

Injured at Work

What workers' compensation data reveal about work-related musculoskeletal disorders (WMSDs)



Promoting Safer, Healthier Workplaces

Summary of Technical Report Number 40-8a-2004, **Work-related Musculoskeletal Disorders in the Neck, Back, and Upper Extremity in Washington State, 1994-2002**

Overview of the Study

Objective, Key Findings

The Safety and Health Assessment and Research for Prevention (SHARP) Program examined workers' compensation data to demonstrate the impact of work-related musculoskeletal disorders (WMSDs) in Washington State workplaces.

The data show that WMSDs¹ continue to represent a significant proportion of workers' compensation costs.

(See Figure 1.)

- WMSDs account for 27 percent of all accepted State Fund² workers' compensation claims.
- These claims are 35 percent of all compensable³ claims.
- WMSDs account for 41 percent of the cost of State Fund workers' compensation claims (compensable and medical-only).

The fact that WMSDs represent a significant proportion of workers' compensation costs suggests that they should be a high priority for injury prevention.



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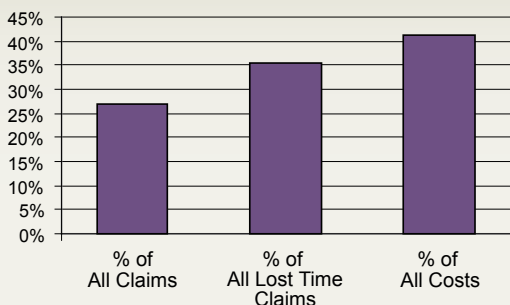
¹ All references to WMSDs in this summary refer to disorders of the neck, back, hand/wrist, elbow and shoulder, unless otherwise indicated.

² "State Fund" means the workers' compensation program operated by the Department of Labor and Industries. Some large employers are self-insured.

³ Generally, "compensable" means the worker received benefits beyond payment of medical bills. These may include partial wage-replacement benefits for being off work four or more days, disability payments, etc.

FIGURE 1.

WMSDs of the Neck, Back and Upper Extremities — State Fund Claims



WMSD Risks

- Work-related musculoskeletal disorders are a number of physical conditions affecting muscles, tendons, nerves and joints that are not caused by acute trauma. Examples include back strain, tendinitis and carpal tunnel syndrome. They occur when the physical demands of work damage these areas of the body.
- WMSDs are caused or aggravated by exposures to frequent or heavy manual handling, awkward postures and forceful or repetitive exertions.
- Risk increases as the frequency, duration or intensity of these exposures increase, or multiple risk factors occur at the same time. Fewer injuries and less-severe injuries would occur by reducing the number and frequency of exposures.

Research Methods

In the current study, the SHARP Program researchers examined State Fund workers' compensation claims for general and selected specific hand/wrist, elbow, shoulder, neck and back disorders accepted between 1994 and 2002. They examined closed compensable claims from self-insured employers for general categories because diagnostic codes (ICD-9) were unavailable. Claims data for the lower extremity are not included in this report. Researchers also used a prevention index (PI) to identify and rank industries with a high risk of WMSDs (see page 10). By using current population survey data (1995-2002) as a denominator, researchers also estimated WMSD incidence rates by age, gender and industry sector.

Claims Data: State Fund Claims

Number and Costs of State Fund Claims

Between 1994 and 2002, the State Fund accepted 365,760 claims for WMSDs. (See Table 1.)

- These claims cost \$3.3 billion in medical costs and partial wage-replacement benefits.
- The average cost per WMSD claim was \$3,000 more than the average cost of all claims.

TABLE 1.

State Fund Workers' Compensation Claims: All Claims, WMSD Claims Compared

| | All Claims | WMSD Claims |
|------------------------------------------------------------------------------------------------------------|-----------------|-----------------|
| Total claims 1994-2002 | 1,360,279 | 365,760 |
| Percent of all claims | 100.0% | 26.9% |
| Total direct cost 1994-2002 | \$8,021,465,066 | \$3,299,653,962 |
| Average total no. claims per year | 151,142 | 40,640 |
| Percent female | 32.3% | 36.9% |
| Median age | 34 | 36 |
| Average yearly claim rate per 10,000 FTEs | 1,105.9 | 297.1 |
| Overall severity rate (lost days) per 10,000 FTEs ** | 33,810.5 | 16,206.4 |
| Total compensable claims | 318,951 | 129,340 |
| Percent of total compensable claims | 23.5% | 35.4% |
| Overall yearly compensable claims rate per 10,000 FTEs | 257.3 | 104.3 |
| Average time-loss days ** | 144 | 176 |
| Median time-loss days ** | 24 | 32 |
| Average total direct cost/claim* | \$5,970 | \$9,208 |
| Median total direct cost/claim* | \$328 | \$666 |
| ** based on 1997-2002 compensable time-loss days | | |
| * Cost adjusted to 2002 using medical CPI for medical costs and overall CPI for wage replacement benefits. | | |

