Occupational Health Indicators for Washington State, 1997 – 2004

Technical Report Number 80-4-2008

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David Bonauto
Naomi Anderson
Jena Pratt

Safety and Health Assessment and Research for Prevention (SHARP) Program,
Washington State Department of Labor and Industries
PO Box 44330
Olympia, Washington, 98504-4330

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Table of Contents:

Report Highlights

Fatal work-related injuries in Washington are below the national average.

Washington's non-fatal occupational injury rate decreased from 1997 to 2004 from 3,200 per 100,000 FTE to 2,100 per 100,000 FTE.

The proportion of all occupational injuries to Hispanic workers doubled from 7% to 15% during 1997 - 2004.

Approximately 37% of all hospital discharges were related to admission where the primary diagnosis involved the spine.

Approximately one of every five hospitalized burns was work-related.

Asbestosis hospitalizations may have peaked in 2000 at 154 per million residents.

Malignant mesiothelioma deaths may have peaked in 1999 at 19.6 per million residents.

The most common occupational injury types represent a large proportion of Washington State workers' compensation compensable claims, claim costs and time loss days.

Introduction:

There are 3 million workers in Washington State. Every year tens of thousands are injured or made ill on the job. These work-related injuries and illnesses have high human and economic costs to workers, employers and Washington State.

Work-related injuries and illnesses can be prevented. Tracking work-related injuries and illnesses is the first step in understanding whether those prevention efforts succeed or need to be improved.

Washington State researchers at the Department of Labor and Industries worked with the Council of State and Territorial Epidemiologists (CSTE) Occupational Health workgroup to develop a set of measures to track occupational injuries and illnesses (see below). These measures are called 'occupational health indicators.'

This report uses the CSTE occupational health indicators and several specific Washington State indicators to track the trend of Washington's work-related injuries, illnesses and exposures. The time period covered in this report is from 1997 to 2004.

A few questions arise in reviewing this report.

How does Washington State compare to other US States or to the nation? With a few exceptions, many of the indicators in this report do not allow comparison to other state data or to the US as a whole. The data for these indicators often are influenced by external factors which vary by state, like what work-related illnesses or hospitalizations may be paid for by the state workers' compensation program. The variability across states can lead to incorrect comparisons of data even from similar data sources. Many factors may influence variability in worker injury and illness rates across states; some factors include the distribution of state private sector employment by industry, occupation or employer size, the adequacy of safety regulations, business safety practices, workers' compensation policy, worker demographics and many others. Identifying these factors and determining how they may influence the reported occupational injury and illness rates is an important topic for future research.

Why only data from 1997 – 2004? The data sources usually publish final annual estimates 1-3 years after completion of the year of record. The Safety and Health Assessment and Research for Prevention (SHARP) program provides annual indicator updates to CSTE. Some measures have data for more recent years. This information can be obtained by contacting SHARP at SHARP@LNI.wa.gov.

How can I use this information? These indicators are estimated from many data sources. They are meant to provide an overview and general assessment of the occupational health status of

Washington State for the years from 1997-2004. Each data source has its strengths and limitations. For many of the measures related to age, gender, industry and occupation, multiple years of data were reviewed by the authors and an estimate for the aggregated years was made. Typically the median estimate was used (the measurement in the middle ranking of the estimates). Most of the measures of frequency (or rates) use the methods documented in CSTE's publication 'A Guide for Tracking Work-Related Health Effects and Their Determinants' located at http://www.cste.org/pdffiles/howoguide8.3.06.pdf. A larger body of technical information is available regarding each data source and can be accessed via the web from the state or federal agency responsible for collecting the information. Some additional information is also available from the authors of this report.

Are there other indicators? The first 12 indicators in this report come from CSTE (as above). Five indicators were added to the original set and are based on common, high cost occupational injuries in Washington State workers' compensation databases (Indicators 13 – 17). Each indicator represents an overview of the injury or illness. It is important to note that Washington State tracks other conditions of significant importance to the occupational safety and health of Washington workers. These include:

- Work-related musculoskeletal disorders of the neck, back and upper extremity
- Work-related asthma
- Occupational pesticide poisoning

Detailed reports for these conditions are available (see technical notes) and specific Washington State indicators may be developed in the future.

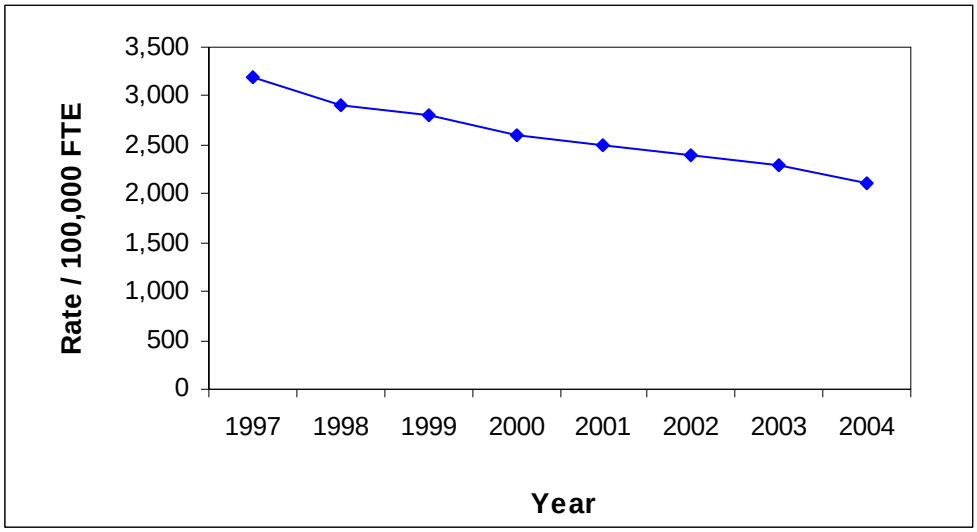
Washington State Indicator 1:
Non-fatal Work Related Injuries and Illnesses Reported by Employers

Introduction: Thousands of workers are injured each day in the United States. The US Bureau of Labor Statistics (BLS) annual survey of occupational injury and illness (SOII) estimates state non-fatal occupational injury and illness rates from a survey of a small number of employer establishments. The BLS SOII is likely limited due to incomplete recording and reporting of occupational injury and illness by employers.

Information you can use:

- Trend: Washington State case rates of occupational injury and illness are decreasing.
  - Over the time period from 1997-2004, Washington State incidence rates of occupational injury and illness for all cases and for those that involve days away from work have been decreasing (See Figure 1).
  - The case incidence rate for the time period is declining for all industry divisions.
- Age: From 1997-2004, for days away from work cases, 15% occurred in workers aged 16-24; about 1% occur in workers over the age of 65.
- Gender: 32% of the days away from work cases occurred in women.
- Industry: From 1997-2002, industries with high incidence rates include Construction; Agriculture, Forestry and Fishing; Manufacturing; Wholesale and Retail Trade; and Transportation and Public Utilities.
- Occupation: From 1997-2002, occupations with the highest numbers of injuries include Operators, Fabricators, and Laborers; Precision Production, Craft, and Repair; and Service.
- Other: From 1997 – 2004, the proportion of non-fatal occupational injuries with days away from work attributed to Hispanic workers doubled from 7% to 15%.

Figure 1: Non-fatal work-related injuries and illness (OII) with days away from work, 1997-2004.



Source: BLS Survey of Occupational Injury and Illness.

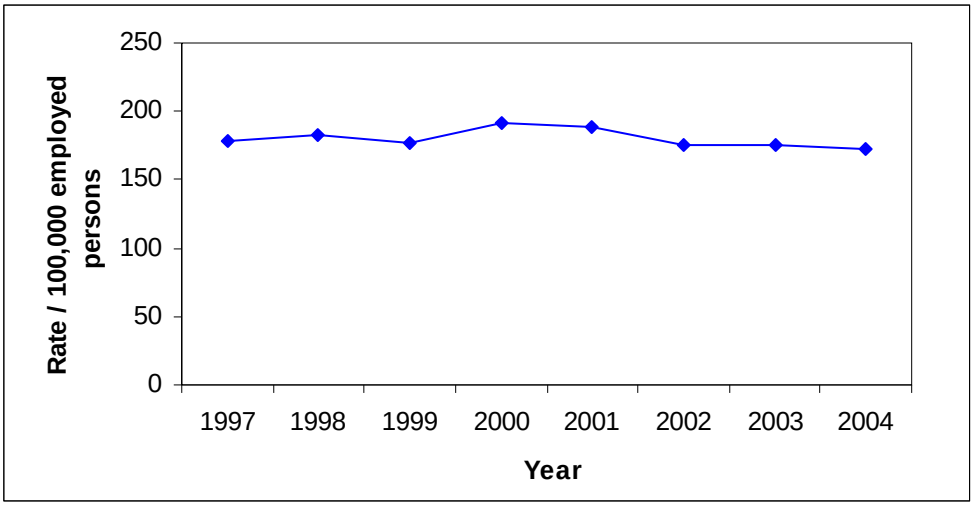
Washington State Indicator 2:
Work-related Hospitalizations

Introduction: More severe occupational injuries and illnesses may result in hospitalization. Hospital discharge data is categorized by payer so it is possible to limit to just those patients who discharges are expected to be billed to the state workers' compensation system. Benefit adequacy of the state workers' compensation program may influence the proportion of hospitalizations paid for by the workers' compensation program. One may expect that most hospitalizations resulting from workers covered by a workers' compensation system would be reported.

