

North Carolina Occupational Health Trends, 2000-2013

**Putting Data to Work
December 2016**

North Carolina Occupational Health Surveillance Program
Occupational and Environmental Epidemiology Branch
Division of Public Health
North Carolina Department of Health and Human Services



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Executive Summary

The goals of the North Carolina Occupational Health Surveillance Program (OHSP) are to describe work-related health risks and to use this information to promote safer work environments with the help of partnerships. The OHSP also provides data, consultation, and other resources to occupational health nurses, industrial hygienists, other health and safety professionals, and industry representatives. The OHSP operates within the Occupational and Environmental Epidemiology Branch of the North Carolina Division of Public Health.

The Occupational Health Indicators (OHI) presented in this report represent a core set of information used to assist in the development of program initiatives and partnerships to monitor the health of the North Carolina workforce. The Occupational Health Indicators Project was designed through a joint effort between the Council of State and Territorial Epidemiologists (CSTE) and the National Institute for Occupational Safety and Health (NIOSH) to enhance occupational health data collection systems and capacity. The indicators include measures of employment demographics, health effects, exposures, hazards, interventions, and socioeconomic impact. North Carolina uses these indicators to describe trends in the occupational health status of the working population, and to establish priorities for prevention and reduction of work-related hazards.

This report aims to:

- Describe the occupational health status of the North Carolina workforce from 2000 through 2013.
- Identify high-risk worker populations, conditions, and hazards of interest by analyzing trends over time.
- Inform public health prevention efforts.

Key findings included in this report:

- **Workforce demographics are changing.** The proportion of the North Carolina workforce identifying as neither White nor Black has increased by 77%, from 3.5% in 2000 to 6.2% in 2013. Likewise, the percentage of the workforce identifying as Hispanic or Latino has increased from 3.7% in 2000 to 8.8% in 2013. The percentage of the workforce aged 65 years and older has increased by nearly 50% from 2000 through 2013.
- **Overall workplace injury and illness rates are falling.** From 2000 through 2013, rates of non-fatal occupational injury and illness among private sector workers in North Carolina decreased by 49%. Work-related hospitalizations declined by about 41%. The overall fatal injury rate has decreased by 57%.
- **Some North Carolinians are at a disproportionately higher risk of fatal work-related injuries than others.** Workers identified as Hispanic are 1.7 times more likely, workers aged 65 years and older are 3.9 times more likely, and those employed in agricultural and related industries are 9.9 times more likely to die on the job as compared to the average worker.
- **Some indicators show improvement despite not showing clear trends.** Although there have been annual fluctuations, the overall rate of work-related amputations has decreased

by 50% from 2000 to 2013. Likewise, the overall rate of work-related burns decreased by 12% during this time period.

- **Pesticide poisonings have increased over time.** Though national trends indicate an overall decline in rates of acute work-related pesticide illness and injury, North Carolina has experienced a rate increase of 10% between 2000 and 2013.
- **The percentage of North Carolina OSHA enforcement activities exceeds the national percentage for all years observed.**

Introduction & Background

The workplace has an important influence on human health, as it contains a variety of health hazards, and most adults spend a large proportion of their time in this setting. Work-related injuries and illnesses can result in death, disability, lost wages, and limited quality of life for workers and their families in addition to decreased productivity and costs to employers (World Health Organization, 1995).

While rates of work-related injuries and illnesses have decreased over the past two decades, North Carolinians are still being hurt and killed on the job. Fortunately, occupational injuries and illnesses are preventable. Tracking work-related injuries and illnesses is the first step in prevention. Surveillance provides information on the magnitude of injuries and illnesses among the working population, and can help identify the most affected worker groups and related risk factors. Findings can be used by the Division of Public Health and its partners—employers, labor unions, industry representatives, health and safety professionals, and community-based organizations—to develop and implement effective interventions that can prevent workplace injury and death.

In 2003, the Council of State and Territorial Epidemiologists (CSTE), in collaboration with the National Institute for Occupational Safety and Health (NIOSH), developed a set of occupational health indicators (OHI) as a set of core measures of public health importance to profile the health status of workers (CSTE, 2016). The indicators are generated from several data sources, each with its own strengths and limitations. Additional information on data sources can be found in the Data Sources section of this report and on the CSTE website (www.cste.org). North Carolina has participated in the Occupational Health Indicators Project since it piloted with an initial set of 19 OHI. The indicators include measures of illness, injury, exposure, hazards, interventions, and socioeconomic impact. Compiling this information allows states to uniformly define, collect, and report work-related illness, injury, and health risk data. North Carolina uses the indicators to describe occupational health trends in the working population, and to establish priorities for more targeted, in-depth analysis of the more concerning conditions or exposures affecting workers. The data ultimately provide a road map for improving worker safety in the state.

This report has compiled a set of twenty indicators to provide an overview and basic trend information describing the health status of workers in North Carolina from 2000 through 2013. Data for Indicator 21: Asthma Among Adults Caused or Made Worse by Work; Indicator 22: Work-Related Severe Traumatic Injury Hospitalizations; Indicator 23: Influenza Vaccination Coverage among Healthcare Personnel; and Indicator 24: Occupational Heat-Related ED Visits were not uniformly available for all years of the study period at the time this report was prepared, and were excluded from analysis. Counts, rates, and percentages presented in this report were calculated using methods described in “Occupational Health Indicators: A Guide for Tracking Occupational Health Conditions and Their Determinants” available at: <http://www.cste.org/group/OHIndicators>.

Demographic Profile

The North Carolina workforce is continuously changing, becoming more diverse over time. Workforce characteristics can impact work-related injury and illness rates, and contribute to the variability in injury and illness rates among states. Demographic profile data were provided by the US Bureau of Labor Statistics (BLS) Current Population Survey (CPS) and include the percentage of workers by age, sex, race, Hispanic ethnicity, self-employment, unemployment, part-time workers, hours worked per week, industry, and occupation.

Table P1: Employment Status of the Civilian Non-Institutional Population Aged ≥ 16 Years, NC, 2000-2013

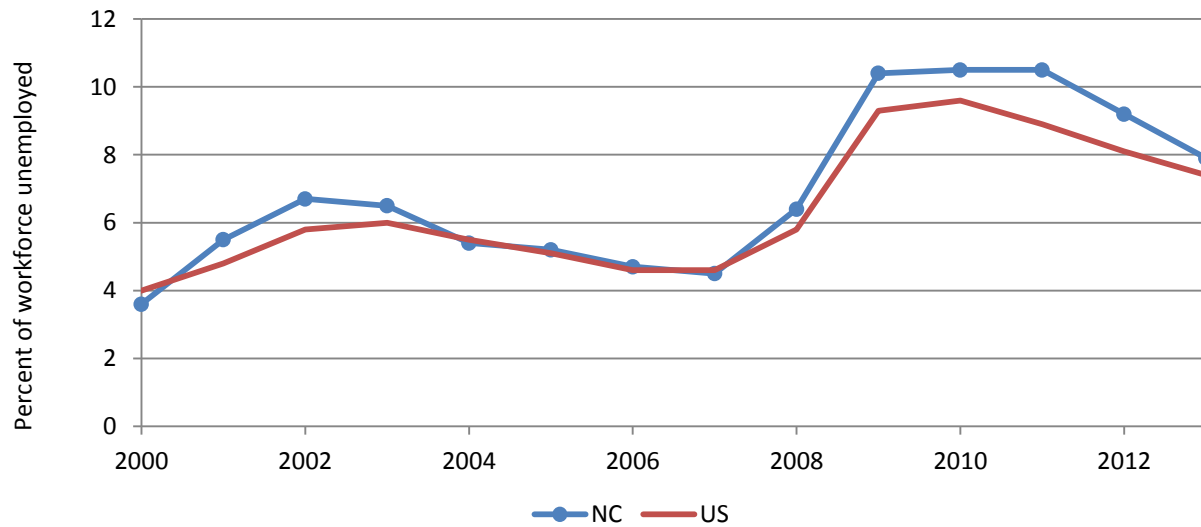
Year	Civilian non-institutional population ¹	Civilian workforce		Employment		Unemployment	
		Number ¹	Percent	Number ¹	Percent	Number ¹	Percent
2000	5,809,000	3,958,000	68.1	3,814,000	65.7	144,000	3.6
2001	5,863,000	3,995,000	68.1	3,773,000	64.4	221,000	5.5
2002	6,262,000	4,171,000	66.6	3,890,000	62.1	281,000	6.7
2003	6,328,000	4,230,000	66.8	3,957,000	62.5	273,000	6.5
2004	6,439,000	4,243,000	65.9	4,016,000	62.4	227,000	5.4
2005	6,567,000	4,318,000	65.8	4,092,000	62.3	226,000	5.2
2006	6,731,000	4,451,000	66.1	4,242,000	63.0	209,000	4.7
2007	6,893,000	4,509,000	65.4	4,305,000	62.5	204,000	4.5
2008	7,011,000	4,534,000	64.7	4,245,000	60.5	289,000	6.4
2009	7,129,000	4,574,000	64.2	4,096,000	57.5	478,000	10.4
2010	7,200,000	4,573,000	63.5	4,094,000	56.9	479,000	10.5
2011	7,405,000	4,631,000	62.5	4,145,000	56.0	486,000	10.5
2012	7,492,000	4,698,000	62.7	4,267,000	57.0	432,000	9.2
2013	7,590,000	4,675,000	61.6	4,305,000	56.7	370,000	7.9

1: Rounded to the nearest 1,000

Data sources: BLS Geographic Profile of Employment and Unemployment, Current Population Survey

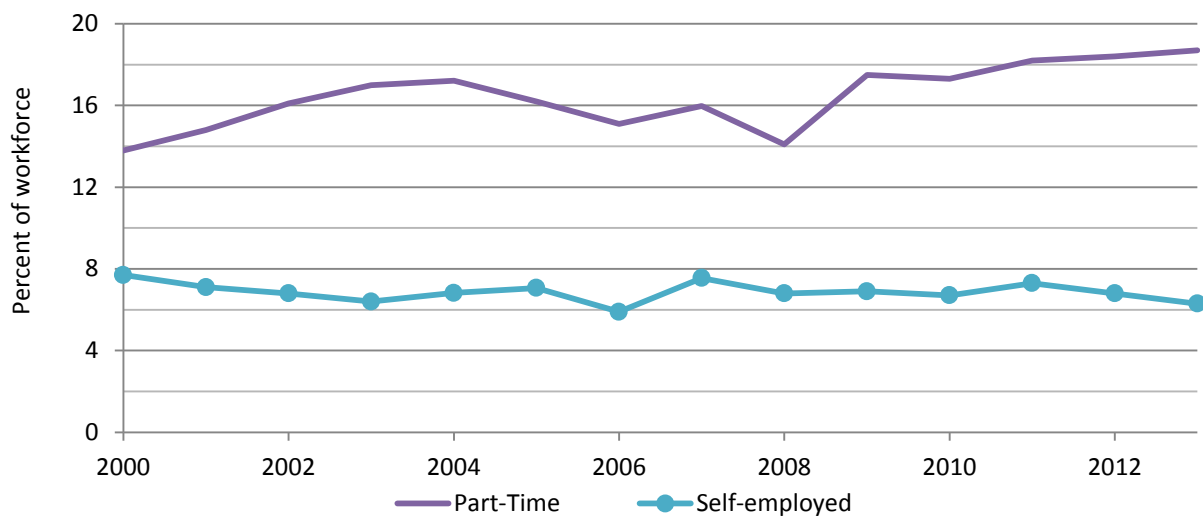
Home to nearly ten million people, North Carolina was ranked the 10th largest state by population in 2013 (US Census Bureau, 2013). An estimated 4,305,000 civilians were employed in North Carolina in 2013, reflecting a 13% rise in employment since 2000. However, the percentage of the civilian non-institutional population actually employed has decreased from 66% in 2000 to 57% in 2013 (Table P1). The percentage of unemployment in North Carolina has more than doubled since 2000, peaking at 10.5% in 2011 (Figure P1). The percentage of the workforce employed part-time has also increased by more than one-third from 13.8% to 18.7% (Figure P2).

Figure P1: Percentage of Civilian Workforce Unemployed, NC & US, 2000-2013



Data sources: BLS Geographic Profile of Employment and Unemployment, Current Population Survey

Figure P2: Percentage of Civilian Workforce Employed Part-Time & Self-Employed, NC, 2000-2013



Date sources: BLS Geographic Profile of Employment and Unemployment, Current Population Survey

Part-time includes those who work 1 to 34 hours per week.

Self-employed includes those who work for profit or fees in their own business, profession, trade, or farm. Only the unincorporated self-employed are included

The working population has also changed by race, ethnicity, and age composition over the 14-year period (Table P2). While the proportions of the workforce identifying as White and Black have declined slightly from 2000 through 2013, the proportion identifying as neither group has increased by 77% from 3.5% in 2000 to 6.2% in 2013. Additionally, the percentage of the North Carolina workforce identifying as Hispanic or Latino has increased from 3.7% in 2000 to 8.8% in 2013. The North Carolina workforce is also aging: in 2013, the percentage of the workforce aged 65 years and older was 4.8%, nearly 50% higher than in 2000 (3.3%).