Affected Body Areas — State Fund Claims

Table 2 displays information about the number and cost of State Fund claims by affected body area.

- WMSDs of the back represent more than 14 percent of all accepted claims.
- WMSDs of the neck require an average of 214 days away from work.

TABLE 2.

State Fund WMSD Claims: Number and Cost of Claims by Affected Body Area

| | Neck | Back | Shoulder | Elbow Forearm | Hand Wrist |
|------------------------------------------------------|----------|---------|----------|---------------|------------|
| Total claims 1994-2002 | 42,771 | 193,377 | 45,976 | 22,770 | 68,595 |
| Percent of all claims | 3.1% | 14.2% | 3.4% | 1.7% | 5.0% |
| Total direct cost 1994-2002 | \$128.2M | \$1.6B | \$463.7M | \$111.5M | \$504.7M |
| Average total number of claims per year | 4,752 | 21,486 | 5,108 | 2,530 | 7,622 |
| Percent female | 45.0% | 30.3% | 36.6% | 39.5% | 50.9% |
| Median age | 37 | 35 | 38 | 39 | 36 |
| Average yearly claim rate per 10,000 FTEs | 34.7 | 157.3 | 37.2 | 18.4 | 55.7 |
| Overall severity rate (lost days) per 10,000 FTEs ** | 529.1 | 7,722.9 | 2,375.9 | 612.3 | 969.3 |
| Total compensable claims | 20,802 | 73,719 | 18,234 | 7,678 | 25,748 |
| Percent of accepted claims | 48.6% | 38.1% | 39.7% | 33.7% | 37.5% |
| Overall yearly compensable claims rate/10,000 FTEs | 16.8 | 59.5 | 14.7 | 6.2 | 20.9 |
| Average time-loss days ** | 214 | 156 | 210 | 186 | 185 |
| Median time-loss days ** | 39 | 19 | 61 | 52 | 62 |
| Average total direct cost/claim* | \$11,520 | \$8,723 | \$11,565 | \$6,516 | \$8,562 |
| Median total direct cost/claim* | \$674 | \$623 | \$665 | \$474 | \$622 |

** based on 1997-2002 compensable time-loss days

* Cost adjusted to 2002 using medical CPI for medical costs and overall CPI for wage replacement benefits.

Table 3 displays information about the number of claims and average costs for selected WMSDs.

- Although claims for sciatica were infrequent, they were the most costly WMSD claim.
- The second and third most-costly WMSD claims were for rotator cuff syndrome and carpal tunnel syndrome, respectively. These claims occurred three to four times as often as sciatica.

TABLE 3.

Number of State Fund Accepted Claims, Average Costs for Selected WMSDs

| | Sciatica | Rotator Cuff Syndrome | Epicondylitis | Hand/Wrist Tendinitis | Carpal Tunnel Syndrome |
|------------------------------------------------------------------------------------------------------------|----------|-----------------------|---------------|-----------------------|------------------------|
| Total claims 1994-2002 | 6,742 | 20,394 | 14,060 | 20,674 | 27,526 |
| Overall yearly claim rate per 10,000 FTEs | 5.4 | 16.4 | 11.3 | 16.7 | 22.2 |
| Overall severity rate (lost days) per 10,000 FTEs | 1,673.8 | 1,911.5 | 473.3 | 969.3 | 1,927.2 |
| Average time- loss days ** | 449 | 278 | 231 | 226 | 222 |
| Average total direct cost/claim* | \$57,688 | \$24,626 | \$9,723 | \$10,724 | \$18,216 |
| ** based on 1997-2002 compensable time loss days | | | | | |
| * Cost adjusted to 2002 using medical CPI for medical costs and overall CPI for wage replacement benefits. | | | | | |

