WASHINGTON STATE OCCUPATIONAL HEALTH INDICATORS: 2000-2014 TRENDS

WASHINGTON STATE, 2000-2014

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WASHINGTON STATE OCCUPATIONAL HEALTH INDICATORS: 2000-2014 TRENDS

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EXECUTIVE SUMMARY

Washington State is home to over 3.5 million workers who form the foundation of the state's thriving economy. Every year, tens of thousands of Washington workers are injured or made ill on the job. These work-related injuries and illnesses have high human and economic costs, but are preventable.

Occupational Health Indicators (OHI) are a set of metrics that provide an overview and general assessment of the employment characteristics and occupational health of Washington State. This report presents the WA OHI data for 2000-2014 to assess injury trends over time and inform prevention efforts.

KEY FINDINGS

Employment characteristics

- Washington workers are aging, which may put more workers at risk for occupational injuries and illnesses.
- The workforce is also becoming more racially/ethnically diverse, with implications for training and prevention.
- The percentage of workers employed in high-risk industries and occupations increased, warranting additional resources and prevention efforts.

Injury and illness outcomes

- Large declines over time in work-related hospitalizations
- Small declines in work-related fatalities, including fatal injuries and deaths from pneumoconiosis
- No change in rates of mesothelioma
- Rates of workers' compensation claims for amputations and work-related pesticide poisonings increased during first part of the study period, before declining to rates in 2014 that were similar to rates observed at the beginning of the study period.

Interventions

- Washington's state OSHA (DOSH) enforcement activities are reaching fewer establishments and covering fewer employees.

CONCLUSIONS

Current declines in many work-related injuries and illnesses are encouraging. However, trends may change, especially given the increase in workers in high-risk industries and the decrease in the reach of DOSH

enforcement activities. Appropriate training and prevention activities are still needed to ensure that workplace injury and illness rates continue to decline among all industries, occupations, and workers. This is especially true for work-related fatalities and mesothelioma, where rates experienced little change over the fifteen years.

The OHI do not explain why rates might be changing; further studies can identify the factors that drive occupational injury and illness rates, and to what extent systemic changes within data sources affect rates. Finally, the OHI provide a partial view of workplace health and safety. Washington should continue to explore additional measures to monitor facets of occupational health that reflect state and local priorities and emerging issues.

INTRODUCTION

Washington State researchers with the Safety & Health Assessment & Research for Prevention (SHARP) Program at 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. These indicators were selected with consideration for: availability of easily obtainable statewide data, public health importance of the occupational health effect or exposure to be measured, and the potential for workplace intervention activities. The Occupational Health Indicators (OHI) are compiled yearly from available data. As a core state involved in the development of the OHI, Washington has been collecting these indicators since their inception in 2001. This report aims to take a systematic approach to analyzing the WA OHI data to assess injury trends and to help identify areas for increased focus.

METHODS

The OHI are collected at various points during the year, and reflect the data available at that point in time. The data sources usually publish final annual estimates 1-3 years after the year in question, so the OHI are collected with a 3-year lag (the 2014 data presented here were collected in 2017) and the state submits their data to CSTE annually in June. To view the yearly WA data as a spreadsheet, please visit the SHARP publications website, where the OHI data are published semi-annually with the current available data. An earlier WA OHI report is also available on the SHARP publications website, which covers the years 1997-2004.

In this report, data sources and additional technical information for the indicators are included as endnotes. More detailed information on the definitions and methodology for OHI calculation is available on the CSTE OHI website, along with data from the states that participate.

TREND ANALYSIS

Indicators were analyzed using Joinpoint (Joinpoint Regression Program, Version 4.7.0.0[i], February 2019) and trend lines are displayed for these data series. Joinpoint fits the trend data and generates trend lines that identify significant changes in trends at "joinpoints". The Joinpoint Regression trend lines displayed for the indicators may be one smooth line (0 joinpoints) or in 2 or 3 segments (for 1 or 2 joinpoints, respectively). These Joinpoint Regression trend lines are differentiated in the figures by color/dash line combinations). We also report the Annual Percent Change (APC) and 95% Confidence Intervals (CI) estimated for each trend line. Unless otherwise noted, rates were calculated for these analyses using the "Poisson" error option in Joinpoint. OHI 1, 4, and 7 are based on the Bureau of Labor Statistics (BLS) Survey of Occupational Injuries and Illnesses (SOII) data,

and require state-specific relative standard errors (RSEs), which were obtained directly from the BLS by request (these were used to calculate standard errors, to conduct trend analysis using Joinpoint's "Standard Error (Provided)" option). Trends for OHI 14, 15, 16, and 18 were analyzed using Joinpoint's "Standard Error (Calculated)" option. Age-standardized rates for OHI 9, 10, and 12 use the US Census 2000 Population, and were analyzed using Joinpoint's "Standard Error (Calculated)" option. The Demographic Profiles were not analyzed for statistical trends. For further information on each indicator, please refer to the Technical Notes at the end of this report, or contact CSTE.

EXCLUSIONS

One indicator was not suitable for statistical trend analysis, and as such, was not included in this report:

- Indicator 17: Occupational safety & health professionals. This indicator had several data collection caveats, and a break in series. Due to difficulty in collecting reliable and consistent data, this indicator was retired after 2015.

Several additional indicators have been instituted in recent years, but are not included in this report because of when they were adopted (earliest year of data included in parentheses):

- Indicator 21: Asthma among Adults Caused or Made Worse by Work (2013).
- Indicator 22: Work-Related Severe Traumatic Injury Hospitalizations (2014).
- Indicator 23: Influenza Vaccination Rates among Health Care Providers (2014).
- Indicator 24: Occupational Heat-Related Emergency Department Visits (2015).
- Indicator 25: Hospitalizations for Work-Related Eye Injuries (2017).

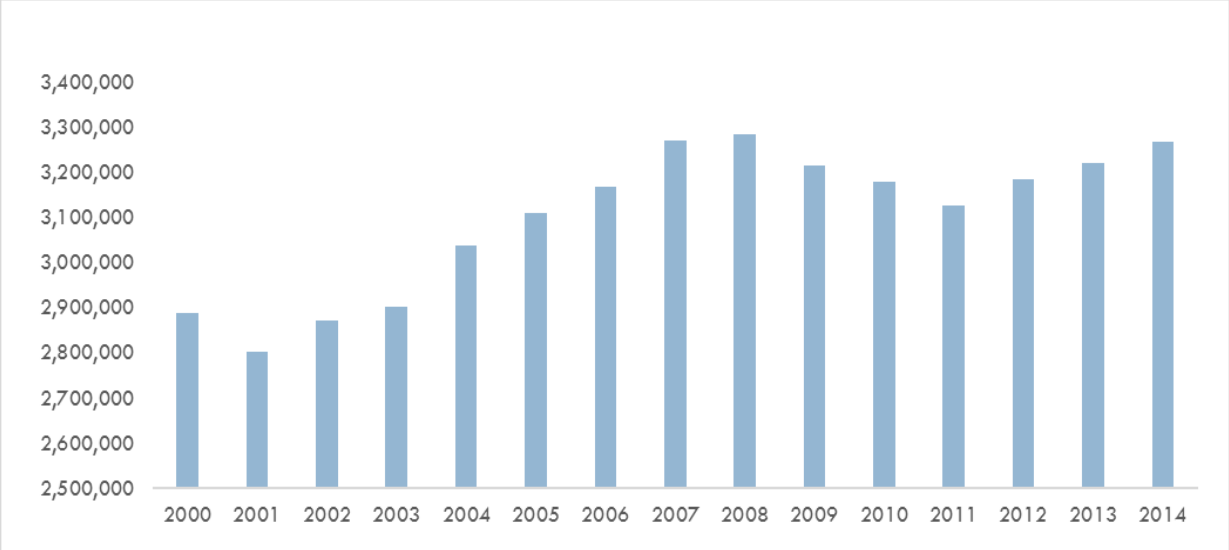
LIMITATIONS

While the OHIs provide a useful snapshot of WA occupational health, several OHIs should not be compared directly with other states or nationally, as they are based on workers' compensation (WC) or hospital discharge data and eligibility criteria and data availability for these systems vary widely by state (OHI 2, 5, 6, 8, 9, 19, 20). Additionally, sample size and industry concentration differences may limit comparability between states and/or state-nationally (OHI 1, 4, and 7). Please refer to the endnote for each indicator for additional information. Other factors which may limit the findings of this report include incomplete case capture and underreporting, and the inherent time lag of the OHI data collection and publication process.

EMPLOYMENT DEMOGRAPHIC PROFILES[ii]

The Demographic Profiles serve to characterize employment in Washington State. The number of employed persons (age 16 or over) increased from 2000-2014, from 2,888,000 in 2000 to 3,269,000 in 2014 (Figure 1). Employment peaked in 2008 at 3,286,000 workers, followed by a period of decreasing employment during the Great Recession in 2009-2011, and another period of rising employment from 2012-2014. This pattern is similar to national trends seen in employment data for the US overall based on Current Population Survey (CPS) data available from the Bureau of Labor Statistics.

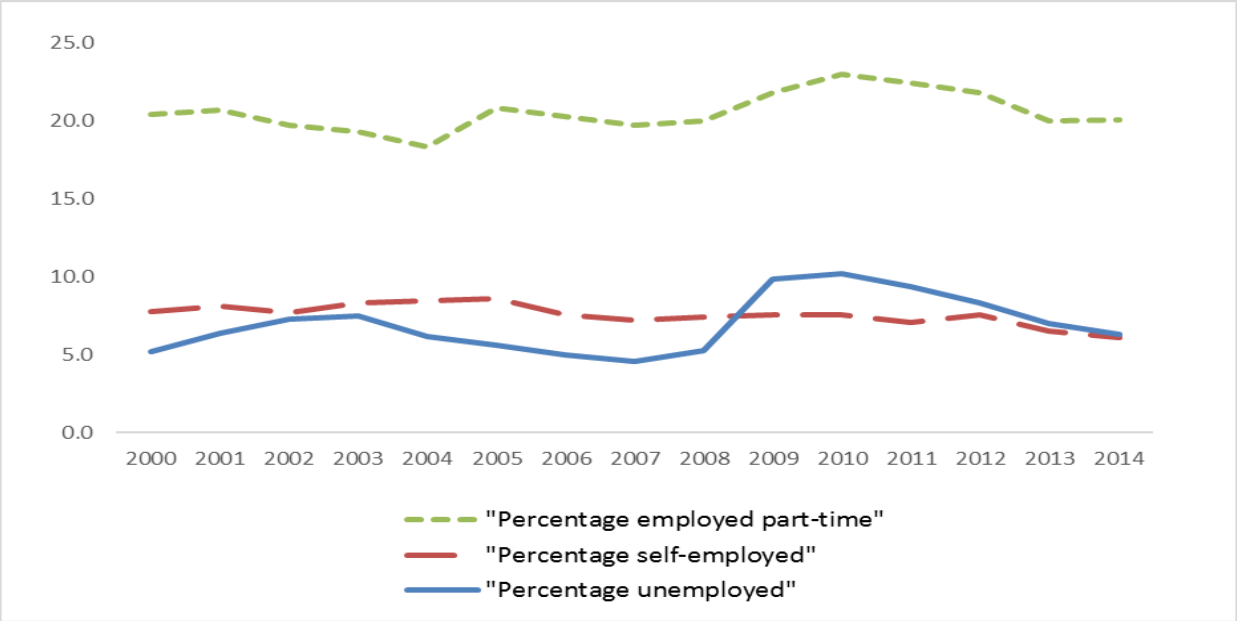
Figure 1. Number of Employed Persons, age 16 or over, Washington State, 2000-2014



SOURCE: CURRENT POPULATION SURVEY ESTIMATES OBTAINED FROM THE BUREAU OF LABOR STATISTICS GEOGRAPHIC PROFILE OF EMPLOYMENT AND UNEMPLOYMENT: HTTPS://WWW.BLS.GOV/OPUB/GEOGRAPHIC-PROFILE/HOME.HTM.

The Great Recession and subsequent recovery is also reflected in the Washington employment status data and hours worked. The percentage of Washington residents who were unemployed more than doubled from a low of 4.6% in 2007 to a high of 10.2% in 2010 (Figure 2). The percentage employed part-time also peaked in 2010 at a high of 23.0%. Both unemployment and part-time employment decreased after 2010, to the 2014 estimates of 6.3% and 20.1%, respectively. The percentage of those self-employed remained mostly flat over time, decreasing slightly from 7.8% in 2000, to 6.1% in 2014.[1]

Figure 2. Civilian Employment Status, Washington State, 2000-2014.

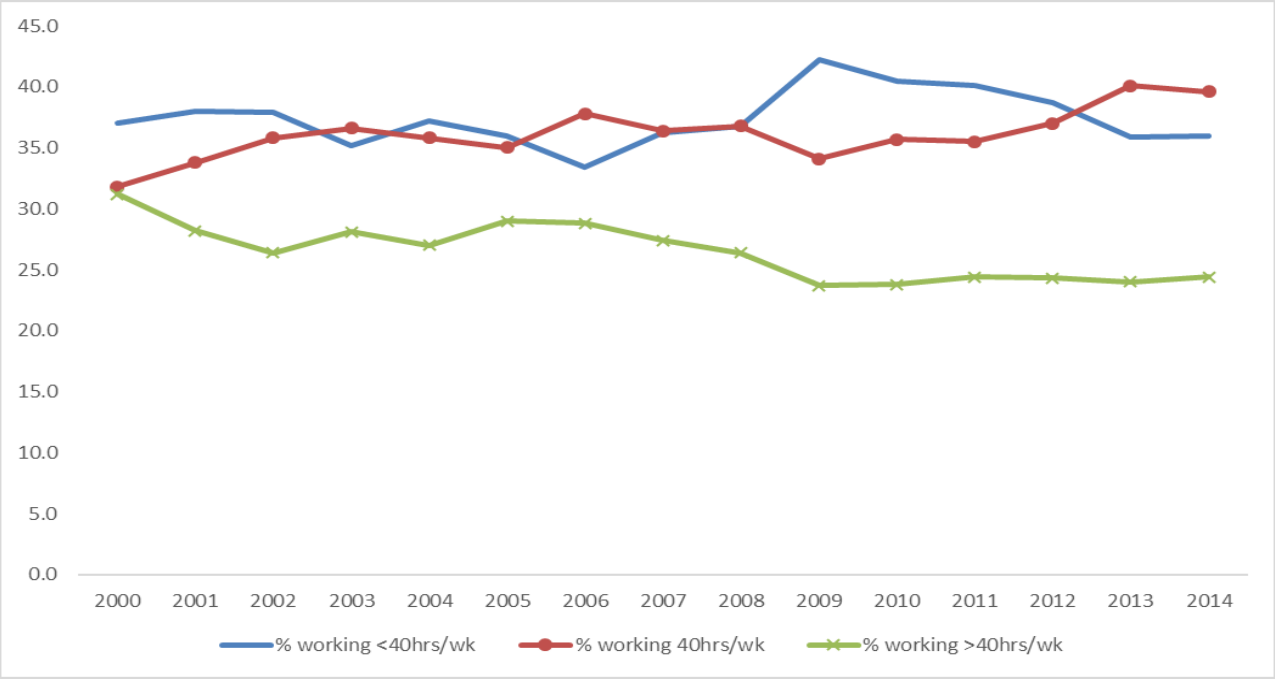


SOURCE: CURRENT POPULATION SURVEY ESTIMATES OBTAINED FROM THE BUREAU OF LABOR STATISTICS GEOGRAPHIC PROFILE OF EMPLOYMENT AND UNEMPLOYMENT: HTTPS://WWW.BLS.GOV/OPUB/GEOGRAPHIC-PROFILE/HOME.HTM.

[1] U.S. Bureau of Labor Statistics, Monthly Labor Review, April 2018: Great Recession, Great Recovery? Trends from the Current Population Survey

The percent of Washington residents working <40 hours per week peaked in 2009 at 42.2%, while the percent working >40 hours per week reached its lowest point that same year, at 23.7% (Figure 3). Over the last five years, and the percent working 40 hours per week generally increased to 39.6% in 2014, while the percent working <40 hours per week generally declined, to 36.0% in 2014.

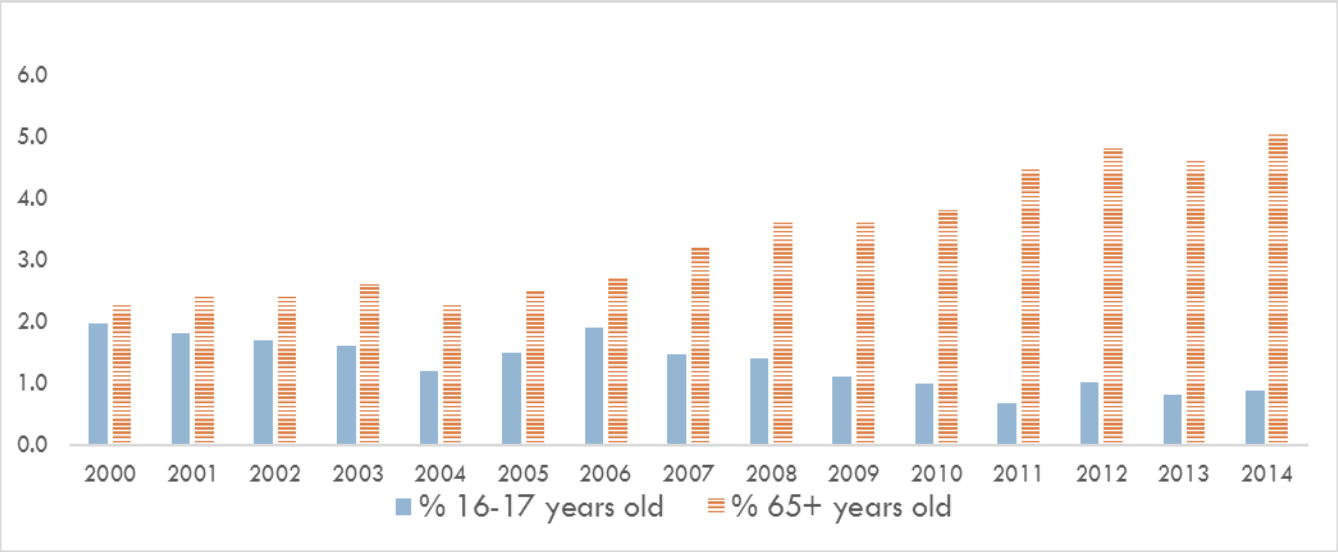
Figure 3. Civilian employment by hours worked, Washington State, 2000-2014.