Table P2: Characteristics & Demographics of the Civilian, Non-Institutional Workforce Aged ≥ 16 Years, NC, 2000-2013

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	US 2013
Percentage by sex															
Males	53.0	52.5	53.3	53.1	53.6	53.9	53.3	52.7	52.7	51.8	51.9	53.0	52.9	52.3	53.0
Females	47.1	47.5	46.7	46.9	46.4	46.1	46.7	47.3	47.3	48.3	48.1	47.0	47.0	47.7	47.0
Percentage by age group															
16 to 17	1.9	1.7	1.6	1.4	1.3	1.2	1.5	1.7	1.2	1.3	1.0	0.7	0.7	0.8	1.0
18 to 64	94.9	95.1	95.2	94.8	95.1	95.6	95.2	94.6	94.5	94.5	94.9	94.6	94.2	94.3	93.6
65+	3.3	3.2	3.2	3.8	3.5	3.2	3.2	3.8	4.2	4.2	4.1	4.6	5.1	4.8	5.3
Percentage by race															
White	74.6	75.6	76.9	76.9	76.9	76.3	76.5	75.6	75.3	74.9	75.3	75.5	74.1	73.2	80.2
Black	21.9	20.3	19.0	18.4	18.7	18.9	19.5	19.7	19.9	19.9	19.2	19.3	20.6	20.6	11.2
Other ¹	3.5	4.1	4.1	4.7	4.4	4.8	4.0	4.7	4.9	5.2	5.5	5.1	5.4	6.2	8.6
Percentage by Hispanic ethnicity															
Hispanic ²	3.7	4.3	4.9	7.1	7.5	7.3	7.0	8.2	6.3	6.1	7.7	7.7	7.4	8.8	15.6
Percentage by employment status															
Self-employed	7.7	7.1	6.8	6.4	6.8	7.1	5.9	7.5	6.8	6.9	6.7	7.3	6.8	6.3	6.5
Part-time ³	13.8	14.8	16.1	17.0	17.2	16.2	15.1	16.0	14.1	17.5	17.3	18.2	18.4	18.7	19.2
Percentage by number of hours worked per week															
< 40	28.6	30.9	34.6	32.8	30.3	29.5	27.9	28.1	31.8	36.4	33.3	35.1	34.6	33.7	34.8
40	42.1	41.9	38.6	41.3	37.7	37.6	41.2	40.4	42.2	41.2	43.0	40.4	40.5	42.9	43.5
41+	29.3	27.2	26.8	25.9	28.0	28.8	27.1	27.4	26.0	22.3	23.7	24.6	24.9	23.4	21.7

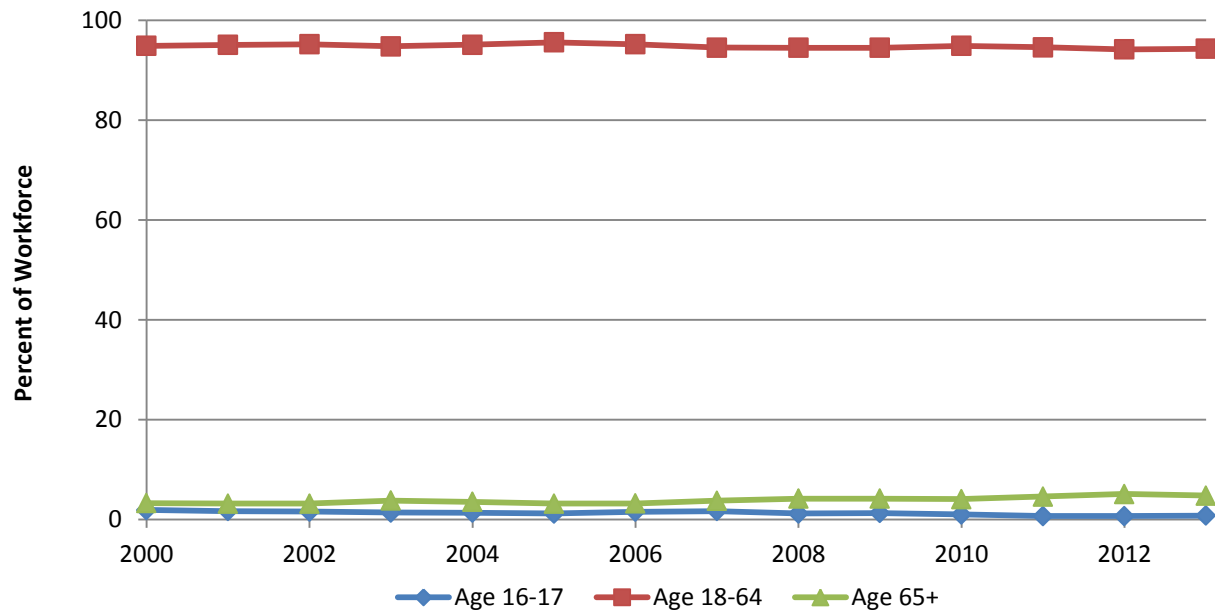
1: Included in "other" are people classified as Asian, American Indian, Alaska Native, Native Hawaiian, Pacific Islander, some other race, and those within two or more race categories.

2: Persons identified as Hispanic may be of any race (White, Black, Other).

3: Individuals employed "part-time" are those who work 1 to 34 hours per week.

Data sources: BLS Geographic Profile of Employment and Unemployment, Current Population Survey

Figure P3: Percentage of Civilian Employment by Age Group, NC, 2000-2013



Data sources: BLS Geographic Profile of Employment and Unemployment, Current Population Survey

North Carolina has experienced many changes in employment by industry and occupation between 2000 and 2013. Education and health services and trade have remained the two largest industry sectors in North Carolina during this time period, accounting for approximately 38% of all employment in the state in 2013. The workforce is transitioning from industries and occupations that emphasize manual labor to those that are professional- and service-based (Tables P3 & P4). Industry sectors with the largest declines in employment from 2003 to 2013 were non-durable goods manufacturing (a 28% decrease) and agriculture and related industries (a 35% decrease). The industry sector experiencing the greatest gains in employment from 2003 to 2013 was leisure and hospitality, as the percentage of the workforce employed in this industry increased by more than 40%.

Table P3: Percentage of Civilian Employment Aged ≥ 16 Years by Industry, NC, 2003-2013

Industry	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Education and health services	20.8	20.1	20.4	20.2	22.4	23.3	25.0	25.1	23.5	22.7	24.4
Wholesale and retail trade	15.1	14.7	14.9	14.9	14.4	14.1	14.5	14.1	14.5	14.7	13.2
Professional and business services	8.5	8.6	9.2	9.0	9.3	9.3	9.4	9.3	10.8	10.9	10.2
Leisure and hospitality	6.8	7.4	7.6	7.8	8.1	9.3	8.9	9.3	7.9	9.1	9.6
Construction	8.9	9.3	9.5	9.8	9.2	9.1	8.0	7.4	7.6	7.2	6.9
Manufacturing											
Non-durable goods	7.9	7.3	6.7	6.8	6.1	5.1	5.6	6.3	5.7	4.8	5.7
Durable goods	7.7	7.7	7.3	7.5	6.4	6.6	6.0	6.0	5.8	6.5	6.1
Financial activities	6.4	6.7	6.5	6.8	6.8	6.3	6.3	6.1	6.4	6.7	5.9
Other services	5.4	5.6	5.2	4.8	5.1	5.1	4.4	4.8	5.5	5.0	5.0
Public administration	3.7	3.9	3.9	3.9	4.2	4.0	4.6	4.7	4.4	4.1	4.5
Transportation and utilities	4.4	4.7	4.7	4.7	4.5	4.4	3.8	4.0	4.5	4.6	4.6
Information	2.0	2.1	2.2	1.8	1.8	2.1	2.3	1.9	2.0	2.2	2.1
Agriculture and related	2.3	2.1	1.8	1.9	1.5	1.2	1.1	1.2	1.3	1.4	1.5
Mining and logging	0.1	*	*	0.1	0.1	0.2	0.1	*	*	0.1	0.2

As NAICS industry classification categories changed in 2003, data for 2000-2002 are not presented.

Percentages may not sum to 100% due to rounding.

*Represents a number that is less than 0.05%

Data sources: BLS Geographic Profile of Employment and Unemployment, Current Population Survey

Table P4: Percentage of Civilian Employment Aged ≥ 16 Years by Occupation, NC, 2003-2013

Occupational Group	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Professional and related	19.9	19.7	18.7	18.5	21.4	21.1	21.6	23.4	22.5	21.6	22.4
Service	14.7	15.5	15.4	13.9	15.7	16.8	17.3	17.2	17.1	17.4	18.0
Management, business and financial	13.4	13.6	13.8	14.2	14.2	14.4	15.8	14.7	15.0	15.6	14.2
Office and administrative support	12.7	12.7	13.1	13.3	12.0	11.9	11.7	11.8	11.1	12.4	12.4
Sales and related occupations	11.1	11.0	11.5	11.8	11.7	11.0	11.6	10.9	10.6	11.7	10.6
Production	9.8	9.0	8.8	8.5	7.6	7.1	6.3	6.9	6.9	6.0	6.4
Construction and extraction	6.9	7.4	7.3	7.8	7.1	7.1	5.8	5.6	6.0	5.1	5.0
Transportation and material moving	6.6	6.3	6.4	6.4	5.7	6.0	5.4	5.1	5.9	5.9	6.2
Installation, maintenance, and repair	3.7	3.9	4.3	4.3	3.9	4.0	4.1	4.0	4.3	3.5	4.0
Farming, fishing, and forestry	1.1	0.9	0.9	1.3	0.7	0.6	0.5	0.4	0.5	0.7	0.8

As SOC occupation classification categories changed in 2003, data for 2000-2002 are not presented.

Percentages may not sum to 100% due to rounding.

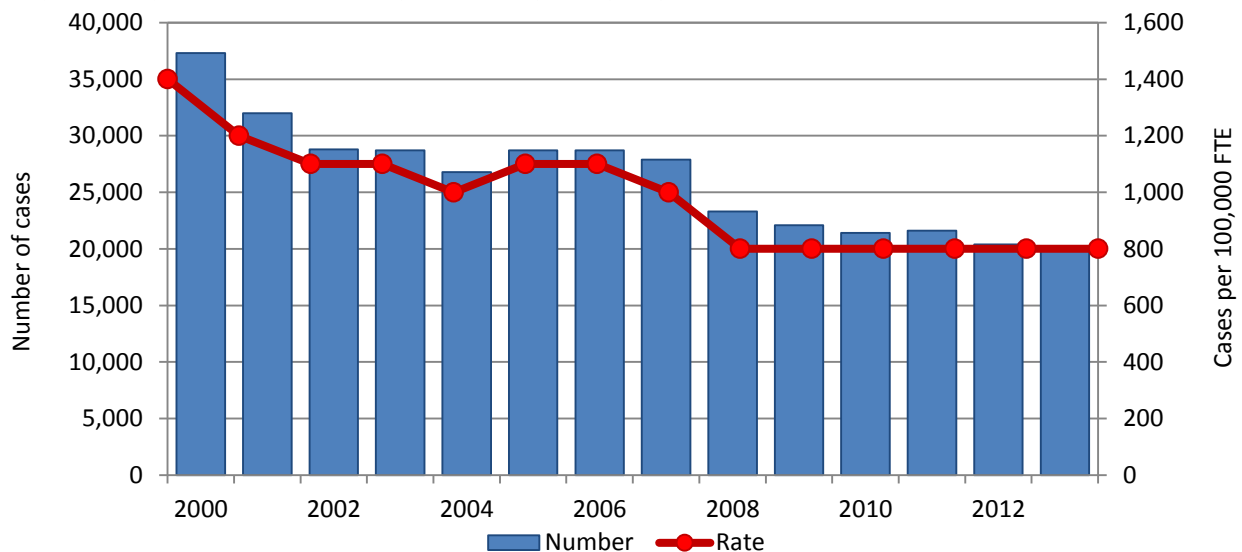
Data sources: BLS Geographic Profile of Employment and Unemployment, Current Population Survey

Indicator 1: Non-Fatal Injuries and Illnesses Reported by Employers

The US Bureau of Labor Statistics (BLS) collects information on occupational injuries and illnesses using the Survey of Occupational Injury and Illnesses (SOII). This survey is conducted annually, and estimates the numbers and rates of injuries and illnesses by state from a sample of private and public employer establishments. Types of injuries and illnesses recorded by the SOII include transportation incidents, assaults, skin diseases, respiratory conditions, hearing loss, and others.

From 2000 to 2013, rates of occupational injury and illness in North Carolina decreased steadily from 5,300 to 2,700 injuries and illnesses per 100,000 full-time equivalent (FTE) workers, representing a 49% decline. Likewise, the rate of work-related injury and illness involving missed work days decreased 43% from 1,400 to 800 injuries and illnesses per 100,000 FTE.

Figure 1: Number & Rate of Non-Fatal Work-Related Injuries & Illnesses Involving Days Away From Work Reported by Employers, NC, 2000-2013



Data sources: BLS Current Population Survey, Survey of Occupational Injuries and Illnesses.

Table 1: Number & Rate of Non-Fatal Work Related Injuries & Illnesses Reported by Private Industry Employers, Aged ≥ 16 Years, NC, 2000-2013

Year	Total Number	Incidence Rate per 100,000 FTE	Annual Change in Incidence Rate
2000	146,500	5,300	
2001	128,100	4,800	-9%
2002	106,700	4,000	-17%
2003	104,900	4,000	0%
2004	106,700	4,100	+3%
2005	107,600	4,000	-2%
2006	107,300	4,000	0%
2007	102,300	3,700	-8%
2008	94,600	3,100	-16%
2009	82,800	3,100	0%
2010	79,500	3,100	0%
2011	78,000	3,100	0%
2012	75,900	2,900	-7%
2013	71,500	2,700	-7%

Employers are required to record events that result in death, loss of consciousness, days away from work, restricted work, or medical treatment beyond first aid.

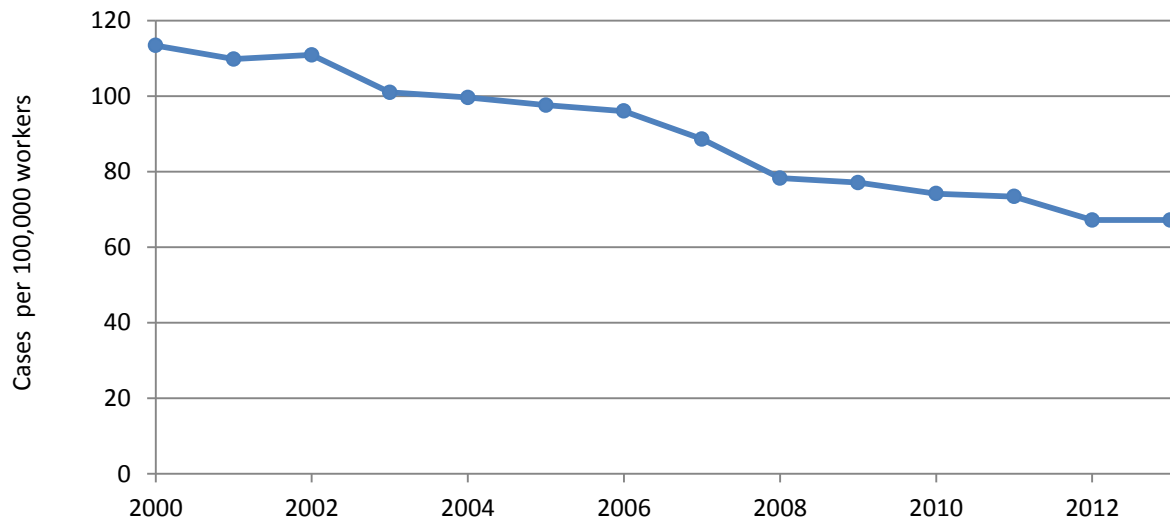
Data sources: BLS Current Population Survey, Survey of Occupational Injuries and Illnesses.

