in relation to carpal tunnel syndrome," *Rheumatology and Rehabilitation*, November 1975, pp. 218-21; and Teresa W. Lewis, "An unnecessary byproduct of industry," *Ohio Monitor*, March 1980, pp. 14-16.

⁵Norman Root and David McCaffrey, "Producing more information on work injury and illness," *Monthly Labor Review*, April 1978, pp. 16-21.

⁶*Supplementary Data System, Microdata Files User's Guide, 1978-1979* (Bureau of Labor Statistics, 1980).

⁷The 26 States included in this analysis of the 1979 SDS survey are Alaska, Arizona, California, Colorado, Hawaii, Idaho, Indiana, Iowa, Kentucky, Maine, Maryland, Michigan, Minnesota, Missouri, Montana, Nebraska, New Jersey, New Mexico, Oregon, South Dakota, Tennessee, Utah, Vermont, Washington, Wisconsin, and Wyoming. Two States (Massachusetts and Ohio) which also provide current case data were not used

for this analysis because their occupational classification system differs from that for the BLS employment data.

⁸Compensation claims attributed to vibration were excluded from this study.

⁹Employment figures for manufacturing; construction; wholesale and retail trade; finance, insurance, and real estate; transportation; services; and government were obtained from *Supplement to Employment and Earnings, States and Areas, Data for 1977-80*, Bulletin 1370-15 (Bureau of Labor Statistics, 1981). Agricultural employment is from "Current Population Survey" (Bureau of Labor Statistics, 1979), table A (unpublished), pp. 1547-49.

¹⁰The SDS data on compensation claims secondary to nonimpact wrist disorders included figures from nine industrial groups (agriculture; mining; construction; manufacturing; wholesale and retail trade; finance, insurance, and real estate; transportation; services; and government). Because of the variance which exists in coverage and reporting procedures for compensation claims among governmental employees, this industrial classification was omitted from tables 1, 2, and 4. The mining industries were also excluded from the analysis because data for the 26 States were not representative of the work force in mining, and because there were only eight cases that met our criteria.

¹¹Root and McCaffrey, "Producing more information," p. 17.

¹²Medical and indemnity compensation cost data were submitted on closed workers' compensation claims by seven States (Arkansas, Colorado, Delaware, Montana, North Carolina, Virginia, and Wisconsin).

¹³*Geographic Profile of Employment and Unemployment, 1979*, Report 619 (Bureau of Labor Statistics, 1980), table 1.

¹⁴See U.S. Office of Management and Budget, *Standard Industrial Classification Manual, 1972* (Washington, U.S. Government Printing Office).

¹⁵Cannon, Bernacki, and Walter, "Personal and occupational factors."

¹⁶See Hymovich and Lindholm, "Hand, wrist and forearm injuries"; Cannon, Bernacki, and Walter, "Personal and occupational factors"; Armstrong, "Carpal tunnel syndrome"; and Birkbeck and Beer, "Occupation."