SOURCE: CURRENT POPULATION SURVEY ESTIMATES OBTAINED FROM THE BUREAU OF LABOR STATISTICS GEOGRAPHIC PROFILE OF EMPLOYMENT AND UNEMPLOYMENT: HTTPS://WWW.BLS.GOV/OPUB/GEOGRAPHIC-PROFILE/HOME.HTM.

Between 2000 and 2014, older workers made up an increasing portion of the Washington workforce, while the proportion of employment among younger workers shrank (Figure 4). In 2000, each group constituted approximately 2% of total employment. By 2014, workers age 16-17 made up >1% of the workforce, while workers age 65 and older represented 5.1%.

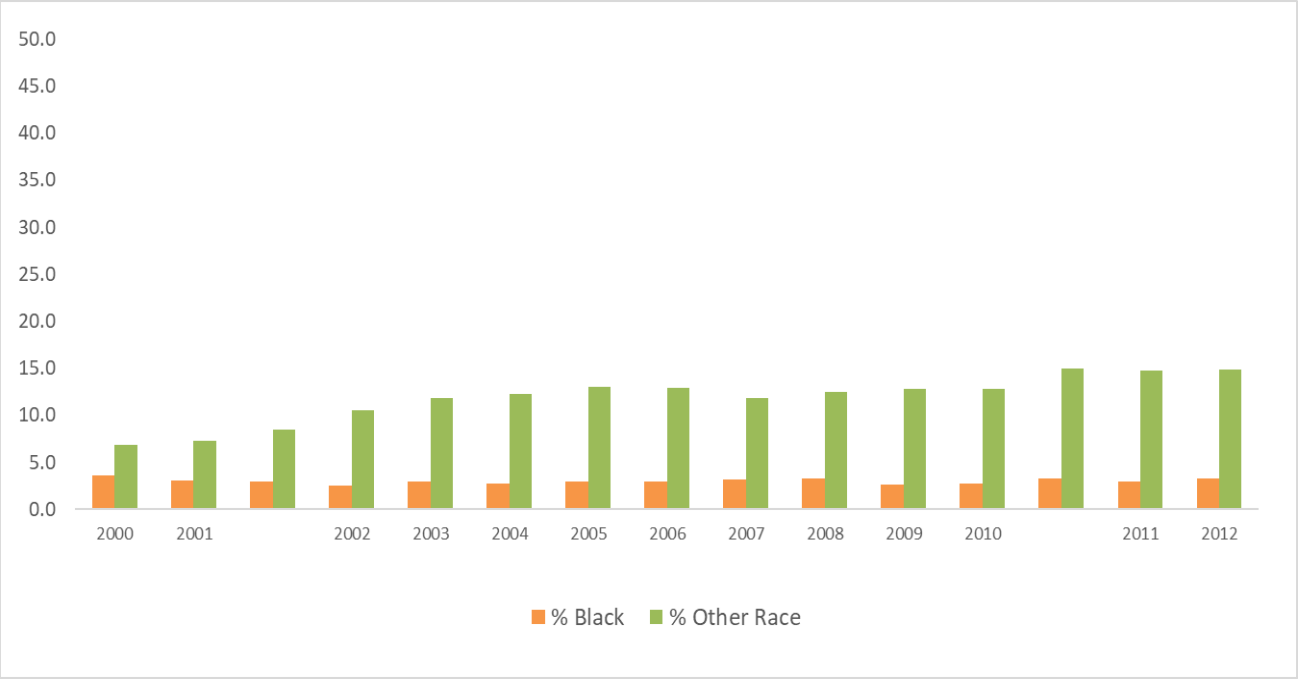
Figure 4. Civilian employment by select age groups, Washington State, 2000-2014.



SOURCE: CURRENT POPULATION SURVEY ESTIMATES OBTAINED FROM THE NIOSH EMPLOYED LABOR FORCE (ELF) QUERY SYSTEM: HTTPS://WWW.CDC.GOV/WISARDS/CPS/.

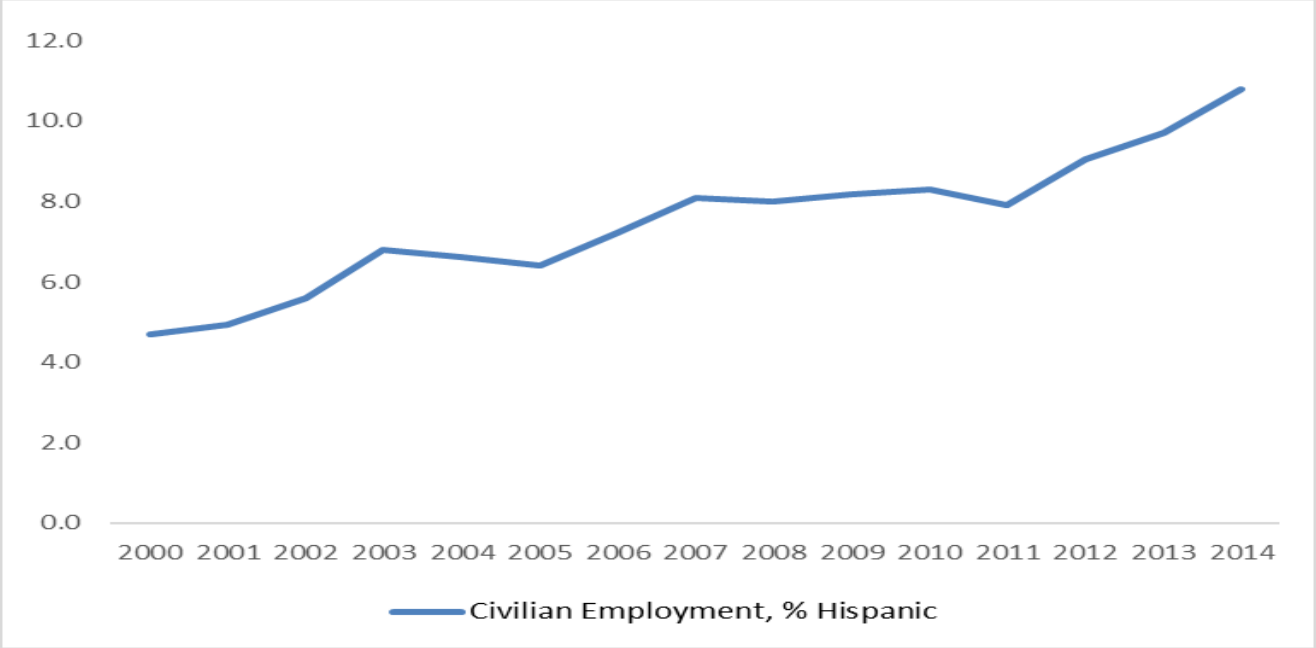
Based on categories defined by BLS, the majority of Washington civilian workers are White (Figure 5), although the workforce is becoming increasingly diverse (Figures 5-6). The percentage of Washington workers who are Black remained around 3%, (3.6% in 2000 and 3.3% in 2014), while the percentage of WA workers who are "Other Race" (neither White nor Black) increased steadily over time from 6.8% in 2000 to 14.9% in 2014. The proportion of Hispanic workers in WA has increased over time, from 4.7% in 2000, to 10.8% in 2014 (Figure 6). The percentage of the civilian employed population that was female remained constant at 46-47% across the time-period (a low of 46.0% in 2007, a high of 47.6% in 2010, data not shown).

Figure 5. Distribution of workers by race, Washington State, 2000-2014.



SOURCE: CURRENT POPULATION SURVEY ESTIMATES OBTAINED FROM THE BUREAU OF LABOR STATISTICS GEOGRAPHIC PROFILE OF EMPLOYMENT AND UNEMPLOYMENT: HTTPS://WWW.BLS.GOV/OPUB/GEOGRAPHIC-PROFILE/HOME.HTM.

Figure 6. Proportion of Hispanic workers, Washington State, 2000-2014.



SOURCE: CURRENT POPULATION SURVEY ESTIMATES OBTAINED FROM THE BUREAU OF LABOR STATISTICS GEOGRAPHIC PROFILE OF EMPLOYMENT AND UNEMPLOYMENT: HTTPS://WWW.BLS.GOV/OPUB/GEOGRAPHIC-PROFILE/HOME.HTM.

INDUSTRY & OCCUPATION

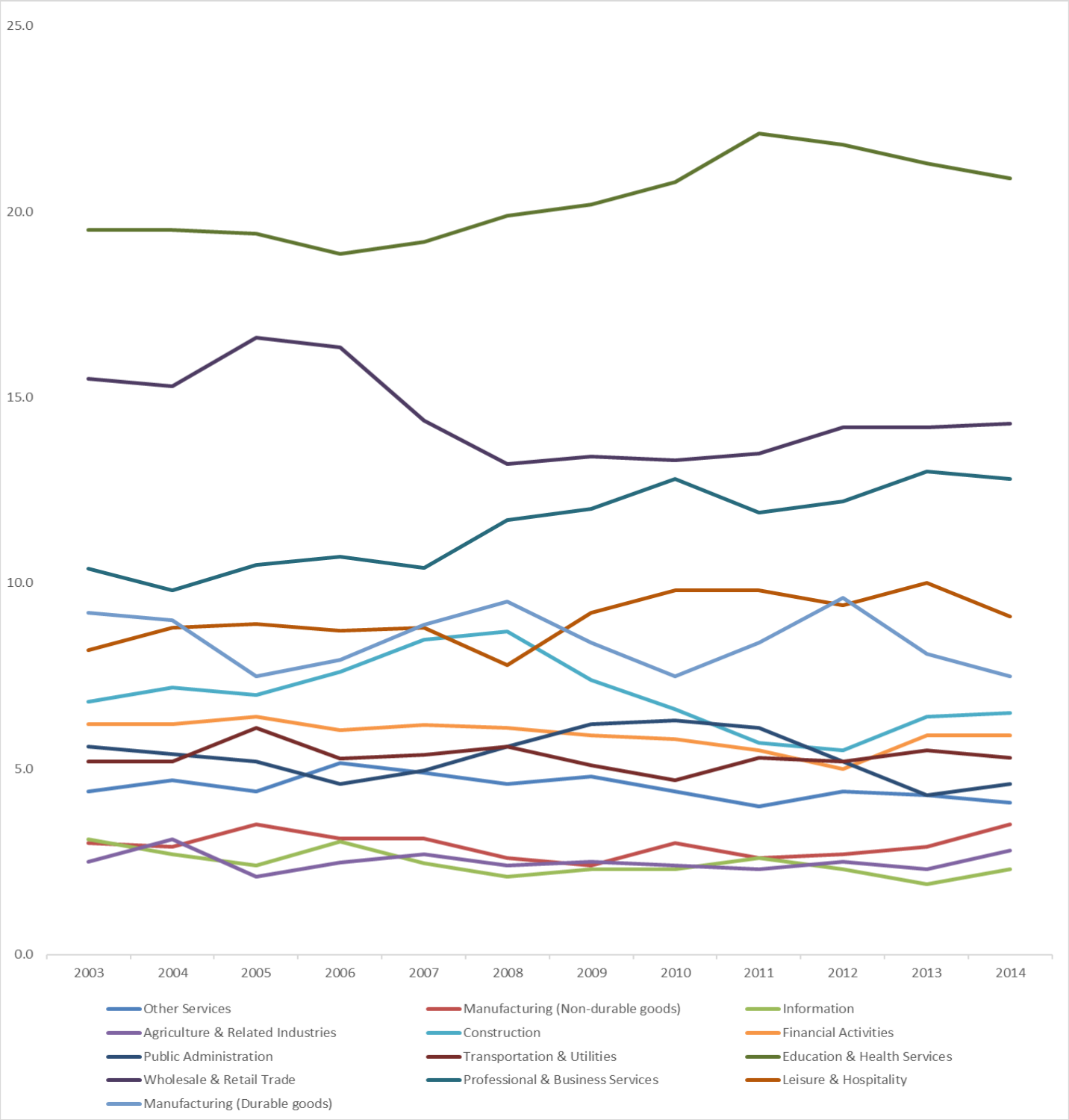
Industry describes the goods or services provided by the employer. Occupation describes a workers' job or work activity. The industry and occupation categories used by the Bureau of Labor Statistics were updated in 2003, so only the years 2003-2014 are displayed.

2003-2014

Between 2003 and 2014, the industries employing the largest percentage of civilian WA workers remained consistent: Education & Health Services; Wholesale & Retail Trade; and Professional & Business. The distribution of civilian employment by industry is presented in Figure 7 and Table 1. Mining & Logging, which consistently makes up less than 1% of employment in Washington State, is excluded from the data presented.

Occupations employing the largest percent of the civilian WA workers were Professional and Related occupations; Service occupations; and Management, Business & Financial Operations occupations. The distribution of civilian employment by occupation is presented in Figure 8 and Table 2.

Figure 7. Distribution of civilian employment in WA 2003-2014, by Industry.



SOURCE: CURRENT POPULATION SURVEY ESTIMATES OBTAINED FROM THE BUREAU OF LABOR STATISTICS GEOGRAPHIC PROFILE OF EMPLOYMENT AND UNEMPLOYMENT: HTTPS://WWW.BLS.GOV/OPUB/GEOGRAPHIC-PROFILE/HOME.HTM.

Table 1. Distribution of civilian employment (%) by Industry in Washington State, 2003-2014.

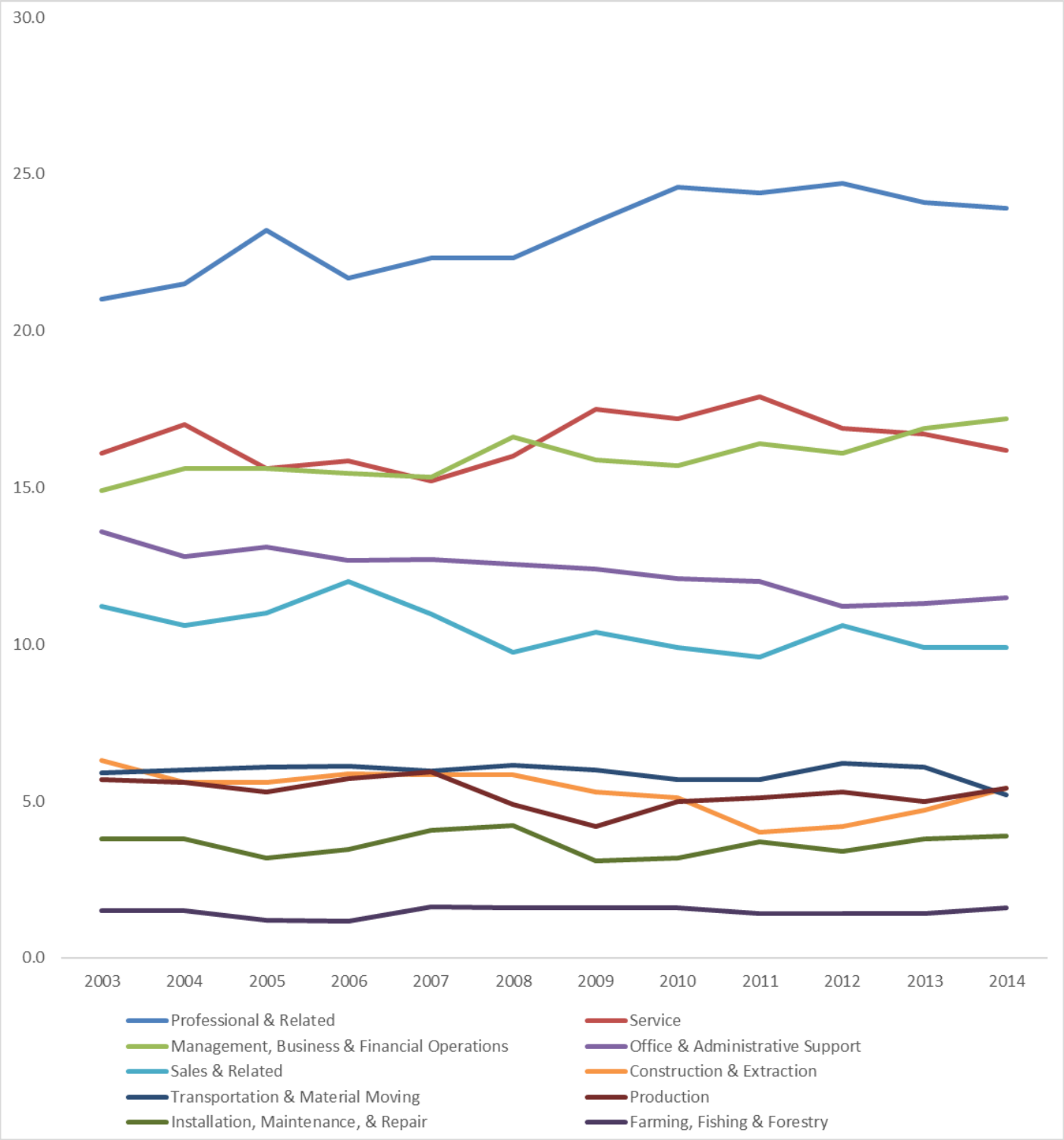
Industry[2]	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Education & Health Services	19.5	19.5	19.4	18.9	19.2	19.9	20.2	20.8	22.1	21.8	21.3	20.9
Wholesale & Retail Trade	15.5	15.3	16.6	16.3	14.4	13.2	13.4	13.3	13.5	14.2	14.2	14.3
Professional & Business Services	10.4	9.8	10.5	10.7	10.4	11.7	12.0	12.8	11.9	12.2	13.0	12.8
Manufacturing (Durable goods)	9.2	9.0	7.5	7.9	8.9	9.5	8.4	7.5	8.4	9.6	8.1	7.5
Leisure & Hospitality	8.2	8.8	8.9	8.7	8.8	7.8	9.2	9.8	9.8	9.4	10.0	9.1
Construction	6.8	7.2	7.0	7.6	8.5	8.7	7.4	6.6	5.7	5.5	6.4	6.5
Financial Activities	6.2	6.2	6.4	6.0	6.2	6.1	5.9	5.8	5.5	5.0	5.9	5.9
Public Administration	5.6	5.4	5.2	4.6	5.0	5.6	6.2	6.3	6.1	5.2	4.3	4.6
Transportation & Utilities	5.2	5.2	6.1	5.3	5.4	5.6	5.1	4.7	5.3	5.2	5.5	5.3
Other Services	4.4	4.7	4.4	5.2	4.9	4.6	4.8	4.4	4.0	4.4	4.3	4.1
Information	3.1	2.7	2.4	3.0	2.5	2.1	2.3	2.3	2.6	2.3	1.9	2.3
Manufacturing (Non-durable goods)	3.0	2.9	3.5	3.1	3.1	2.6	2.4	3.0	2.6	2.7	2.9	3.5
Agriculture & Related Industries	2.5	3.1	2.1	2.5	2.7	2.4	2.5	2.4	2.3	2.5	2.3	2.8

SOURCE: CURRENT POPULATION SURVEY ESTIMATES OBTAINED FROM THE BUREAU OF LABOR STATISTICS GEOGRAPHIC PROFILE OF EMPLOYMENT AND UNEMPLOYMENT: HTTPS://WWW.BLS.GOV/OPUB/GEOGRAPHIC-PROFILE/HOME.HTM.