Information you can use:

- Trend: There is no apparent decrease in Washington State hospital discharge rates where workers' compensation is the primary payer from 1997 - 2004 (See Figure 2).
    - The average number of hospital discharges per year where workers' compensation was the expected payer was approximately 5200.
- Age: About 5.5% of the discharges were for those aged 16 – 24 and about 4% were for those aged 65 and older.
- Gender: 25% of hospitalizations were for women.
- Industry: Hospital discharge data does not include industry coding.
- Occupation: Hospital discharge data does not include occupational coding.
- Other:
    - About 37% of the discharges had as a primary diagnosis of a sine disorder.
    - The proportion of all spine disorder admissions that were work-related decreased over the time period from 13% to 7%.
    - The injury rates for counties in Eastern Washington and the Olympic Peninsula are higher than the rest of the state. Lower rates appear in SW Washington but this may be related to bias resulting from hospitalizations in Oregon.

Figure 2: Work-related hospitalized injuries, 16 years and older, 1997-2004.



Source: WA State Comprehensive Hospital Abstract Reporting System; BLS Current Population Survey.

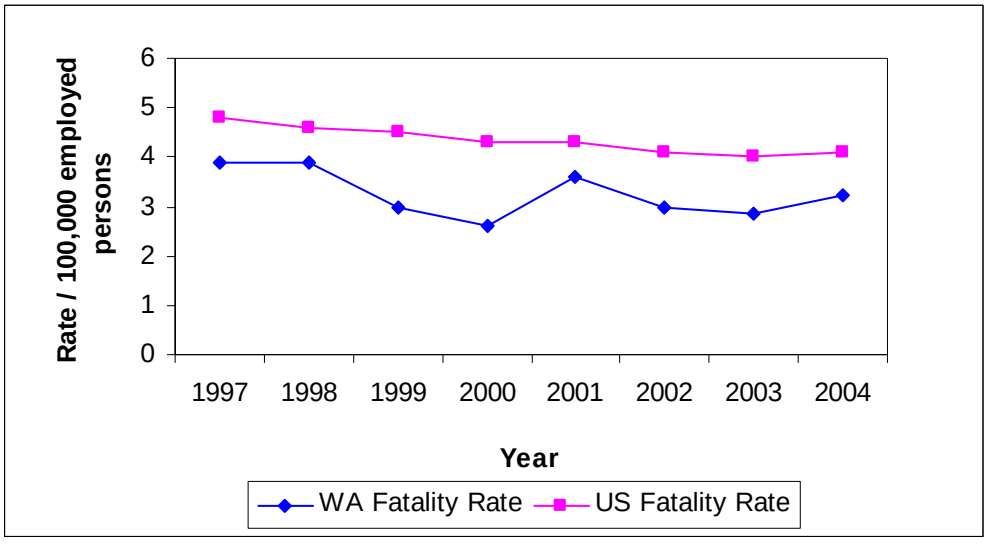
Washington State Indicator 3:
Fatal Work Related Injuries

Introduction: More than 80 Washington State workers die each year from injuries received at work or illnesses caused by the work environment. One death is too many. Data tracking the number of workplace death is from the Census of Fatal Occupational Injuries (CFOI) administered by the Bureau of Labor Statistics. CFOI gathers data for all states and is a reliable count (not estimate) of all traumatic injury deaths related to work.

Information you can use:

- Trend: For the period from 1997-2004, there was a general decrease in the trend of fatal work-related injuries in Washington State but rates are unstable from year to year (Fig 3).
  - Washington's fatality rate is below the US national rate.
  - The average number of work-related fatal injuries from the years 1997-2004 is 95.
- Gender: About 8% of the fatalities were in women.
- Age: 10% of fatalities occurred in workers younger than 25; 8% of fatalities occurred in workers older than 65.
- Industry: From 1997-2002, the highest rates included Manufacturing; Construction; Agriculture, Forestry and Fishing; and Transportation and Utilities.
- Occupation: From 1997-2002, the highest number of fatalities were to Operators, Fabricators, and Laborers; Precision Production, Craft, and Repair; and Farming, Forestry and Fishing.
- Other:
  - For the period of 1997-2004, an average of 43% of work related fatalities were transportation related.

Figure 3: Work-related fatality rate for the US and Washington State, 1997-2004.



Source: BLS CFOI data; BLS Current Population Survey.

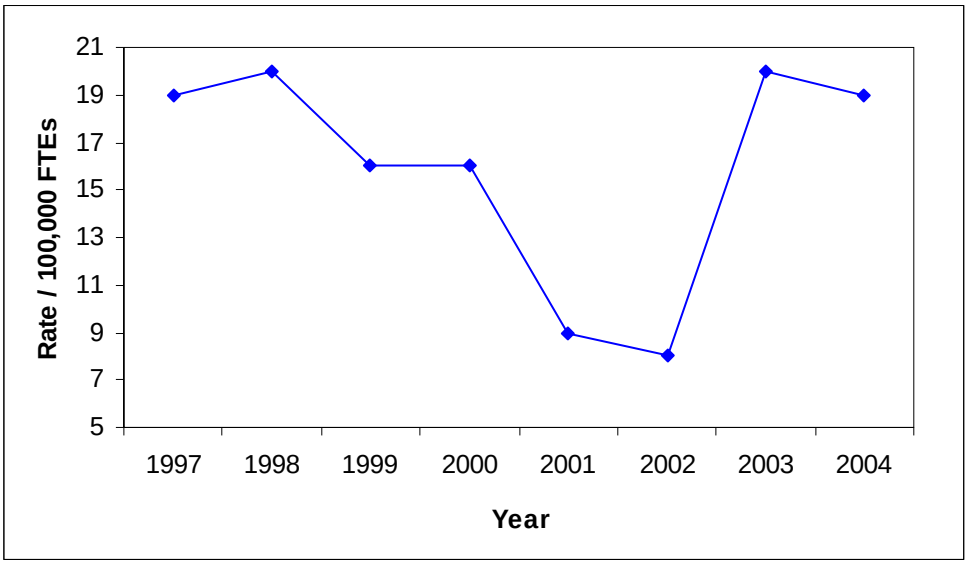
Washington State Indicator 4:
Work-Related Amputations Requiring Days Away From Work Reported by Employers

Introduction: Amputations are serious injuries. Losing a finger, toe or worse - part of your arm or leg - can have significant social and economic consequences. Data tracking the number of workplace amputations is available from two major data sources for Washington State: the Bureau of Labor Statistics (BLS) Survey of Occupational Injuries and Illness (SOII) and the Washington State workers' compensation system. This indicator relies on BLS SOII data.

Information you can use:

- Trend: For the period from 1997-2004, the amputation rate was unstable (Figure 4).
  - In 2003 and 2004 there was an increase in the number of estimated amputations. There is no clear reason for this increase.
- Age: For 1997 – 2004, about 13% of amputations occurred in workers aged 16-24; the other 87% occurred in workers 25-64.
- Gender: About 10% of the amputations occurred in women.
- Industry: Manufacturing accounted for about 51% of all amputation injuries.
- Occupation: The most common occupations with amputation injuries from 1997 -2002 were: Operator, Fabricator, or Laborer; and Precision Production, Craft and Repair.
- Other:
  - Body Part Injured: Almost all amputations were finger amputations.
  - Source: Machinery was implicated as the source of most amputations.
  - Event: The most common injury event was being 'caught in' machinery.
  - Time loss from work: Over 90% of the amputations had more than 3 of lost work time.

Figure 4: Work-related amputations with days away from work, 1997-2004.



Source: BLS Survey of Occupational Injury and Illness.

