

**Oklahoma Occupational Safety and Health Surveillance Program  
Final Progress Report  
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## **List of Terms and Abbreviations**

**CFOI**—Census of Fatal Occupational Injuries

**CSTE**—Council of State and Territorial Epidemiologists

**IPS**—Injury Prevention Service

**NIOSH**—National Institute for Occupational Safety and Health

**OSDH**—Oklahoma State Department of Health

**OSHA**—Occupational Safety and Health Administration

**U.S.**—United States

## Abstract

Title: Oklahoma Occupational Safety and Health Surveillance Program

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The Oklahoma State Department of Health (OSDH), Injury Prevention Service (IPS) conducted a project to establish a fundamental surveillance system to collect data on occupational hazards, diseases, injuries, and deaths in Oklahoma. Occupational injuries are a significant public health problem in the United States (U.S.) and in Oklahoma. Surveillance data from the national Census of Fatal Occupational Injuries (CFOI) indicate that in the U.S. almost 5,000 persons die each year from occupational injuries. In Oklahoma, over 100 occupational injury deaths are reported annually. Transportation incidents account for the highest number of deaths followed by agriculture-related deaths. Overall, men account for more than 90% of deaths. Injuries occur most commonly among workers 35-54 years of age.

For this project, data were collected on 13 health conditions and 6 health condition determinants. These data were collected and analyzed to determine the magnitude and trends of occupational indicators and to develop, implement, and evaluate occupational injury and illness prevention programs in Oklahoma. Indicator data for 2003-2008 were collected using the standardized methods specified in *Occupational Health Indicators: A Guide for Tracking Occupational Health Conditions and Their Determinants*. These guidelines were compiled by the Council of State and Territorial Epidemiologists (CSTE) in collaboration with the National Institute for Occupational Safety and Health (NIOSH). The 19 health conditions and their determinants include: nonfatal work-related injuries and illnesses reported by employers, work-related hospitalizations, work-related amputations with days away from work reported by employers, amputations filed with the state workers' compensation system, work-related musculoskeletal disorders with days away from work reported by employers, carpal tunnel syndrome cases filed with the state workers' compensation system, hospitalizations from or with pneumoconiosis, mortality from or with pneumoconiosis, acute work-related pesticide-associated illness and injury reported to poison control centers, incidence of malignant mesothelioma, elevated blood lead levels, workers employed in high risk industries and occupations, occupational safety and health professionals, Occupational Safety and Health Administration (OSHA) enforcement activities, and workers' compensation awards. Data were collected from existing data sources, including Oklahoma Vital Statistics, the Oklahoma hospital discharge database, Oklahoma Workers' Compensation Court, the Bureau of Labor Statistics website, the U.S. Census Bureau website, the National Academy of Social Insurance website, the American Association of Poison Control Centers, the Oklahoma Central Cancer Registry, the Oklahoma Adult Blood Lead Epidemiology and Surveillance program and OSHA.

Comprehensive, statewide data were also collected on work-related fatalities from multiple reporting sources, including the Office of the Chief Medical Examiner, OSDH Division of Vital Records, OSHA, and the Oklahoma Department of Labor Public Employees Occupational Safety and Health Division.

Summary data reports, *Injury Updates*, and fact sheets were prepared utilizing the data described above. Materials were distributed and posted on the IPS website (<http://ips.health.ok.gov>) to allow employers and safety managers to utilize the information in safety trainings.

The Oklahoma Occupational Safety and Health Surveillance Advisory Committee continued meeting to enhance the Oklahoma Occupational Safety and Health Surveillance program. Members of the Advisory Committee included a representative for each of the local data sources and representatives from the Department of Labor, OSHA, the Oklahoma Poison Control Center, and academia. The Advisory Committee reviewed data collection procedures, examined data collected, provided input on reports, assisted with distribution of materials, and reviewed the state strategic plan.

The IPS also participated in the Consortium of Occupational State-based Surveillance and the Coordination Committee to discuss program efforts with other states and NIOSH, to review and edit the existing occupational indicators, and to propose and prepare new indicators.