Indicator 2: Work-Related Hospitalizations

Hospitalizations for work-related injuries and illnesses were identified with non-federal, acute care hospital discharge data and defined as hospitalizations in which the source of payment is workers' compensation. Employees hospitalized that were not covered by workers' compensation programs are not included in this analysis. Benefit coverage of state workers' compensation programs influences the proportion of hospitalizations paid for by the programs (Sengupta & Reno, 2007). Although only a fraction of occupational injuries and illnesses results in hospitalization, individuals hospitalized for work-related health conditions often suffer from serious and costly health outcomes (Dembe, Mastroberti, Fox, Bigelow, & Banks, 2003).

In 2013, approximately 2,892 North Carolina workers' compensation cases resulted in hospitalization. From 2000 through 2013, there was a 41% decrease in the rate of hospital discharges in which workers' compensation was the primary payer from 113 hospitalizations to 67 hospitalizations per 100,000 employed persons aged 16 years and older.

Figure 2: Rate of Work-Related Inpatient Hospitalizations, Aged ≥ 16 Years, NC, 2000-2013



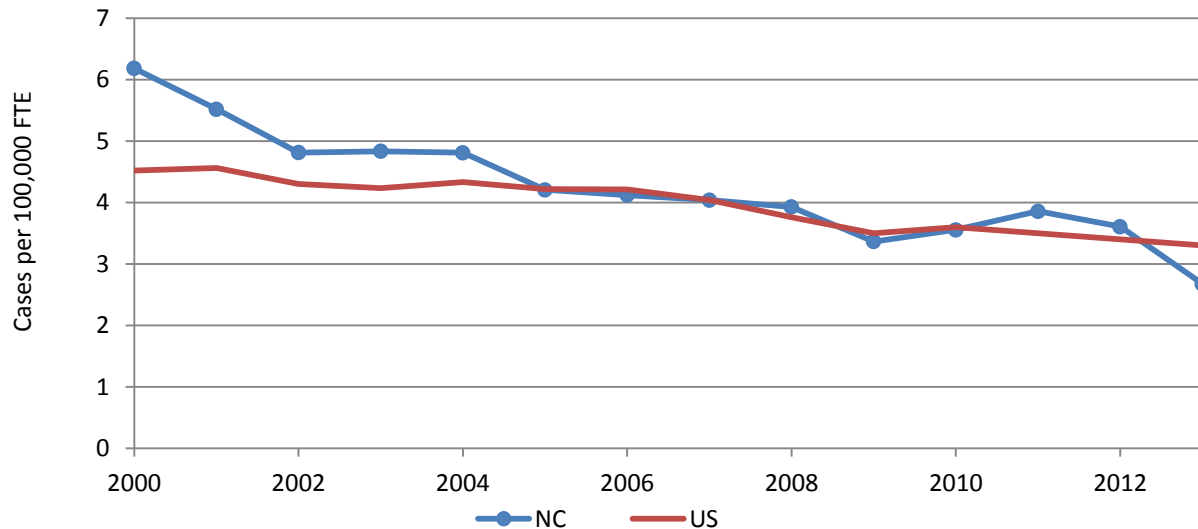
Excludes residents who were hospitalized out of state and patients with unknown age or residence. Secondary hospitalizations may be included. Includes only treatment in which the primary payer is listed as workers' compensation in non-federal, acute care hospitals. Data sources: BLS Current Population Survey, NC Inpatient Hospital Discharge Database

Indicator 3: Fatal Work-Related Injuries

Occupational fatality data were provided by the Census of Fatal Occupational Injuries (CFOI) administered by the BLS. This data source includes detailed counts of all intentional and unintentional fatal work-related injuries in the US each year.

During the study period, an average of 165 fatal occupational injuries occurred per year. A 57% decrease in fatal injuries was observed in North Carolina between 2000 and 2013, as rates fell from 6.2 to 2.7 deaths per 100,000 FTE. North Carolina fatal injury rates have decreased more rapidly than the national average, which has seen a 27% decline during the same time period. Despite the exclusion of deaths occurring during workers' commutes, about 40% of fatal occupational injuries in North Carolina were associated with transportation incidents.

Figure 3.1: Rate of Fatal Work-Related Injuries, NC & US, 2000-2013



Excludes illness-related deaths unless precipitated by injury event.

Workers under the age of 16 years, volunteer workers, and members of the resident military are not included in the denominator, but may be included in the numerator.

Data sources: BLS Current Population Survey, Census of Fatal Occupational Injuries

The rate of fatal work-related injuries in the industry sector including agriculture, forestry, fishing, and hunting (26.7 deaths per 100,000 FTE) was nearly ten times the overall rate (2.7 deaths per 100,000 FTE) in 2013. Demographic groups at higher risk than average for fatal injury were Hispanic workers (4.6 deaths per 100,000 FTE in 2013) and those aged 65 years and older (10.5 deaths per 100,000 FTE in 2013). Although these worker groups account for a relatively small proportion of work-related deaths, they face a disproportionately higher risk of fatal occupational injuries. However, there was an overall decline in the rate of fatal occupational injuries over time, including within high-risk worker groups (e.g Hispanic workers).

Table 3: Rate¹ of Fatal Work-Related Injuries by Industry Sector, NC, 2008-2013

Industry	2008	2009	2010	2011	2012	2013	Average
Education and health services	0.8	0.8	0.7	-	0.6	-	0.7
Wholesale and retail trade	3.3	2.2	4.3	3.5	4.2	2.5	3.3
Professional and business services	4.2	2.5	6.1	3.8	4.1	2.2	3.8
Leisure and hospitality	2.1	4.4	2.6	2.6	3.1	2.4	2.9
Construction	9.7	7.4	9.8	10.8	7.5	7.3	8.7
Manufacturing	3.0	3.4	1.0	1.2	2.4	1.0	2.0
Public administration	4.2	4.3	3.2	4.5	3.5	-	3.9
Transportation and utilities	10.2	10.0	9.9	15.2	10.7	6.5	10.4
Agricultural and related	41.7	31.6	24.0	27.8	25.4	26.7	29.5

1: Rate of Fatal Work-Related Injuries per 100,000 FTE

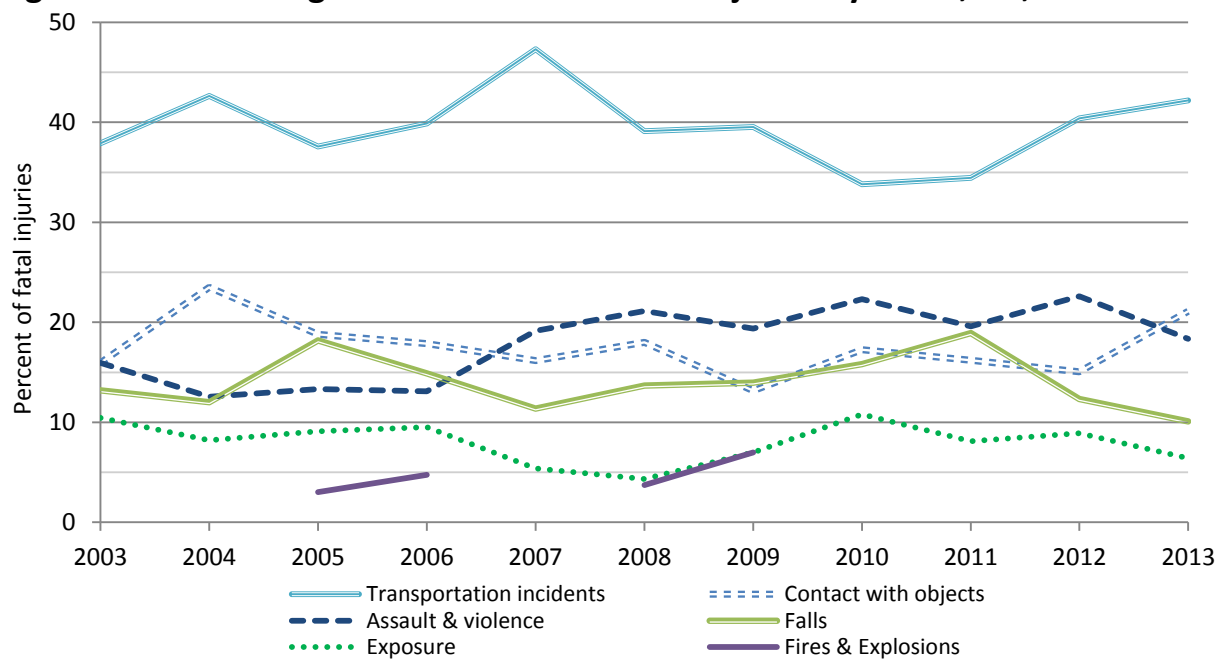
Workers under the age of 16 years, volunteer workers, and members of the resident military are not included in rate calculations.

The government industry category is not presented separately and may be included in any industry category.

Dashes indicate a fatality rate that was not calculated because the data did not meet publication criteria or there were no data reported. The following industry sectors did not meet publication criteria or had no data reported for three or more of the years presented: mining, information, financial activities, and other services.

Data sources: BLS Current Population Survey, Census of Fatal Occupational Injuries

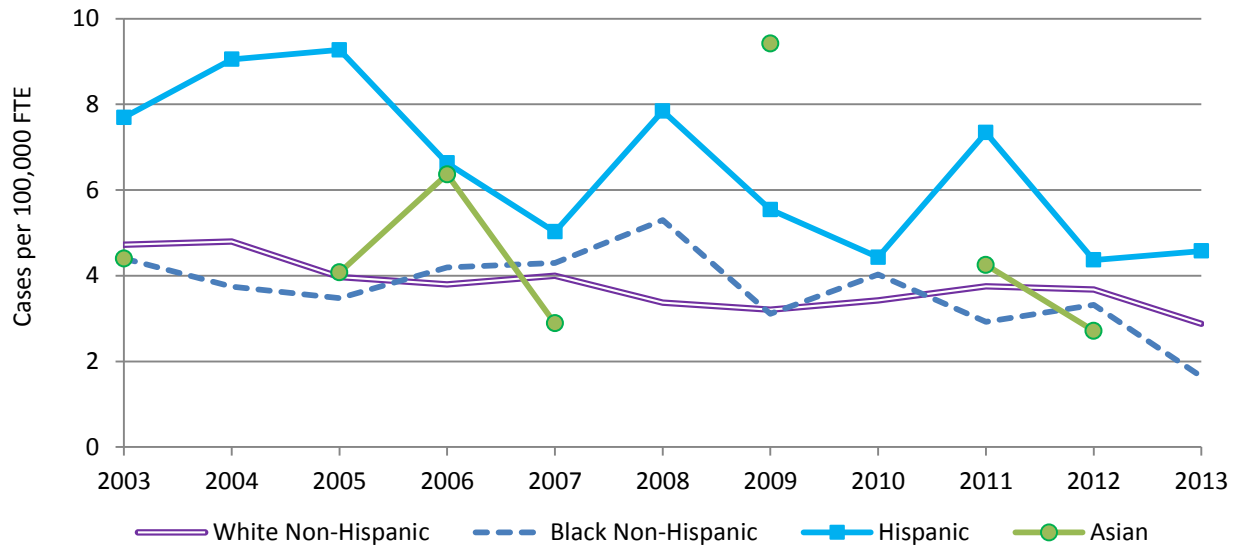
Figure 3.3: Percentage of Fatal Work-Related Injuries by Event, NC, 2003-2013



Workers under the age of 16 years, volunteer workers, and members of the resident military are not included in the denominator, but may be included in the numerator.

Data sources: BLS Current Population Survey, Census of Fatal Occupational Injuries

Figure 3.4: Rate of Fatal Work-Related Injuries by Select Race & Ethnicity, NC, 2003-2013



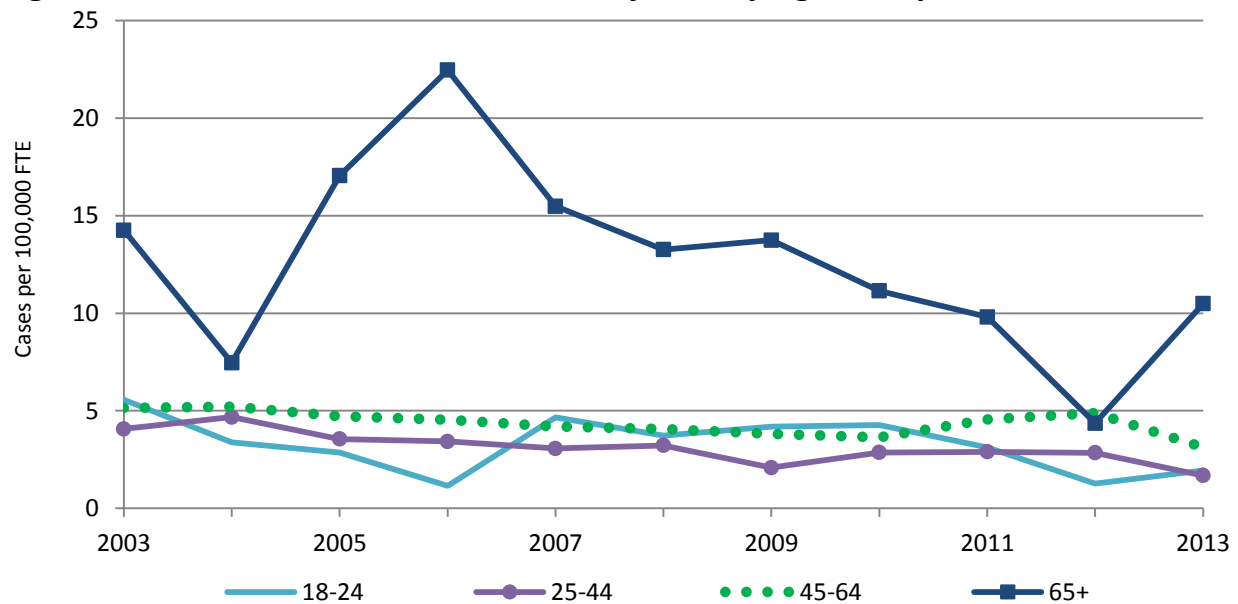
Excludes illness-related deaths unless precipitated by injury event.