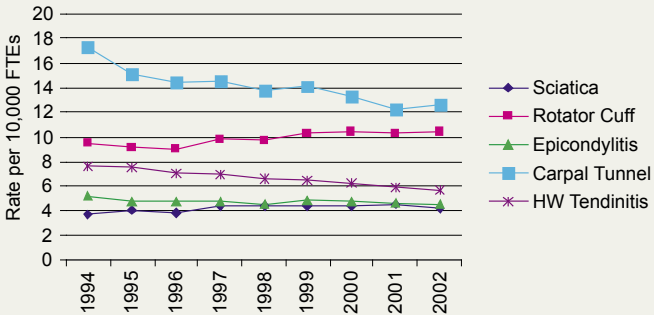
Changes in Compensable Incidence Rates — State Fund Claims

Figure 2 shows the incidence rates for specific WMSD conditions.

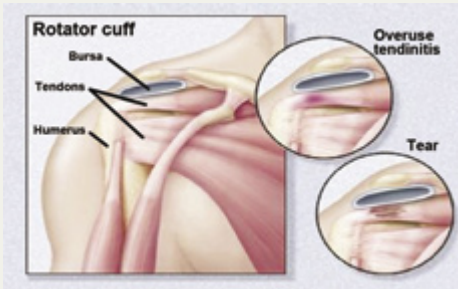
- **Sciatica** – increased 2.3 percent per year
- **Rotator cuff** – increased 1 percent per year
- **Epicondylitis** – remained stable at 0.4 percent per year
- **Carpal tunnel syndrome** – decreased significantly at 3.7 percent per year

FIGURE 2.

Incidence Rates for Specific WMSD Conditions: State Fund Compensable Claims



Specific WMSD Conditions Illustrated



Rotator Cuff Syndrome

Involves inflammation, degeneration and tear of the tendons around the shoulder (with the supraspinatus tendon most frequently involved).

Illustration courtesy of Mayo Foundation for Medical Education and Research.

Epicondylitis

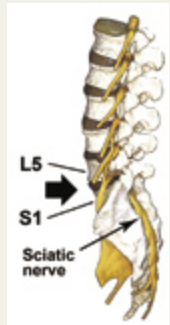
An inflammation of the tendon at the elbow (lateral epicondylitis or tennis elbow is most common).



Illustration courtesy of Taylor & Francis, LTD.

Sciatica

The sciatic nerve runs between L5 and S1 and can be compressed by herniation of the disk there. Sciatic pain is manifested as radiating back pain that goes below the knee.



Hand/wrist Tendinitis

Is the inflammation of the flexor or extensor tendons or their lubricating sheaths (tenosynovitis).

Carpal Tunnel Syndrome

Is the compression of the median nerve at the wrist, due to inflammation.



Claims Data: Self-insured Employers

The SHARP Program researchers also reviewed data on self-insured employers. These employers tend to be larger companies and represent a different set of risks than employers covered by the State Fund. For self-insured employers, only data on closed compensable claims were available for review. (See Table 4.)

- For the period 1994 to 2002, self-insured employers closed 75,074 compensable WMSD claims, an average of 8,342 per year.
- WMSDs represent 46 percent of the compensable claims closed by self-insured employers.
- WMSDs of the back represent 22 percent of compensable claims in self-insured companies. Table 5 shows claims by affected body area.

TABLE 4.

Characteristics of Compensable WMSD Claims, Self-insured Employers, 1994-2002

| | All Claims | WMSDs |
|-------------------------------------------|------------|--------|
| Total compensable claims | 164,638 | 75,074 |
| % of all compensable claims | 100.0% | 45.6% |
| Average total no. claims/year | 18,293 | 8,342 |
| % female | 43.7% | 48.0% |
| Median age | 41 | 40 |
| Average yearly claim rate per 10,000 FTEs | 320.5 | 146.1 |

TABLE 5.