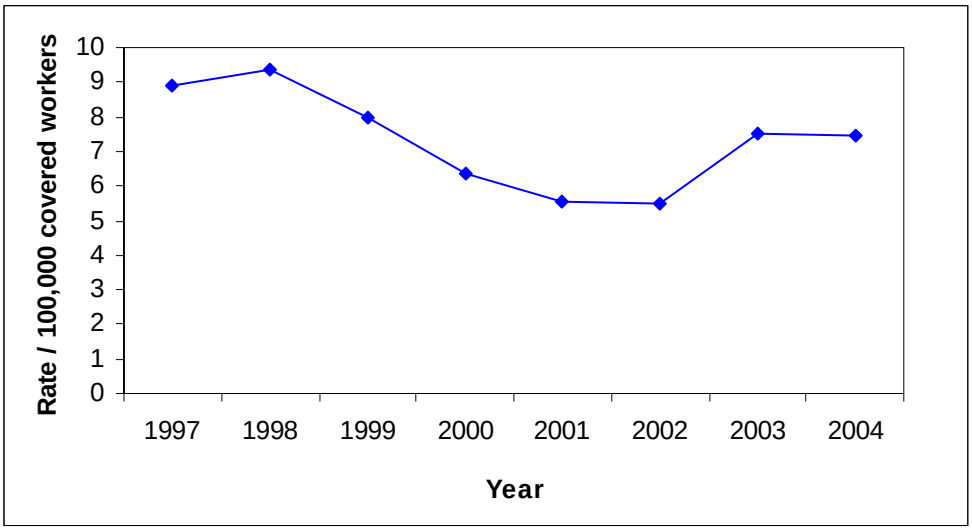
Washington State Indicator 5:
State Workers' Compensation Claims for Amputations

Introduction: This indicator relies on amputation data from Washington State workers' compensation system. Unlike the BLS data for amputations, state workers' compensation data are actual case counts rather than survey estimates. These counts rely upon the case being identified as being work-related and reported to the state workers' compensation system. The denominator data is the estimated number of workers covered by workers' compensation.

Information you can use:

- Trend: For the period from 1997-2004, the amputation rates were unstable (Figure 5). For this time period, there were 2,167 amputations reported to workers' compensation.
    - In 2003 and 2004 the amputation rate increased for Washington State.
- Age: The average age of an amputee was 36 years old.
- Gender: 11% of all amputations occurred in women.
- Industry: During the time period from 1997 – 2004, 32% of claims occurred in Manufacturing, 18% in Construction, and 10% in Accommodation and Food Services.
- Other:
    - Body Part Injured: 97% of amputations involved the fingers.
    - Source: Machinery accounted for 37% of amputations. Non-powered hand tools and powered hand tools accounted for 11% and 8% of amputations, respectively.
    - Event: Fifty-nine percent of all amputations resulted from being 'struck by' or 'struck against' an object. Being 'caught in, under, or between' accounted for 32%.
    - Time loss from work: For the period of 1997-2004, 57% of the amputations led to more than 3 days of time loss.

Figure 5: Work-related amputation cases resulting in greater than 3 lost workdays, 1997-2004.



Source: Washington State Workers' Compensation Data warehouse; National Academy of Social Insurance.

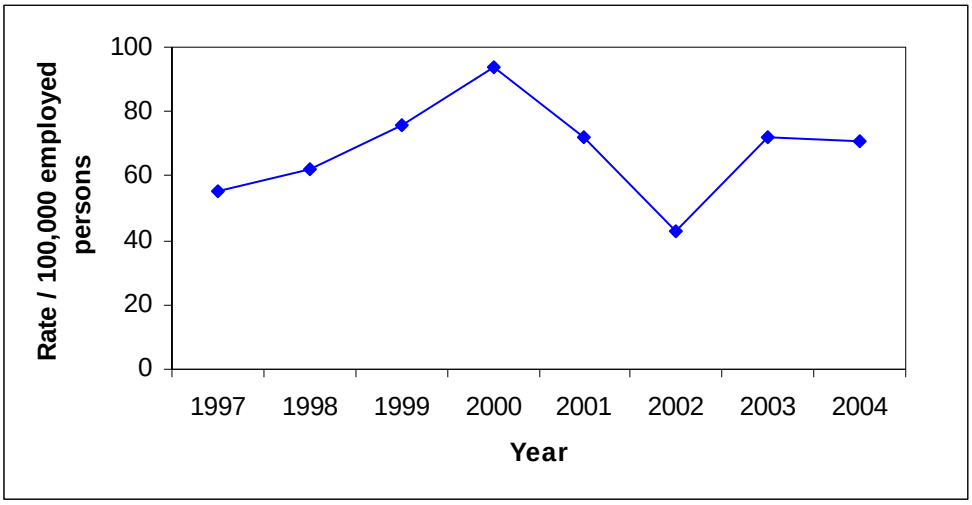
Washington State Indicator 6:
Work-related Burn Hospitalizations

Introduction: Work-related burns are not only extremely painful but also result in large amounts of lost work time. Hospital discharge data is useful to estimate the number of hospitalized burns in Washington State. Cases are identified by identifying standard diagnosis codes for burns with those injuries where the expected payer is the state workers' compensation system. Benefit adequacy of the state workers' compensation program may influence the proportions of hospitalizations paid for by the workers' compensation program.

Information you can use:

- Trend: There is no apparent decrease in Washington State hospital discharge rates where workers' compensation is the primary payer from 1997 - 2004 (See Figure 6).
    - The average number of hospital discharges per year was approximately 69.
    - The numbers ranged from a low of 43 in 2002 and a high of 94 in 2000.
- Age: From 1997 – 2004, 78% of all work-related burn hospitalization occurred for those aged 25 – 64; 21% was for those aged 16 – 24; and the remaining 1% was for those aged 65 and older.
- Gender: From 1997-2004, 13% of hospitalized burn work-related burn injuries were to women.
- Industry: Data not available.
- Occupation: Data not available.
- Other:
    - Approximately 18% of all hospitalized burns for the period 1997-2004 were work-related.

Figure 6: Hospitalization for work-related burns, 1997-2004.



Source: WA State Comprehensive Hospital Abstract Reporting System; BLS Current Population Survey

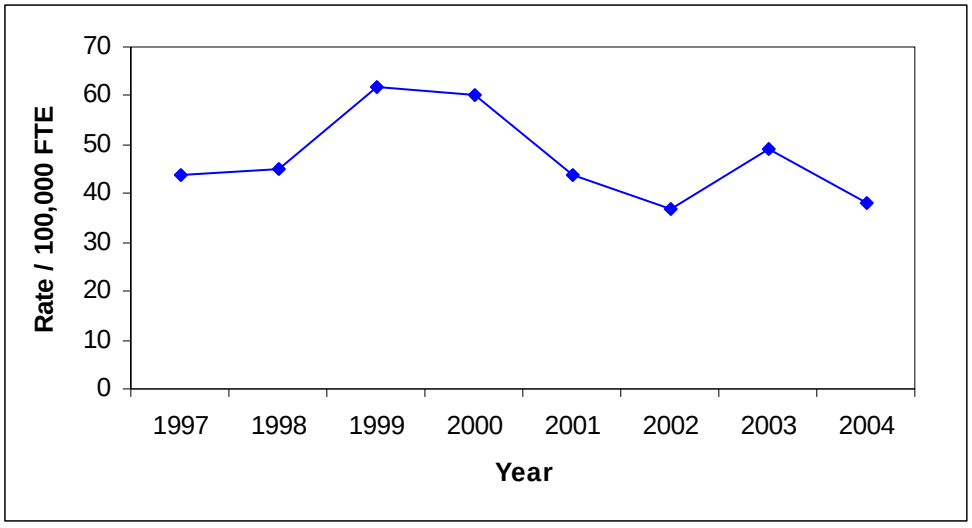
Washington State Indicator 7:
Carpal Tunnel Syndrome Reported by Employers

Introduction: Carpal tunnel syndrome is a common severe occupational musculoskeletal disorder. The only available estimate of carpal tunnel syndrome for most US states originates from the US Bureau of Labor Statistics Survey of Occupational Injury and Illness (SOII). The BLS SOII relies on employer reporting of cases of occupational injury and illness. Research evidence suggests significant underreporting of CTS on the BLS SOII.

Information you can use:

- Trend: Washington State case rates of CTS ranged from 62 per 100,000 FTE in 1999 to 37 per 100,000 FTE in 2002. While CTS rates are lower since 2001, the annual rate estimates of CTS are highly variable (Figure 7).
- Age: Over the time period from 1997-2004, the most common age groups affected by CTS were those workers aged 25-34, 35-44, and 45-54. No statement can be made about the proportion of injuries in workers under 25 or over 65 years of age.
- Gender: Generally for Washington workers for the period from 1997-2004, there are twice the number of cases of CTS in women as in men. However, estimates of the relative proportion of men and women with CTS in the Washington workforce fluctuates throughout the period. For example in 2000 approximately two-thirds of the estimated cases were in men, while in 2003 only one-quarter of the estimate cases were in men.
- Industry: CTS case incidence rates are inconsistently reported by industry for the time period from 1997-2004. The Washington State industries which have the highest incidence rates for CTS are Manufacturing; Services; Construction; and Trade, Transportation and Utilities.
- Occupation: CTS is most common in office workers and production workers.
- Other: The estimated median time loss days ranged from 17 days in 2001 to 54 in 2003.

Figure 7: Washington CTS rate reported by employers, 1997- 2004.



Source: BLS Survey of Occupational Injury and Illness.

Washington State Indicator 8:
State Workers' Compensation Claims for Carpal Tunnel Syndrome

Introduction: This indicator relies on carpal tunnel syndrome data from Washington State workers' compensation system. Unlike the BLS data for carpal tunnel syndrome, state workers' compensation data are actual case counts rather than survey estimates. These counts rely upon the case being identified as being work-related and reported to the state workers' compensation system.