### **Highlights/Significant Findings**

The IPS collected indicator data for 2003-2008 as specified by the *Occupational Health Indicators: A Guide for Tracking Occupational Health Conditions and Their Determinants*. Oklahoma's crude traumatic fatality rate was higher than the U.S. rate in 2003-2008. Oklahoma's incidence rate of work-related injuries and illnesses decreased from 10% from 2003-2008; however, in 2003, 2005, and 2007, half of all cases that involved days away from work involved more than ten days away from work. The annual incidence rate of amputations filed with the Oklahoma Workers' Compensation Court nearly doubled from 2003-2008 (6.9 and 12.2 per 100,000, respectively). The rate of work-related burn hospitalizations increased steadily from 2003-2008. The rate of musculoskeletal disorders involving days away from work decreased 40% from 2004-2008. The rate of total pneumoconiosis hospitalizations remained fairly stable from 2003-2008, however the rate of asbestosis hospital discharges increased 27% and the rate of coal workers' pneumoconiosis hospital discharges decreased 68%. Acute pesticide-related injuries and illnesses remained fairly stable during the three-year time period 2003-2005. Acute pesticide-related injury and illness data was not available for 2006-2007. The number of malignant mesothelioma cases stayed fairly stable over the six-year period. There were steady declines among Oklahomans with elevated blood lead levels greater than or equal to 25 µg/dL from 2003-2008.

Analysis of work-related fatality data from January 1, 1998 through December 31, 2009 revealed a total of 1,346 work-related deaths in Oklahoma with an average of 112

deaths per year (6.9 deaths per 100,000 workers). The ages of persons who died ranged from 13 to 91 years old, with an average age of 46 years. Twenty-three percent of deaths occurred among workers between the ages of 35-44 years, and 20% of deaths occurred among those 45-54 years of age. Males outnumbered females 9 to 1, with males accounting for 93% of all work-related deaths. Data collection for 2010-2011 is ongoing.

## **Translation of Findings**

Preventing occupational injuries and deaths is a complex challenge that requires access to accurate, detailed information and collaborative efforts and input from a variety of state and federal agencies, organizations, and businesses. The IPS examined indicator data for trends within Oklahoma and compared to U.S. data; two summary data reports were prepared. Comprehensive work-related fatality surveillance data were analyzed and reports were prepared on the epidemiology of work-related deaths, including high-risk industries and common injuries. Fact sheets were also prepared on electrocutions, mobile machinery, oil and gas, construction, farming, work zone construction, and work-related motor vehicle crash deaths. Most of these materials included case reports on specific injury incidents. Materials were distributed to employers and safety managers to post and/or use for safety trainings, thus translating the findings to direct employee training. Presentations utilizing the data and case reports were also made by IPS staff members and Advisory Committee members at local and national meetings. The program findings can also be used to establish priorities/resource allocation and to identify areas for collaboration on common goals.

## **Outcomes/Relevance/Impact**

This program provided the first momentum to collect and compile occupational injury indicator data in Oklahoma. The indicator data have allowed comparisons of Oklahoma data to the U.S. and other state data. Advisory committee meetings and communications were continued, creating important partnerships between agencies working with similar issues. The program drew attention to these issues and initiated discussions of how to attract the interest of agencies, businesses, and legislators. In addition, Advisory Committee members who had previously not worked together began engaging in collaborative projects. The representative of the Oklahoma Adult Blood Lead Epidemiology and Surveillance program began working with the Department of Labor to enhance educational efforts. In addition, the Oklahoma Poison Control Center has strongly encouraged employees to document work-relatedness of each case that contacts the Poison Control Center's hotline. Collection of the data also paved the way for the existing state plan chapter on occupational injuries and fatalities to be revised for upcoming years. The Project Director served as a member of the annual conference planning committee for the Oklahoma Safety Council, the largest conference in the state for safety professionals. She also collaborated with NIOSH staff and other occupational safety and health surveillance professionals to publish "Occupational Highway Transportation Deaths, United States, 2003-2008" in the *Morbidity and Mortality Weekly Report* (MMWR).

The impact of the reports and fact sheets was not measured directly; however, evaluation of previous Oklahoma Fatality Assessment and Control Evaluation project reports found that employers and safety managers did post and use educational materials in their trainings. Evaluations indicated that “real life” case reports were most helpful. Previous feedback on report length indicated that some preferred a one-page summary report, thus the fact sheets were widely distributed in addition to full reports. Input on format/content was also obtained from the Oklahoma Occupational Safety and Health Surveillance Advisory Committee.