Workers under the age of 16 years, volunteer workers, and members of the resident military are not included in the denominator, but may be included in the numerator.

Persons identified as Hispanic may be of any race, but are classified here only by ethnicity.

Data sources: BLS Current Population Survey, Census of Fatal Occupational Injuries

Figure 3.5: Rate of Fatal Work-Related Injuries by Age Group, NC, 2003-2013



Excludes illness-related deaths unless precipitated by injury event.

Workers under the age of 16 years, volunteer workers, and members of the resident military are not included in the denominator, but may be included in the numerator.

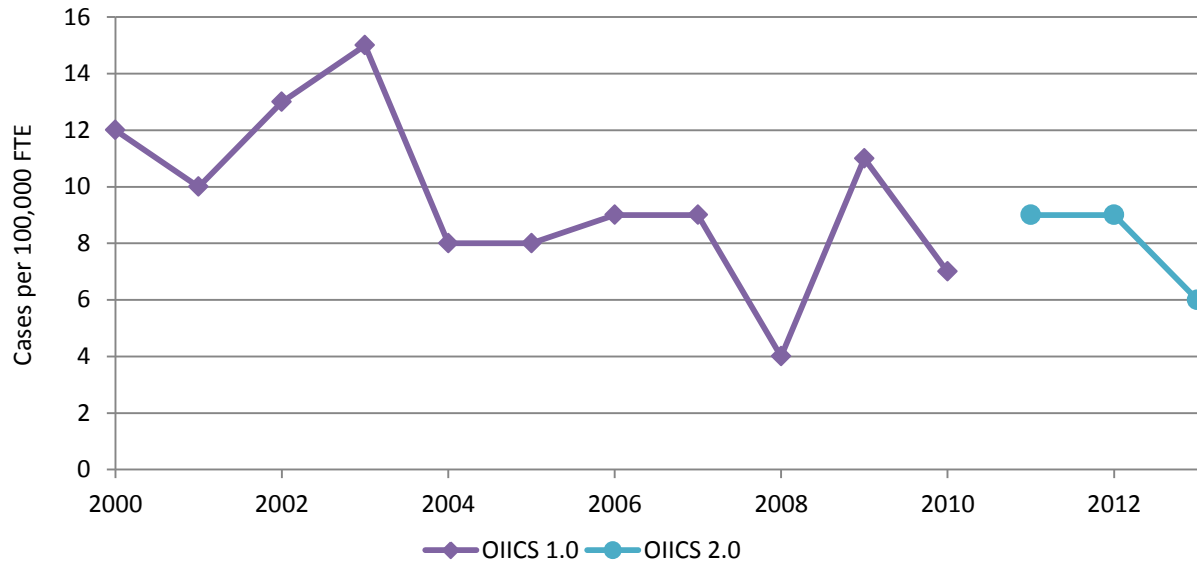
Data sources: BLS Current Population Survey, Census of Fatal Occupational Injuries

Indicator 4: Amputations Reported by Employers

The BLS collects information on amputations using the SOII. An amputation is defined as the total or partial loss of an appendage—most commonly involving a hand. These preventable injuries can have a significant impact on a worker’s quality of life and earning potential. Many amputees are unable to return to work following their injuries (Whyte & Carroll, 2002).

The rate of work-related amputations in North Carolina varied from 2000 through 2013 due to the relatively small number (annual average of 247) of amputations per year. In 2013, 150 amputations were reported, representing 6 amputations per 100,000 FTE. This was a 50% decrease in the rate from the year 2000, when 342 amputations were reported.

Figure 4: Rate of Work-Related Amputations with Days Away From Work Reported by Employers, NC, 2000-2013



Since the adoption of the Occupational Injury and Illness Classification System (OIICS) version 2.01, the BLS cautions against directly comparing codes from 1992-2010 and from 2011 onward.

Employers are required to record events that result in death, loss of consciousness, days away from work, restricted work, or medical treatment beyond first aid.

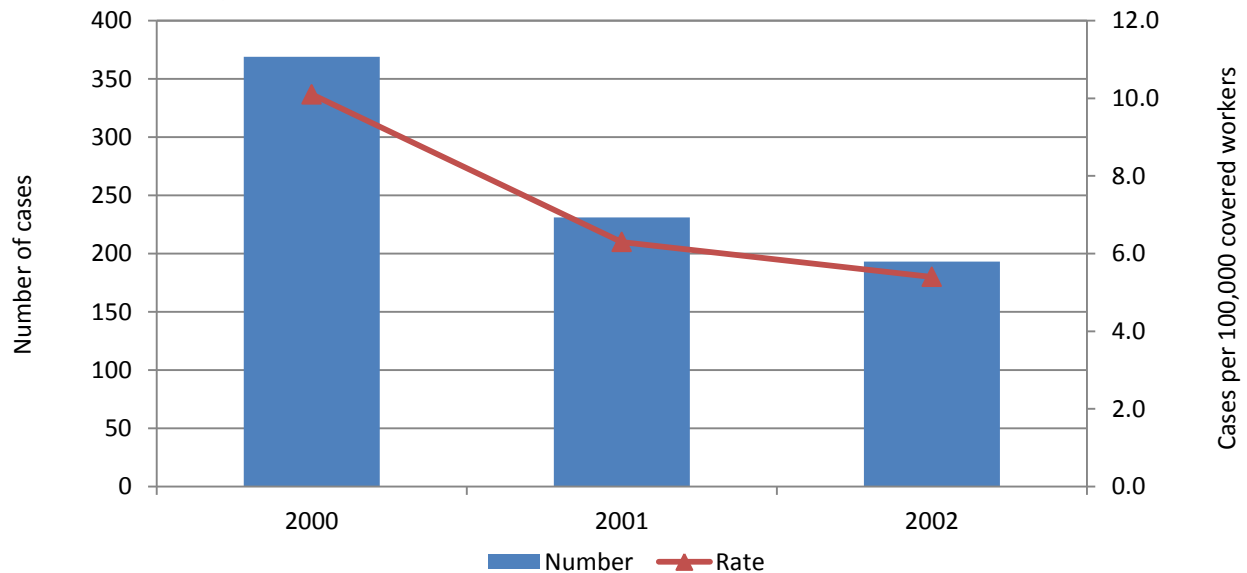
The military, self-employed individuals, farms with fewer than 11 employees, and federal agencies are excluded.

Data sources: BLS Current Population Survey, Survey of Occupational Injuries and Illnesses

Indicator 5: Amputations Identified in the North Carolina Workers' Compensation System

This indicator uses workers' compensation claims data to identify contributory factors of work-related amputations, which can be used to develop or improve prevention strategies. Data for 2000 through 2002 suggest a decline in amputation claims involving time away from work. Data for 2003-2013 were not available.

Figure 5: Number & Rate of Amputations with Lost Work-Time Filed with State Workers' Compensation, NC, 2000-2002



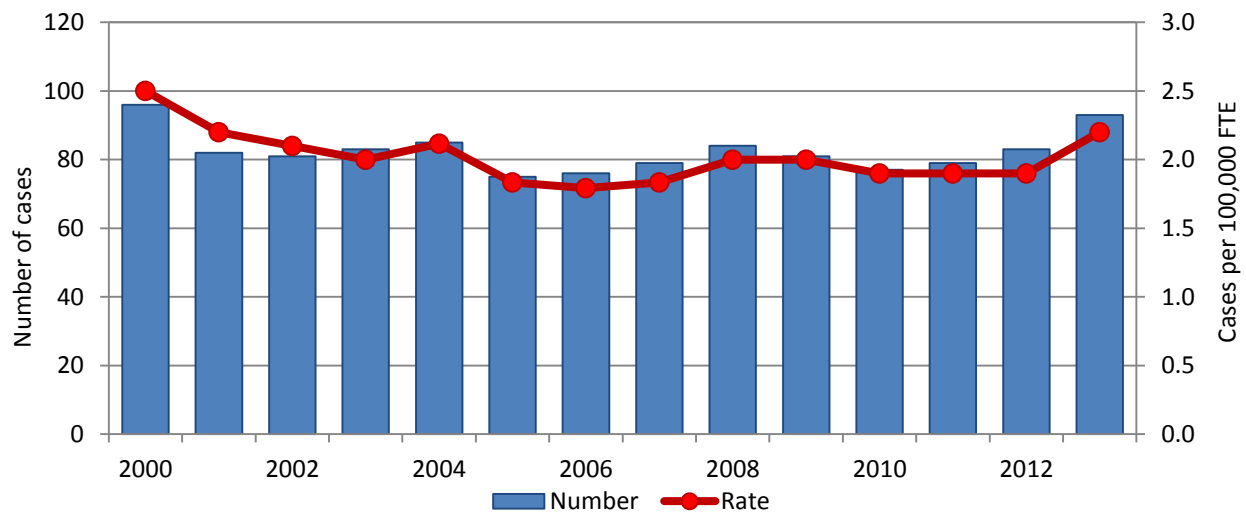
Data sources: NC Industrial Commission Workers' Compensation system, National Academy of Social Insurance

Indicator 6: Hospitalizations for Work-Related Burns

Work-related burns are some of the most devastating injuries affecting workers. Although hospitalizations for occupational burns are rare, they may be painful, disabling, disfiguring, and costly to treat (Baggs, Curwick, & Silverstein, 2002). To track hospitalizations for work-related burns, this indicator utilizes hospital discharge records for which workers' compensation is the payer source.

The number and rate of work-related burn hospitalizations has varied slightly between 2000 and 2013. In 2013, 2.2 hospitalizations per 100,000 FTE were reported, which represents a 12% decline in the rate of work-related burns since 2000. Hospitalizations for work-related burns reached their lowest level in 2005, when approximately 1.8 workers per 100,000 employed persons were hospitalized for work-related burns.

Figure 6: Number & Rate of Inpatient Hospitalizations for Work-Related Burns, NC, 2000-2013



Excludes residents who were hospitalized out of state, patients under age 16, and patients with unknown age or residence. Secondary hospitalizations may be included. Includes only treatment in which the primary payer is listed as workers' compensation in non-federal, acute care hospitals.

Data sources: BLS Current Population Survey, NC Inpatient Hospital Discharge Database

Indicator 7: Musculoskeletal Disorders Reported by Employers

Comprising the largest category of work-related illness, Musculoskeletal Disorders (MSDs) are soft-tissue injuries or disorders of muscles, tendons, nerves, ligaments, joints, or spinal discs. These disorders may be caused by repetitive motions, awkward body postures, use of vibrating tools, exposure to extreme temperatures, and manual handling of heavy loads. In addition, MSDs can be caused by single traumatic events such as falls (Punnett & Wegman, 2004). This indicator utilizes SOII data to characterize MSDs by body part affected.

In 2013, more than 5,000 MSDs caused employees to miss at least one day of work in North Carolina (Table 7). This represents 197 incidents per 100,000 FTE, a 51% decline from 2000. Roughly half (54%) of all MSDs during this time period involved the back. Figure 7 illustrates the decline in all categories of work-related MSDs with days away from work reported by employers in North Carolina between 2000 and 2013.

Table 7: Number of Work-Related Musculoskeletal Disorders with Days Away From Work Reported by Employers, NC, 2000-2013

Year	All	Neck, Shoulder, and Upper Extremities	Carpal Tunnel Syndrome	Back
2000	11,019	2,824	410	6,657
2001	9,436	2,122	544	5,633
2002	8,464	2,314	471	4,889
2003	7,400	1,930	290	4,100
2004	7,090	1,990	290	3,760
2005	7,690	2,070	270	4,060
2006	7,040	2,020	270	3,850
2007	6,880	1,820	200	3,850
2008	5,940	1,480	140	3,390
2009	5,600	1,510	130	3,080
2010	5,200	1,520	130	2,660
2011	5,720	1,650	160	2,550
2012	6,310	1,500	70	3,000
2013	5,230	1,410	80	2,330

MSDs do not include disorders caused by crashes or similar incidents.

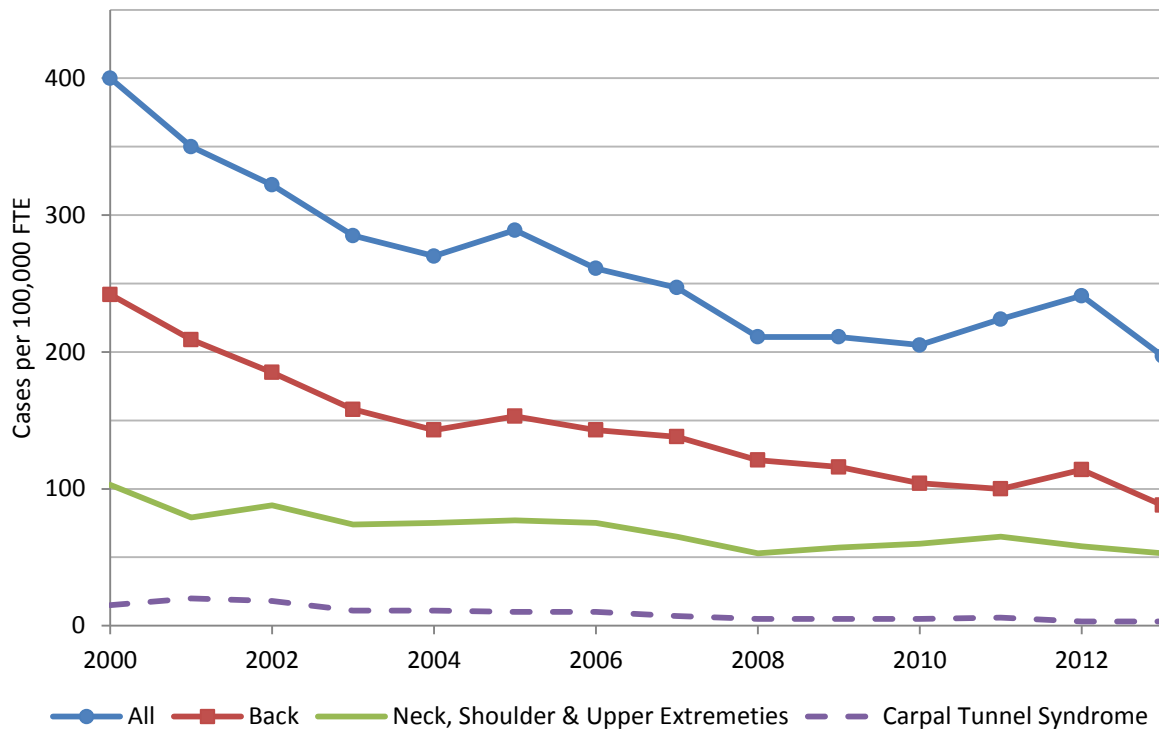
Since the adoption of the Occupational Injury and Illness Classification System (OIICS) version 2.01, the BLS cautions against directly comparing codes from 1992-2010 and from 2011 onward.