Surveillance for CTS and other work-related musculoskeletal disorders of the back, neck and upper extremity in Washington State precedes the development of the CSTE occupational health indicators. The CSTE indicators attempted to develop a case definition that might allow some utility across most US states. By using the expansive medical and case information within the Washington workers' compensation system, the Washington State surveillance system better characterizes the magnitude and burden of CTS compared to the CSTE CTS indicator. Similarly, the estimate of the **number of workers** covered by workers' compensation insurance for the CSTE indicators is from the National Academy of Social Insurance (NASI). The CSTE indicators therefore count part-time workers the same as those who work full-time or more. The availability of the denominator data based on hours worked in the Washington State workers' compensation system more accurately estimates the period of time workers are exposed to hazards. The existing surveillance system in Washington State uses hours to calculate full-time equivalent employees (FTEs) and as such better characterizes exposures and a more accurate estimate of the incidence rate of CTS in Washington State.

Therefore, this indicator trend data for CTS results from a restrictive case definition used for the CSTE indictors. More accurate estimates and characterization of CTS workers compensation claims are available from the Washington State surveillance system for musculoskeletal disorders (See Technical Notes).

Information you can use:

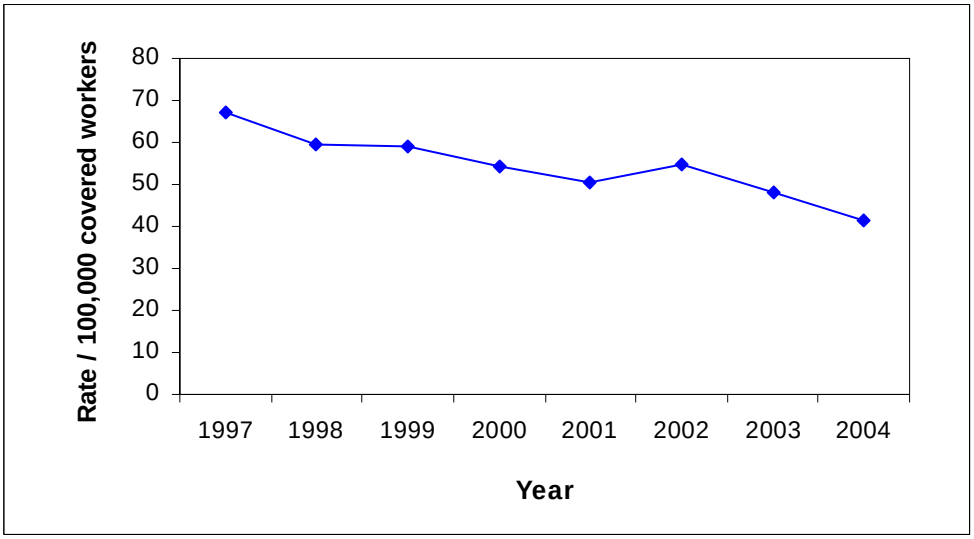
- Trend: For the period from 1997-2004, there was a general decrease in the trend of CTS reported to the state workers' compensation system. CTS incidence rates decreased from 66.9 cases per 100,000 workers in 1997 to 41.3 cases per 100,000 workers in 2004 (Figure 8). There were 11,309 CTS cases reported to Washington State workers' compensation system from 1997-2004.[1,2]

[1] The case definition used is a combination of the following ANSI Z16.2 codes - CTS defined per combination of ANSI Z16.2 codes for state fund and self-insured claims –Nature Code = 562 - 'Nerve Disorder' with Type Code = 12 - Overexertion' and Body Part Code = 320 'Wrist'. This includes all state fund claims and all self-insured compensable claims identified in Washington workers' compensation system with dates of injury from January 1, 1997 to December 31, 2004.

[2] WA State Surveillance System: From 1996-2004, over 17,302 compensable CTS cases were identified in Washington State workers' compensation State Fund data. The annual average claims incidence rate was 135 cases per 100,000 FTE.

- Age: From 1997 – 2004, about 96% of all work-related CTS claims were for those aged 25 – 64. About 3% of workers were under 25 years old and about 1% were over 64 years old.
- Gender: From 1997 – 2004, 60% of all CTS claims were women.
- Industry: From 1997-2004, the industries with the highest rates of CTS claim were: Manufacturing, Health Care and Social Assistance, Construction, Retail Trade, and Public Administration.

Figure 8: Washington State Worker's Compensation CTS Claims, 1997-2004.



Source: Washington State Workers' Compensation Data warehouse; National Academy of Social Insurance.

Washington State Indicator 9:
Hospitalizations from or with Asbestosis

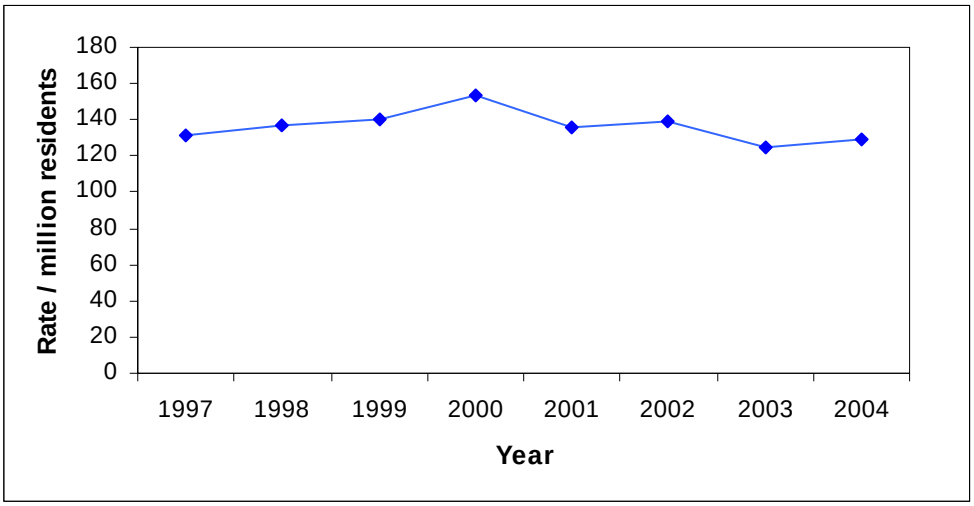
Introduction: Asbestos is known to cause significant lung disease. A common disease resulting from asbestos exposure is asbestosis, a condition in which there is reduction in an individual's lung capacity.

Asbestosis is one of many occupational lung diseases caused by dust exposure. These dust related lung diseases are commonly referred to as 'pneumoconiosis.' In Washington State the most common pneumoconiosis is asbestosis. Measuring morbidity and mortality from asbestosis is related to capturing hospitalizations with asbestosis (Indicator 9) and deaths with asbestosis (Indicator 10). There is a long interval between asbestos exposure and the occurrence of lung disease, therefore rate trends may reflect exposure controls implemented 20 or more years ago.

Information you can use:

- Trend: The age adjusted hospitalization rate for people with pneumoconiosis peaked in 2000 at 154.0 per million residents (Figure 9).
    - The total number of hospital discharges with asbestosis from 1997-2004 was 4,661.
- Age: From 1997 – 2004, 90% of all asbestosis discharges occurred for those aged 65 and older; about 10% were for those aged 25-64. The median age for people with asbestosis was 78 years old.
- Gender: From 1997-2004, 95% of hospitalizations were for men.
- Industry: Data not available.
- Occupation: Data not available.

Figure 9 Asbestosis age-adjusted hospitalizations, 1997-2004.



Source: WA State Comprehensive Hospital Abstract Reporting System; US Census.

Washington State Indicator 10:
Mortality from or with Asbestosis

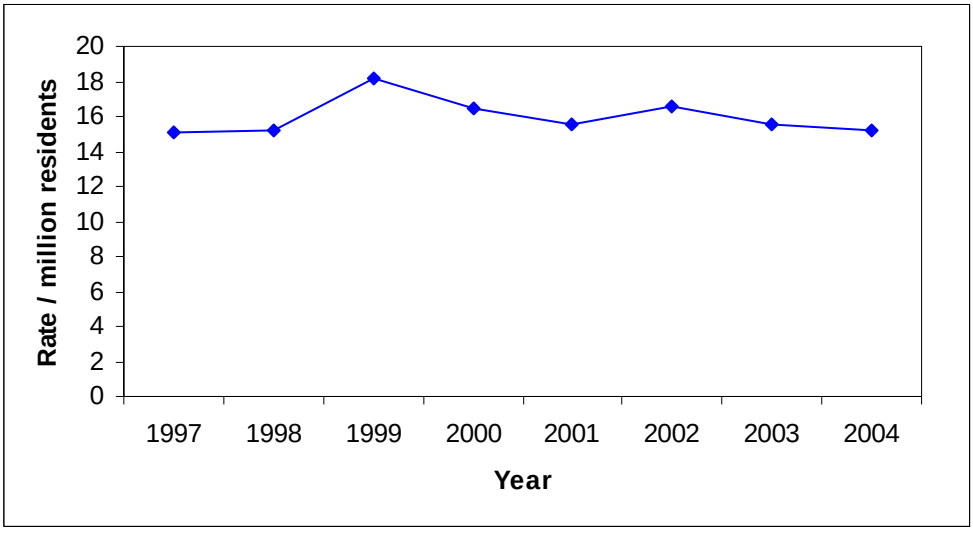
Introduction: Asbestos is known to cause significant lung disease. A common disease resulting from asbestos exposure is asbestosis, a condition in which there is reduction in an individual's lung capacity.