The IPS worked with Dr. Mark Brandenburg to develop the Rodeo Medicine Referral System. Rodeo athletes train and compete while traveling across the country, often hundreds of miles from their homes and primary care physicians. The livelihood of a rodeo athlete and his/her family depends upon the athlete’s ability to compete in rodeo events. The combination of this distance from home and a necessity to compete results in many athletes competing in rodeo events while injured. The Rodeo Medicine Referral System provides injured athletes and family members the opportunity to search healthcare providers near their location and be seen, often on short notice.

## **Scientific Report**

**Background.** Occupational injuries are a significant public health problem in the U.S. and in Oklahoma. Surveillance data from the national CFOI indicate that in the U.S. almost 5,000 persons die each year from occupational injuries. In Oklahoma, over 100 occupational injury deaths are reported annually. Transportation incidents account for the highest number of deaths followed by agriculture-related deaths. Overall, men account for more than 90% of deaths. Injuries occur most commonly among workers 35-54 years of age.

The IPS implemented the Oklahoma Occupational Safety and Health Surveillance program to establish a fundamental surveillance system on occupational hazards, diseases, injuries, and deaths in Oklahoma. Standardized data on occupational indicators and comprehensive data on work-related fatalities were collected and analyzed to determine the magnitude and trends of occupational conditions and to initiate prevention efforts in Oklahoma.

**Specific Aims.** The specific aims of the program are listed below with accomplishments on each specific aim.

### **1. Collect statewide data on the 19 occupational health conditions and their determinants.**

Data were collected on the 13 health conditions and the 6 health condition determinants described in the CSTE/NIOSH guidelines, *Occupational Health Indicators: A Guide for Tracking Occupational Health Conditions and Their Determinants*. Data for 2003-2008 were collected using standardized methodology from existing data sources. Oklahoma occupational health indicator data for 2003-2007 was analyzed and published in the

*Oklahoma Occupational Health Indicators, 2003-2007* data book. In addition, comprehensive, multi-source, statewide data were collected on occupational fatalities.

**2. Collect comprehensive, multi-source, statewide data on occupational fatalities.**

The IPS continues to collect statewide data on fatal work-related injuries that occur in Oklahoma from multiple sources, including the Office of the Chief Medical Examiner, Vital Statistics, OSHA, the Oklahoma Department of Labor, Oklahoma Department of Public Safety, and supplemental data sources. Data collection for 2009 is complete. Data collection for 2010 and 2011 is ongoing.

**3. Analyze occupational health data and provide the data to the National Institute for Occupational Safety and Health, the Council of State and Territorial Epidemiologists, and other partners/stakeholders.**

Occupational health indicator data collected for 2003-2007 were analyzed and published in 2010 in a data book, *Oklahoma Occupational Health Indicators, 2003-2007*. In 2011, another data book of 2003-2008 indicators, *Oklahoma Occupational Health Indicators, 2003-2008*, was published. These data books include an executive summary, introduction, and an employment demographic profile for the U.S. and Oklahoma. Detailed background and analysis are included for each occupational health indicator, and graphs/tables compare Oklahoma and U.S. data. In addition, a detailed description of all data sources, including limitations, is provided in the publications. The reports were/will be distributed to NIOSH, CSTE, partners in other states working on occupational incident prevention, the Oklahoma Department of Labor, OSHA, and all members of the Advisory Committee. A comprehensive report on work-related fatalities from 1998-2009 in Oklahoma is currently being prepared.

The following reports were completed along with a one-page fact sheet (also translated into Spanish) and distributed to targeted audiences:

- Work-Related Burns among Restaurant and Food Service Workers, Oklahoma, 1988-2006
- Work-Related Burns among Roofers, Oklahoma, 1988-2006
- Prevention at Work: Work-Related Traumatic Brain Injuries, Oklahoma, 2004-2007 (featured in the April 2010 NIOSH eNews)
- 2007-2008 Traffic Crash Data Linkage Results: Work-Related Roadway Crash Fatalities
- Work Zone-Related Deaths, Oklahoma, 1998-2008
- Prevention at Work: Construction-Related Deaths, Oklahoma, 1998-2008
- Prevention at Work: Farming-Related Deaths, Oklahoma, 1998-2008
- Injury Update: Work-Related Mobile Machinery Deaths, Oklahoma, 1998-2008
- Prevention at Work: Work-Related Electrocution Deaths, Oklahoma, 2000-2009
- Oil and Gas-Related Deaths, Oklahoma, 1998-2008 (safety sheet only)

The findings of two studies on occupational fatalities among persons less than 25 years of age and traffic crashes were shared in oral presentations by the occupational health epidemiologist at the CSTE annual conference in June 2009 and 2011, respectively.