Employers are required to record events that result in death, loss of consciousness, days away from work, restricted work, or medical treatment beyond first aid. If an employer has more than 30 cases with days away from work, the employer is only required to report on 30 such cases.

The military, self-employed individuals, farms with fewer than 11 employees, and federal agencies are excluded.

Data sources: BLS Current Population Survey, Survey of Occupational Injuries and Illnesses

Figure 7: Rate of Work-Related Musculoskeletal Disorders with Days Away From Work Reported by Employers, NC, 2000-2013

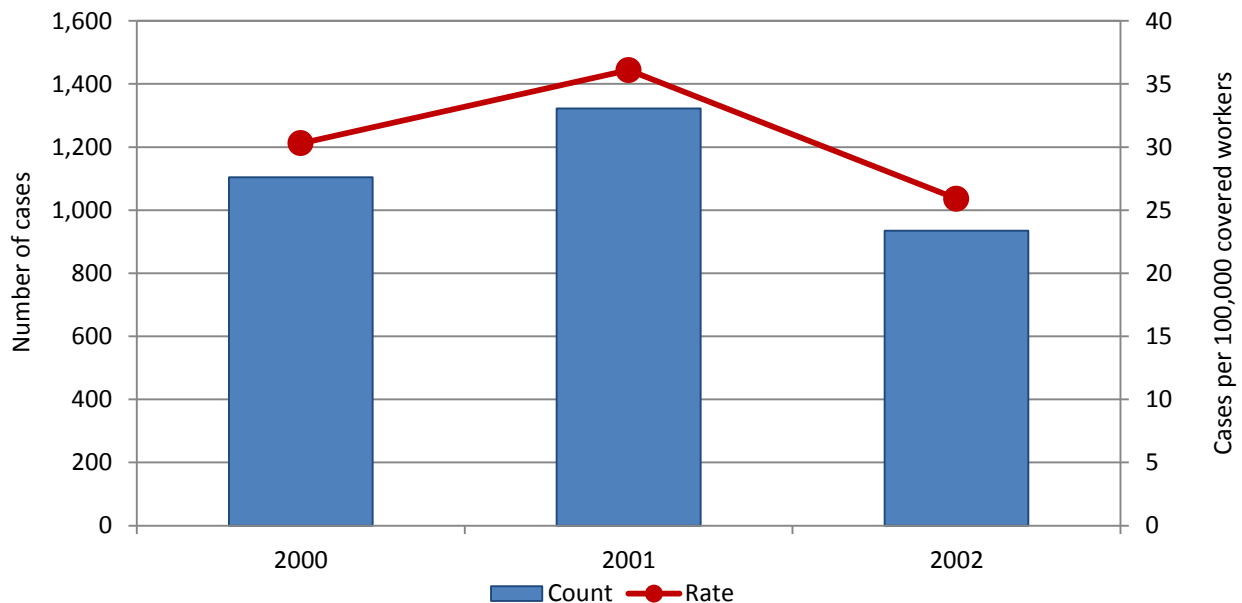


MSDs do not include disorders caused by crashes or similar incidents. Employers are required to record events that result in death, loss of consciousness, days away from work, restricted work, or medical treatment beyond first aid. If an employer has more than 30 cases with days away from work, the employer is only required to report on 30 such cases. The military, self-employed individuals, farms with fewer than 11 employees, and federal agencies are excluded. Data sources: BLS Current Population Survey, Survey of Occupational Injuries and Illnesses

Indicator 8: Carpal Tunnel Syndrome Cases Identified by Workers' Compensation System

This indicator uses workers' compensation claims data to identify contributory factors of work-related carpal tunnel syndrome (CTS) cases, which can be used to develop or improve prevention strategies. CTS is a disorder of the nervous system resulting in numbness, tingling, or weakness in the hand and fingers. This musculoskeletal disorder is associated with forceful work and highly repetitive movements of the wrist. Activities often triggering the symptoms of CTS include keyboarding, driving, using a telephone handset, and crocheting (Bernard, 1997). Data for 2000 through 2002 show variation in the number and rate of CTS claims involving time away from work (Figure 8). Data for 2003 onward were not available.

Figure 8: Number & Rate of Carpal Tunnel Syndrome Cases with Lost Work-Time Filed with State Workers' Compensation, NC, 2000-2013



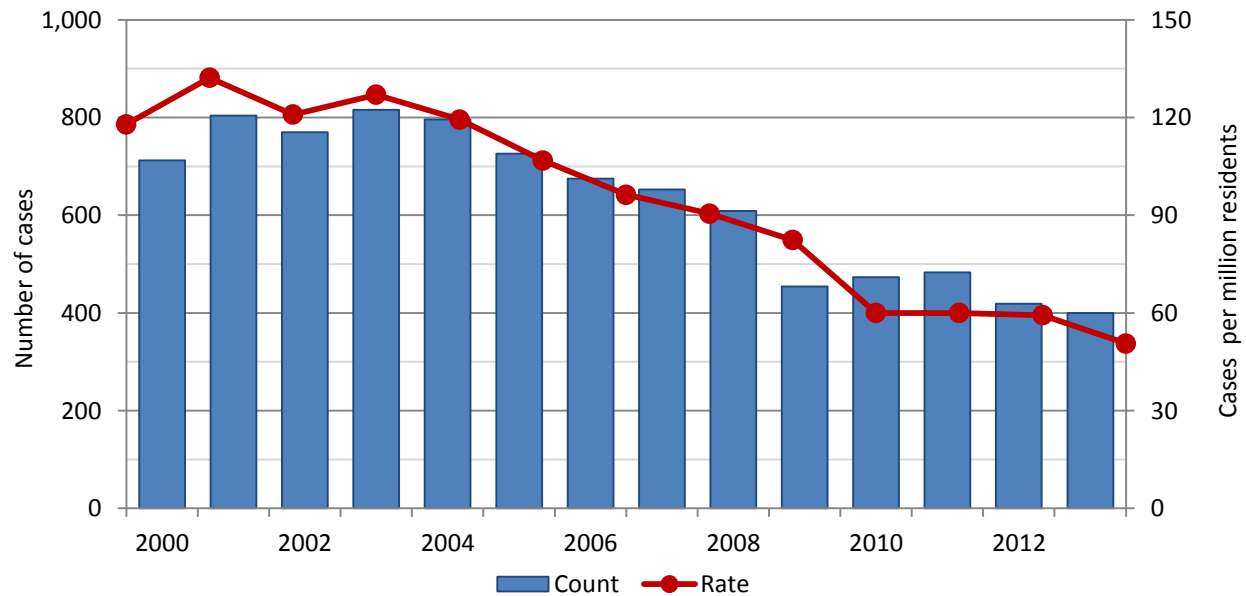
Data sources: NC Industrial Commission Workers' Compensation system, National Academy of Social Insurance

Indicator 9: Hospitalizations from or with Pneumoconiosis

Pneumoconioses are a group of lung conditions resulting from chronic inhalation of substances such as fibers and dust, usually in an occupational setting. The most common forms of pneumoconioses are asbestosis, silicosis, and coal workers' pneumoconiosis. Affected individuals may experience many years of latency between exposure and full development of the disease. Severe cases of pneumoconiosis can lead to lung impairment, disability, and premature death (Centers for Disease Control and Prevention, 2012). This indicator uses hospital discharge data to describe trends in pneumoconiosis.

In 2013, there were 400 reported hospitalizations in North Carolina with pneumoconiosis listed as a primary or secondary diagnosis, with an age-adjusted rate of 46.5 hospitalizations per million residents. This reflects a decrease of 61% in the age-adjusted hospitalization rate since 2000. Asbestosis hospitalizations comprised the majority (75%) of pneumoconiosis hospitalizations during this time period, with an age-adjusted rate of 40.2 hospitalizations per million residents in 2013.

Figure 9.1: Number & Age-Adjusted Rate of Hospitalizations From or With Pneumoconiosis, NC, 2000-2013



Excludes residents who were hospitalized out of state, patients under age 15, and patients with unknown age or residence. Secondary hospitalizations may be included. Includes only treatment in which the primary payer is listed as workers' compensation in non-federal, acute care hospitals.

Age-standardized rates are based on the 2000 US Standard Population and the Census Bureau's State Population Estimates.

Data sources: US Census, NC Inpatient Hospital Discharge Database

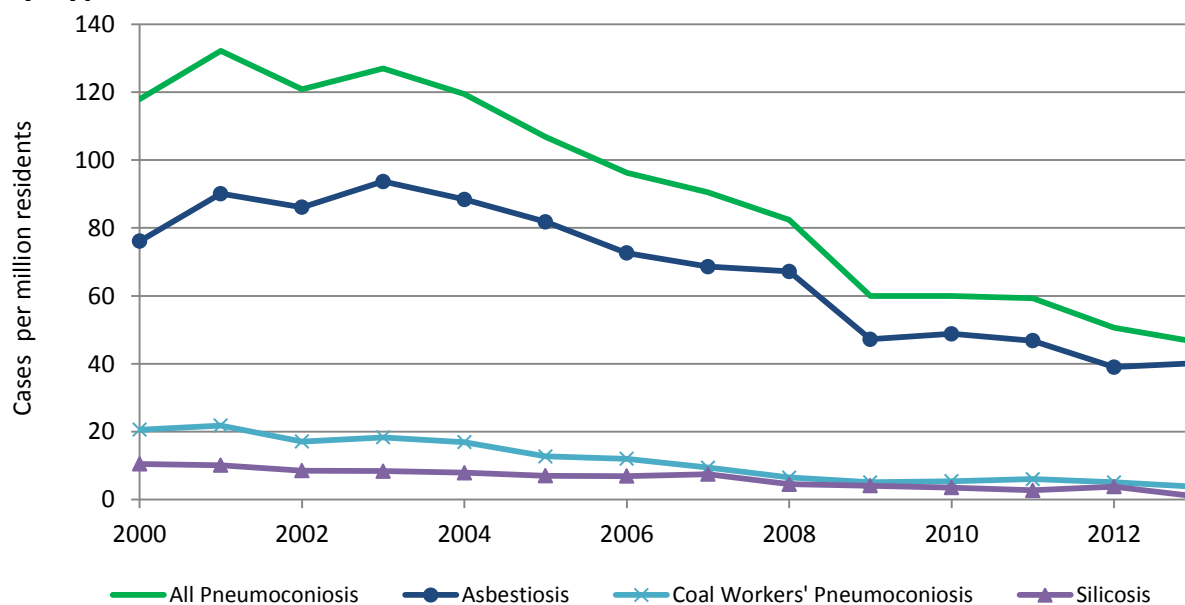
Table 9: Number of Hospitalizations From or With Pneumoconiosis, Aged ≥ 15, NC, 2000-2013

Year	All Pneumoconiosis	Asbestosis	Silicosis	Coal Workers' Pneumoconiosis	Other and Unspecified Pneumoconiosis
2000	712	460	64	125	63
2001	804	547	61	134	62
2002	770	548	55	109	63
2003	816	601	54	119	46
2004	796	590	52	114	44
2005	726	551	49	89	38
2006	675	504	50	87	37
2007	653	493	55	69	36
2008	609	494	35	49	35
2009	454	356	31	40	27
2010	473	383	28	45	19
2011	483	378	23	51	31
2012	419	320	31	45	24
2013	400	344	8	35	14

Excludes residents who were hospitalized out of state, patients under age 15, and patients with unknown age or residence. Secondary hospitalizations may be included. Includes only treatment in which the primary payer is listed as workers' compensation in non-federal, acute care hospitals.

Data sources: NC Inpatient Hospital Discharge Database

Figure 9.2: Age-Adjusted Rate of Hospitalizations From or With Pneumoconiosis, by Type, NC, 2000-2013



Excludes residents who were hospitalized out of state, patients under age 15, and patients with unknown age or residence. Secondary hospitalizations may be included. Includes only treatment in which the primary payer is listed as workers' compensation in non-federal, acute care hospitals.

Age-standardized rates are based on the 2000 US Standard Population and the Census Bureau's State Population Estimates.

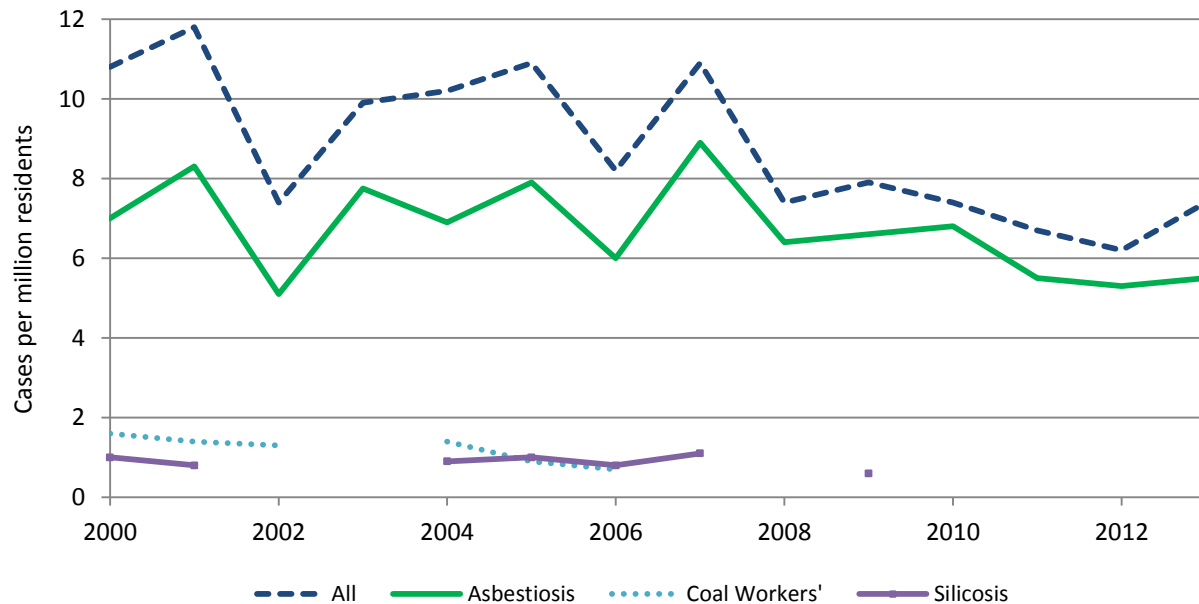
Data sources: US Census, NC Inpatient Hospital Discharge Database

Indicator 10: Mortality from or with Pneumoconiosis

In addition to hospitalization surveillance, tracking pneumoconiosis mortality is essential for measuring progress towards elimination of the disease, as well as for targeting prevention and disease management programs.