Measures of asbestosis in the Washington population can look at morbidity (e.g. hospitalizations) or contributions to mortality (e.g. where the death certificate identifies asbestosis as a contributing cause of death). There is a long interval between asbestos exposure and the occurrence of lung disease, therefore rate trends may reflect exposure controls implemented 20 or more years ago.

Information you can use:

- Trend: The age adjusted mortality rate for people with asbestosis peaked in 1999 with 18.2 deaths per million residents (Figure 10).
    - The total number of deaths with asbestosis from 1997-2004 was 548.
- Age: From 1997 – 2004, 95% of all asbestosis deaths occurred for those aged 65 and older. The median age for deaths from or with asbestosis was 80 years old.
- Gender: 4% of deaths from or with asbestosis occurred in women.
- Industry: Death certificate data is coded in accordance with the 1990 Census Industry codes. For the time period from 1997-2004, the industries with the most number of deaths from asbestosis were Construction (134 deaths) and Ship and Boat Building (91 deaths).
- Occupation: Death certificate data is coded in accordance with the 1990 Census Occupation codes. For the time period from 1997-2004, the occupations with the most number of deaths from asbestosis were Plumbers, pipefitters, steamfitter (43 deaths), Electricians (31), Managers and Administrators, not elsewhere classified (30), Carpenters (23), and Welders and Cutters (19).

Figure 20 Age-adjusted mortality from asbestosis, 1997-2004.



Source: WA State Vital Records – Death Data; US Census.

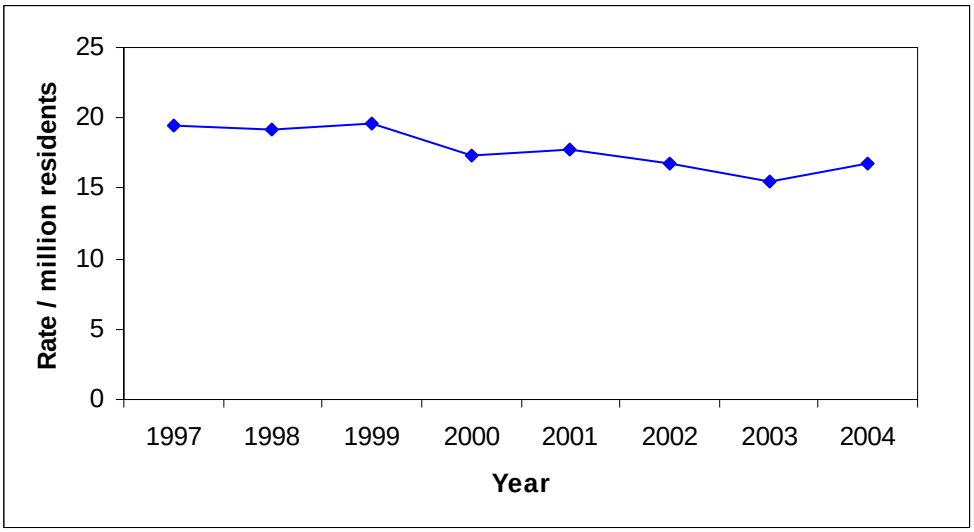
Washington State Indicator 11:
Incidence of Malignant Mesothelioma

Introduction: Asbestos is known to cause significant lung disease. A cancer that is almost uniquely associated with asbestos exposure is malignant mesothelioma. Malignant mesothelioma occurs with significant latency (>30 years) and its risk is not associated with smoking. Cases of malignant mesothelioma are recorded in the Washington State Department of Health's State Cancer Registry.

Information you can use:

- Trend: The age adjusted incidence rate for malignant mesothelioma for the period from 1997-2004 peaked in 1999 at 19.6 per million residents (Figure 11).
    - The total number of deaths with asbestosis from 1997-2004 was 667.
- Age: From 1997 – 2004, 93% of all malignant mesothelioma diagnoses occurred in people aged 55 and older. The median age for malignant mesothelioma was 75 years old.
- Gender: 19% of the deaths from or with malignant mesothelioma occurred in women.
- Industry: Reliable industry information is not available in the Washington State Cancer Registry.
- Occupation: Reliable occupational information is not available in the Washington State Cancer Registry.

Figure 11 Washington State malignant mesothelioma incidence rate, 1997-2004.



Source: Washington State Department of Health, Cancer Registry.

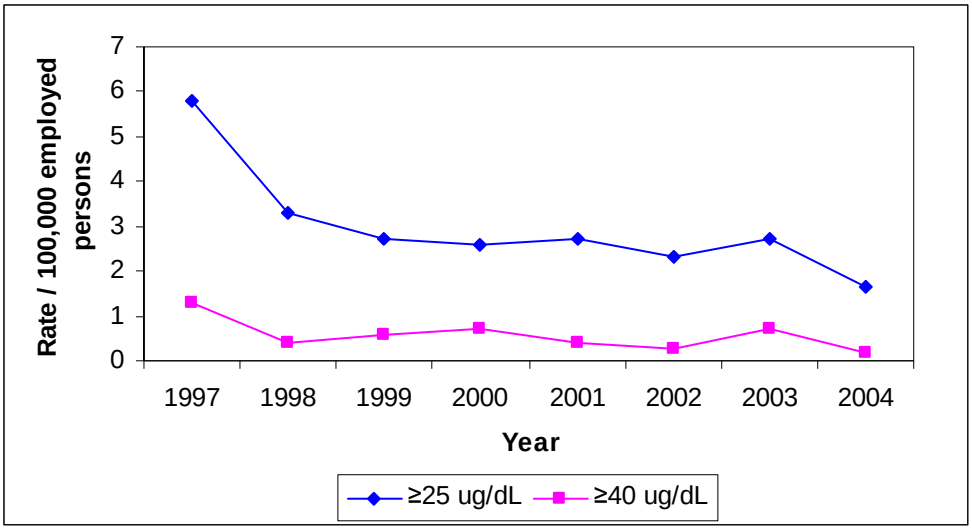
Washington State Indicator 12:
Elevated Blood-Lead Levels Among Adults

Introduction: Lead poisoning in adults is primarily due to occupational exposure. The blood lead level (BLL) is the best biological indicator of recent lead exposure. Washington State participates in NIOSH's Adult Blood Lead Epidemiology and Surveillance (ABLES) program. Medical laboratories in Washington State are required to report BLLs to the Washington State Department of Health. Biological effects of lead exposure may occur at levels <25ug/dl.

Information you can use:

- Trend: For the period from 1997-2004, there was a general decrease in the trend of BLLs greater than 25 ug/dl and 40ug/dl reported to Washington State ABLES (Figure 12).
- Age: Among adults with elevated blood-lead levels, 8% were under age 25 and 4% were over age 65. The median age was 40 years, with a range of 17 - 79 years.
- Gender: From 1997-2004, 3% of adults with elevated blood-lead levels were women.
- Industry: The industries with the highest rates of adult elevated blood-lead levels include: Construction, Manufacturing, and Services.
- Occupation: Data not available.

Figure 12 Annual incidence of elevated blood-lead levels, 1997-2004.



Source: WA State Adult Blood Epidemiologic Surveillance Systems; BLS Current Population Survey.

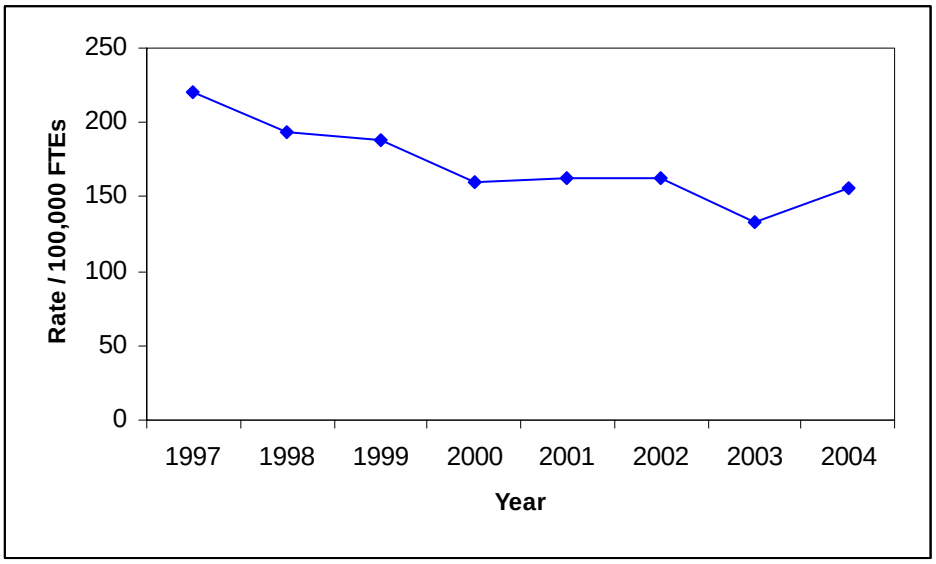
Washington State Indicator 13:
Traumatic Injuries: Fall from Elevation

Introduction: Injuries resulting from a worker falling from an elevated work surface are common. From 1997-2004, there were 28,032 fall from elevation workers' compensation claims. These injuries account for 6.5% of all time loss workers' compensation claims, 11% of compensable claim costs and 10% of all time loss days.