The OSDH Childhood Lead Poisoning Prevention Program coordinator presented results from a study on oil field workers and take-home lead exposure from lead-based pipe dope. These findings were also published in *Oil & Gas Journal*, and the coordinator is working with NIOSH and the International Association of Drilling Contractors to encourage awareness and provide technical assistance. In addition, several other occupational health presentations were made during the grant period to regional builders associations, electric cooperatives, the Oklahoma Certified Healthy Businesses committee, and the OSDH Acute Disease Service.

**4. Maintain the Scientific Advisory Committee to provide input on collecting and disseminating data on occupational health conditions and establishing prevention programs.**

The Oklahoma Occupational Safety and Health Surveillance Advisory Committee was established to enhance the Oklahoma Occupational Safety and Health Surveillance program. Members of the Advisory Committee included a representative for each of the local data sources (Vital Statistics, the hospital discharge database, Oklahoma Workers' Compensation Court, the Oklahoma Central Cancer Registry, and the Adult Blood Lead Epidemiology and Surveillance Program). In addition, representatives from the Department of Labor, OSHA, and the Oklahoma Poison Control Center are included. A professor from the Department of Occupational and Environmental Health at the Oklahoma University College of Public Health, an agricultural engineering professor from Oklahoma State University, a vocational technology instructor in Enid, Oklahoma, and a pesticide expert also serve on the committee. The Advisory Committee reviewed data collection procedures, examined data collected, provided input on reports, assisted with distribution of materials, and reviewed the state strategic plan. The Advisory Committee also provided ideas for additional surveillance activities and priorities in Oklahoma. The full Advisory Committee met three times from 2008-2011 in addition to several informal meetings and many telephone calls and emails with selected members for targeted input and review of program activities and materials.

In December 2009, the Oklahoma Commissioner of Health selected reducing occupational fatalities as a priority to improve the health of workers in Oklahoma and to increase Oklahoma's overall ranking in the United Health Foundation's *America's Health Rankings*. In 2009, Oklahoma ranked #49 among all states overall and #43 for occupational fatalities. A subcommittee of Advisory Committee members and stakeholders was convened to develop a plan to reduce occupational fatalities. Objectives of the plan include:

1. Collect and analyze data on occupational fatalities and hospitalizations, in addition to incidents at OSDH;
2. Pursue policies to reduce work-related motor vehicles crashes such as prohibiting the use of electronic devices and cellular phones while driving;
3. Establish alliances to review incidents, near misses, and safety measures to reduce serious workplace injuries;
4. Prepare and distribute educational and prevention materials on work-related injuries and deaths in Oklahoma.

**5. Review and update the Year 2010 objectives and implementation plan for occupational injuries and fatalities in the state strategic plan.**

The chapter on occupational injuries in *Injury Free Oklahoma: Strategic Plan for Injury and Violence Prevention* was modified in conjunction with the Oklahoma Occupational Safety and Health Surveillance Advisory Committee. The updated Occupational Injuries chapter of the plan, which was completed in October 2009, includes background data for the U.S. and Oklahoma, funding information, a list of publications, collaboration information, goals and objectives, and an updated action plan.

**6. Participate in all meetings of the Consortium of Occupational State-based Surveillance (COSS) and the Coordination Committee.**

Program staff participated with other state and federal partners on conference calls and at the Western States Occupational Network meeting in September 2008 in Colorado, the COSS meeting in November 2008 in Kentucky, the CSTE meeting in June 2009 in New York, the Western States Occupational Network meeting in September 2009 in Colorado, the COSS meetings in January 2010 in California and November 2010 in Austin, and the CSTE meetings in June 2010 in Oregon and 2011 in Pittsburgh. Modifications to the original occupational indicator guidelines were discussed and completed, including two guidelines reviewed and modified by the Oklahoma program. Guidelines on a potential new carbon monoxide indicator for states to collect were created, coordinated by the Oklahoma program.