Between 2000 and 2013, the number of deaths from or with pneumoconiosis fluctuated slightly with an overall downward trend. In 2013, 62 deaths were reported among North Carolina residents for which the underlying or contributing cause of death was listed as pneumoconiosis, with 7.4 deaths per million residents. This represents a decline in the age-adjusted death rate of more than 31% since 2000. Asbestosis comprised approximately 77% of the deaths from pneumoconiosis in 2013.

Figure 10: Age-Adjusted Pneumoconiosis Death Rate by Type, NC, 2000-2013



Excludes deaths of out-of-state residents, those under age 15, and those with unknown age or residence.

Causes of death listed on the death certificate and coding of those causes may be inaccurate.

As pneumoconioses are chronic diseases of long latency, current incidence is not necessarily indicative of current exposure.

Age-standardized rates are based on the 2000 US Standard Population and the Census Bureau's State Population Estimates. Rates for years when deaths < 5 are excluded, as counts are too small to produce reliable estimates

Data sources: US Census, State Center for Health Statistics

Table 10.1: Number of Deaths From or With Pneumoconiosis, Aged ≥ 16 Years, NC, 2000-2013

Year	All Pneumoconiosis	Coal Workers' Pneumoconiosis	Asbestosis	Silicosis	Other and Unspecified Pneumoconiosis
2000	63	9	41	6	8
2001	69	8	49	5	8
2002	46	8	32	*	5
2003	62	*	49	*	6
2004	66	9	45	6	6
2005	72	6	52	7	7
2006	57	5	41	6	5
2007	77	*	63	8	*
2008	54	*	46	*	*
2009	59	5	49	5	*
2010	55	*	50	*	*
2011	52	6	43	*	*
2012	48	*	41	*	*
2013	62	12	46	*	*

* < 5 deaths

Excludes deaths of out-of-state residents, those under age 15, and those with unknown age or residence.

Causes of death listed on the death certificate and coding of those causes may be inaccurate.

Data sources: US Census, State Center for Health Statistics

Indicator 11: Acute Work-Related Pesticide Poisonings Reported to Poison Control Centers

Workers who handle pesticides are at increased risk of illness from occupational exposure. Poison Control Centers (PCCs) are important sources of reports of acute poisonings and chemical exposures among workers. These data can be useful for targeted prevention. Data for this indicator are comparable across states due to the uniformity in case handling by PCCs.

In 2013, there were 101 cases of work-related pesticide poisonings reported to the North Carolina poison control center, with a rate of 2.3 cases per 100,000 workers aged 16 years and older. This represents a 10% overall increase since 2000. During the period between 2000 and 2012, the rate of work-related pesticide poisonings in North Carolina remained higher than the US rate, exceeding it by approximately 32% in 2012. This difference may be due, in part, to the sizeable agricultural industry in the state.

Table 11.1: Number & Rate of Acute Work-Related Pesticide-Associated Illness & Injury Reported to Poison Control Centers, Aged ≥ 16 Years, NC & US, 2000-2013

Year	North Carolina		United States	
	Number	Rate ¹	Number	Rate ¹
2000	79	2.1	2,827 ²	2.1 ²
2001	72	1.9	2,474 ²	1.8 ²
2002	103	2.7	2,528 ²	1.9 ²
2003	66	1.7	2,503 ²	1.8 ²
2004	82	2.0	2,476	1.8
2005	102	2.5	2,593	1.8
2006	147	3.5	2,560	1.8
2007	120	2.8	2,458	1.7
2008	103	2.4	2,171	1.5
2009	81	2.0	2,040	1.5
2010	140	3.4	2,871	2.1
2011	112	2.7	2,857	2.0
2012	118	2.8	2,696	1.9
2013	101	2.3	- ³	- ³

1: Rates are calculated per 100,000 employed persons aged ≥ 16 years.

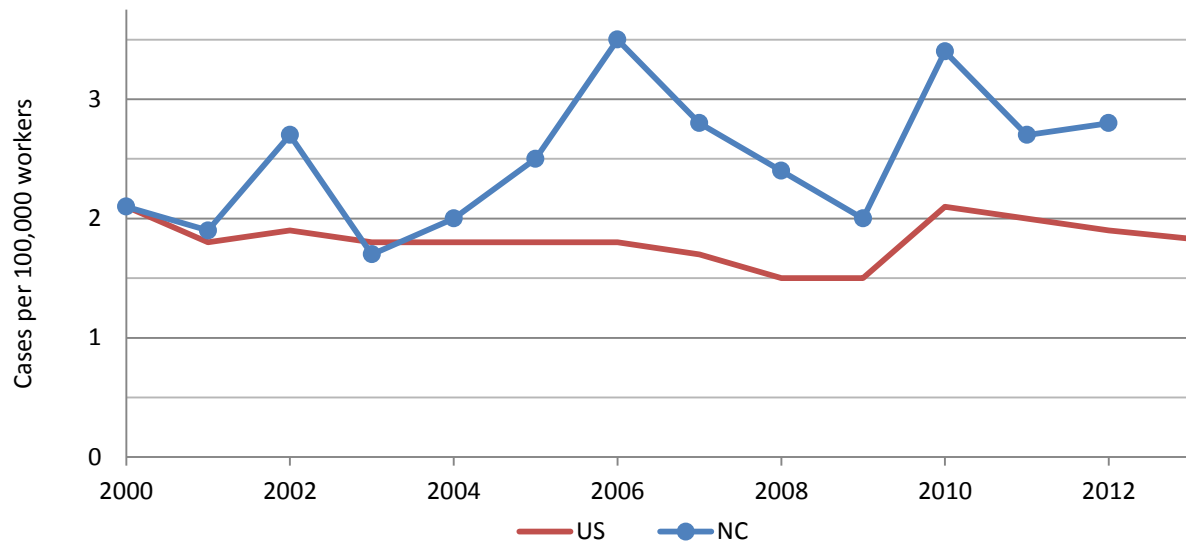
2: US calculations for 2000-2003 do not include MS and ND.

3: Data not available.

Excludes out-of-state residents and cases of suspected suicide, intentional abuse, intentional action but specific intention unknown, malicious, or unknown reason.

Data Sources: BLS Geographic Profile of Employment and Unemployment, American Association of Poison Control Centers

Figure 11: Rate of Acute Work-Related Pesticide-Associated Illness & Injury Reported to Poison Control Centers, Workers Aged ≥ 16 Years, NC, 2000-2013



US rate calculations for 2000-2003 do not include MS and ND.

Excludes out-of-state residents and cases of suspected suicide, intentional abuse, intentional action but specific intention unknown, malicious, or unknown reason.

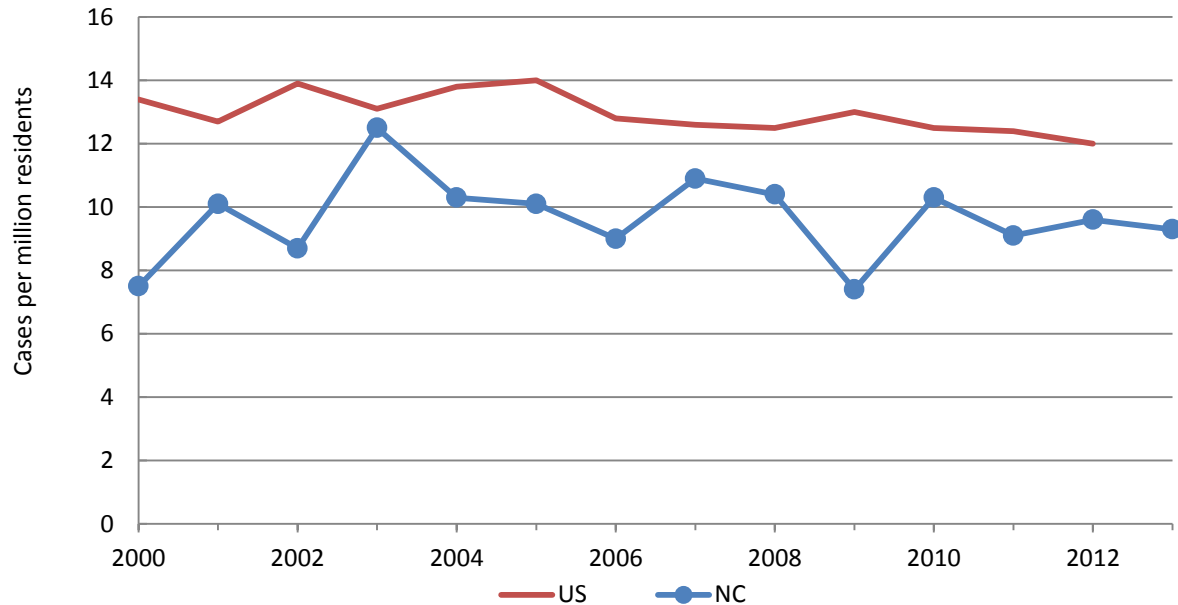
Data Sources: BLS Geographic Profile of Employment and Unemployment, American Association of Poison Control Centers

Indicator 12: Incidence of Malignant Mesothelioma

Mesothelioma is a deadly cancer of the thin lining of the lungs and other organs, which may develop years after chronic exposure to asbestos. Data from state cancer registries were used to measure incidence of this disease. This rare disease is primarily diagnosed in older adults who survive an average of eight months following diagnosis (Beebe-Dimmer et al., 2015).

In 2013, 79 newly diagnosed mesothelioma cases were reported in North Carolina, with an age-standardized rate of 9.3 cases per million residents. This represents an average increase of 4% per year, a 24% overall increase in the incidence rate since 2000. Though fluctuating throughout this time period, the rate of mesothelioma incidence in North Carolina has remained below the national average, which was 12 cases per million residents in 2012.

Figure 12: Age-Adjusted Rate of Malignant Mesothelioma Incidence, Residents Aged ≥ 15 Years, NC, 2000-2013



Not all cases are caused by occupational exposures.

Causes of death listed on the death certificate and coding of those causes may be inaccurate.

Age-standardized incidence rates are expressed as cases per one million residents and are based on the 2000 US Standard Population and the Census Bureau's Population Estimates.

Data Sources: NC Central Cancer Registry, North American Association of Central Cancer Registries, US Census.

Table 12.1: Number & Rate of Malignant Mesothelioma Incidence, Residents Aged ≥ 15 Years, NC & US, 2000-2013

Year	North Carolina		United States	
	Number	Rate ¹	Number	Rate ¹
2000	46	7.5	-	13.4
2001	62	10.1	-	12.7
2002	53	8.7	761	13.9
2003	76	12.5	728	13.1
2004	68	10.3	2,759	13.8
2005	69	10.1	2,691	14.0
2006	62	9.0	2,637	12.8
2007	80	10.9	2,872	12.6
2008	76	10.4	3,003	12.5
2009	72	7.4	2,921	13.0
2010	80	10.3	2,850	12.5
2011	81	9.1	3,108	12.4
2012	77	9.6	3,109	12.0
2013	79	9.3	- ²	- ²

1: Age-standardized incidence rates are expressed as cases per one million residents and are based on the 2000 US Standard Population and the Census Bureau's Population Estimates.

2: Data not available.

Not all cases are caused by occupational exposures.

Causes of death listed on the death certificate and coding of those causes may be inaccurate.

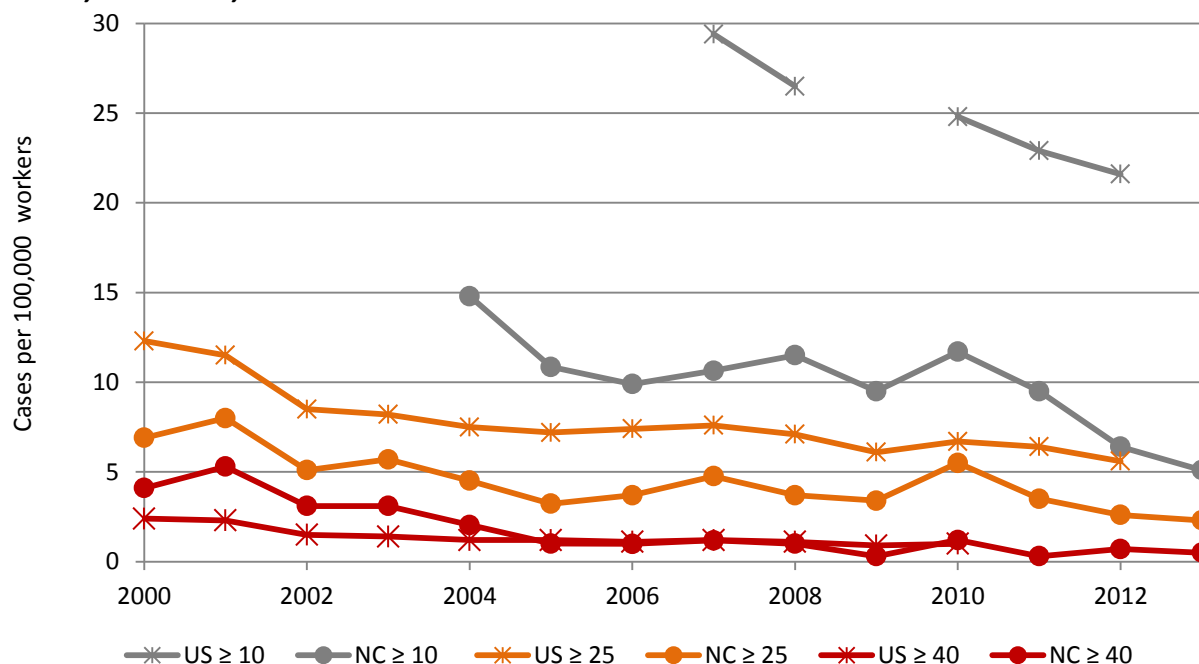
Data Sources: NC Central Cancer Registry, North American Association of Central Cancer Registries, US Census.