Compensable WMSD Claims By Affected Body Area, Self-insured Employers, 1994-2002

| | Neck | Back | Shoulder | Elbow Forearm | Hand Wrist |
|-------------------------------------------|-------|--------|----------|---------------|------------|
| Total claims | 2,167 | 37,085 | 9,606 | 2,663 | 12,031 |
| % of all compensable claims | 1.3% | 22.5% | 5.8% | 1.6% | 7.3% |
| Average total no. claims/year | 241 | 4,121 | 1,067 | 296 | 1,337 |
| % female | 52.0% | 41.4% | 44.5% | 44.9% | 58.8% |
| Median age | 39 | 39 | 41 | 41 | 41 |
| Average yearly claim rate per 10,000 FTEs | 4.2 | 72.3 | 18.6 | 5.2 | 23.4 |

Compensable Claims Rate — State Fund and Self-insured Employers

The claims rate for all compensable claims and for compensable WMSD claims decreased significantly for both State Fund and self-insured employers. (See Figure 3.)

Rates for compensable back claims decreased 5.6 percent per year for State Fund claims and 5.2 percent per year for self-insured claims.

Upper extremity WMSDs decreased more slowly. State Fund claims decreased 2.4 percent per year. Self-insured claims decreased 2.0 percent per year. (See Figure 4.)

FIGURE 3.

Claims Rates — All Compensable Claims Compared to Compensable WMSD Claims

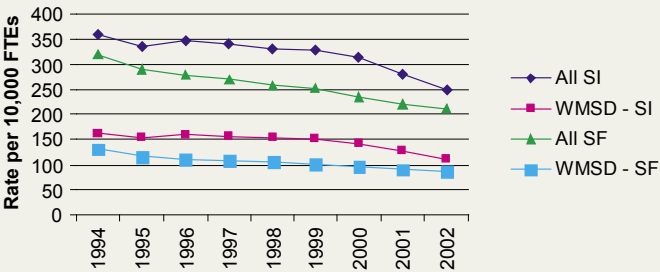
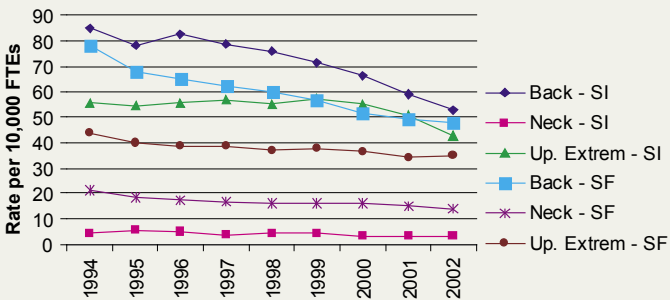


FIGURE 4.

Compensable WMSD Claims for Specific Body Areas



Industries with Highest Risk of WMSDs

SHARP researchers use a prevention index (PI) to identify the industry sectors with the greatest potential for prevention of WMSDs. The PI is the average of an industry's ranking for number of injuries and its ranking for claims rate.

An industry will rank high on the PI if it has a relatively large number of claims and a relatively high claims rate.

SHARP researchers also calculate a rate ratio for each industry. The rate ratio compares the claim incidence rate for each industry with the overall claim incidence rate for all industries in Washington State.

A rate ratio of 3, for example, means that the rate for that industry is three times the overall rate.

Industry Sectors – State Fund Claims

For State Fund employers, construction, manufacturing, and health care were the top three industry sectors on the prevention index.

(See Table 6, Page 11.) Claim costs and lost time are also highest in construction.

Industry Sectors – Self-insured Claims

Among self-insured employers, the top three industry sectors on the prevention index were health care, transportation, and retail trade.

(See Table 7, Page 12.)

Four-digit NAICS⁴ Ranking by Prevention Index

In addition to the PI ranking by industry sector (two-digit NAICS), SHARP researchers also calculated the PI for the more-specific four-digit NAICS categories. This ranking combined State Fund and self-insured compensable claims.

Couriers had the highest incidence rate, which was 4.6 times the overall WMSD rate for all industries. **(See Table 8, Page 13.)**

FOOTNOTES

⁴ NAICS is the North American Industry Classification System.

TABLE 6.