[2] Mining & Logging makes up less than 1% of WA civilian employment each year and is not included.

- Comparing the first and last years of the time period (2003 vs 2014),
    - Professional and Business Services experienced the greatest change in the percent of employment, from 10.4% in 2003 to 12.8% in 2014, for an increase of 2.4%.
    - Other industries with increased percentages of total employment in 2014 vs. 2003 include: Education and Health Services (+1.4%), Leisure and Hospitality (+0.9%), Manufacturing-Nondurable Goods (+0.5%)
    - Manufacturing-Durable Goods saw the greatest decline in its proportion of employment (-1.7%), accounting for 9.2% of employment in 2003 and 7.5% in 2014.
    - Other industries with lower percentages of total employment in 2014 compared with 2003 include: Wholesale and Retail Trade (-1.2%), Public Administration (-1.0%), and Information (-0.8%)
    - In the remaining industries, the proportion of total employment in 2014 were within 0.3% of the 2003 estimates.
- Wholesale and Retail Trade experienced the greatest change at any point during the 12-year period: The proportion of employment in Wholesale and Retail Trade declined 3.4% over four years, from a peak of 16.6% in 2005 to a low of 13.2% in 2008. Wholesale and Retail Trade also saw the greatest increase over the last five years, with the percent of total employment increasing annually by an average 0.3% between 2010 and 2014.
- Over the last five years, Public Administration experienced the greatest average annual decline in percent of employment (-0.4% annually, 2010-2014).
- Note that data displayed are proportions, and not numbers of workers. Declines in the percentage of employment, especially in recent years, may reflect employment in an industry that is growing in terms of the number of workers, but at a pace slower than other industries.

Figure 8. Distribution of civilian employment by Occupation in Washington State, 2003-20114.



SOURCE: CURRENT POPULATION SURVEY ESTIMATES OBTAINED FROM THE BUREAU OF LABOR STATISTICS GEOGRAPHIC PROFILE OF EMPLOYMENT AND UNEMPLOYMENT: HTTPS://WWW.BLS.GOV/OPUB/GEOGRAPHIC-PROFILE/HOME.HTM.

Table 2. Distribution of civilian employment (%) by Occupation in Washington State, 2003-20114.

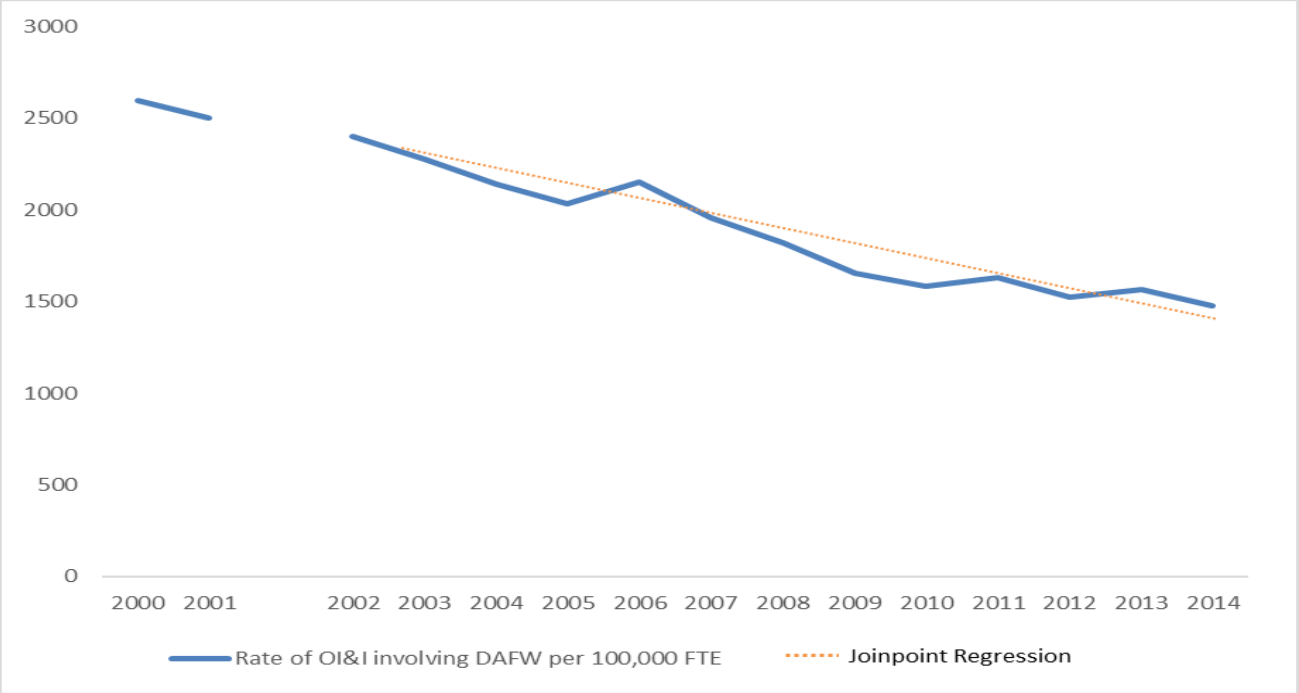
Occupation	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Professional & Related	21.0	21.5	23.2	21.7	22.3	22.3	23.5	24.6	24.4	24.7	24.1	23.9
Service	16.1	17.0	15.6	15.8	15.2	16.0	17.5	17.2	17.9	16.9	16.7	16.2
Management, Business & Financial Operations	14.9	15.6	15.6	15.5	15.3	16.6	15.9	15.7	16.4	16.1	16.9	17.2
Office & Administrative Support	13.6	12.8	13.1	12.7	12.7	12.6	12.4	12.1	12.0	11.2	11.3	11.5
Sales & Related	11.2	10.6	11.0	12.0	11.0	9.8	10.4	9.9	9.6	10.6	9.9	9.9
Construction & Extraction	6.3	5.6	5.6	5.9	5.8	5.9	5.3	5.1	4.0	4.2	4.7	5.4
Transportation & Material Moving	5.9	6.0	6.1	6.1	6.0	6.2	6.0	5.7	5.7	6.2	6.1	5.2
Production	5.7	5.6	5.3	5.7	5.9	4.9	4.2	5.0	5.1	5.3	5.0	5.4
Installation, Maintenance, & Repair	3.8	3.8	3.2	3.5	4.1	4.2	3.1	3.2	3.7	3.4	3.8	3.9
Farming, Fishing & Forestry	1.5	1.5	1.2	1.2	1.6	1.6	1.6	1.6	1.4	1.4	1.4	1.6

SOURCE: CURRENT POPULATION SURVEY ESTIMATES OBTAINED FROM THE BUREAU OF LABOR STATISTICS GEOGRAPHIC PROFILE OF EMPLOYMENT AND UNEMPLOYMENT: HTTPS://WWW.BLS.GOV/OPUB/GEOGRAPHIC-PROFILE/HOME.HTM.

- Comparing 2014 to 2003:
    - The largest increase in percent of total employment occurred among Professional and Related occupations, which increased 2.9% between 2003 and 2014.
    - The proportion of workers in Management, Business & Financial Operations was also greater in 2014 compared with 2003 (+2.3%),
    - Office & Administrative Support experienced the largest decline in 2014 compared to 2003 (-2.1%).
    - Occupations that also saw lower shares of total employment in 2014 include: Sales and Related occupations (-1.3%), Construction and Extraction (-0.9%), and Transportation and Material Moving (-0.7%)
    - In 2014, the proportion of workers in Installation, Maintenance, & Repair; Farming, Fishing & Forestry; Service; and Production occupations were within 0.3% of 2003 estimates.
- Over the last five years (2010-2014):
    - Management, Business & Financial Operations experienced the fastest increase in percent of total employment, with an average annual increase of 0.4%.
    - Services saw the greatest average annual decline (-0.3%)
- Note that data displayed are proportions, and not numbers of workers. Declines in the percentage of employment, especially in recent years, may reflect employment in an occupation that is growing in terms of the number of workers, but at a pace slower than other occupations.

INDICATOR 1: NONFATAL WORK-RELATED INJURIES & ILLNESSES REPORTED BY EMPLOYERS[iii]

Figure OHI.1. Rate of nonfatal work-related injuries and illnesses reported by employers per 100,000 FTE, Washington State, 2000-2014.



SOURCE: BUREAU OF LABOR STATISTICS SURVEY OF OCCUPATIONAL INJURIES AND ILLNESSES ESTIMATES: HTTPS://WWW.BLS.GOV/IIF/OSHSTATE.HTM.

- The rate of employer-reported nonfatal work related injuries involving days away from work (DAFW) decreased from 2,600 per 100,000 FTEs in 2000 (2,400 per 100,000 FTEs in 2002) to 1500 per 100,000 FTEs in 2014, a 38% decrease from 2002 to 2014.

- The rate of employer-reported occupational injuries and illnesses involving DAFW appear to decline by 4.1% annually (95% CI: -4.9, -3.3).[3]

[3] There was a change in OSHA recordkeeping rules between 2001 and 2002, and RSEs for the year 2002 rate were not available, so trend analysis for the rate of all occupational injury and illness is limited to the years 2003-2014.

INDICATOR 2: WORK-RELATED HOSPITALIZATIONS[iv]

Figure OHI.2. Annual rate of work-related hospitalizations per 100,000 employed persons age 16 or over, Washington State, 2000-2014.

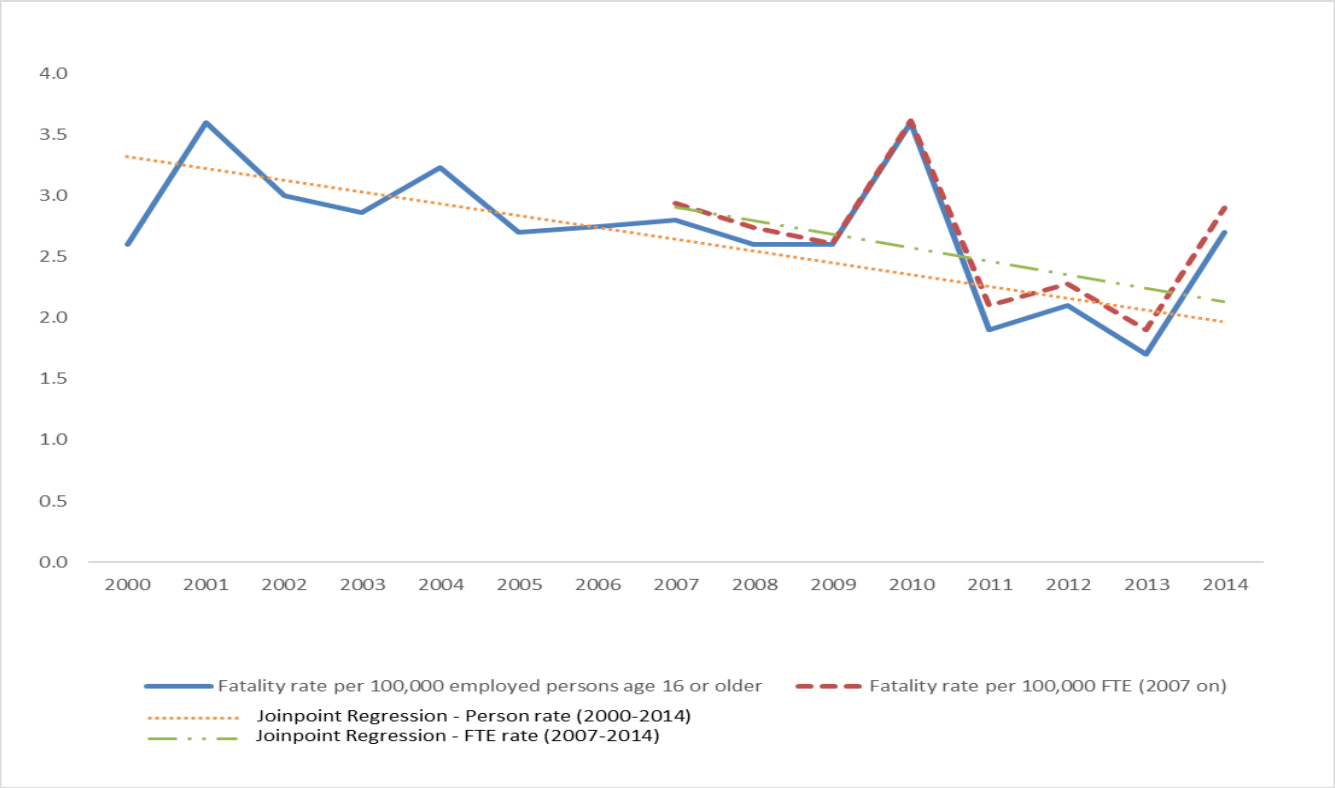
SOURCE: AUTHORS' CALCULATIONS FROM WASHINGTON STATE HOSPITAL DISCHARGE DATA AND CURRENT POPULATION SURVEY ESTIMATES OBTAINED FROM THE BUREAU OF LABOR STATISTICS GEOGRAPHIC PROFILE OF EMPLOYMENT AND UNEMPLOYMENT: HTTPS://WWW.BLS.GOV/OPUB/GEOGRAPHIC-PROFILE/HOME.HTM.

- The work-related hospitalization rate fell from 192.0 per 100,000 employed persons in 2000, to 113.4 per 100,000 employed persons in 2014.

- The work-related hospitalization rate appear to decline by an estimated 1.6% per year (95% CI: -2.2, -1.1) from 2000-2012, and by 13.8% per year from 2012-2014 (95% CI: -22.5, -4.2).

INDICATOR 3: FATAL WORK-RELATED INJURIES[v]

Figure OHI.3. Rate of work-related traumatic fatalities, Washington State, 2000-2014.

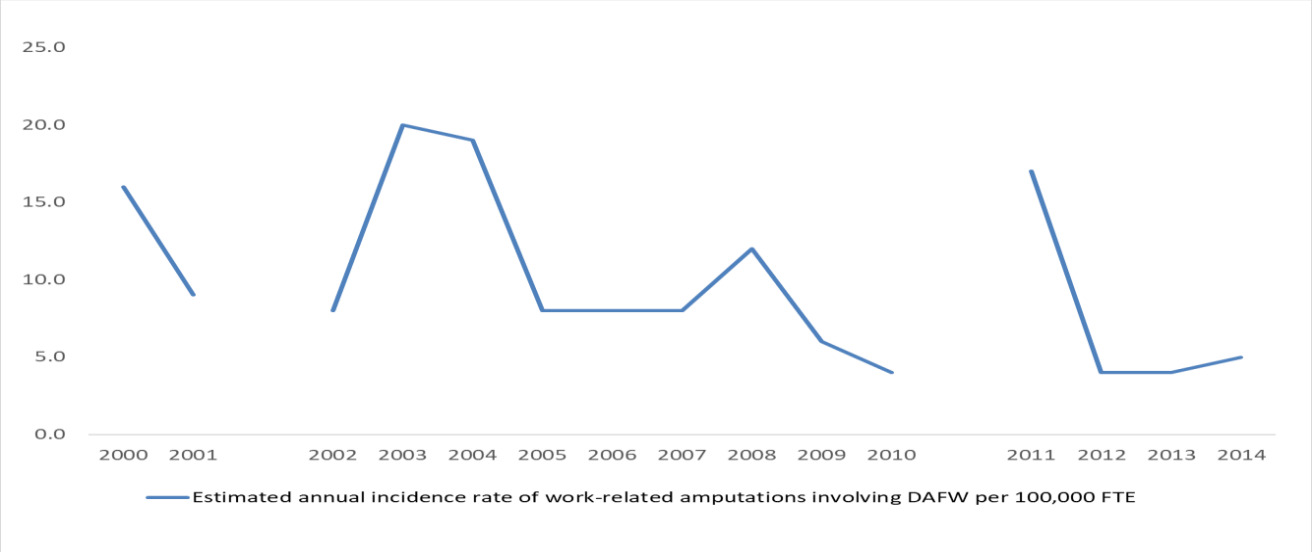


SOURCE: AUTHORS' CALCULATIONS FROM BUREAU OF LABOR STATISTICS CENSUS OF FATAL OCCUPATIONAL INJURIES DATA: HTTPS://WWW.BLS.GOV/IIF/OSHSTATE.HTM, AND CURRENT POPULATION SURVEY ESTIMATES OBTAINED FROM THE NIOSH EMPLOYED LABOR FORCE (ELF) QUERY SYSTEM: HTTPS://WWWN.CDC.GOV/WISARDS/CPS/.