Information you can use:

- Trend: From 1997 to 2004, there was a decreasing compensable claims incidence rate for fall from elevation worker injuries (See Figure 13).
- Age: The average age for a worker with this injury type was 39 years old.
- Gender: About 24% of fall from elevation claims were from women.
- Industry: The industry sectors with the highest injury rates were: Construction, Agriculture, Manufacturing, and Transportation & Warehousing.
- Occupation: The occupations where these injuries were most common were: Construction and Extraction, Transportation and Material Moving, and Farming, Fishing, and Forestry.
- Other:
  - The average cost of a fall from elevation compensable claim was $36,700; with a median cost of $6,850.
  - Fall from elevation claims had an average length of time loss at 230 days per claim with a median length of 40 lost work days.

Figure 13: Washington State Workers' Compensation Claims Incidence Rate for Fall from Elevation Injuries per 100,000 FTEs, 1997-2004.



Source: Washington State Workers' Compensation Data warehouse.

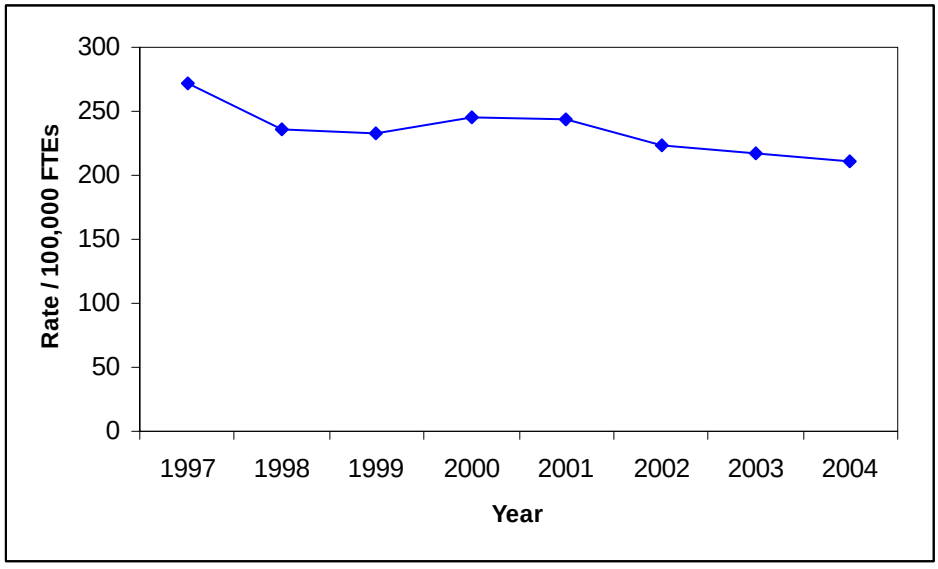
Washington State Indicators 14:
Traumatic Injuries: Fall on Same Level

Introduction: Injuries resulting from a worker falling to the ground on which he/she is working are common. From 1997-2004, there were 38,288 claims for fall on the same level. These injuries account for 9% of all time loss workers' compensation claims, 11% of compensable claim costs and 11% of all time loss days.

Information you can use:

- Trend: From 1997 to 2004, there was a decreasing compensable claims incidence rate for fall on same level worker injuries (See Figure 14).
- Age: The average age for a worker with this injury type was 41.5 years old.
- Gender: About 46% of fall on same level injuries were to women.
- Industry: The industries with the highest injury rates were: Transportation & Warehousing, Accommodation and Food Services, and Construction.
- Occupation: The occupations with the highest number of these injuries were: Transportation and Material Moving, Food Preparation and Serving, and Construction and Extraction.
- Other:
  - The average cost of a fall on same level compensable claim was $28,680; with a median cost of $4,950.
  - The average length of time loss for such an injury was 195 days; with a median length of 31 days.

Figure 14: Washington State Workers' Compensation Claims Incidence Rate for Fall on Same Level Injuries per 100,000 FTEs, 1997-2004.



Source: Washington State Workers' Compensation Data warehouse.

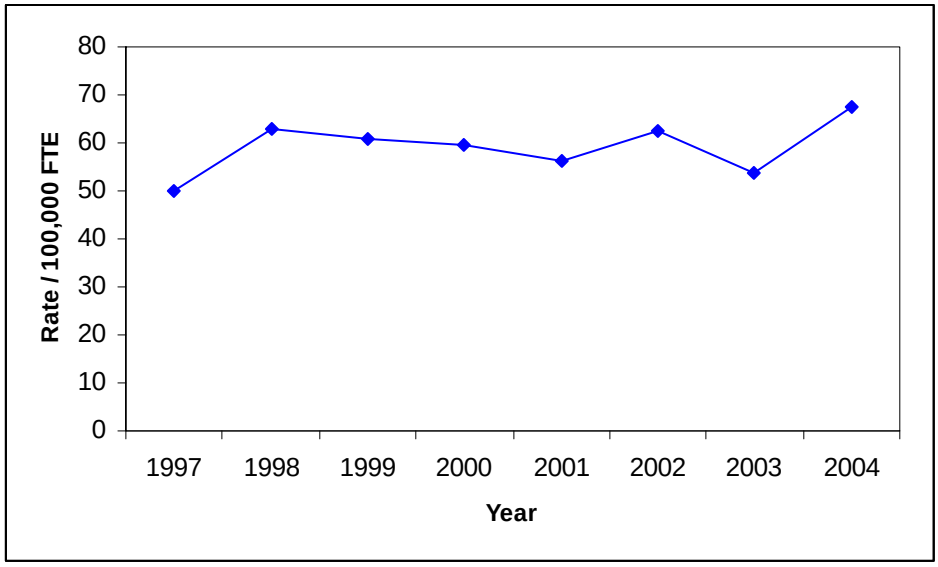
Washington State Indicator 15:
Traumatic Injuries: Caught In/Under/Between

Introduction: Injuries resulting from a worker being caught in, under or between an object are common. From 1997-2004, there were 9,674 workers compensation claims for caught in/under/between injuries. These injuries account for 2% of all time loss workers' compensation claims, 2% of compensable claim costs and 2% of all time loss days.

Information you can use:

- Trend: From 1997 to 2004, there is little discernible change in the compensable claims incidence rate for these injuries (See Figure 15).
- Age: The average age for a worker with this injury type was 37 years old.
- Gender: About 20% of caught in/under/between claims were to women.
- Industry: The industries with the highest injury claim rates were: Construction, Agriculture, and Transportation & Warehousing.
- Occupation: The occupations with the highest numbers of these injuries were: Transportation and Material Moving, Production Occupations, and Construction and Extraction.
- Other:
  - The average cost of a caught in/under/between compensable claim was $22,200; with a median cost of $4,800.
  - The average length of time loss for such an injury was 115 days; with a median length of 20 days.

Figure 15: Washington State Workers' Compensation Claims Incidence Rate for Caught In/Under/Between injuries per 100,000 FTEs, 1997-2004.



Source: Washington State Workers' Compensation Data warehouse.

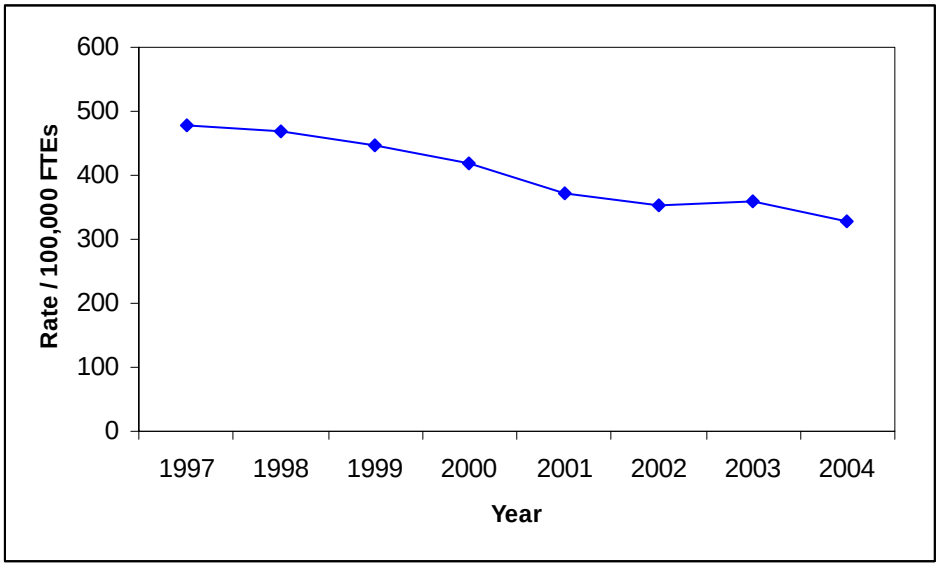
Washington State Indicator 16:
Traumatic Injuries: Struck By/Against

Introduction: Injuries where workers are struck by an object or against an object are common. From 1997-2004, there were 65,673 claims for struck by or against injuries. These injuries account for 15.6% of all time loss workers' compensation claims, 13.8% of compensable claim costs and 12.7% of all time loss days.