Industry Sector Ranking by Prevention Index, State Fund Claims, 1994-2002

| NAICS Description | Count | Cost | Lost Work Days | Rate | Rate Ratio |
|-------------------------------------------------------|--------|---------------|----------------|-------|------------|
| 23 Construction | 54,852 | \$827,672,851 | 3,189,575 | 536.0 | 1.8 |
| 32 Manufacturing (Wood, Paper, Printing) | 16,099 | \$125,570,587 | 522,073 | 481.1 | 1.6 |
| 62 Health Care and Social Assistance | 31,462 | \$216,133,150 | 1,024,015 | 332.8 | 1.1 |
| 33 Manufacturing (Metals, Equipment) | 23,380 | \$211,299,315 | 919,014 | 374.6 | 1.3 |
| 44 Retail Trade (Non-Department Stores) | 34,029 | \$270,625,673 | 1,140,441 | 313.2 | 1.1 |
| 48 Transportation | 12,591 | \$138,039,144 | 524,894 | 453.2 | 1.5 |
| 56 Admin. & Support / Waste Mgmt. & Remediation Serv. | 19,667 | \$147,302,364 | 769,989 | 330.9 | 1.1 |
| 42 Wholesale Trade | 25,144 | \$198,270,565 | 825,315 | 312.4 | 1.1 |
| 72 Accommodation and Food Services | 26,875 | \$165,373,653 | 839,323 | 274.9 | 0.9 |
| 31 Manufacturing (Food, Fabric, Textiles) | 9,620 | \$78,149,944 | 349,193 | 441.5 | 1.5 |
| 92 Public Administration | 18,654 | \$157,830,291 | 555,790 | 267.2 | 0.9 |
| 49 Warehousing and Couriers | 2,874 | \$20,022,785 | 101,585 | 517.9 | 1.8 |
| 11 Agriculture, Forestry, Fishing and Hunting | 12,889 | \$115,230,254 | 537,461 | 247.4 | 0.8 |
| 45 Retail Trade (Department Stores) | 10,497 | \$68,395,460 | 340,463 | 264.3 | 0.9 |
| 81 Other Services (Except Public Admin.) | 14,453 | \$158,243,613 | 704,417 | 238.9 | 0.8 |
| 21 Mining | 972 | \$14,427,429 | 49,253 | 384.2 | 1.3 |
| 22 Utilities | 1,281 | \$11,862,458 | 35,465 | 330.6 | 1.1 |
| 71 Arts, Entertainment, and Recreation | 3,755 | \$23,912,184 | 103,256 | 239.1 | 0.8 |
| 53 Real Estate and Rental and Leasing | 8,215 | \$66,894,154 | 294,367 | 209.0 | 0.7 |
| 61 Educational Services | 8,772 | \$68,622,456 | 271,914 | 139.0 | 0.5 |
| 99 Unclassified Establishments | 634 | \$5,784,163 | 18,343 | 241.0 | 0.8 |
| 54 Professional, Scientific, & Technical Service | 7,412 | \$61,679,930 | 253,425 | 90.1 | 0.3 |
| 51 Information | 3,626 | \$24,008,915 | 87,200 | 126.3 | 0.4 |
| 52 Finance and Insurance | 3,522 | \$30,103,616 | 113,932 | 66.9 | 0.2 |
| 55 Management of Companies and Enterprises | 45 | \$811,150 | 2,910 | 176.3 | 0.6 |

2-digit NAICS codes for Industry Sector. NAICS codes are missing for 14,440 claims.
Cost adjusted to 2002 using medical CPI for medical costs and overall CPI for wage replacement benefits.

Time-loss days from 1997-2002

TABLE 7.

Industry Sector Ranking by Prevention Index, Self-insured Claims, 1994-2002

| NAICS Description | Count | Rate | Rate Ratio |
|----------------------------------------------------------|--------|-------|------------|
| 62 Health Care and Social Assistance | 11,454 | 183.0 | 1.3 |
| 48 Transportation | 5,160 | 353.6 | 2.4 |
| 49 Warehousing and Couriers | 3,193 | 570.7 | 3.9 |
| 45 Retail Trade (Department Stores) | 5,839 | 169.2 | 1.2 |
| 92 Public Administration | 6,808 | 167.1 | 1.1 |
| 44 Retail Trade (Non-Department Stores) | 7,764 | 166.0 | 1.1 |
| 56 Admin/Support & Waste Manage/ Remediation Services | 1,617 | 251.6 | 1.7 |
| 33 Manufacturing (Metals, Equipment) | 11,955 | 124.6 | 0.9 |
| 31 Manufacturing (Food, Fabric, Textiles) | 3,168 | 175.0 | 1.2 |
| 32 Manufacturing (Wood, Paper, Printing) | 3,534 | 167.7 | 1.2 |
| 53 Real Estate and Rental And Leasing | 38 | 190.7 | 1.3 |
| 42 Wholesale Trade | 1,439 | 140.8 | 1.0 |
| 61 Educational Services | 5,645 | 83.2 | 0.6 |
| 23 Construction | 835 | 128.5 | 0.9 |
| 72 Accommodation and Food Services | 1,104 | 121.5 | 0.8 |
| 21 Mining | 140 | 157.9 | 1.1 |
| 51 Information | 2,013 | 67.5 | 0.5 |
| 22 Utilities | 783 | 122.3 | 0.8 |
| 11 Agriculture, Forestry, Fishing and Hunting | 1,035 | 88.5 | 0.6 |
| 81 Other Services (Except Public Administration) | 826 | 119.0 | 0.8 |
| 52 Finance and Insurance | 631 | 34.7 | 0.2 |
| 99 Unclassified Establishments | 33 | 49.9 | 0.3 |