- There are two rates displayed, one calculating the fatality rate per 100,000 employed persons (the only method used from 2000-2006), and one calculating the fatality rate per 100,000 FTE (hours based) that begins in 2007, which is the current method used (2007-2014). The employed person rate is displayed for 2000-2014 for comparison. The rates are similar.
- Both the highest and lowest fatal injury rates occurred in the last five years of the study period: 3.6 per 100,000 employed persons in 2010, and 1.7 per 100,000 employed persons in 2013. The rate based on FTE demonstrated a similar pattern. After three years of consistently low rates from 2011 to 2013, 2014 experienced a high rate fatal work injuries, similar to those observed during the first half of the period.
- The trend of the rate using employed persons (2000-2014) appears to decline by an estimated 2.5% per year (95% CI: -4.5, -0.4).
- The trend of the rate using FTEs showed a similar decline of an estimated -2.8% per year (95% CI: -10.1, 5.1) for years 2007 through 2014. Although wide and spanning zero, the confidence interval suggests that the fatality rate over time is likely decreasing.

INDICATOR 4: WORK-RELATED AMPUTATIONS WITH DAYS AWAY FROM WORK REPORTED BY EMPLOYERS[vi]

Figure OHI.4. Estimated annual incidence rate of work-related amputations involving days away from work per 100,000 FTE, Washington State, 2000-2014.



SOURCE: BUREAU OF LABOR STATISTICS SURVEY OF OCCUPATIONAL INJURIES AND ILLNESSES ESTIMATES: HTTPS://WWW.BLS.GOV/IIF/DATA.HTM.

- The rate of employer-reported work-related amputations involving DAFW peaked in 2003 at 20 per 100,000 FTE, and was at its lowest in 2010, 2012, and 2013 at 4 per 100,000 FTE.

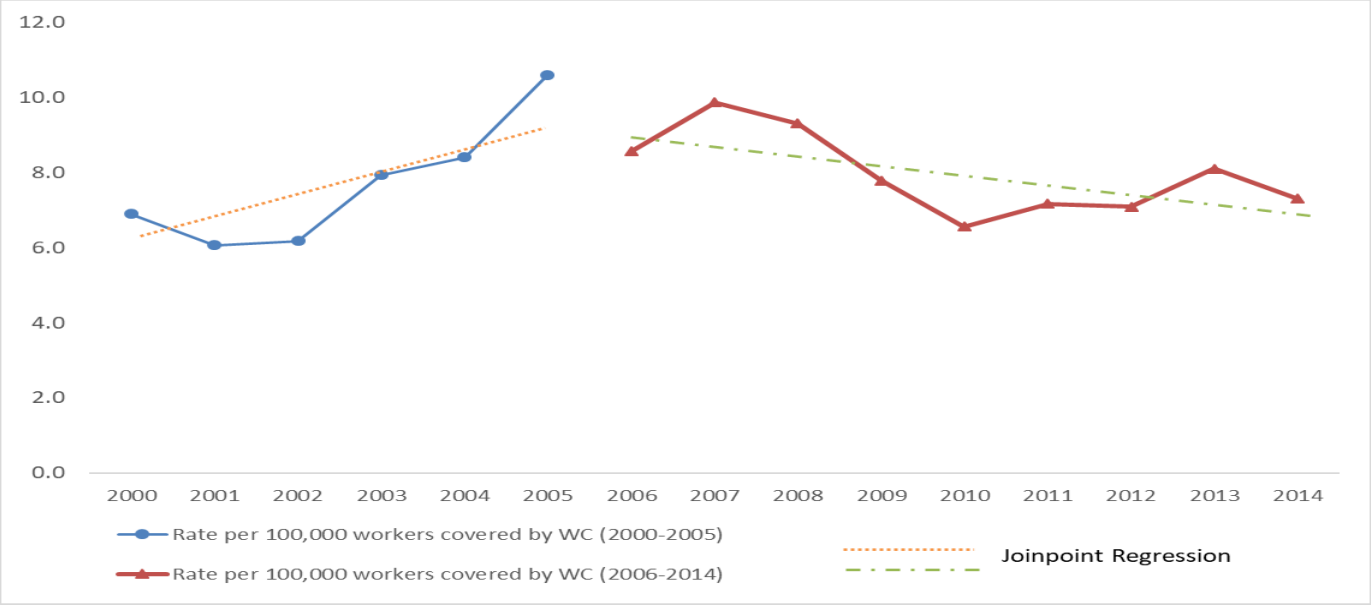
- The largest within-series year-over-year change in rates occurred between 2011 and 2012, when rates fell 76% from 17 amputations per 100,000 FTE to 4 cases per 100,000 FTE.

- Because of the erratic rate changes and the small number of years per time period where the years are comparable, no trend analysis is presented.[4]

[4] There was a change in OSHA recordkeeping rules between 2001 and 2002, and the BLS instituted a change in 2011 to using a revised version of the Occupational Injuries and Illnesses classification System (OIICS) to code injury characteristics. Prior to 2011, "amputation" was defined as traumatic loss of a limb or other external body part involving bone loss. Beginning in 2011, the new classification system revised the definition of "amputation" to include partial amputations regardless of bone loss, medical amputations due to irreparable traumatic injury, and amputations of body parts that were surgically reattached. RSEs were not available for the rate in 2002.

INDICATOR 5: STATE WORKERS' COMPENSATION CLAIMS FOR AMPUTATIONS WITH LOST WORK TIME[vii]

Figure OHI.5. Annual incidence rate of amputations filed with state workers' compensation per 100,000 covered workers, Washington State, 2000-2014.



SOURCE: AUTHORS' CALCULATIONS FROM WASHINGTON WORKERS' COMPENSATION DATA.

- The study period started and ended with similar rates of workers' compensation claims for amputations, at 6.9 and 7.3 per 100,000 covered workers in 2000 and 2014, respectively. The rate peaked at 10.6 per 100,000 covered workers in 2005.

- Due to changes in the coding system, trend analysis is conducted for two time periods, from 2000-2005, and from 2006-2014.[5] The rate was estimated to increase by 10.6% annually (95% CI: 2.3, 19.5) from 2000 to 2005, and then to decrease thereafter by an estimated 3.2% annually (95% CI: -6.3, 0.0) from 2006-2014. Although including zero, the confidence interval suggests that the amputation rate over time is likely decreasing.

[5] There was a change in the coding structure used to identify cases during 2005: ANSI Z16.2 codes were used to identify cases in WA until July 2005, and subsequently, cases were identified using OIICS v1.01. The first full year of data using OIICS coding was 2006, so trend analysis is conducted from 2000-2005, and from 2006-2014.

INDICATOR 6: HOSPITALIZATIONS FOR WORK-RELATED BURNS[viii]

Figure OHI.6. Annual rate of hospitalizations for work-related burns per 100,000 employed persons, Washington State, 2000-2014.

SOURCE: AUTHORS' CALCULATIONS FROM WASHINGTON STATE HOSPITAL DISCHARGE DATA AND CURRENT POPULATION SURVEY ESTIMATES OBTAINED FROM THE BUREAU OF LABOR STATISTICS GEOGRAPHIC PROFILE OF EMPLOYMENT AND UNEMPLOYMENT: HTTPS://WWW.BLS.GOV/OPUB/GEOGRAPHIC-PROFILE/HOME.HTM.

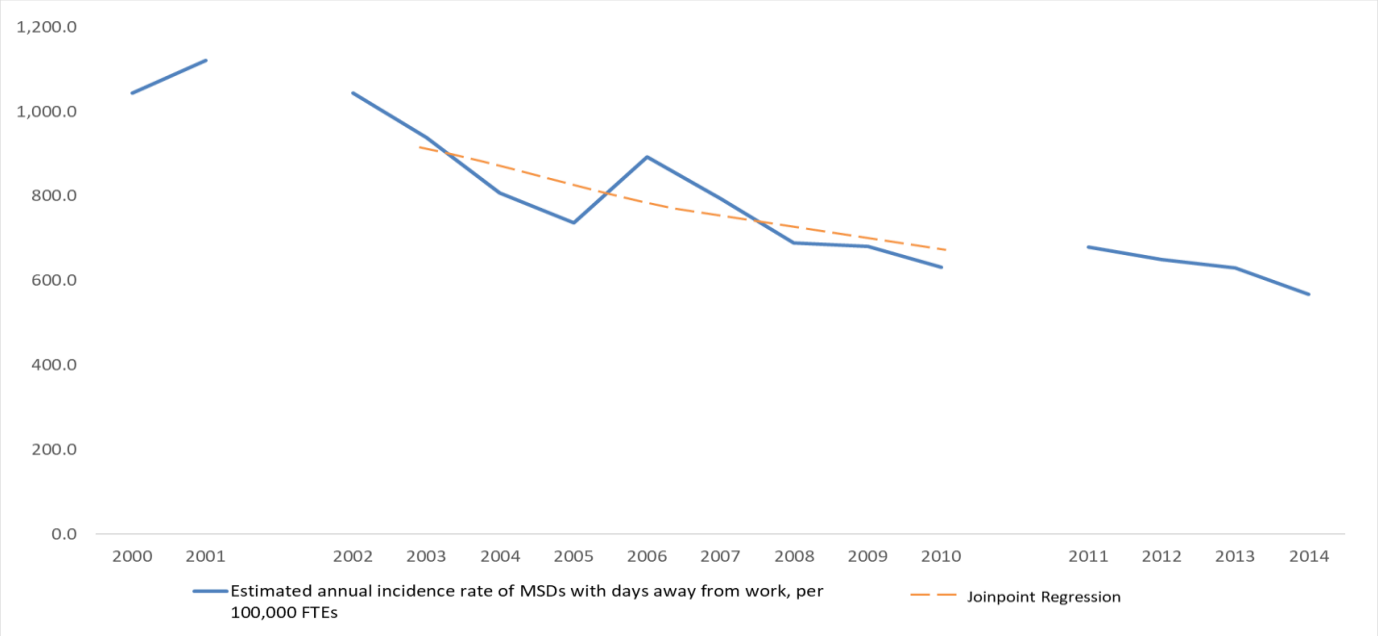
- On average, 66 WA workers per year were hospitalized with a work-related burn from 2000-2014. The number of hospitalized burns peaked in 2000 at 94, and were lowest in 2014 at 37 (data not shown).

- There was a significant decrease in the number of hospitalizations for work-related burns from a high of 3.3 per 100,000 employed persons in 2000, to a low of 1.1 in 2014.

- Overall, the rate of hospitalization for work-related burns in WA decreased by an estimated 3.5% per year (95% CI: -5.9, -1.0).

INDICATOR 7: WORK-RELATED MUSCULOSKELETAL DISORDERS (MSDS) WITH DAYS AWAY FROM WORK REPORTED BY EMPLOYERS[ix]

Figure OHI.7A. Estimated annual incidence rates of MSDs with days away from work per 100,000 FTEs, reported by employers, Washington State, 2000-2014.



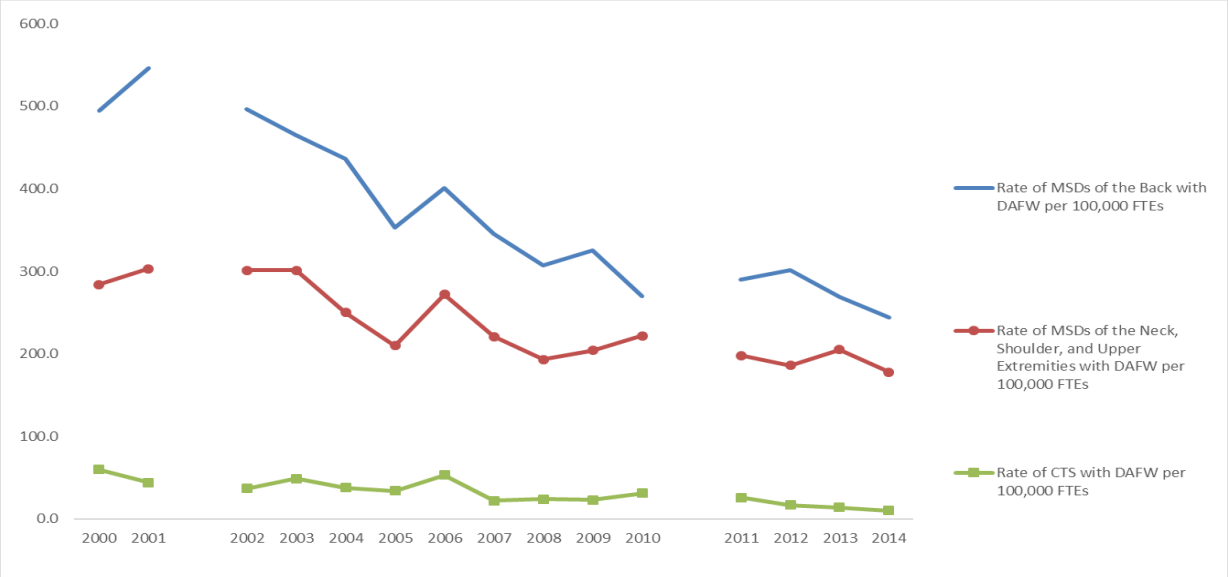
SOURCE: BUREAU OF LABOR STATISTICS SURVEY OF OCCUPATIONAL INJURIES AND ILLNESSES ESTIMATES: HTTPS://WWW.BLS.GOV/IIF/DATA.HTM.

- The rate of musculoskeletal disorders (MSDs) with days away from work ranged from a high of 1,121 per 100,000 FTEs in 2001 to 568 per 100,000 FTEs in 2014, with a smaller peak in 2006 (892 per 100,000 FTEs). Overall, the rate of MSDs appears to be decreasing.

- Between 2003 and 2010,[6] the annual incidence rate of MSDs with days away from work was estimated to decline by 4.7% per year (95% CI -7.7, -1.8).

[6] There was a change in OSHA recordkeeping rules between 2001 and 2002, and then in 2011 the BLS instituted a change to using a revised version of the Occupational Injuries and Illnesses classification System (OIICS) to code injury characteristics. RSEs for the year 2002 rate were not available. Therefore, trend analysis is limited to the years 2003-2010.

Figure OHI.7B. Estimated annual incidence rates of select MSDs with days away from work per 100,000 FTEs, reported by employers, Washington State, 2000-2014.



SOURCE: BUREAU OF LABOR STATISTICS SURVEY OF OCCUPATIONAL INJURIES AND ILLNESSES ESTIMATES: HTTPS://WWW.BLS.GOV/IIF/DATA.HTM.

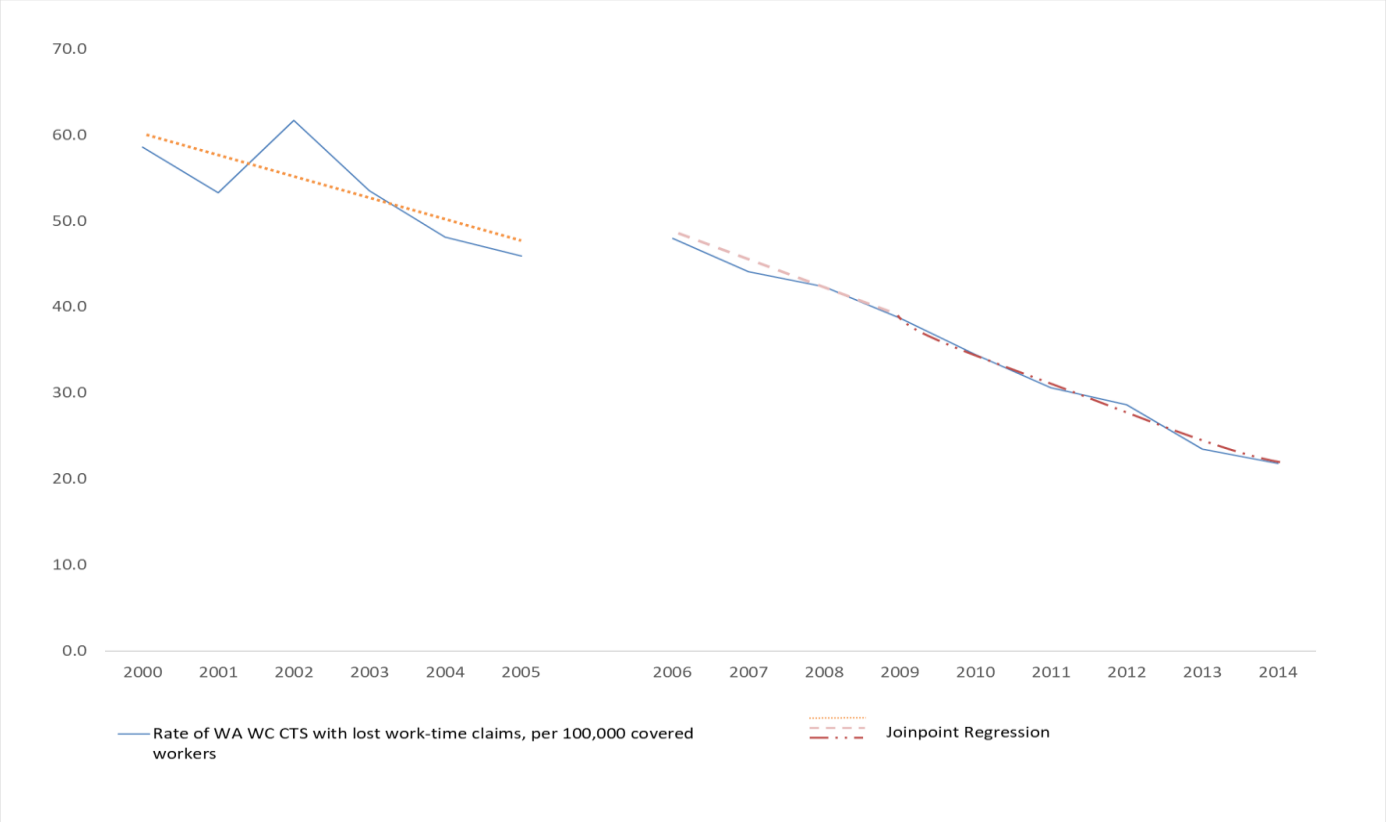
- No trend analysis was conducted for the specific sub-types (Figure OHI.7B). The rate of MSDs of the Back, MSDs of the Neck, Shoulder, and Upper Extremities, and the rate of carpal tunnel syndrome (CTS) all followed the same overall pattern – highs toward the beginning of the time-period, small peaks in 2006, and overall apparent decline through 2014 when the lowest rates were observed.