Information you can use:

- Trend: From 1997 to 2004, there was a decreasing compensable claims incidence rate for injuries from the worker being struck by/against an object (See Figure 16).
- Age: The average age for a worker with this injury type was 41.5 years old.
- Gender: About 27% of struck by/against injuries were to women.
- Industry: The industries with the highest rates of these injuries were: Construction, Transportation & Warehousing, and Agriculture.
- Occupation: The occupations with the highest number of struck by/against injuries were: Transportation and Material Moving, Construction and Extraction, and Production Occupations.
- Other:
    - The average cost of a struck by/against compensable claim was $20,650; with a median cost of $3,075.
    - The average length of time loss for such an injury was 126 days; with a median length of 17 days.

Figure 16: Washington State Workers' Compensation Claims Incidence Rate for Struck By/Against injuries per 100,000 FTEs, 1997-2004.



Source: Washington State Workers' Compensation Data warehouse.

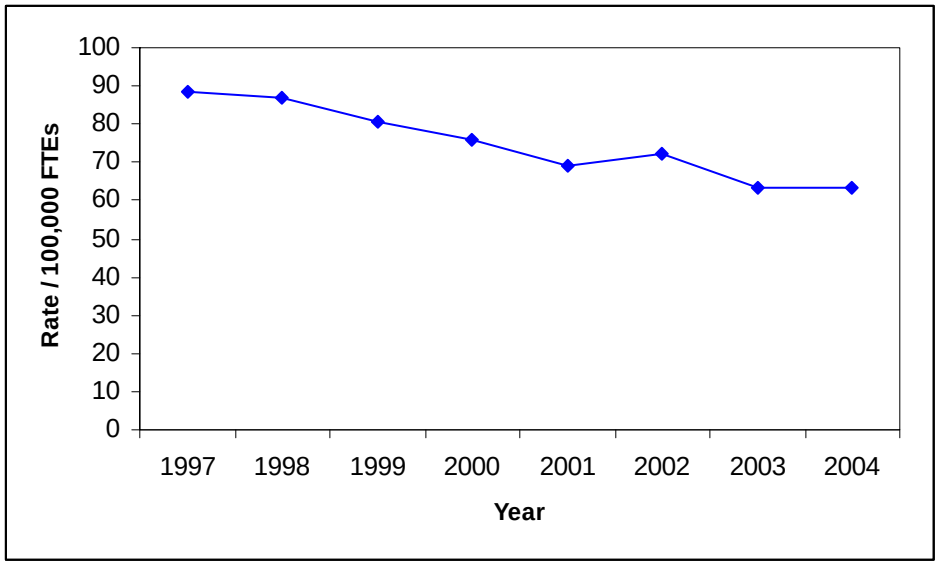
Washington State Indicator 17:
Traumatic Injuries: Vehicle

Introduction: Injuries where a worker is in or operating a motor vehicle are common. From 1997-2004, there were 12,226 compensable claims related to vehicle injuries.
These injuries account for 2.9% of all time loss workers' compensation claims, 5.1% of compensable claim costs and 3.8% of all time loss days.

Information you can use:

- Trend: From 1997 to 2004, there was a decreasing compensable claims incidence rate for vehicle related injuries (See Figure 17).
- Age: The average age for a worker with this injury type was 39 years old.
- Gender: About 29% of vehicular related compensable claims were to women.
- Industry: The industries with the highest rates of these injuries were: Transportation & Warehousing, Public Administration, and Construction.
- Occupation: The occupations with the highest numbers of these injuries were: Transportation and Material Moving, Construction and Extraction, and Protective Service.
- Other:
    - Vehicle related injury claims had an average claim cost of $42,400; with a median claim cost, $7,020.
    - The average length of time loss for such an injury was 220 days; with a median length of 33 days.

Figure 17: Washington State Workers' Compensation Claims Incidence Rate for Vehicle Injuries per 100,000 FTEs, 1997-2004.



Source: Washington State Workers' Compensation Data warehouse.

Conclusions:

The indicators presented in this report provide an overview of the occupational health status of Washington State from 1997 through 2004. The trends suggest a decrease in many of the occupational injury and illness rates in Washington State. These indicators were developed by the Council of State and Territorial Epidemiologists, with Washington State presentation, and some represent common occupational injuries in Washington State.

There are limitations to the indicator data for Washington State. Data is often unavailable to specifically identify the industries at highest risk. Detailed information about subgroups of the working population at risk and how the injury occurred are also absent from these data systems. Information about less common injuries is poorly estimated. More importantly, we can not definitively answer the question as to why occupational injury and illness trends are decreasing in the state. Optimistically, improvements in workplace safety by employers, and workers may explain the decreasing injury and illness trends. However, the data systems available for estimating the trends may systematically bias the results. Employment patterns towards less hazardous work may also provide the rationale for the decrease. This is an area for further research and consideration.

Technical Notes:

Introduction: The most recent information on Washington State surveillance systems for tracking work-related musculoskeletal disorders of the neck, back, and upper extremities can be found at http://www.LNI.wa.gov/Safety/Research/Files/2007WmsdRpt.pdf. Information on Washington state surveillance for work-related asthma is available at http://www.LNI.wa.gov/Safety/Research/Pubs/default.asp#WorkAsthma. Information regarding Washington State tracking of work-related pesticide poisoning is available at http://www.doh.wa.gov/ehp/Pirt/#pirtreports.

Indicator 1: General methods for generating this indicator are in *Council of State and Territorial Epidemiologists. A Guide for Tracking Work-Related Health Effects and Their Determinants. August 2006; pp. 18-23.* Technical notes on the Survey of Occupational Injury and Illness (SOII) are on the Bureau of Labor Statistics (BLS) website (see http://www.bls.gov/iif/home.htm). Published peer reviewed studies have demonstrated underreporting to the BLS SOII (See *Silverstein B, Viikari-Juntura E, Kalat J. Use of a prevention index to identify industries at high risk for work-related musculoskeletal disorders of the neck, back, and upper extremity in Washington state, 1990-1998. Am J Ind Med. 2002 Mar;41(3):149-69* and *Rosenman KD, Kalush A, Reilly MJ, Gardiner JC, Reeves M, Luo Z. How much work-related injury and illness is missed by the current national surveillance system? J Occup Environ Med. 2006 Apr;48(4):357-65*.) There are few comparisons of underreporting across states (See *Boden LI, Ozonoff A. Capture-recapture estimates of nonfatal workplace injuries and illnesses. Ann Epidemiol. 2008 Jun;18(6):500-6. Epub 2008 Feb 20*). For a general overview related to issues of barriers to reporting to BLS see *Azaroff LS, Levenstein C, Wegman DH. Occupational injury and illness surveillance: conceptual filters explain underreporting. Am J Public Health. 2002 Sep; 92(9):1421-9.* In 2003 the classification systems for SOII industry and occupational coding changed. Therefore, the industry and occupation data reported is truncated at 2002.

Indicator 2: General methods for generating this indicator are in *Council of State and Territorial Epidemiologists. A Guide for Tracking Work-Related Health Effects and Their Determinants. August 2006; pp. 24,25.* State-to-state variation in workers' compensation benefits likely prohibit comparisons of hospital discharge rates across states. Back surgery hospital utilization patterns vary by US region (See *Mirza SK, Deyo RA. Systematic review of randomized trials comparing lumbar fusion surgery to non-operative care for treatment of chronic back pain. Spine. 2007 Apr 1;32(7):816-23.*) Back injury is one of the most prevalent cost drivers in workers' compensation programs. County level injury rates were determined by using county employment estimates from the 2000 Census and the average annual number of work-related hospitalizations for county residents during the study time period.

Indicator 3: General methods for generating this indicator are in *Council of State and Territorial Epidemiologists. A Guide for Tracking Work-Related Health Effects and Their Determinants. August 2006; pp. 26-28.* Unlike other indicators which rely on survey estimates, CFOI data is a census of fatalities. Technical notes on the Census of Fatal Occupational Injury are on the BLS website (see http://www.bls.gov/iif/home.htm). In 2003 the classification systems for CFOI industry and

occupational coding changed. Therefore, the industry and occupation data reported is truncated at 2002.