TABLE 8.

Four-digit NAICS Ranking by Prevention Index, Combined State Fund and Self-insured Compensable Claims

| NAICS Description | Count | Rate | Rate Ratio |
|-----------------------------------------------------------------------------------------|-------|-------|------------|
| 4921 Couriers | 3,546 | 535.8 | 4.6 |
| 2381 Foundation, Structure, & Building Exterior Contractors | 5,535 | 301.8 | 2.6 |
| 6231 Nursing Care Facilities | 3,882 | 304.2 | 2.6 |
| 4811 Scheduled Air Transportation | 3,063 | 363.3 | 3.1 |
| 4841 General Freight Trucking | 3,370 | 279.5 | 2.4 |
| 2383 Building Finishing Contractors | 3,177 | 275.7 | 2.4 |
| 2361 Residential Building Construction | 4,060 | 240.6 | 2.1 |
| 6233 Community Care Facilities For The Elderly | 2,526 | 286.5 | 2.5 |
| 5621 Waste Collection | 1,168 | 382.8 | 3.3 |
| 5617 Services To Buildings & Dwellings | 3,388 | 218.7 | 1.9 |
| 6221 General Medical & Surgical Hospitals | 8,747 | 197.3 | 1.7 |
| 4451 Grocery Stores | 7,741 | 198.4 | 1.7 |
| 4842 Specialized Freight Trucking | 1,139 | 280.5 | 2.4 |
| 3219 Other Wood Product Manufacturing | 2,153 | 217.9 | 1.9 |
| 7213 Rooming & Boarding Houses | 1,280 | 220.1 | 1.9 |
| 2389 Other Specialty Trade Contractors | 1,517 | 216.3 | 1.9 |
| 3313 Alumina/Aluminum Production & Processing | 1,243 | 218.4 | 1.9 |
| 4854 School & Employee Bus Transportation | 580 | 390.9 | 3.4 |
| 3116 Animal Slaughtering & Processing | 975 | 222.0 | 1.9 |
| 4248 Beer, Wine, & Distilled Alcoholic Beverage Wholesalers | 737 | 234.0 | 2.0 |
| 4521 Department Stores | 4,699 | 167.2 | 1.4 |
| 4244 Grocery & Related Product Wholesalers | 2,857 | 170.9 | 1.5 |
| 2362 Nonresidential Building Construction | 1,851 | 179.0 | 1.5 |
| 3115 Dairy Product Manufacturing | 563 | 289.4 | 2.5 |
| NAICS groups averaging less than 200,000 hours per year were excluded from the analysis | | | |
| NAICS codes are missing for 6,215 cases | | | |

Incidence Rate by Age, Gender and Industry Sector

Rate for Compensable WMSD Claims: State Fund and Self-insured Employers Combined

Male workers and female workers differed in their claims experience by age group and industry sector.

- For men, the highest rates are between ages 20-39, and then rates decline relatively sharply. (See Figure 5.)
- Construction has the highest rates for most male age groups.
- For women, there is a more mixed pattern both by age group and industry sector. (See Figure 6.)

FIGURE 5.