- Compared to 2002, the rate in 2010 was lower for MSDs of the back by 46%, for MSDs of the neck, shoulder and upper extremities by 26%, and for CTS by 16%. (Cases were coded using OIICS v1.)

- Between 2011 and 2014, MSDs of the back declined by 16%, MSDs of the neck, shoulder, and upper extremities declined by 10%, and CTS declined by 62%. (Cases coded using OIICS v2.)

INDICATOR 8: STATE WORKERS' COMPENSATION CLAIMS FOR CARPAL TUNNEL SYNDROME WITH LOST WORK TIME[x]

Figure OHI.8. Annual incidence rate of carpal tunnel syndrome cases with lost work time filed with state workers' compensation per 100,000 covered workers, Washington State, 2000-2014.



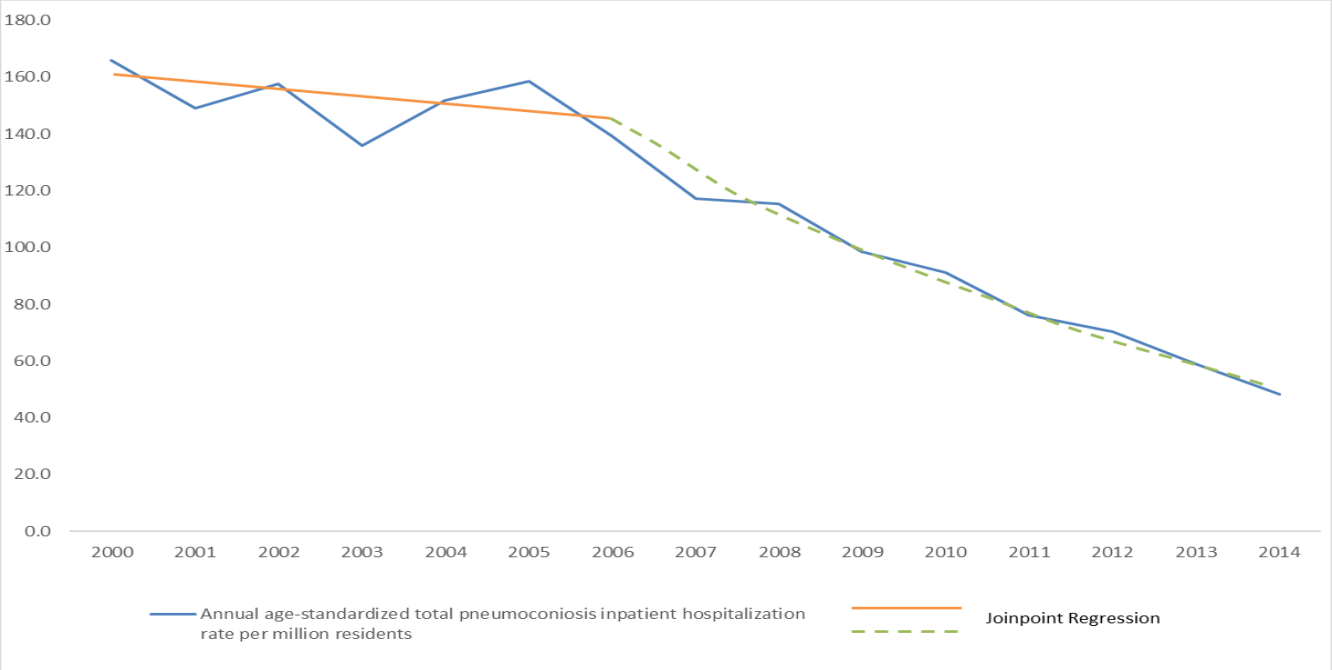
SOURCE: AUTHORS' CALCULATIONS FROM WASHINGTON WORKERS' COMPENSATION DATA.

- Overall, the rate of CTS claims with lost work time[7] decreased from 58.6 per 100,000 covered workers in 2000, to 21.8 per 100,000 covered workers in 2014, with a peak of 61.7 per 100,000 covered workers in 2002 (Figure OHI.8).
- The annual incidence rate of CTS claims with lost work-time filed with WA WC appears to decrease by 4.5% per year from 2000-2005 (95% CI: -9.2, 0.4), and by 6.6% from 2006-2009 (95% CI: -10.8, -2.1) and by 11.1% per year thereafter (95% CI: - 13.4, -8.7).

[7] There was a change in the coding structure used to identify cases during 2005: ANSI Z16.2 codes were used to identify CTS cases in WA until July 2005, and subsequently, cases were identified using OIICS v1.01. The first full year of data using OIICS coding was 2006, so separate trend analyses were conducted for 2000-2005, and 2006-2014.

INDICATOR 9: HOSPITALIZATIONS FROM OR WITH PNEUMOCONIOSIS[xi]

Figure OHI.9. Annual rates of hospitalizations from or with pneumoconiosis per million residents, Washington State, 2000-2014.



SOURCE: AUTHORS' CALCULATIONS FROM WASHINGTON STATE HOSPITAL DISCHARGE DATA AND US CENSUS BUREAU POPULATION ESTIMATES: HTTPS://FACTFINDER.CENSUS.GOV/FACES/NAV/JSF/PAGES/INDEX.XHTML.

- The age-standardized rate of all pneumoconiosis declined in WA from 2000-2014.[8] The rates were highest in 2000 at 165.8 per million residents, and in 2005 at 158.6 per million residents before declining steadily for the rest of the period to a low of 48.1 per million in 2014.

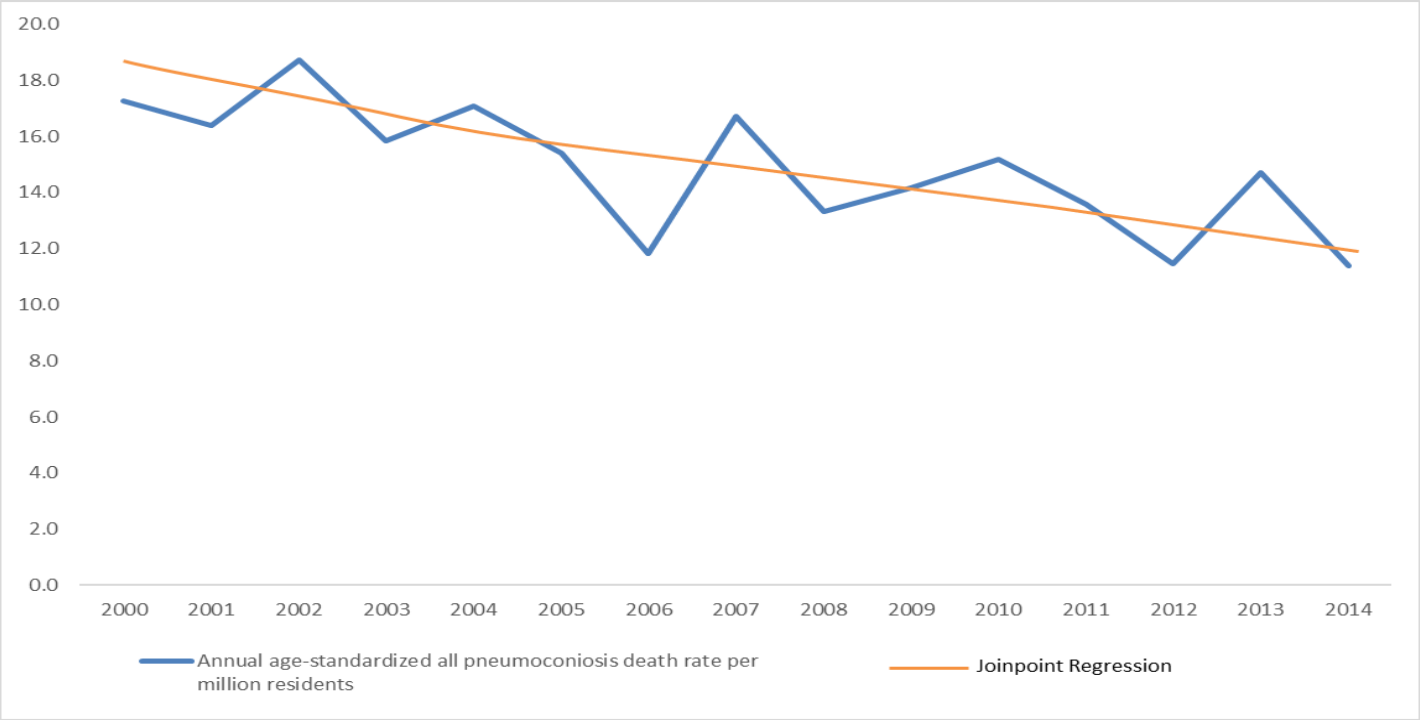
- The age-standardized rate fell substantially from 2008 through 2014, declining by 58% over the six years.

- The age-standardized rate changed little between 2000 and 2006 (annual percent change = -1.7%, 95% CI: -4.6, 1.4). The rate was estimated to decline by 11.9% per year from 2006-2014 (95% CI: -14.0, -9.6).

[8] Indicator 9 tracks hospitalizations from/with pneumoconiosis. Several specific sub-types of pneumoconiosis are included in this indicator (asbestosis, silicosis, and coal workers' pneumoconiosis) but are not analyzed separately in this report. Asbestosis is the most common type of pneumoconiosis in Washington State and the rates (not shown) are very similar to that of "all pneumoconiosis."

INDICATOR 10: MORTALITY FROM OR WITH PNEUMOCONIOSIS[xii]

Figure OHI.10. Annual rates of deaths from or with pneumoconiosis per million residents, Washington State, 2000-2014.



SOURCE: AUTHORS' CALCULATIONS FROM WASHINGTON STATE VITAL STATISTICS DATA AND US CENSUS BUREAU POPULATION ESTIMATES: HTTPS://FACTFINDER.CENSUS.GOV/FACES/NAV/JSF/PAGES/INDEX.XHTML.

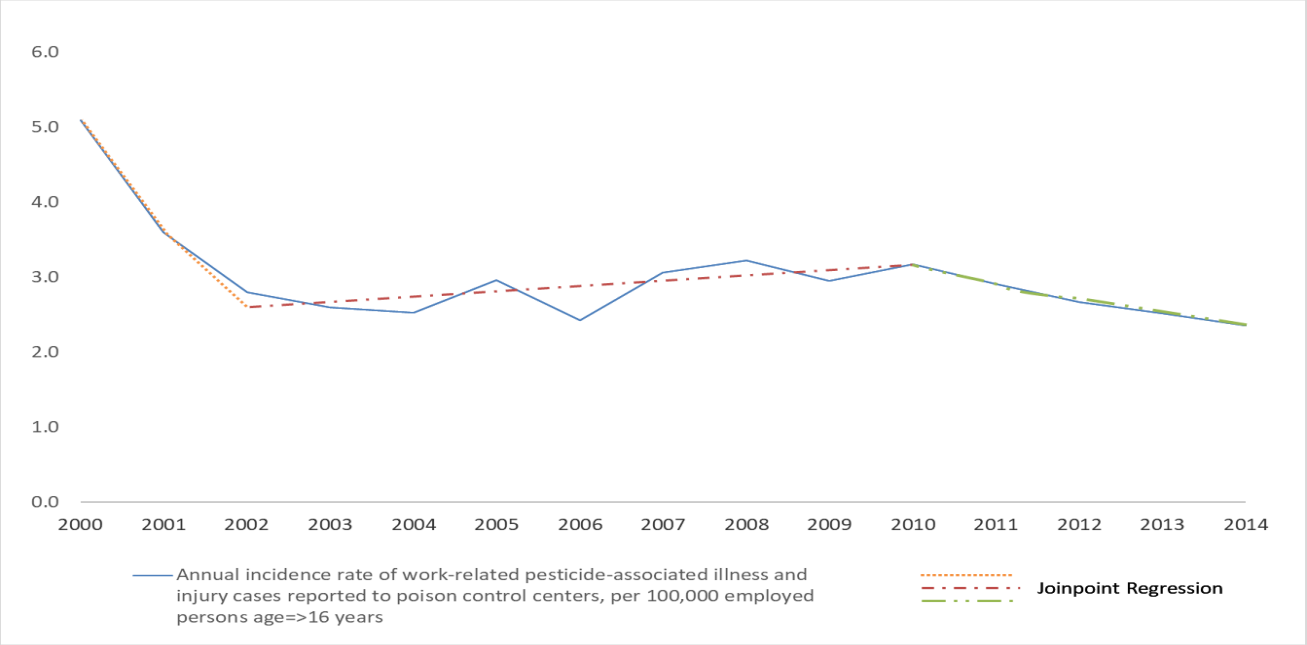
- Age-standardized rates fluctuated between a high of 18.7 cases per million residents in 2002 and a low of 11.4 cases per million residents in 2014.

- Trend analysis was limited to the age-standardized rate of all pneumoconiosis deaths per million residents age 15 and over.[9] Rates of pneumoconiosis deaths were estimated to decline by 2.4% per year (95% CI: - 3.8, -1.1).

[9] Indicator 10 tracks mortality from or with pneumoconiosis. Several specific sub-types of pneumoconiosis are included in this indicator (asbestosis, silicosis, and coal workers' pneumoconiosis), but are not analyzed separately in this report. Asbestosis is the most common type of pneumoconiosis in Washington State and the rates (not shown) are very similar to that of "all pneumoconiosis."

INDICATOR 11: ACUTE WORK-RELATED PESTICIDE-ASSOCIATED ILLNESS & INJURY REPORTED TO POISON CONTROL CENTERS[xiii]

Figure OHI.11. Annual incidence rate of work-related pesticide-associated illness and injury cases per 100,000 employed persons reported to poison control centers, Washington State, 2000-2014.



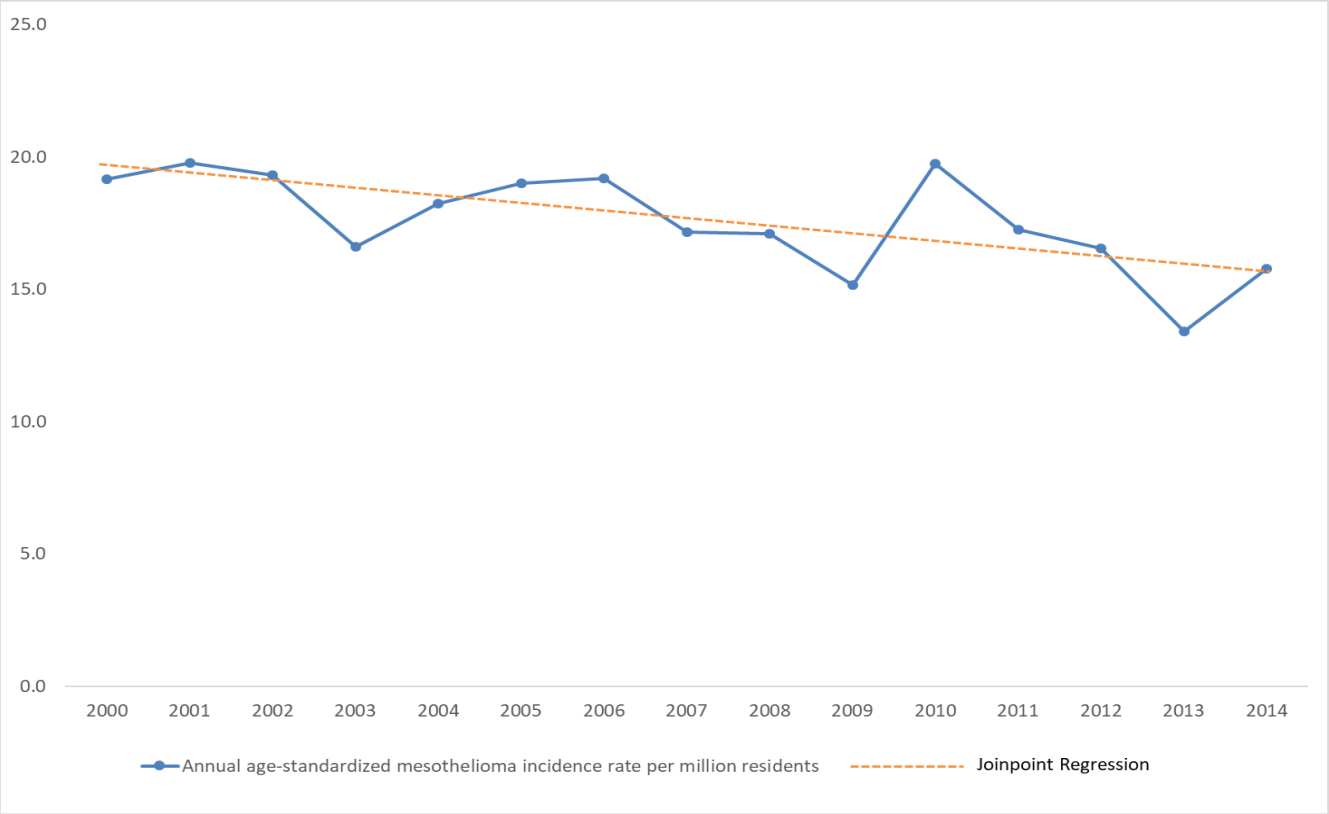
SOURCE: POISON CONTROL CENTER DATA OBTAINED FROM CDC/NIOSH.

- The rate of acute work-related pesticide-associated illness and injury reported to poison control centers in 2000 was substantially higher than subsequent years. From 2000-2002, the rate appears to decline by 28.7% per year (95% CI: - 42.4, -11.7), from 5.1 cases per 100,000 employed in 2000 to 2.8 in 2002.

- Between 2002 and 2010, the rate of acute work-related pesticide associated illness and injury was estimated to increase by 2.5% per year (95% CI: -0.9, 6.0), and between 2010 and 2014 it appears to decrease by 7.2% per year (95% CI: -14.4, 0.6), ending at a rate of 2.4 in 2014.