Indicator 13: Elevated Blood Lead Levels among Adults

Lead is a toxic metal commonly found in the environment and also the workplace, where worker exposure in some industries can be common. The vast majority of adult cases are associated with occupational exposure. The blood lead level (BLL) is a biological indicator that can be used to identify recent exposure. The average BLL for the general US population is less than 2 µg/dL (CDC, 2015). Even at low doses, lead exposure can become toxic and may result in acute and chronic life-threatening cardiovascular, kidney, neurological, and reproductive outcomes (CDC, 2013). Data measuring elevated BLL were collected by the North Carolina Adult Blood Lead Epidemiology Surveillance (ABLES) program until September 2013. From 2013 onward, adult BLL data were collected by the North Carolina Lead Surveillance System (NC LEAD).

In 2013, 219 cases of elevated BLL ≥ 10 µg/dL were reported in residents aged ≥ 16 years in North Carolina, with a prevalence rate of 5.1 cases per 100,000 employed persons. Of these cases, 137 (63%) were newly reported cases, with an incidence rate of 3.2 cases per 100,000 employed persons. In the same year, 99 cases of elevated BLL ≥ 25 µg/dL were reported in residents aged ≥ 16 years in North Carolina, with a prevalence rate of 2.3 cases per 100,000 employed persons. Of these cases, 59 (60%) were newly reported cases, with an incidence rate of 1.4 cases per 100,000 employed persons. Also in 2013, 23 cases of elevated BLL ≥ 40 µg/dL were reported in North Carolina residents aged ≥ 16 years, with a prevalence rate of 0.5 cases per 100,000 employed persons. Of these cases, 14 (61%) were newly reported case, with an incidence rate of 0.3 cases per 100,000 employed persons. With the exception of the most extreme cases (≥ 40 µg/dL), the North Carolina prevalence rate has remained well below the national average. The prevalence rate of elevated BLL ≥ 40 µg/dL in North Carolina remained above the national rate through 2004, but remained at or below the US rate from 2005 through 2009.

Figure 13: Prevalence Rate of Elevated Blood Lead Levels among Adults Aged ≥ 16 Years, NC & US, 2000-2013



All cases of adult elevated blood lead levels (BLLs) are included in the numerator, but the denominators include only employed persons. A prevalent case is a person with a blood lead level greater than or equal to the listed level that was reported at least once in the calendar year. Data sources: Adult Blood Lead Epidemiology Surveillance System (ABLES). Workforce estimates from the BLS Current Population Survey.

Table 13.1: Prevalence & Incidence Rates¹ of Elevated Blood Lead Levels, NC, 2000-2013

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	US 2012
BLL ≥ 10 µg/dL															
Prevalence	-	-	-	-	14.8	10.9	9.9	10.6	11.5	9.5	11.7	9.5	6.4	5.1	21.6
Incidence	-	-	-	-	11.2	8.4	7.7	8.5	8.1	6.9	9.7	6.6	3.9	3.2	
BLL ≥ 25 µg/dL															
Prevalence	6.9	8.0	5.1	5.7	4.5	3.2	3.7	4.8	3.7	3.4	5.5	3.5	2.6	2.3	5.6
Incidence	4.00	4.90	2.80	3.80	2.71	2.08	2.57	3.23	2.00	1.90	4.40	2.10	1.30	1.40	
BLL ≥ 40 µg/dL															
Prevalence	4.1	5.3	3.1	3.1	2.0	1.0	1.0	1.2	1.0	0.3	1.2	0.3	0.7	0.5	1.0 ²
Incidence	2.5	2.8	0.9	1.8	1.1	0.5	0.6	0.7	0.6	0.2	1.0	0.5	0.4	0.3	

1: Rates represent cases per 100,000 employed persons age ≥ 16 years

2: Latest available (2010) data provided.

State lead registries regularly update data, thus published numbers may change over time.

All cases of adult elevated blood lead levels (BLLs) are included in the numerator, but the denominators include only employed persons.

A prevalent case is a person with a blood lead level greater than or equal to the listed level that was reported at least once in the calendar year. An incident case is a person with a blood lead level greater than or equal to the listed level that was reported in the calendar year, but not in the immediately preceding calendar year.

Data sources: Adult Blood Lead Epidemiology Surveillance System (ABLES). Workforce estimates from the BLS Current Population Survey.

Indicators 14-16: Workers Employed in Industries and Occupations with High Risk for Morbidity and Mortality

Workers in certain industries and occupations are consistently at a much higher risk for injuries and illnesses than the overall workforce. Examples of the most common occupations associated with high risk for morbidity and mortality include construction laborers, nurses, and truck drivers. Examples of industries associated with high rates of morbidity and mortality include construction, truck transportation, and landscaping. The proportion of the workforce that is employed in high risk industries and occupations varies across states, which may explain some of the differences in occupational injuries and illnesses among states. High risk industries and occupations experienced injury and illness rates that were more than double the national average, according to CFOI and SOII data. The North American Industry Classification System (NAICS) is the standard used by federal agencies to categorize establishments by primary business activity. The Standard Occupational Classification (SOC) system provides detailed worker categories based on profession, skills, and duties.

Table 14.1: Number & Percentage of Employment in Industries & Occupations at High Risk for Morbidity & Mortality, NC, 2000-2013

Year	Industries at High Risk for Morbidity		Occupations at High Risk for Morbidity		Industries at High Risk for Mortality		Occupations at High Risk for Mortality	
	Number Employed	Percent of Workforce	Number Employed	Percent of Workforce	Number Employed	Percent of Workforce	Number Employed	Percent of Workforce
2000	215,578	6.4%	266,035	7.0%	592,293	15.5%	242,142	6.3%
2001	214,116	6.2%	276,419	7.3%	556,663	14.7%	242,414	6.4%
2002	206,128	6.2%	259,907	7.1%	560,545	15.2%	239,480	6.5%
2003	250,517	7.5%	502,794	15.1%	623,966	10.6%	431,642	12.9%
2004	231,008	6.5%	561,764	18.6%	638,660	18.6%	508,245	14.8%
2005	240,737	7.1%	586,210	19.3%	649,939	18.7%	519,511	15.0%
2006	243,931	6.9%	572,690	18.0%	688,006	19.1%	579,932	16.1%
2007	254,196	7.1%	548,069	17.5%	640,097	17.5%	524,652	14.4%
2008	236,682	6.6%	1,068,966	25.1%	534,635	15.0%	636,783	12.6%
2009	337,406	10.1%	518,681	17.3%	435,001	15.2%	522,306	12.6%
2010	237,705	7.3%	491,922	16.4%	500,421	14.5%	404,259	11.8%
2011	241,143	7.3%	489,591	16.5%	539,170	15.7%	469,089	13.6%
2012	247,129	7.4%	528,910	16.7%	574,867	15.9%	452,760	12.5%
2013	193,729	5.7%	529,448	16.5%	573,852	15.7%	465,545	12.8%

Includes employed persons age 16 years or older.

For 2000-2003, high risk private sector industries and occupations are based on the 2003 SOII and CFOI data.

For 2004-2012, high risk private sector industries and occupations are based on the 2008 SOII and CFOI data.

For 2013, high risk private sector industries and occupations are based on the 2014 SOII and 2011 CFOI data.

Industries are classified as "high risk" for morbidity if they had occupational injury and illness rates of more than double the national rate.

Occupations are classified as "high risk" for morbidity if they had days away from work injury and illness rates of more than double the national rate.

Industries and occupations are classified as "high risk" for mortality if they have fatality rates of more than double the national rate.

Data Source: BLS Current Population Survey, SOII, CFOI

Indicator 17: Occupational Safety and Health Professionals

Occupational safety and health professionals aim to identify and reduce the risk of hazardous workplace conditions and practices. This occupational health indicator helps to determine if there is a sufficient number or trained personnel to implement preventive occupational health services within a state. Occupational safety and health professionals included are board-certified occupational medicine physicians, members of the American College of Occupational and Environmental Medicine (ACOEM), board-certified occupational health nurses, members of the American Association of Occupational Health Nurses (AAOHN), board-certified industrial hygienists, members of the American Industrial Hygiene Association (AIHA), board-certified safety professionals, and members of the American Society of Safety Engineers (ASSE).

The groups exhibiting the largest change between 2003 and the latest year for which data were available include ACOEM, AAOHN, and AIHA. These associations saw a decrease in membership rates of 50%, 44%, and 49%, respectively (Table 17).

Table 17: Number & Rate of Occupational Safety & Health Professionals, NC, 2003-2012

Organization	2003	2004	2005	2006	2007	2008	2009	2010	2012	2013	US 2013
American Board of Preventive Medicine											
Number	53	51	51	48	50	52	54	53	58	NA	2,974²
Rate ¹	1.3	1.3	1.2	1.1	1.2	1.2	1.3	1.3	1.4	NA	2.1²
American College of Occupational and Environmental Medicine											
Number	126	122	107	96	99	90	80	75	70	70	3,710
Rate ¹	3.2	3.0	2.6	2.3	2.3	2.1	2.0	1.8	1.6	1.6	2.6
American Board of Occupational Health Nurses											
Number	339	337	322	374	305	297	290	284	NA	238	4,529
Rate ¹	8.6	8.4	7.9	8.8	7.1	5.9	7.1	6.9	NA	5.5	3.1
American Association of Occupational Health Nurses											
Number	424	463	462	459	427	403	344	NA	256	NA	4,648²
Rate ¹	10.7	11.5	11.3	10.8	9.9	9.5	8.4	NA	6.0	NA	3.3²
American Board of Industrial Hygiene											
Number	188	190	194	199	190	196	196	200	138	174	5,785
Rate ¹	4.8	4.7	4.7	4.7	4.4	4.6	4.8	4.9	3.2	4.0	4.0
American Industrial Hygiene Association											
Number	306	317	301	289	152	249	225	208	208	170	6,224
Rate ¹	7.7	7.9	7.4	6.8	3.5	5.9	5.5	5.1	4.9	3.9	4.3
Board of Certified Safety Professionals											
Number	269	278	284	301	320	326	335	347	372	384	13,687
Rate ¹	6.8	6.9	6.9	7.1	7.4	7.7	8.2	8.5	8.7	8.9	9.5
American Society of Safety Engineers											
Number	854	947	1,056	873	819	814	761	789	794	764	32,907
Rate ¹	21.6	23.6	25.8	20.6	19.0	19.2	18.6	19.3	18.6	17.7	22.9

1: Rate represents the number of members per 100,000 employed persons aged ≥ 16 years.

2: Latest available (2012) data provided.

2000-2002 & 2011 data not available.

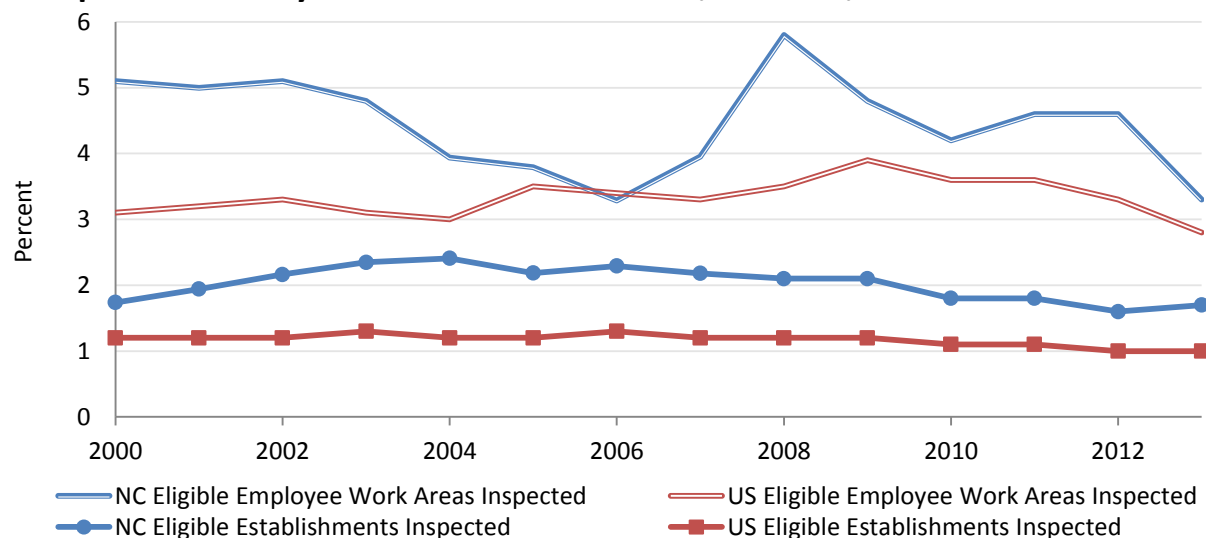
Data sources: American Board of Preventive Medicine Diplomates Database, American College of Occupational and Environmental Medicine Annual Roster, American Board of Occupational Health Nurses Directory, American Association of Occupational Health Nurses Annual Roster, American Board of Industrial Hygiene, American Industrial Hygiene Association Directory, Board Certified Safety Health Professionals Directory, American Society of Safety Engineers Directory, BLS Geographic Profile of Employment and Unemployment, Current Population Survey

Indicator 18: Occupational Safety and Health Administration Enforcement Activities

The Occupational Safety and Health Administration (OSHA) was established with a mission to ensure that working conditions are safe and healthy for all employees. As such, OSHA uses standards, enforcement activities, and compliance assistance to achieve its mission. North Carolina is one of many states that operate OSHA-approved safety and health programs covering private and public sector workers in place of federal administration. This state plan is authorized to conduct inspections to ensure compliance with standards issued by OSHA. The agency may issue citations and impose fines on employers if violations are found. Inspections can occur in response to events including fatal incidents, a series of hospitalizations, worker complaints, or referrals from other agencies. In addition, regular inspections may be scheduled to target certain high-risk industries, occupations, or worksites (OSHA, 2015). Establishments participating in the Voluntary Protection Program (VPP) or the Safety and Health Achievement and Recognition Program (SHARP) are not subject to routine OSHA inspections (CSTE, 2016).

The number of establishments inspected by North Carolina OSHA in 2013 was 4,400, representing approximately 1.7% of eligible, OSHA-covered workplaces. The establishment inspection rate has varied slightly since 2000, peaking at 2.4% in 2004. In 2013, inspections covered the work areas of 129,738 employees, 3.3% of all eligible, OSHA-covered workers. As illustrated in Figure 18, the percentage of North Carolina OSHA inspection activities has consistently exceeded the US percentage.