**7. Conduct a performance review of the surveillance program.**

The Principal Investigator and the Project Director met at the end of each grant year and conducted a performance review of the Oklahoma Occupational Safety and Health Surveillance program to evaluate the accomplishments and impact of the program. The grant application and the timeline were reviewed to ensure that all tasks were completed. Data were examined to ensure information on all indicators was collected. Conditions with substantially higher rates in Oklahoma than the U.S. were discussed. Minutes of the Advisory Committee meetings were reviewed and suggestions from members were discussed to determine additional efforts that were needed. Partnerships with other divisions of the OSDH and other agencies were also assessed.

**Procedures.** In 1998, a set of occupational health indicators similar to those published in other areas of public health was developed to allow collection of standardized data on priority occupational conditions. As specified by the grant guidance, the IPS has followed the data collection procedures outlined in *Occupational Health Indicators: A Guide for Tracking Occupational Health Conditions and Their Determinants* to collect indicator data. The 19 indicators and their determinants include: nonfatal work-related injuries and illnesses reported by employers, work-related hospitalizations, work-related amputations with days away from work reported by employers, amputations filed with the state workers' compensation system, work-related musculoskeletal disorders with days away from work reported by employers, carpal tunnel syndrome cases filed with the state workers' compensation system, hospitalizations from or with pneumoconiosis, mortality from or with pneumoconiosis, acute work-related pesticide-associated illness

and injury reported to poison control centers, incidence of malignant mesothelioma, elevated blood lead levels, workers employed in high risk industries and occupations, occupational safety and health professionals, OSHA enforcement activities, and workers' compensation awards. Demographic profiles were also compiled for Oklahoma and the U.S.

In July 1997, when the IPS was first awarded a Fatality Assessment and Control Evaluation grant, the Commissioner of Health declared occupational fatalities a reportable condition for special study as authorized by Title 310 Oklahoma State Department of Health, Chapter 515-1-6. This mandate has allowed ongoing collection of comprehensive, multi-source, statewide data on work-related fatalities. As mandated by law, confidentiality was maintained for all cases. Data were entered under a security password, and report forms were stored in locked cabinets and rooms.

**Methodology.** Data on the 19 health conditions and their determinants were collected using standardized methodology from existing data sources, including Oklahoma Vital Statistics, the Oklahoma hospital discharge database, Oklahoma Workers' Compensation Court, the Bureau of Labor Statistics website, the U.S. Census Bureau website, the National Academy of Social Insurance website, the American Association of Poison Control Centers, the Oklahoma Central Cancer Registry, the Oklahoma Adult Blood Lead Epidemiology and Surveillance program and OSHA.

The IPS collected data on all work-related deaths through August 31, 2007 with Fatality Assessment and Control Evaluation funding, and through June 30, 2011 with Oklahoma Occupational Safety and Health Surveillance funding. The IPS will continue to collect data on all work-related deaths because preventing occupational fatalities is a priority area for the OSDH. An occupational fatality was defined as an intentional or unintentional death resulting from an injury that could be classified by International Classification of Diseases (10th revision; ICD-10) codes ranging from V01 to Y98. Occupational-related deaths included full-time or part-time workers as well as unpaid family members who were engaged in work activities in a work environment at the time of death. All persons with an occupational fatality were included in surveillance, including persons of all ages, races and ethnicities, and males and females.

Information on occupational fatalities was collected from a variety of agencies; however, no single source identified all cases. Reports were collected for all cases (as applicable) from the Office of the Chief Medical Examiner, OSDH Division of Vital Records, OSHA, Oklahoma Department of Labor, statewide reportable injury surveillance data, and newspaper clippings. Data collected included the date, time, and county of the incident; a narrative description of the circumstances surrounding the death; the age, race, ethnicity, sex, date of birth, and date of death of the victim; the occupation and industry; the cause of death; and the type of incident.

*Office of the Chief Medical Examiner.* The IPS received reports of investigation by e-mail on all non-natural deaths from the Office of the Chief Medical Examiner on a daily basis. The Oklahoma medical examiner system is a statewide centralized system; the

system is computerized and is responsible for the investigation of all injury-related deaths. The report form includes the decedent's name, demographic information, the probable cause of death, location of injury death, a narrative description of circumstances and injuries, and a toxicology report. The narrative description of all medical examiner reports of non-natural deaths were reviewed for inclusion in the occupational fatality surveillance system.

*Oklahoma State Department of Health Division of Vital Records.* Copies of death certificates that reflected an "Injury at Work" were reviewed by the IPS for inclusion in the occupational fatality surveillance system. Death certificates were also obtained if the "Injury at Work" variable was not marked as "yes" but the fatality was reported as work-related by another data source.