INDICATOR 12: INCIDENCE OF MALIGNANT MESOTHELIOMA, AGE 15 AND OLDER[xiv]

Figure OHI.12. Annual incidence rate of mesothelioma per million residents, Washington State, 2000-2014.



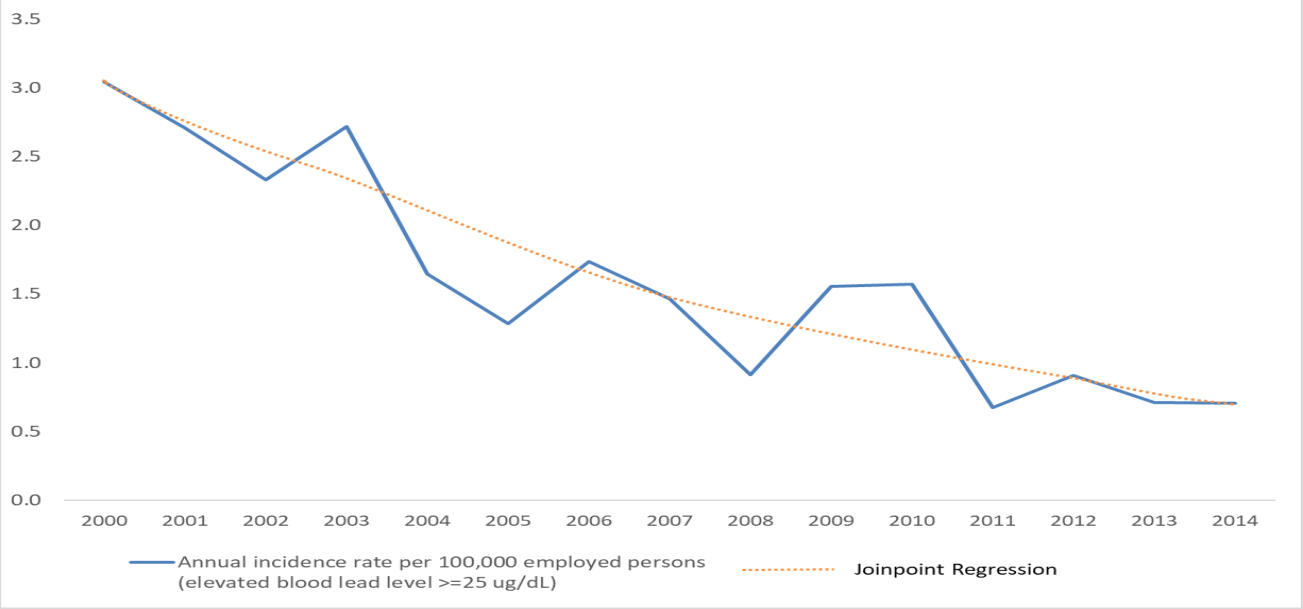
SOURCE: AUTHORS' CALCULATIONS FROM WASHINGTON STATE VITAL STATISTICS DATA AND US CENSUS BUREAU POPULATION ESTIMATES: HTTPS://FACTFINDER.CENSUS.GOV/FACES/NAV/JSF/PAGES/INDEX.XHTML.

- The age-standardized rate of mesothelioma fluctuated over time between 19.1 in 2000 and 15.8 in 2014.

- The age-standardized rate of mesothelioma decreased gradually during 2000-2014, (annual percent change = -1.6, 95% CI: -2.7,-0.5).

INDICATOR 13: ELEVATED BLOOD LEAD LEVELS (BLL) AMONG ADULTS[xv]

Figure OHI.13. Annual incidence rate for elevated blood lead levels per 100,000 employed persons, Washington State, 2000-2014.



SOURCE: AUTHORS' CALCULATIONS FROM WASHINGTON STATE ADULT BLOOD LEAD EPIDEMIOLOGY AND SURVEILLANCE (ABLES) DATA AND CURRENT POPULATION SURVEY ESTIMATES OBTAINED FROM THE BUREAU OF LABOR STATISTICS GEOGRAPHIC PROFILE OF EMPLOYMENT AND UNEMPLOYMENT: HTTPS://WWW.BLS.GOV/OPUB/GEOGRAPHIC-PROFILE/HOME.HTM.

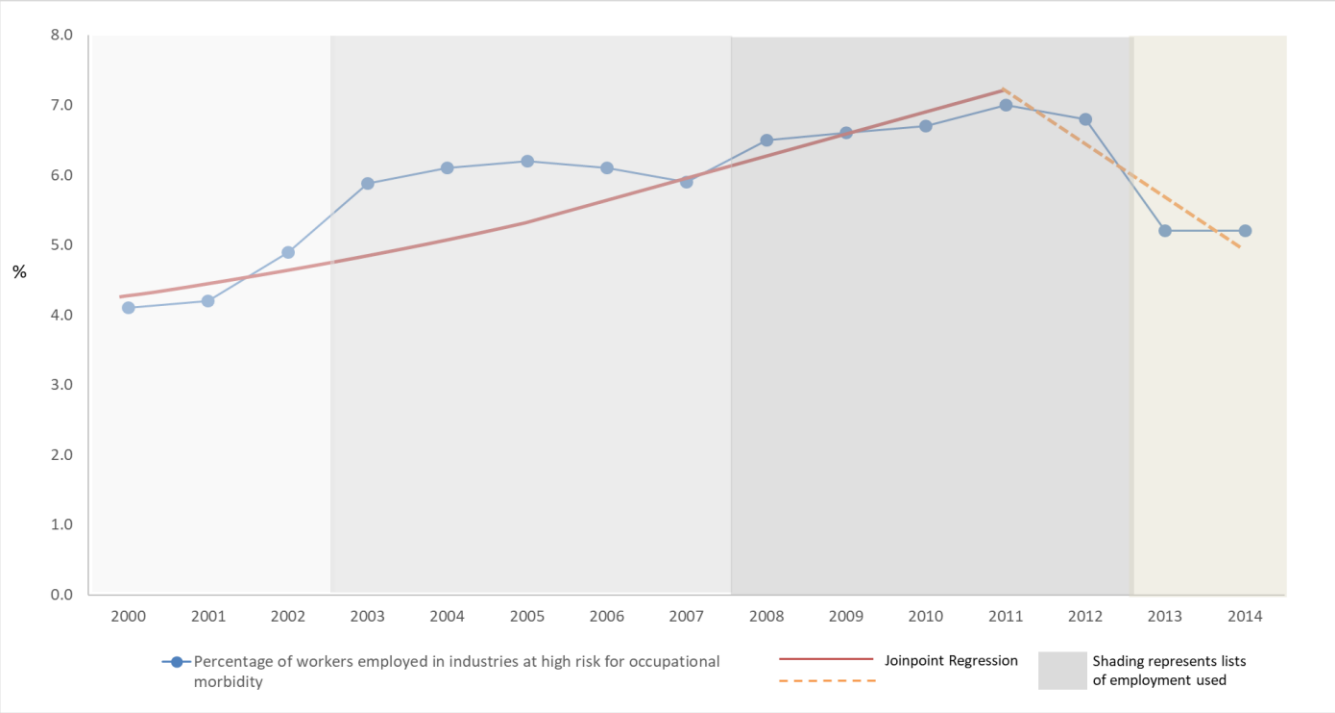
- For persons age 16 years or older with a blood lead level of > 25 µg/dL, the annual incident rate per 100,000 employed persons fell from 3.0 in 2000 to 0.7 in 2014.[10]

- Incidence rates of individuals with blood lead levels >25 µg/dL appears to decrease by an estimated 9.5% per year (95% CI: -12.0, -6.9) between 2000 and 2014.

[10] For persons age 16 years or older with a blood lead level of ≥ 40 µg/d, no trend analysis was conducted due to the small numbers of incident cases per year. No trends were analyzed for additional categories of elevated BLL included in this indicator (≥10 and ≥5 µg/dL), because collection at these levels was not instituted until 2014.

INDICATOR 14: PERCENTAGE OF WORKERS EMPLOYED IN INDUSTRIES AT HIGH RISK FOR OCCUPATIONAL MORBIDITY[xvi]

Figure OHI.14. Percentage of workers employed in industries at high risk for occupational morbidity, Washington State, 2000-2014.



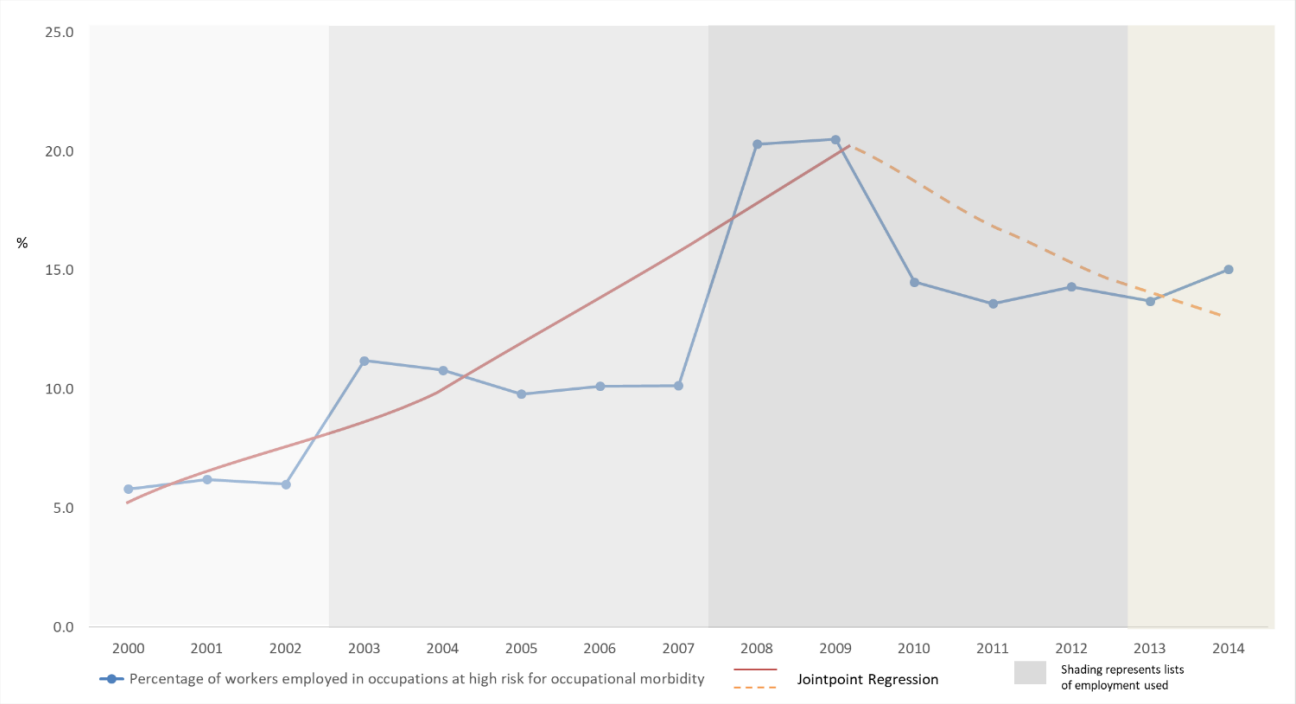
SOURCE: AUTHORS' CALCULATIONS FROM US CENSUS BUREAU COUNTY BUSINESS PATTERNS DATA: HTTPS://FACTFINDER.CENSUS.GOV/FACES/NAV/JSF/PAGES/SEARCHRESULTS.XHTML.

- The percentage of workers employed in these industries ranged from 4.1% in 2000 to 7.0% in 2011, followed by a decrease from 2011-2014.

- Between 2000 and 2011, the percentage of workers employed in industries at high risk for occupational morbidity was estimated to increase (annual percent change= 4.9, 95% CI: 1.8, 8.1). After 2011, the trend changed, and employment in high-risk industries appeared to decrease, but the confidence interval (wide and spanning zero) suggests that the true trend lies within a wide range of possibilities (annual percent change point estimate= -11.2, 95% CI: -28.2, 9.8).
- Note the list of industries included contains many exclusions and represents an undercount of workers at high risk (please see technical notes at the end of this document).

INDICATOR 15: PERCENTAGE OF WORKERS EMPLOYED IN OCCUPATIONS AT HIGH RISK FOR OCCUPATIONAL MORBIDITY[xvii]

Figure OHI.15. Percentage of workers employed in occupations at high risk for occupational morbidity, Washington State, 2000-2014.



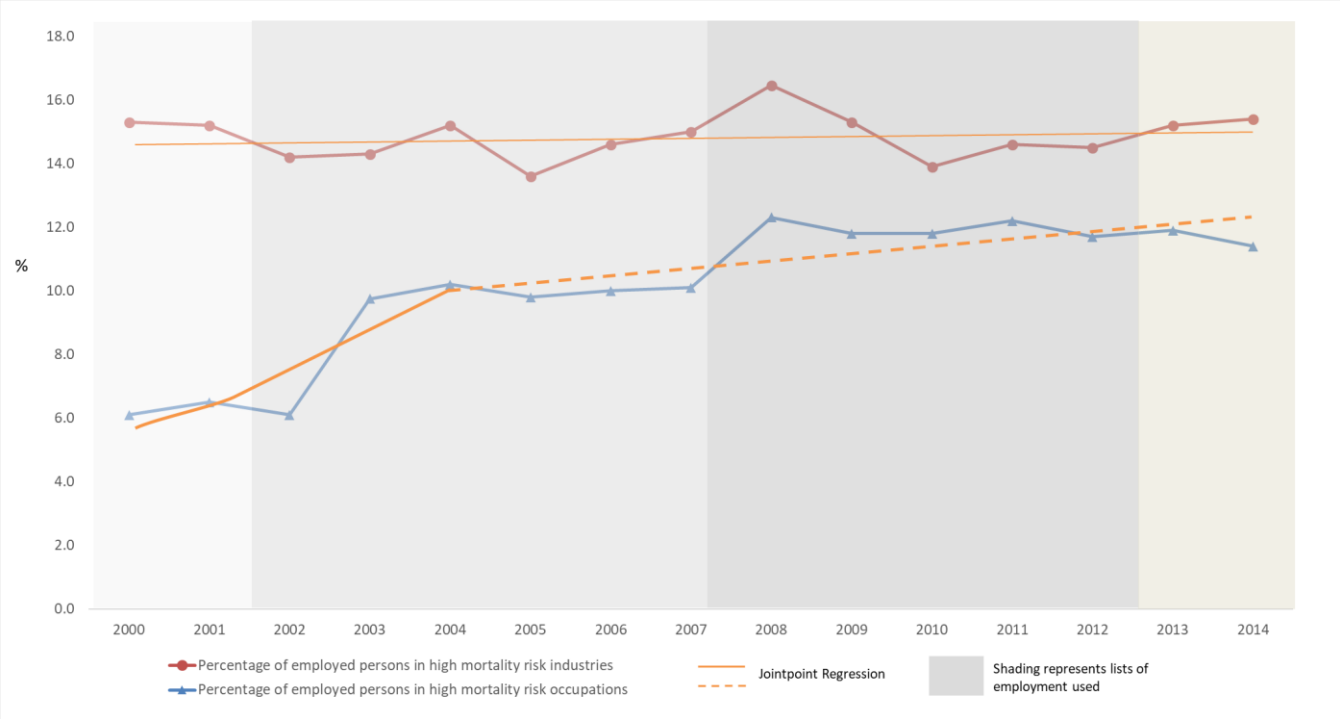
SOURCE: CURRENT POPULATION SURVEY ESTIMATES OBTAINED FROM THE NIOSH EMPLOYED LABOR FORCE (ELF) QUERY SYSTEM: HTTPS://WWWN.CDC.GOV/WISARDS/CPS/.

- Between 2000 and 2009, the percentage of workers employed in occupations at high risk for occupational morbidity increased from 5.8% in 2000 to 20.5% in 2009 (annual percent change = 14.1, 95% CI: 7.6, 20.9). The years 2008-2009 are substantially higher, and it is possible they may not be reflective of the general trend and are exerting undue influence.

- In the last 5 years (2009-2014), the trend changed and remained relatively stable from 2010 through 2014, with around 14% of workers in occupations at high risk for occupational morbidity (annual percent change =-6.9, 95% CI: -18.3, 6.1).

INDICATOR 16: PERCENTAGE OF WORKERS EMPLOYED IN INDUSTRIES AND OCCUPUTIONS AT HIGH RISK FOR OCCUPATIONAL MORTALITY[xviii]

Figure OHI.16. Percentage of workers employed in industries and occupations at high risk for occupational mortality, Washington State, 2000-2014.