Indicator 4: General methods for generating this indicator are in *Council of State and Territorial Epidemiologists. A Guide for Tracking Work-Related Health Effects and Their Determinants. August 2006; pp. 29-31.* Technical notes on the Survey of Occupational Injury and Illness (SOII) are on the Bureau of Labor Statistics (BLS) website (see http://www.bls.gov/iif/home.htm). Published peer reviewed studies have demonstrated amputations missed the BLS SOII (See *Stanbury M, Reilly MJ, Rosenman KD.Work-related amputations in Michigan, 1997.Am J Ind Med. 2003 Oct;44(4):359-67*.) Rate instability may reflect variation in the relative error of the estimate from year to year for conditions of low prevalence. In 2003 the classification systems for SOII industry and occupational coding changed. Therefore, the industry and occupation data reported is truncated at 2002.

Indicator 5: General methods for generating this indicator are in *Council of State and Territorial Epidemiologists. A Guide for Tracking Work-Related Health Effects and Their Determinants. August 2006; pp. 32-34.* Published peer reviewed studies have demonstrated underreporting of self-reported injuries and illnesses to the Washington State workers' compensation system (See *Fan ZJ, Bonauto DK, Foley MP, Silverstein BA. Underreporting of work-related injury or illness to workers' compensation: individual and industry factors. J Occup Environ Med. 2006 Sep;48(9):914-22.*) Amputations reflect those capture by ANSI Z 16.2 nature code '100' – Amputation with date of injury in the year reported. This includes compensable cases where there were more than 3 days of time loss. Cases from state fund and self-insured workers' compensation programs are included. Previous analysis of workers' compensation data suggests misclassification of a large number of amputation cases as alternative nature codes (David Bonauto, MD, MPH, personal communication). General information about Washington State workers' compensation data and program is available at *Bonauto D, Silverstein B, Adams D, Foley M. Prioritizing industries for occupational injury and illness prevention and research, Washington State Workers' compensation claims, 1999-2003.J Occup Environ Med. 2006 Aug;48(8):840-51.*

Indicator 6: General methods for generating this indicator are in *Council of State and Territorial Epidemiologists. A Guide for Tracking Work-Related Health Effects and Their Determinants. August 2006; pp. 35,36.* State-to-state variation in workers' compensation coverage likely prohibit comparisons of hospital discharge rates across states.

Indicator 7: General methods for generating this indicator are in *Council of State and Territorial Epidemiologists. A Guide for Tracking Work-Related Health Effects and Their Determinants. August 2006; pp. 37-41.* Technical notes on the Survey of Occupational Injury and Illness (SOII) are on the Bureau of Labor Statistics (BLS) website (see http://www.bls.gov/iif/home.htm). Published peer reviewed studies have demonstrated underreporting to the BLS SOII of work-related musculoskeletal disorders and CTS (See *Silverstein B, Viikari-Juntura E, Kalat J. Use of a prevention index to identify industries at high risk for work-related musculoskeletal disorders of the neck, back, and upper extremity in Washington state, 1990-1998. Am J Ind Med. 2002 Mar;41(3):149-69* and *Rosenman KD, Gardiner JC, Wang J, Biddle J, Hogan A, Reilly MJ, Roberts K, Welch E. Why most workers with occupational repetitive trauma do not file for workers' compensation. J Occup Environ Med. 2000 Jan;42(1):25-34*.) There are few comparisons of underreporting across states (See *Boden LI, Ozonoff A. Capture-recapture estimates of nonfatal workplace injuries and illnesses. Ann Epidemiol. 2008 Jun; 18(6):500-6*). For a

general overview related to issues of barriers to reporting to BLS see *Azaroff LS, Levenstein C, Wegman DH. Occupational injury and illness surveillance: conceptual filters explain underreporting. Am J Public Health. 2002 Sep; 92(9):1421-9.*

Indicator 8: General methods for generating this indicator are in *Council of State and Territorial Epidemiologists. A Guide for Tracking Work-Related Health Effects and Their Determinants. August 2006; pp. 42-44.* Published peer reviewed studies have demonstrated underreporting of self-reported injuries and illnesses to the Washington State workers' compensation system (See *Fan ZJ, Bonauto DK, Foley MP, Silverstein BA. Underreporting of work-related injury or illness to workers' compensation: individual and industry factors. J Occup Environ Med. 2006 Sep; 48(9):914-22.*) Carpal tunnel syndrome cases reflect those capture by ANSI Z16.2 codes for state fund and self-insured claims –Nature Code = 562 - 'Nerve Disorder' with Type Code = 12 - Overexertion' and Body Part Code = 320 'Wrist' with date of injury in the year reported. This includes compensable cases where there were more than 3 days of time loss. Cases from state fund and self-insured workers' compensation programs are included.

Previous analysis of workers' compensation data suggests misclassification of a large number of CTS cases with alternative body part, type, and nature codes (See *Silverstein B, Viikari-Juntura E, Kalat J. Use of a prevention index to identify industries at high risk for work-related musculoskeletal disorders of the neck, back, and upper extremity in Washington State, 1990-1998. Am J Ind Med. 2002 Mar; 41(3):149-69*). Data from the Washington State Department of L&I Work-related Musculoskeletal Disorders surveillance system is from *Silverstein BA, Adams D. Work-related Musculoskeletal Disorders of the Neck, Back, and Upper Extremity in Washington State, 1996-2004. Department of Labor and Industries, SHARP Technical Report #40-10a-2006, December 2006* available at http://www.LNI.wa.gov/Safety/Research/Files/WmsdFinal.pdf and at http://www.LNI.wa.gov/Safety/Research/Files/InjuredAtWork.pdf. The estimates provided suggest that the restrictive CSTE case definition significantly undercounts CTS claims. This undercount is further magnified because CSTE counts include self-insured claims (~1/3 of the workforce) while the Washington State surveillance system data does not. General information about Washington State workers' compensation data and program is available at *Bonauto D, Silverstein B, Adams D, Foley M. Prioritizing industries for occupational injury and illness prevention and research, Washington State Workers' compensation claims, 1999-2003. J Occup Environ Med. 2006 Aug; 48(8):840-51.*

Indicator 9: General methods for generating this indicator are in *Council of State and Territorial Epidemiologists. A Guide for Tracking Work-Related Health Effects and Their Determinants. August 2006; pp. 45-49.* The data is not deduplicated and therefore may overestimate the number of people hospitalized with pneumoconiosis. Recognition of disease may be influenced by population prevalence and physician familiarity of occupational diseases. Coding algorithms may influence documentation of pneumoconiosis on the hospital discharge billing.

Indicator 10: General methods for generating this indicator are in *Council of State and Territorial Epidemiologists. A Guide for Tracking Work-Related Health Effects and Their Determinants. August 2006; pp. 50-54.* Recognition of disease may be influenced by population prevalence and physician familiarity of occupational diseases. Place of death may not reflect the US state of exposure.

Indicator 11: General methods for generating this indicator are in *Council of State and Territorial Epidemiologists. A Guide for Tracking Work-Related Health Effects and Their Determinants. August 2006; pp. 60-62.* There may be underreporting of mesothelioma cases to the Washington State Cancer Registry. It is likely that there are non-occupational cases included in this report. Additional cases may not be documented due to the possible under recognition of disease. Place of death may not reflect the US state where exposure occurred.

Indicator 12: General methods for generating this indicator are in *Council of State and Territorial Epidemiologists. A Guide for Tracking Work-Related Health Effects and Their Determinants. August 2006; pp. 63-65.* Laboratory reports may not be submitted to the Washington Department of Health and the Washington State ABLES program. It is likely that there are non-occupational cases included in this report. Additional exposure may not be documented due to the possible under recognition of disease and/or use of lead.

Indicator 13 – 17: General methods for generating these indicators are in *Bonauto D, Silverstein B, Adams D, Foley M. Prioritizing industries for occupational injury and illness prevention and research, Washington State Workers' compensation claims, 1999-2003. J Occup Environ Med. 2006 Aug; 48(8):840-51.* Use of workers' compensation data is known to underreport occupational injury and illness (see *Fan ZJ, Bonauto DK, Foley MP, Silverstein BA. Underreporting of work-related injury or illness to workers' compensation: individual and industry factors. J Occup Environ Med. 2006 Sep; 48(9):914-22.*)

Conclusions: For a general discussion of the factors leading to underreporting see *Azaroff LS, Levenstein C, Wegman DH. Occupational injury and illness surveillance: conceptual filters explain underreporting. Am J Public Health. 2002 Sep; 92(9):1421-9.* Underreporting to Washington workers' compensation is available at *Fan ZJ, Bonauto DK, Foley MP, Silverstein BA. Underreporting of work-related injury or illness to workers' compensation: individual and industry factors. J Occup Environ Med. 2006 Sep;48(9):914-22.*