*Occupational Safety and Health Administration.* OSHA faxed fatality/catastrophe reports to the IPS when they received a report of a traumatic occupational fatality. These brief, immediate reports included information about the worker's occupation/industry and circumstances resulting in the death.

*Oklahoma Department of Labor.* The Oklahoma Department of Labor Public Employees Occupational Safety and Health program sent the IPS reports of occupational fatalities involving public employees when they occurred. These reports included information about occupation/industry and cause of death.

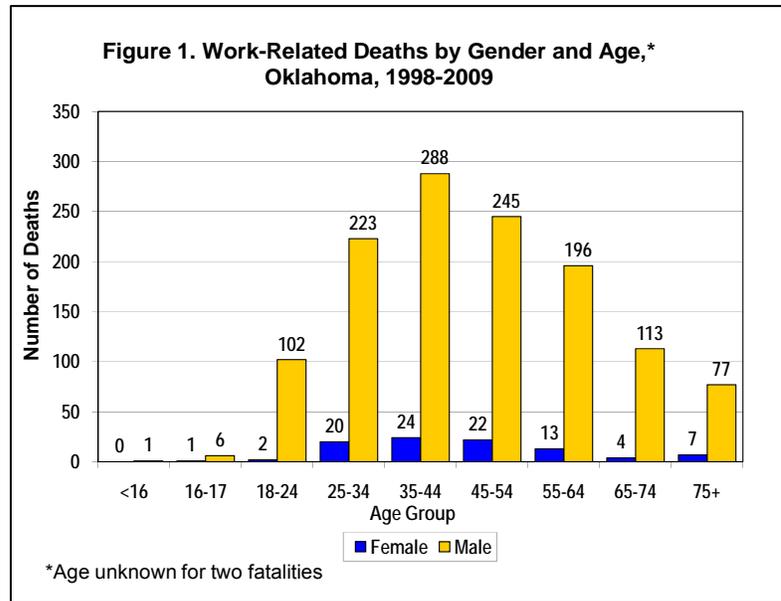
*Newspaper Clippings.* The IPS obtained articles on work-related deaths from a newspaper clipping service. In addition, a staff member searched the internet for occupational fatalities.

**Results and Discussion.** Analyses indicated that occupational illnesses, injuries, and deaths are significant public health problems in Oklahoma. The following are highlights from the 2003-2008 occupational indicator report:

- In 2008, Oklahoma's incidence rate of work-related injuries and illnesses was 4,500 per 100,000 FTEs; this was down 20% from 2004 and 10% from 2003.
- The annual total incidence rate for cases involving days away from work decreased steadily from 1,700 per 100,000 FTEs in 2004 to 1,200 per 100,000 FTEs in 2008.
- The total number of work-related injuries and illnesses that involved more than 10 days away from work was highest in 2005 and 2007, with more than 7,000 cases. However, this number decreased 25% from 7,110 in 2007 to 5,330 in 2008.
- Although the number of work-related traumatic fatalities declined from 2003-2006, it increased from 2006-2008. Oklahoma's crude fatality rate among workers 16 years of age and older was 37-65% higher than the rate for the U.S. each of these years.
- The annual rate of work-related burn hospitalizations increased 54% between 2003 and 2008 (2.6 and 4.0 per 100,000 employed persons, respectively).

- The number and incidence rate of musculoskeletal disorders involving days away from work decreased steadily from 2004-2008 (534 to 323 per 100,000 FTEs, respectively).