Incidence of WMSD Claims by Age, Males, 1995-2002

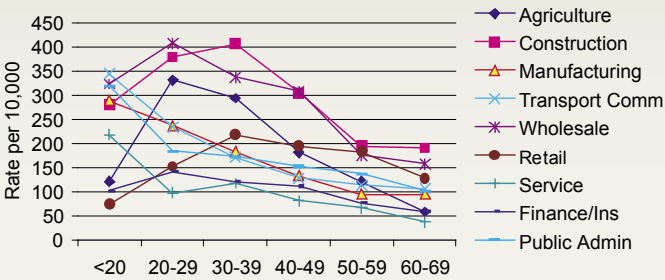
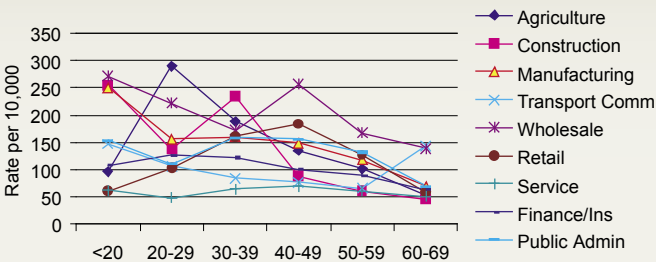


FIGURE 6.

Incidence of WMSD Claims by Age, Females, 1995-2002



Average Lost Workdays: State Fund Claims

A very different picture emerges for average lost workdays by age and industry sector, for both men and women.

- Mean lost days increase sharply for men with each decade. (See Figure 7.)
 - For women, the increase in lost time starts to flatten between ages 40 and 50, and decrease after age 60. (See Figure 8.)
- Note: The spike in the transportation sector is the result of three very severe claims with extensive lost time.

FIGURE 7.

State Fund Compensable WMSDs, 1995-2002: Mean Lost Workdays by Age and Industry: Males

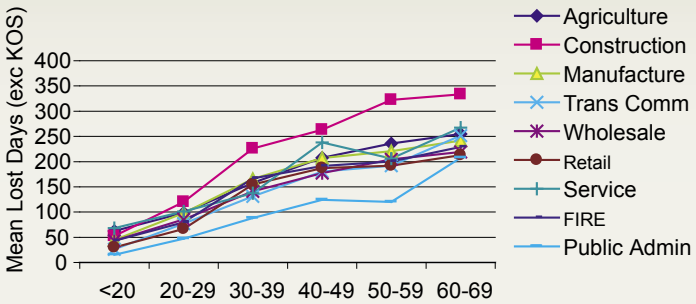
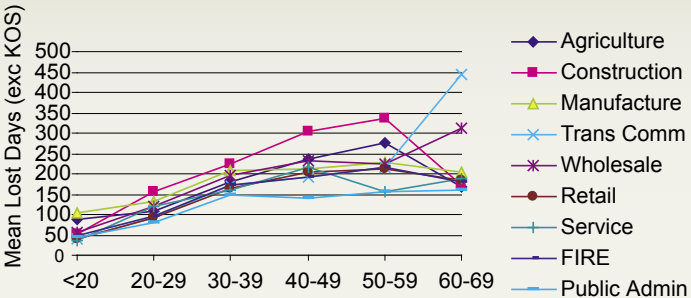


FIGURE 8.

State Fund Compensable WMSDs, 1995-2002: Mean Lost Workdays by Age and Industry: Females



Conclusions

Work-related musculoskeletal disorders continue to be a large and costly problem in Washington State.

The highest risks of WMSDs are in industries where workers' jobs involve manual handling and forceful repetitive exertions.

The rates for some WMSDs (back, carpal tunnel syndrome) are decreasing relatively rapidly, while others are stable (epicondylitis) or increasing (rotator cuff, sciatica). This may reflect changes in work environment in some industries (reduced manual handling and repetitive work) that is not occurring in other industries.

Males and females have somewhat different patterns of claims in different industries. This may reflect different jobs within these industry sectors.

The burden of WMSDs is mostly underestimated because the estimates do not include claims data for the lower extremity. In addition, there is evidence in scientific literature that these kinds of disorders are underreported, and the indirect costs to the employer, employee and society are not included.

Full Report Available

This document is a summary of Technical Report Number 40-8a-2004, **Work-related Musculoskeletal Disorders in the Neck, Back, and Upper Extremity in Washington State, 1994-2002.**

For a full discussion and detailed methodology, contact the SHARP Program to obtain a copy of the full report, authored by Barbara Silverstein, Ph.D., MPH, Darrin Adams, BS, and John Kalat, BA.

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