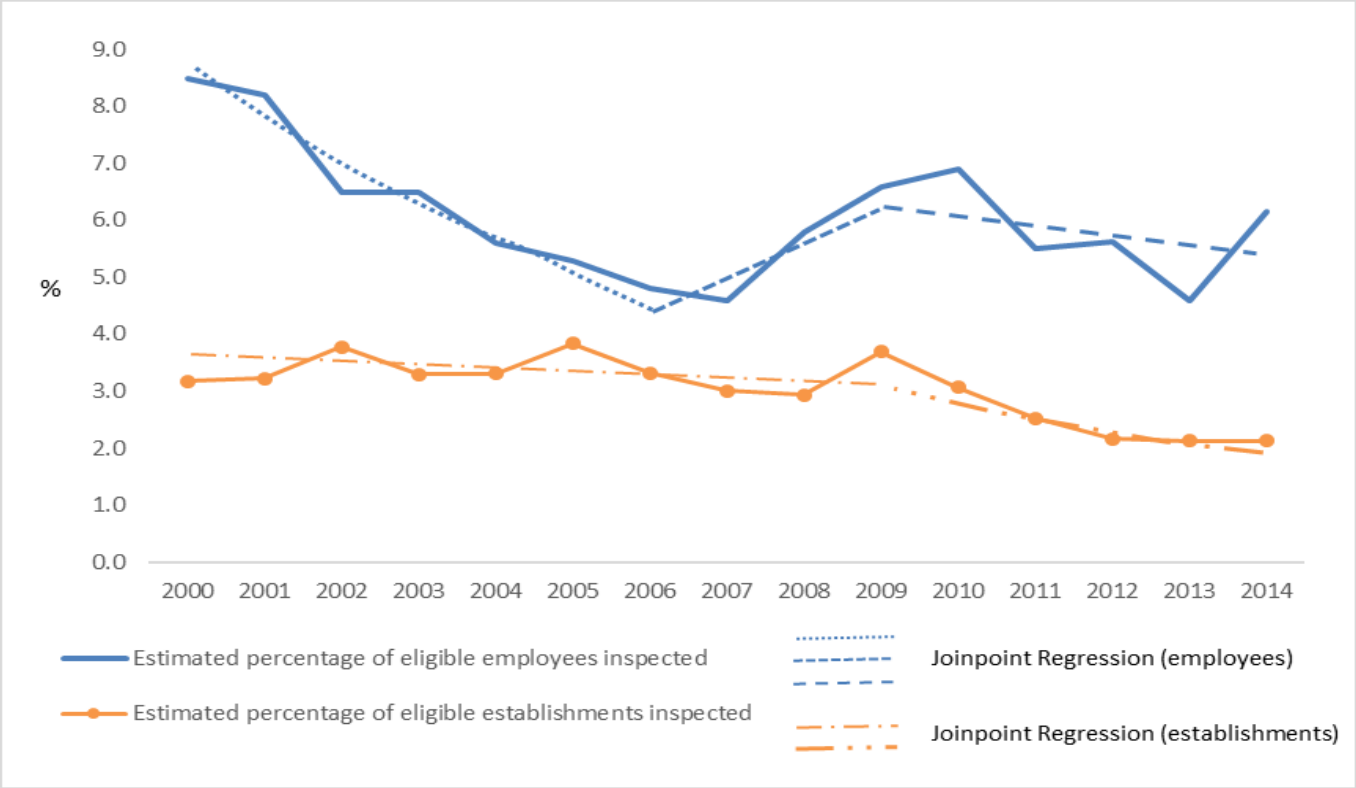
SOURCE: CURRENT POPULATION SURVEY ESTIMATES OBTAINED FROM THE NIOSH EMPLOYED LABOR FORCE (ELF) QUERY SYSTEM: HTTPS://WWWN.CDC.GOV/WISARDS/CPS/.

- The percentage of workers employed in high mortality risk industries remained relatively stable over time, estimated at 15.5% in both 2000 and 2014, and ranged from a low of 13.6% in 2005, to a high of 16.4% three years later in 2008. There was no meaningful change over time (annual percent change =0.2, 95% CI: -0.5, 0.8).

- Trend analysis suggested a significant increase in the percentage of employed persons in high mortality risk occupations between 2000 and 2004, largely driven by the increase from 6.0% in 2002 to 10.0% one year later in 2003 (annual percent change= 15.6, 95% CI: 3.8, 28.9). From 2004 on, the percent of workers in high mortality risk occupations increased slightly (annual percent change=1.9, 95% CI:-0.3, 4.2).

INDICATOR 18: OSHA ENFORCEMENT ACTIVITIES[xix]

Figure OHI.18. Percentage of eligible employees and establishments inspected, Washington State, 2000-2014.



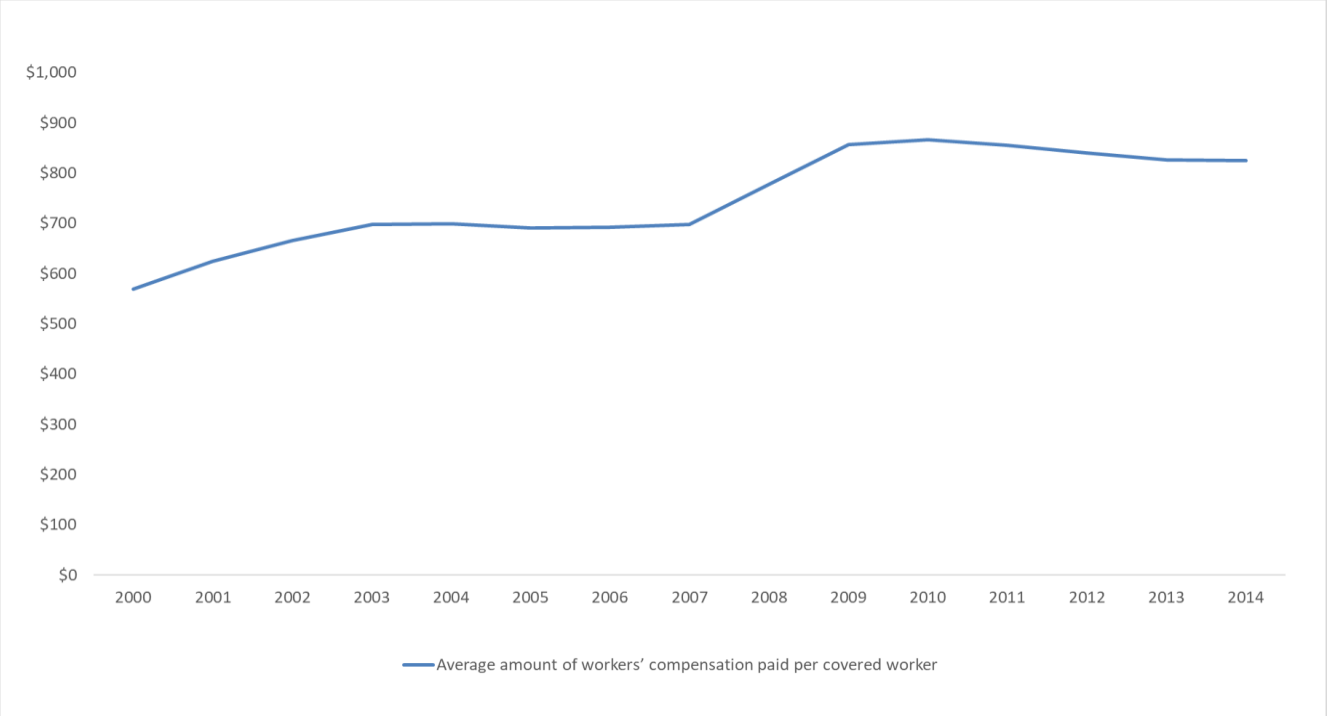
DATA SOURCE: AUTHORS' CALCULATIONS FROM OSHA DATA AND THE QUARTERLY CENSUS OF EMPLOYMENT AND WAGES: HTTPS://WWW.BLS.GOV/CEW/DATA.HTM.

- The percent of eligible ***employees*** who had their workplaces inspected by the Washington State Division of Occupational Safety and Health (DOSH)[11] decreased by nearly half from 8.5% in 2000 to 4.8% in 2006 (annual percent change (APC)=-10.0, 95% CI: -15.1, -4.6), then increased by an estimated 12.2% annually (95% CI: -23.3, 64.1) between 2006 and 2009 .
- The percent of eligible ***establishments*** that were inspected remained steady from 2000-2009 (APC=<1, 95% CI: -2.8, 2.4).
- 2009 marked the beginning of a decline in both the percent of inspected employees (APC = -3.7, 95% CI: -10.8, 4.1) and inspected establishments (APC for establishments = -10.2, 95% CI: -16.2, -3.8). Confidence intervals for the trends for inspections among eligible employees suggest that the true trend may lie somewhere along a wide range of estimates.

[11] Washington State maintains its own OSHA-approved state-plan workplace and health safety program – the Washington State Division of Occupational Safety and Health (DOSH). For additional information, please see the OSHA Washington State-Plan page.

INDICATOR 19: WORKERS' COMPENSATION AWARDS[xx]

Figure OHI.19. Average amount of workers' compensation paid per covered worker, Washington State, 2000-2014.

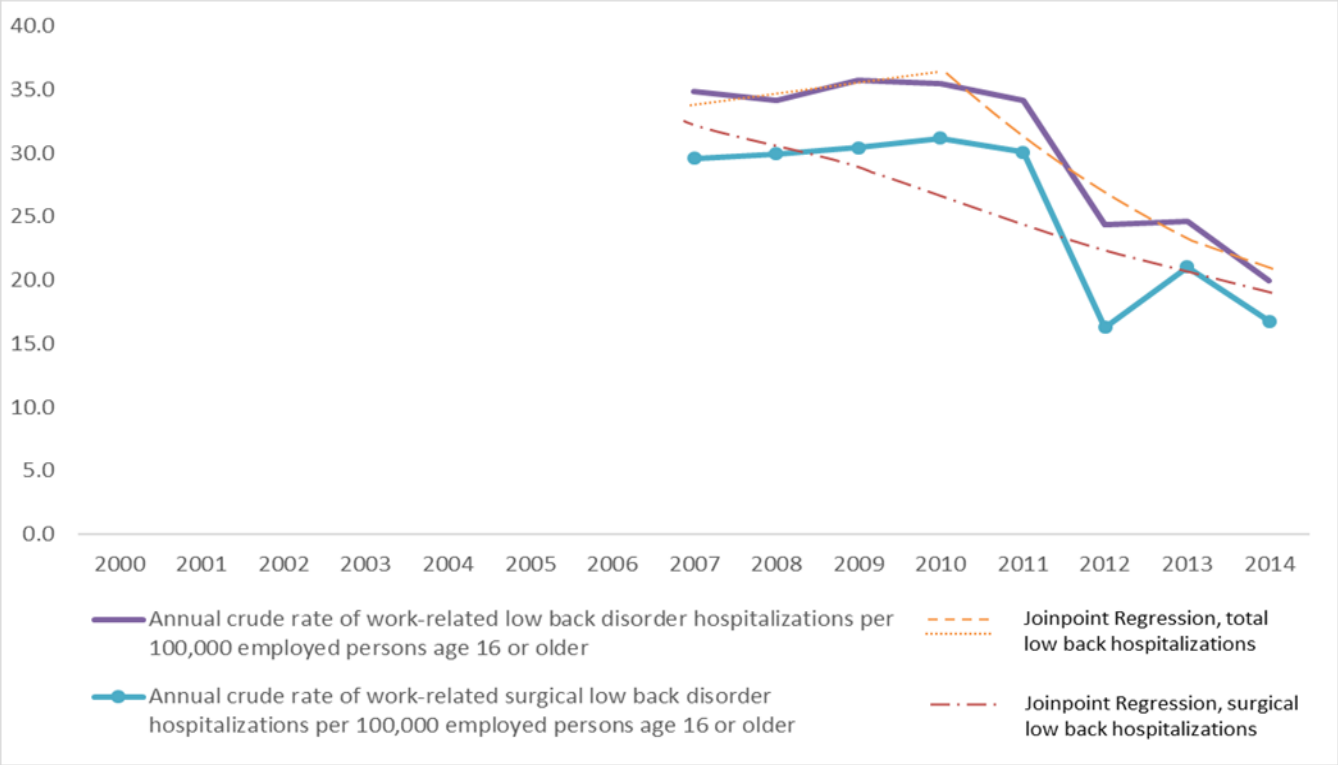


SOURCE: NATIONAL ACADEMY OF SOCIAL INSURANCE, WORKERS' COMPENSATION REPORTS: HTTPS://WWW.NASI.ORG/.

- While the dollar amount of workers' compensation awards per covered worker in Washington State appeared to increase over time, other social and economic factors influence workers' compensation awards, such as total number of claims declining over time, a possible shift toward the filing of claims for more severe injuries, or wage growth and inflation. Please refer to the National Academy of Social Insurance Workers' Compensation Reports for a thorough discussion of workers' compensation costs, benefits, and trends.

INDICATOR 20: WORK-RELATED LOW BACK DISORDER HOSPITALIZATIONS[xxi]

Figure OHI.20. Annual rates of work-related low back disorder hospitalizations per 100,000 employed persons, Washington State, 2007-2014.



SOURCE: AUTHORS' CALCULATIONS FROM WASHINGTON STATE HOSPITAL DISCHARGE DATA AND CURRENT POPULATION SURVEY ESTIMATES OBTAINED FROM THE BUREAU OF LABOR STATISTICS GEOGRAPHIC PROFILE OF EMPLOYMENT AND UNEMPLOYMENT: HTTPS://WWW.BLS.GOV/OPUB/GEOGRAPHIC-PROFILE/HOME.HTM.

- The rate of total low back disorder hospitalizations, first calculated for 2007, was stable between 2007 and 2010, at approximately 35 per 100,000 employed persons (annual percent change = 2%, 95% CI: -13.3, 19.9).
- Between 2011 and 2012, there was a sharp drop in rates from 34.2 per 100,000 employed persons to 24.3. This drop drove the decline in work-related low back disorders between 2010 and 2014, estimated at 13.6% per year (95% CI: -23.4, -2.5).
- The decline between 2011 and 2012 was even more pronounced in the rates of work-related surgical low back disorders, which fell by almost half, from 30.1 to 16.3 per 100,000 employed persons.
- Between 2007 and 2014, the rate of work-related surgical low back disorders was estimated to decline by 7.8% per year (95% CI: -14.0, -1.1).

CONCLUSIONS

Nearly all work-related injury and illness outcomes measured as part of Washington's Occupational Health Indicators decreased between 2000 and 2014. Several indicators experienced pronounced declines in the more recent years of the study period, which also saw a decrease in unemployment, part-time work, and employment in high-risk industries.

The largest declines were observed among employer-reported amputations (during a limited time period) and work-related hospitalizations, while the smallest declines occurred among indicators based on fatality data, namely injury-related fatalities and deaths from pneumoconiosis. No meaningful change was observed over the study period for rates of mesothelioma, a disease with the longest latency period of any of the indicators and which likely results from exposures that occurred decades prior.

While declines in work-related injuries and illness are encouraging, they be temporary. An increase in the percent of workers in occupations at high risk for mortality, and a decrease in the percent of establishments (and workers at establishments) inspected by Washington's state OSHA may challenge the recent gains in occupational safety and health. Additionally, increases in rates of injuries and illnesses were not entirely absent from the study period: work-related pesticide cases reported to poison control centers and workers' compensation claims for amputations increased during the first part of the study period. These conditions may be more sensitive to changes in the economy or other factors that may change course in the near future, potentially reversing the current trend of declining rates. Other indicators experienced large year-over-year changes in rates, and lacked a clear reason for such change. Without knowing why rates are changing, we cannot be certain that current trends will continue.

Differences in methodology, definitions, and covered populations limit comparisons of outcomes, whether across states or across data sources. However, comparisons within a data source may offer insights into possible systemic issues influencing a particular source. Of the three employer-reported indicators, two (MSDs and DAFW) showed similar annual percent change estimates of approximately -4%. Employer-reported SOII data may reflect a broader shift away from DAFW cases as more employers accommodate job restrictions, and instead classify those cases as injuries or illnesses involving job transfer or restrictions (DJTR). Of the four indicators based on hospital discharge data, three saw substantial decreases in rates in recent years. Work-related hospitalizations, both total and for low back injuries had nearly identical decreases over a similar time period of almost -14% annually, while hospitalizations involving pneumoconiosis saw a similar decline of -11.5% annually. A portion of the decline in work-related hospitalization rates may be attributable to a change away from in-patient admissions in favor of outpatient visits or stays classified as observations, driven perhaps by new treatment options or billing incentives.

Not all indicators demonstrated the same pattern within a particular data source. Compared with other hospital discharge-based indicators, hospitalized burns experienced a more moderate decline of -3.5% annually. The case number and rate of hospitalized burns are continually among the lowest of any indicator, perhaps suggesting that additional improvement in this indicator will be increasingly difficult to achieve. Employer-reported amputations, another condition less common than other indicator outcomes and one with rates that varied widely across years, experienced an estimated decline that was four times greater than other indicators based on employer-reported data. Finally, the two indicators based on workers' compensation claims data – amputations and carpal tunnel syndrome – experienced dissimilar decreases, with declines in carpal tunnel syndrome up to three times greater than the decline in amputations. The diverse estimates offer little additional insight into workers' compensation claims data, which has seen declines in recent years in both rates of time loss claims and MSD claims. Occupational injury and illness rates are likely the combined effects of economic and social factors, data source dynamics, and efforts to improve workplace health and safety. Quantifying each factor's impact on occupational injury and illness rates will improve our understanding of the overall health and safety of Washington's workplaces.

Generally, the current trends in Washington's Occupational Health Indicators are encouraging, but continued progress toward eliminating workplace injuries and illnesses will be achieved by gaining a better understanding of why many rates are declining, a continued emphasis on preventing work-related fatalities and conditions involving long latencies, and designing safety training and injury prevention efforts appropriate for an aging workforce, and a racially and ethnically diverse workforce.

Finally, as the product of a multi-state collaboration, the indicators reflect national priorities, and some – like those that estimate the number of workers in high risk industries and occupations – rely on national data. Washington should continue explore ways to identify and monitor occupational issues that are priorities for the state and local communities. Using state-specific metrics to identify high-risk workers, applying the Prevention Index to identify priority conditions, and utilizing state data, like Fatality Assessment and Control Evaluation (FACE) program data can build a more complete picture of occupational health and safety in Washington.