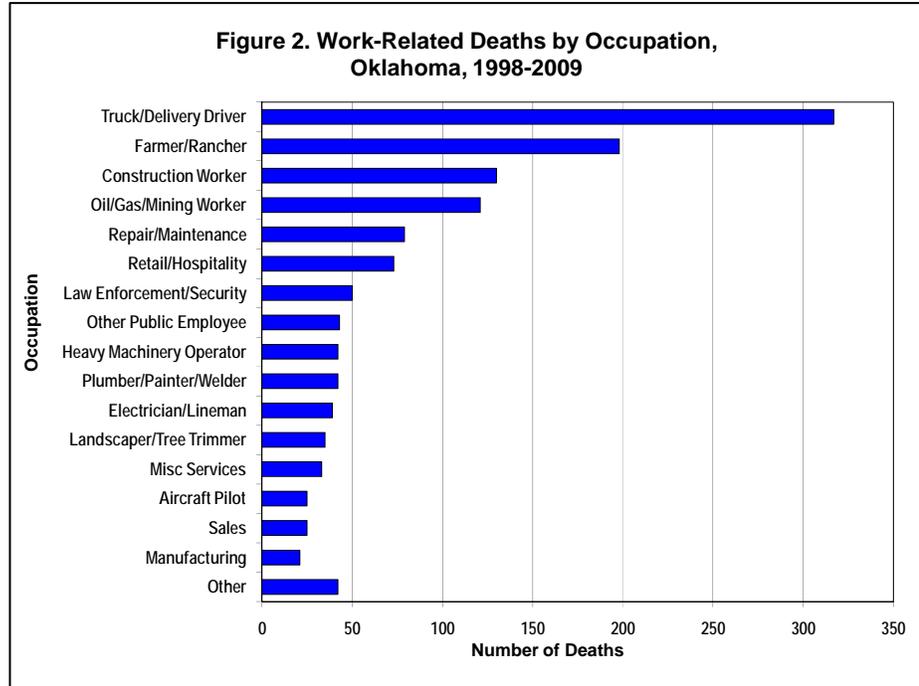
- The incidence rate of carpal tunnel syndrome cases involving days away from work reached a four-year low in 2006 with 10 cases per 100,000 FTEs (down 60% from 2003), but more than doubled from 2006-2008 to 21 cases per 100,000 FTEs. The number of carpal tunnel syndrome cases filed with the Oklahoma Workers' Compensation Court rose from 318 in 2003 to 438 in 2008.



- Mortality from or with pneumoconiosis remained consistent over the six-year period. While pneumoconiosis-related hospitalizations also remained fairly stable, there was a steady decline in coal workers' pneumoconiosis (16.4 discharges per million residents in 2003 compared to 5.2 per million residents in 2008). The rate of asbestosis hospital discharges increased 27% from 2003-2008.
- The number of cases of malignant mesothelioma reached a six-year high of 41 in 2006 before decreasing approximately 25% to 32 in 2008. The annual incidence rate of mesothelioma increased nearly 10% from 2003-2008.
- Steady declines appeared among Oklahomans with elevated blood lead levels greater than or equal to 25 µg/dL (a 57% decline in the prevalence rate and a 40% decrease in the incidence rate); however, such declines disappeared when examining only those with incident blood lead levels greater than or equal to 40 µg/dL.

Analysis of Oklahoma occupational fatality data from January 1, 1998 through December 31, 2009 revealed a total of 1,346 work-related deaths in Oklahoma, with an average of 112 deaths per year (6.9 deaths per 100,000 workers). The ages of persons who died ranged from 13 to 91 years old, with an average age of 46 years. Twenty-three percent of deaths occurred among workers between the ages of 35-44 years, and 20% of deaths occurred among those 45-54 years of age. Males outnumbered females 9 to 1, with males accounting for 93% of all work-related deaths (Figure 1). Eighty-four percent of persons who died were white, 6% were Native American, 5% were black, 2% were Asian or Pacific Islander, and 4% were of other or unknown race. Seven percent of persons who died were of Hispanic ethnicity.

The leading causes of work-related deaths included motor vehicle crashes (37%), machinery (15%), and falls from elevation (11%). Other common causes of work-related deaths included being struck and/or crushed by an object, homicide/assault, electrocution, fire/explosion, and suicide at work (Table 1).



Semi-truck and delivery truck drivers had the largest number of work-related fatalities by occupation (24%), followed by farmers/ranchers (15%) and construction workers (10%). Additional occupational fatalities occurred among oilfield workers; repairmen/mechanics and maintenance workers; retail and hospitality workers; law enforcement/other security; public employees; and heavy machinery operators. Other employees included healthcare workers, animal trainers and handlers, taxicab drivers, management, and clerical workers (Figure 2).

**Conclusions.** Occupational hazards, diseases, injuries, and deaths are a public health problem in Oklahoma. The rate for many occupational indicators is higher in Oklahoma than in the U.S. In addition, the work-related fatality rate in Oklahoma has consistently been higher than the U.S. rate. Transportation and agriculture industries have high work-related fatality rates in Oklahoma. It is important to continue to collect and distribute detailed information on work-related indicators and fatalities and to monitor trends overall and within subgroups to be able to develop targeted prevention measures.

Table 1. Causes of Work-Related Deaths, Oklahoma, 1998-2009

Type of Incidents	Number of Deaths	Percent
Motor Vehicle Crash	499	37%
Machine-Related	204	15%
Falls from Elevation	149	11%
Struck and/or Crush by Object	101	8%
Homicide/Assault	96	7%
Electrocution	75	6%
Fire/Explosion	59	4%
Suicide	30	2%
Toxic Exposure	26	2%
Caught by or between	20	2%
Heat /Cold Related	14	1%
Drowning	11	1%
Other	62	5%
<b>TOTAL</b>	<b>1346</b>	<b>100%</b>

## **Publications**

The project director collaborated with NIOSH staff and other occupational safety and health surveillance professionals to publish “Occupational Highway Transportation Deaths, United States, 2003-2008” in the *Morbidity and Mortality Weekly Report* (MMWR).

## **Inclusion of Gender and Minority Study Subjects**

All persons who suffered a work-related incident, including males and females and minorities, were included in the program.

## **Inclusion of Children**

All persons who suffered a work-related incident, including children under 18 years of age, were included in the program.

## **Materials Available for Other Investigators**

All materials created by the Oklahoma Occupational Safety and Health Surveillance program are available for other investigators to use. All materials are available on the IPS website (<http://ips.health.ok.gov>).

Two summary data reports on occupational indicator data were published by the IPS in September 2010 and September 2011. The data reports included an executive summary, introduction, employment demographic profile for Oklahoma and the U.S., and data on each of the indicators and determinants. Background information and references are presented for each indicator. The data source, demographic group, and inclusion criteria are also documented for each indicator. A comparison of Oklahoma versus U.S. data is provided by indicator. In addition, a detailed description of all data sources, including limitations, is provided in the publication.

- *Oklahoma Occupational Health Indicators, 2003-2007*
- *Oklahoma Occupational Health Indicators, 2003-2008*

The following reports were completed along with a one-page fact sheet (also translated into Spanish) and distributed to targeted audiences:

- Work-Related Burns among Restaurant and Food Service Workers, Oklahoma, 1988-2006
- Work-Related Burns among Roofers, Oklahoma, 1988-2006
- Safety in Eating and Drinking Establishments (safety sheet only)

- Prevention at Work: Work-Related Traumatic Brain Injuries, Oklahoma, 2004-2007
- 2007-2008 Traffic Crash Data Linkage Results: Work-Related Roadway Crash Fatalities
- Work Zone-Related Deaths, Oklahoma, 1998-2008
- Prevention at Work: Construction-Related Deaths, Oklahoma, 1998-2008
- Prevention at Work: Farming-Related Deaths, Oklahoma, 1998-2008
- Injury Update: Work-Related Mobile Machinery Deaths, Oklahoma, 1998-2008
- Prevention at Work: Work-Related Electrocution Deaths, Oklahoma, 2000-2009
- Oil and Gas-Related Deaths, Oklahoma, 1998-2008 (safety sheet only)

*Injury Update* topics that were not specific only to workers, but provided information that would be helpful to subgroups of workers included burn injuries resulting from brush, trash, and grass fires. The work-related *Injury Update* and *Prevention at Work* reports were sent to a wide audience, including career/vocational schools, university-level occupational health and safety programs, industry and union associations, the Oklahoma Safety Council, OSHA, hospitals, injury prevention specialists, county health departments, emergency medical services, fire departments, and the media.

In 2008, a news release on nail gun-related injuries was sent to statewide media outlets. Additionally, a news release has been prepared on farming-related deaths and will be distributed to statewide media outlets pending final internal review. In April 2010, *NIOSH eNews* featured a brief report on results from *Prevention at Work: Work-Related Traumatic Brain Injuries, Oklahoma, 2004-2007*.

*Injury Free Oklahoma 2010-2015*, a supplement to the state strategic plan addressing injury prevention, was published by the IPS in 2009. The plan was developed with the assistance of experts from across the state and includes a chapter targeting occupational injuries and fatalities. The chapter includes background information on occupational injuries and fatalities, Year 2010 objectives, recommended prevention strategies, an implementation plan, and references. The Advisory Committee assisted the IPS with preparation of the occupational injuries and fatalities chapter.