DATA SOURCES & TECHNICAL NOTES

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i JOINPOINT REGRESSION PROGRAM, VERSION 4.7.0.0, FEBRUARY 2019. Statistical Research and Applications Branch, National Cancer Institute. Kim HJ, Fay MP, Feuer EJ, Midthune DN. Permutation tests for joinpoint regression with applications to cancer rates. Stat Med 2000;19:335-51 (correction: 2001;20:655).

ii EMPLOYMENT DEMOGRAPHIC PROFILES. Numerator data come from the Geographic Profile of Employment and Unemployment from the Bureau of Labor Statistics. Denominator: employed population 16 years or older for the same calendar year. For additional information on Washington State labor trends, please consult the Bureau of Labor Statistics, or the Washington State Employment Security Department.

iii INDICATOR 1: NONFATAL WORK-RELATED INJURIES & ILLNESSES REPORTED BY EMPLOYERS. Numerator data are from the Bureau of Labor Statistics (BLS) Survey of Occupational Injuries and Illnesses (SOII). Denominator: estimated total full-time equivalent workers (FTEs) worked for the same calendar year. Differences in industry concentration and sample size prohibit state-level data from being directly compared to other states or with national estimates.

iv INDICATOR 2: WORK-RELATED HOSPITALIZATIONS. Numerator data are Washington State inpatient hospital discharges. Denominator: employed persons age 16 years or older for the same calendar year. Attribution to work and documentation of work-relatedness may vary by provider, prohibiting state-level data from being directly compared to other states or with national estimates. Workers' compensation eligibility criteria and availability of data from workers' compensation programs varies among states, prohibiting state-level data from being directly compared to other states or with national estimates.

v INDICATOR 3: FATAL WORK-RELATED INJURIES. Numerator data from the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries. Denominator: Total hours worked by all employees. Starting with 2007 data, the denominator was changed to be Full-Time Equivalent workers (FTEs) to be consistent with what is currently used by the Bureau of Labor Statistics (BLS) to calculate fatality rates (hours based). As such, the rates are not directly comparable to each other. "The BLS uses a different methodology to calculate fatal work-related injury rates from what CSTE presents here. As a result, rates calculated using this indicator methodology may differ from the BLS published rates. For more information regarding the BLS methodology please visit the BLS website" (OHI How-To Guide). Certain states, including WA, have a Fatality Assessment and Control

Evaluation (FACE) Program (numbers/rates may differ due to different methodology) which publish in-depth reports on fatalities in the state, and may provide additional information.

[vi] INDICATOR 4: WORK-RELATED AMPUTATIONS WITH DAYS AWAY FROM WORK REPORTED BY EMPLOYERS. Numerator data comes from the estimated annual number of work-related amputation cases with days away from work from the Bureau of Labor Statistics (BLS) Survey of Occupational Injuries and Illnesses (SOII). The denominator is the estimated total full-time equivalents (FTEs) worked for the same calendar year. Difference in industry concentration and sample size prohibit state-level data from being directly compared to other states or with national estimates. "Information about the original OIICS coding structure as well as the new OIICS 2.01 coding structure is available here. A summary of these changes can be found here and includes information about the changes made to the Nature codes involving amputations, avulsions, and enucleations. For OHI 4, this change requires the use of 'Amputations code 1311XX' for data from 2011 and forward, while 'Amputations code 031XXX' was used for 2010 and previous calculations. Due to the extensive revisions, BLS cautions users against directly comparing Event, Source, Secondary Source, Part, and Nature case characteristics codes from 1992-2010 to data from 2011 onward" (OHI How-to Guide).

[vii] INDICATOR 5: STATE WORKERS' COMPENSATION CLAIMS FOR AMPUTATIONS WITH LOST WORK-TIME. Numerator data are the amputations with lost work-time claims filed with the WA workers' compensation system. Denominator is the estimated number of workers covered by the state workers' compensation system for the same calendar year. Workers' compensation eligibility criteria and availability of data from workers' compensation programs varies among states, prohibiting state-level data from being directly compared to other states or with national estimates.

[viii] INDICATOR 6: HOSPITALIZATIONS FOR WORK-RELATED BURNS. Numerator data are Washington State inpatient hospital discharges, with primary diagnoses of burn injury (ICD-9-CM codes 940-949) and with primary payer coded as workers' compensation. Denominator: employed persons age 16 years or older for the same calendar year. Attribution to work and documentation of work-relatedness may vary by provider, and workers' compensation eligibility criteria and availability of data from workers' compensation programs varies among states, prohibiting state-level data from being directly compared to other states or with national estimates.

[ix] INDICATOR 7: WORK-RELATED MUSCULOSKELETAL DISORDERS WITH DAYS AWAY FROM WORK REPORTED BY EMPLOYERS. Numerator data are from the BLS SOII, estimated cases of musculoskeletal disorders (MSDs) involving days away from work. Denominator data is the estimated full-time equivalents (FTEs) worked for the same calendar year. Data are available on the BLS website. "The definition of musculoskeletal

disorders (MSDs) involving days away from work used by BLS has changed over time. An early definition included all cases of overexertion and repetitive motion (OIICS event codes 220-239). The definition used from 2000 – 2010 added nature codes as well as an additional event code. In 2011, BLS adopted a new version of the Occupational Injury and Illness Classification System (OIICS v. 2.01) which affected the numbering and hierarchical ordering of codes and resulted in another modification to the MSD definition (see table below). Because of this change in the MSD definition, BLS suggests that estimates for MSD case counts and rates for 2011 should not be compared with prior years (e.g. BLS has designated a 'break in series' starting with the 2011 data). However, data users may decide that the MSD definitions (listed in the table referenced below) are similar enough for analyzing trends in counts and/or rates over time (e.g. 2000 – 2011). For more detailed descriptions of the Nature and Event codes… refer to the OIICS 1.01 coding structure and the new 2.01 version" (OHI How-to Guide). Additionally, starting in 2003, Nature and Body Part Tables displayed MSD cases by ownership (private industry, local government, state government) in states where the BLS SOII covers these workers; however, this indicator is limited to private industry employees. Differences in industry concentration and sample size prohibit state-level data from being directly compared to other states or with national estimates.

[x] INDICATOR 8: STATE WORKERS' COMPENSATION CLAIMS FOR CARPAL TUNNEL SYNDROME WITH LOST WORK-TIME. Data are the annual number of carpal tunnel syndrome (CTS) cases with lost work-time filed with the WA workers' compensation system. Denominator is the estimated number of workers covered by the state workers' compensation system for the same calendar year. Difference in industry concentration and sample size prohibit state-level data from being directly compared to other states or with national estimates. An additional caveat for this indicator is that the coding system used to identify these cases from the WA WC system was changed twice over the time period. Originally, the CTS cases were identified using the American National Standards Institute (ANSI) Z.16.2 coding system, which was used until July 1, 2005. Subsequently, CTS cases were identified using the Occupational Injury and Illness Classification System (OIICS) 1.01 developed by the Bureau of Labor Statistics. While the BLS updated their coding once more, to OIICS 2.01, cases in WA WC are still identified with v1.01 codes, so these data may not be directly comparable to data from other states using the newer coding system. Information about the original OIICS coding structure as well as the new OIICS 2.01 coding structure is available here.

Workers' compensation eligibility criteria and availability of data from workers' compensation programs varies among states, prohibiting state-level data from being directly compared to other states or with national estimates.

[xi] INDICATOR 9: HOSPITALIZATIONS FROM OR WITH PNEUMOCONIOSIS. Data are Washington State inpatient hospital discharges, with a primary or contributing diagnosis of ICD-9-CM codes 500-505 "total pneumoconiosis" (Asbestosis cases are those with a primary or contributing diagnosis of ICD-9 501 "Asbestosis"). Denominator data comes from the US Census estimates – midyear resident population age 15 years or older for the same calendar year. Age-adjustment uses the U.S. 2000 Standard population. Workers' compensation eligibility criteria and availability of data from workers' compensation programs varies among states, prohibiting state-level data from being directly compared to other states or with national estimates.

[xii] INDICATOR 10: MORTALITY FROM OR WITH PNEUMOCONIOSIS. Data are the annual number of deaths in Washington State with a primary or contributing diagnosis of ICD-9-CM codes 500-505 "total pneumoconiosis" (Asbestosis cases are those with a primary or contributing diagnosis of ICD-9 501 "Asbestosis"). Denominator data comes from the US Census estimates – midyear resident population age 15 years or older for the same calendar year. Age-adjustment uses the U.S. 2000 Standard population.

[xiii] INDICATOR 11: ACUTE WORK-RELATED PESTICIDE-ASSOCIATED INJURIES AND ILLNESSES REPORTED TO POISON CONTROL CENTERS. The data are the reported cases of work-related pesticide poisoning. These data have been provided to the states from NIOSH for this indicator. Availability of poison center data varies by state.

[xiv] INDICATOR 12: INCIDENCE OF MALIGNANT MESOTHELIOMA, AGES 15 AND OLDER. The data are incident cases with mesothelioma, obtained annually by agreement with the Washington State Department of Health Cancer Registry. Denominator data comes from the US Census estimates – midyear resident population age 15 years or older for the same calendar year. Age-adjustment uses the U.S. 2000 Standard population.

[xv] INDICATOR 13: ELEVATED BLOOD LEAD LEVELS AMONG ADULTS. Numerator data are from the Washington State Adult Blood Lead Epidemiology Surveillance (ABLES) program, cases from all reported state residents age 16 years or older, with elevated blood levels (≥5, 10, 25, or 40µg/dL (micrograms per deciliter)). Denominator data are the employed population age 16 years or older for the same calendar year.

[xvi] INDICATOR 14: PERCENTAGE OF WORKERS EMPLOYED IN INDUSTRIES AT HIGH RISK FOR OCCUPATIONAL MORBIDITY. The industries at high risk for morbidity are identified based on reported injury and illness rates (from the BLS SOII, using North American Industrial Classification System (NAICS) industry coding), and the numerator and denominator data are the number of employed workers, 16 years or older, from the U.S. Census Bureau County Business Patterns (CBP). The list of included industries is reassessed and changed periodically (generally every 5 years): 2000-2002 (based on 2000 data), 2003-2007 (based on 2003 data), 2008-2012 (based on 2008 data), 2013-2018 (based on 2013 data). The list of included industries can be

found on the CSTE OHI website. The list is based on national rates, which may not reflect state priorities; and it excludes many industries (e.g. farms) which may have high rates but for which data is not available using these sources. Thus, it is an undercount of high morbidity risk workers/industries (not an exclusive list) and should be interpreted with caution.

"Limitations pertaining to how the list of "high risk" industries were conceived: The SOII is a function of BLS using a probability sample and not a census of all employers. It is based on injury and illness data maintained by employers and is subject to sampling error. Excluded from the survey are the military, self-employed individuals, farms with fewer than 11 employees, and Federal agencies. In some states, the survey does not cover the state and municipal employees. Therefore, the recommended measures of frequency are limited to private sector workforce only. Some states do not participate in the Federal-State survey, and in some participating states, the sample sizes are insufficient to generate State-specific estimates. Numbers and rates may not be published/released by BLS due to the reliability of the estimates. Employers vary with respect to how much they may reduce their potential reporting burden by placing affected workers on restricted work activity, thereby avoiding the reporting of lost workday cases (which require reporting of additional details). In addition, the SOII only collects data for the incident year, and does not capture lost work-time that may carry over to a new calendar year. For example, a debilitating injury that occurs on the last day of the calendar year will have no lost work-time associated with it in the SOII. The CBP is based on mid-March payrolls of all employers in the United States, but does not cover farms, public administration, or the self-employed. Exact employment counts for a particular NAICS may not be provided within a State because of confidentiality issues.

Further limitations pertaining specifically to the estimated proportion of workers employed in high-risk industries: Although this list of high-risk industries for this indicator derives from injury rates reported in the BLS SOII survey, the estimate for the number of workers in any given state employed in a high-risk industry comes from the CDC Employed Labor Force (ELF) query system. The ELF system in turn is based on a subset of Community Population Survey (CPS) data. CPS is a weekly household survey conducted with a multistage cluster sampling design. As such, it has potential for sampling error. CPS could over– or under-estimate the number of workers in any given industry and estimates of fewer than 1,000 individuals are deemed unstable by BLS. Furthermore, due to differences in the way population controls are applied to estimates in the ELF system and in other BLS reports, certain employment estimates obtained through ELF may differ slightly from values reported directly by BLS. Finally, it is worth noting that values obtained using CPS-based data represent average number of workers in any given category and year, based on surveys conducted throughout the year" (OHI How-to-Guide, 2019).

[xvii] INDICATOR 15: PERCENTAGE OF WORKERS EMPLOYED IN OCCUPATIONS AT HIGH RISK FOR OCCUPATIONAL MORBIDITY. The occupations at high risk for morbidity are identified based on reported injury and illness rates (from the BLS SOII), and the numerator and denominator data are the number and percentage of employed persons (in the identified occupations) from the Current Population Survey (CPS) which uses Bureau of Census Occupation codes (BOC) (currently 2010 BOC). Currently, these are gathered using the NIOSH Employed Labor Force (ELF) web-based query system. For information on historical data gathering for this (or other indicators), please contact SHARP or CSTE. The list of included industries is reassessed and changed periodically (generally every 5 years): 2000-2002 (based on 2000 data), 2003-2007 (based on 2003 data), 2008-2012 (based on 2008 data), 2013-2018 (based on 2013 data). The list of included industries can be found on the CSTE OHI website.

"**Limitations pertaining to how the list of "high risk" occupations was conceived:** The BLS annual Survey of Occupational Injuries and Illnesses (SOII) is based on injury and illness data maintained by employers and is subject to sampling error, a function of BLS using a probability sample and not a census of all employers. Excluded from the survey are the military, self-employed individuals, farms with fewer than 11 employees, and Federal agencies. The CPS can be used to estimate the private sector employment in the US, excluding the self-employed, but may not match perfectly those workers covered in the SOII.

Further limitations pertaining specifically to the estimated proportion of workers employed in high-risk occupations: Although this list of high-risk occupations for this indicator derives from injury rates reported in the BLS SOII survey, the estimate for the number of workers in any given state employed in a high-risk industry comes from the CDC Employed Labor Force (ELF) query system. The ELF system in turn is based on a subset of Community Population Survey (CPS) data. CPS is a weekly household survey conducted with a multistage cluster sampling design. As such, it has potential for sampling error. CPS could over– or under-estimate the number of workers in any given occupation and estimates of fewer than 1,000 individuals are deemed unstable by BLS. Furthermore, due to differences in the way population controls are applied to estimates in the ELF system and in other BLS reports, certain employment estimates obtained through ELF may differ slightly from values reported directly by BLS. Finally, it is worth noting that values obtained using CPS-based data represent average number of workers in any given category and year, based on surveys conducted throughout the year" (OHI How-to-Guide, 2019).

[xviii] INDICATOR 16: PERCENTAGE OF WORKERS EMPLOYED IN INDUSTRIES AND OCCUPATIONS AT HIGH RISK FOR OCCUPATIONAL MORTALITY. The high mortality risk industries and occupations are identified based on the BLS Census of Fatal Occupational Injuries (CFOI) for private sector workers 16 years of age and older, with fatality rates more than twice as high as the overall rate. The numerator and denominator

data are the number and percentage of employed persons (in the identified occupations) from the Current Population Survey (CPS), which uses Bureau of Census Industry and Occupation codes (currently 2010). Currently, these are gathered using the NIOSH Employed Labor Force (ELF) web-based query system. For information on historical data gathering for this (or other indicators), please contact SHARP or CSTE. The list of included industries is reassessed and changed periodically (generally every 5 years): 2000-2002 (based on 2000 data), 2003-2007 (based on 2003 data), 2008-2012 (based on 2008 data), 2013-2018 (based on 2013 data). The list of included industries can be found on the CSTE OHI website.

"**Limitations pertaining to how the list of "high risk" industries and occupations was conceived:** The CFOI program counts suicides at work as work-related fatalities, even when the cause of death may not be due to factors at work. CFOI does not count military deaths. To be consistent with Indicators #14 and #15, this indicator has been limited to private sector workers. Although, unlike Indicators #14 and #15, the self-employed are included.

Further limitations pertaining specifically to the estimated proportion of workers employed in high-risk industries and occupations: Although this list of high-risk industries and occupations for this indicator derives from fatality rates reported in the BLS CFOI survey, the estimate for the number of workers in any given state employed in a high-risk industry comes from the CDC Employed Labor Force (ELF) query system. The ELF system in turn is based on a subset of Community Population Survey (CPS) data. CPS is a weekly household survey conducted with a multistage cluster sampling design. As such, it has potential for sampling error. CPS could over– or under-estimate the number of workers in any given occupation, and estimates of fewer than 1,000 individuals are deemed unstable by BLS. Furthermore, due to differences in the way population controls are applied to estimates in the ELF system and in other BLS reports, certain employment estimates obtained through ELF may differ slightly from values reported directly by BLS. Finally, it is worth noting that values obtained using CPS-based data represent average number of workers in any given category and year, based on surveys conducted throughout the year" (OHI How-to-Guide, 2019).

[xix] INDICATOR 18: OSHA ENFORCEMENT ACTIVITIES. OSHA activity data are distributed to the states by NIOSH every year, prior to the annual submission date or may be obtained from federal or regional OSHA office inspection reports. Denominator data (eligible establishments, employment, exclusions) is obtained from the BLS Quarterly Census of Employment and Wages (QCEW). Enforcement activity may be either 1) targeted to high-hazard industries and employers with the highest injury and illness rates, or 2) triggered by: a fatality, hospitalization of a worker, work-related amputation, an injury resulting in the loss of an eye, a worker complaint, or a referral from an outside source. This indicator only measures enforcement activity (not other OSHA activities such as education, or compliance assistance). The percentage of eligible establishments

inspected may be slightly overestimated, and the number of covered workers overcounted, because OSHA may conduct multiple inspections of the same worksite in a year. Additionally, federal OSHA states and state plan states have varying rules on whether they inspect farms with ≤10 employees, and agricultural establishments are excluded from the denominator in all but a few states, so the percentages of establishments/employees may be overestimated in states that do inspect small farms.

[xx] INDICATOR 19: WORKERS' COMPENSATION AWARDS. Data are from the National Academy of Social Insurance (NASI). Please refer to the NASI Workers' Compensation reports for more in-depth data on workers' compensation and differences by state. Workers' compensation eligibility criteria and availability of data from workers' compensation programs varies among states, prohibiting state-level data from being directly compared to other states or with national estimates.

[xxi] INDICATOR 20: WORK-RELATED LOW-BACK DISORDER HOSPITALIZATIONS. Numerator data are the annual number of work-related low back disorder hospitalizations (all; and surgical only) for employed persons age 16 years or older, identified from inpatient hospital discharge data with the primary payer coded as workers' compensation. The denominator is from the BLS Current Population Survey (CPS). Attribution to work and documentation of work-relatedness may vary by provider, prohibiting state-level data from being directly compared to other states or with national estimates. Workers' compensation eligibility criteria and availability of data from workers' compensation programs varies among states, prohibiting state-level data from being directly compared to other states or with national estimates.