Figure 18: Percentage of Establishments & Employee Work Areas Inspected by the Occupational Safety & Health Administration, NC & US, 2000-2013



Mines and farms not included

Data sources: OSHA Annual Inspection Reports, BLS Covered Employers and Wages (QCEW)

Table 18: Number & Percentage of Establishments & Employee Work Areas Inspected by the Occupational Safety and Health Administration, NC, 2000-2013

Year	OSHA-covered establishments inspected by OSHA		OSHA-covered employees whose work areas were inspected by OSHA	
	Number	Percent	Number	Percent
2000	3,859	1.7	193,857	5.1
2001	4,359	1.9	190,127	5.0
2002	5,033	2.2	191,584	5.1
2003	5,465	2.3	179,526	4.8
2004	5,465	2.4	147,665	3.9
2005	5,064	2.2	145,207	3.8
2006	5,544	2.3	129,578	3.3
2007	5,454	2.2	159,513	4.0
2008	5,438	2.1	232,591	5.8
2009	5,153	2.1	182,272	4.8
2010	4,506	1.8	160,166	4.2
2011	4,480	1.8	175,366	4.6
2012	4,114	1.6	178,935	4.6
2013	4,400	1.7	129,738	3.3
US 2013	88,239	1.0	3,301,630	2.8

Mines and farms not included.

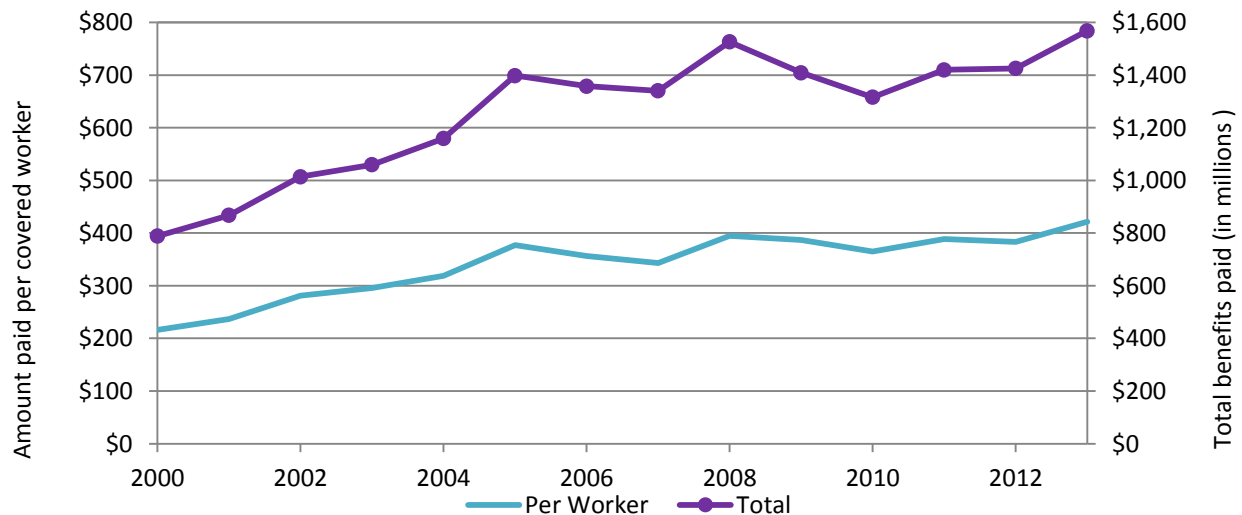
Data sources: OSHA Annual Inspection Reports, BLS Covered Employers and Wages (QCEW)

Indicator 19: Workers' Compensation Awards

Workers' compensation is a state-based social insurance program that seeks to guarantee compensation for eligible workers who suffer from occupational injuries and illnesses. The program provides benefits to pay for medical expenses and partially replace lost wages related to a workplace injury or illness. In work-related deaths, dependents are eligible for survivor benefits. Differences exist among states in wages, medical costs, and workers' compensation eligibility. This indicator does not include human, non-economic costs, nor all the economic costs associated with occupational injury and illness. Workers' compensation data likely underestimate injuries and illnesses, as many workers do not file for compensation, and claims may be denied.

Benefits paid by the workers' compensation program have steadily increased in North Carolina, peaking at \$1,568,586,000 in 2013. This was nearly double the \$788,369,000 paid in 2000. Likewise, the average amount paid per worker has increased from \$216 in 2000 to \$422 in 2013. These trends have not accounted for changes in the workforce or economic inflation. The Consumer Price Index inflation rate over this 14-year period was approximately 35% (BLS, 2016).

Figure 19: Workers' Compensation Benefits Paid in Total & per Worker, NC, 2000-2013



Includes employed persons aged ≥ 16 years.

The average amount of workers' compensation benefits paid presented represents cost per covered worker. All workers who are eligible for compensation should they sustain work-related injuries or illnesses are considered "covered" workers.

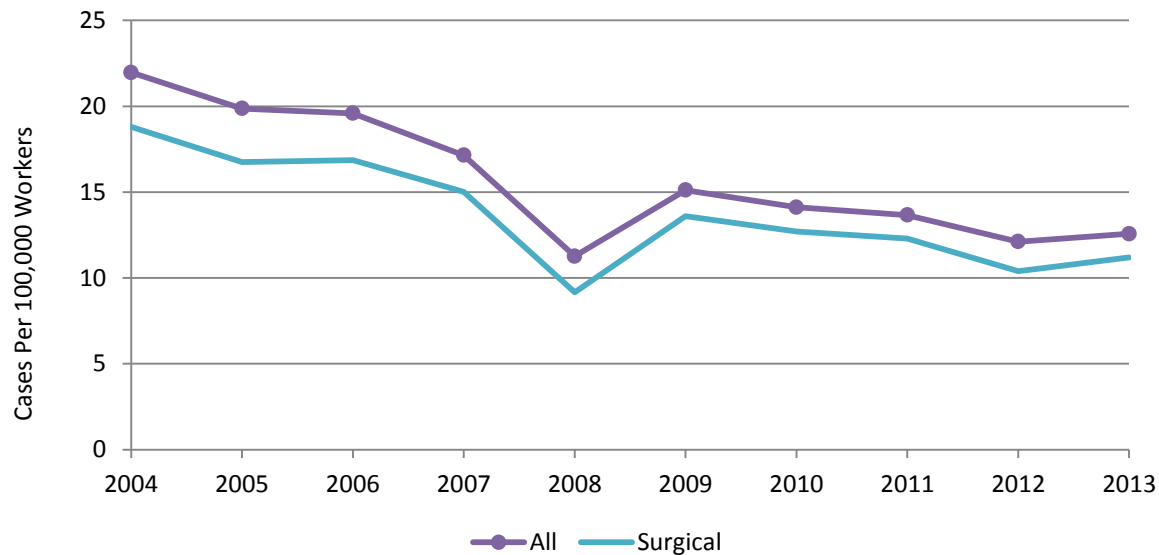
Data source: National Academy of Social Insurance

Indicator 20: Work-Related Low Back Disorder Hospitalizations

Work-related low back pain is “inordinately common” among American workers (Stewart, Ricci, Chee, Morganstein, & Lipton, 2003). Hospitalization for occupational back disorders can have substantial direct and indirect costs related to medical care, functional impairment, and lost productivity. Low back disorders are measured with hospital discharge records listing workers’ compensation as the primary payer, which are only available for non-federal, acute care hospitals.

In 2013, 541 workers were hospitalized for work-related low back disorders, representing a crude rate of 12.6 hospitalizations per 100,000 employed persons aged 16 years and older. The majority of hospitalizations (89%) in 2013 required surgical procedures. The overall low back hospitalization rate fell by nearly 43% between 2004 and 2013.

Figure 20: Rate of Hospitalizations for Work-Related Low Back Disorders, NC, 2004-2013



Excludes residents who were hospitalized out of state, patients under age 16, and patients with unknown age or residence. Secondary hospitalizations may be included. Includes only treatment in which the primary payer is listed as workers’ compensation in non-federal, acute care hospitals. Data sources: BLS Geographic Profile of Employment and Unemployment, Current Population Survey, NC Inpatient Hospital Discharge Database

Discussion

The data presented in this report are intended to offer a descriptive profile of the health status of the North Carolina workforce. Health effect indicators with rates or counts higher than their national counterparts may be considered potential problem areas that can be the focus of further investigation. To better understand how to address these problem areas, more in-depth investigation should focus on identifying at-risk worker, industry, and occupational groups, and other risk factors potentially contributing to these observed rates. Analyzing categories of worker populations within industry, occupation, and demographic groups may provide further insight for priority-setting. Given data source limitations, most indicators in this report may underestimate the true extent of injuries and illnesses among workers in North Carolina. Factors that may contribute to this underestimation include:

- Exclusion of worker groups such as those employed in the military and small farms with 10 or fewer employees.
- Underreporting by employees and healthcare providers of occupational injury and illness due to unawareness of or lack of adherence to state reporting laws.
- Failure to report cases according to applicable state laws.
- Difficulty attributing diseases with long latency or multifactorial causes to a given exposure.
- Random variation inherent in populations at risk.

Inclusion criteria used may also influence counts and rates. For instance, when compiling data for indicators using hospital discharge data, work-related cases were selected for analysis if the data source indicates that workers' compensation was listed as the primary payment source for hospital visits. This method of selection does not take into account persons hospitalized for occupational injury who do not use workers' compensation as the primary payment source. Changes in reporting laws or programmatic development of surveillance activities in certain years may also contribute to changes counts and rates. Explanations of data sources are provided in the Data Sources section, and a complete description of methodologies for generating OHIs can be found on CSTE's website: "Occupational Health Indicators: A Guide for Tracking Work-Related Health Effects and their Determinants" on the CSTE website (www.CSTE.org).

The OHI data alone do not provide all the necessary information for managing state occupational health programs, but may raise awareness about occupational health status of workers, present potential starting points for further investigation, and help open a dialogue among state partners to determine strategies for preventing injuries and illnesses in the workplace. Often, OHI data gathered using state-based data sources are not comparable across states because reporting requirements and data collection practices may differ between states. Indicator data are most informative when compiled within states over time.

Data Sources

Data Source Descriptions, Limitations & Notes (presented in alphabetical order)

Adult Blood Lead Epidemiology and Surveillance System (ABLES) – (Indicator #11)

The national Adult Blood Lead Epidemiology and Surveillance (ABLES) Program is a state-based surveillance program designed to build state surveillance capacity for cases of laboratory-reported elevated adult blood lead levels. It is funded by the Centers for Disease Control and Prevention (CDC) and the National Institute of Occupational Safety and Health (NIOSH). Mandatory reporting requirements in North Carolina require laboratories throughout the state to report any blood lead level (BLL) 40 µg/dL and above for individuals 18 years and older to the Occupational and Environmental Epidemiology Branch of the North Carolina Division of Public Health. Data is submitted biannually to NIOSH and aggregated for the national database.

ABLES defines a case as an individual reported with a BLL ≥ 10 µg/dL. A prevalent case is one that is reported at least once in the calendar year. An incident case is one that is reported within the calendar year, but not in the immediately preceding calendar year.

Limitations: Because rates calculated for this indicator include both occupational and non-occupational reported cases in the numerators, but denominators only include employed persons, the rates presented in this report may overestimate the incidence of work-related lead exposure in North Carolina. In the United States, up to about 95 percent of elevated BLL ≥ 25 among adults are attributable to work-related exposures (CDC, 2015). Rates may be underestimated in some capacity. Even though North Carolina requires employers to report incidents of occupational lead exposure, data from testing laboratories or occupational lead registries may still be incomplete, and many workers with significant occupational lead exposure may not be appropriately tested. Workers may choose to not be tested, depending on industry, occupation, and work status. Additionally, cases of lead exposure in occupational versus non-occupational settings can be indistinguishable. Some workers may also have BLL tests conducted outside of the state, which are not captured in these counts, and data on state of employment/exposure or state of residency may be determined in all cases.

Census of Fatal Occupational Injuries (CFOI) – (Indicator #3)

The Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) is a federal-state cooperative program that uses multiple sources to identify, verify, and profile fatal worker injuries. Information about each workplace fatal injury – occupation and other worker characteristics, equipment involved, and circumstances of the event – is obtained by cross-referencing source documents. Data compiled by the CFOI program are issued annually. Because it is a census, CFOI data is considered complete.

CFOI includes all fatalities resulting from unintentional injuries (motor vehicle crashes, falls, etc.) and intentional injuries (homicides, suicides, etc.) that occur at work. Private wage, salary, self-employed, and public-sector workers are comprehensively counted in this census. Fatalities occurring during commute to or from work are excluded, as well as deaths resulting from acute or latent illnesses which can be difficult to identify as work-related.

Limitations: CFOI reports work-related fatalities by the state in which the fatal incident occurred, but not necessarily state of residence or state of death. However, denominator data used for calculating rates is based on state of residence, and therefore state rates may overestimate risk if

deceased persons working in North Carolina were out-of-state residents, and underestimate risk if deceased workers were North Carolina residents fatally injured on the job outside the state.

Notes: Fatal occupational injury rates are calculated using full-time equivalent workers (FTE) in the denominator, which takes into account number of hours worked. However, prior to 2009, similar rates were calculated using the number of persons employed. Comparing fatality rates with different denominators is discouraged.

National Academy of Social Insurance – (Indicator #19)

The National Academy of Social Insurance provides information on workers' compensation benefits, coverage, and costs. This indicator only captures the direct financial cost of work-related injuries and illnesses. It does not include their true economic burden. There are significant differences among state workers' compensation programs. Therefore, differences among states in benefits paid may be due to a variety of factors. For this reason, this indicator should be used to monitor trends within states over time rather than to compare states. See more information and limitations in the section below entitled "North Carolina Industrial Commission Workers' Compensation System."

National Poison Data System (NPDS) – (Indicator #9)

NPDS is maintained by the American Association of Poison Control Centers (AAPCC). Data regarding poisoning conditions from poison control centers (PCCs) throughout the country are uploaded to NPDS in near-real time. PCC clinical specialists in poison information collect data immediately and on-site, provide consultation 24 hours/day to callers with concerns over actual or potential exposure to toxic substances, and are nationally accessible to calls from the public or from health professionals. Data elements gathered by PCCs generally include demographics, intentionality of exposure, whether the exposure was work-related, location of exposure (workplace, etc.), route, duration and reason for exposure; type of substance(s) involved, symptoms, therapies, and medical outcomes. PCC data are useful for monitoring pesticide poisonings nationally because PCC services are provided to almost the entire United States population. However, calls to state and regional PCCs are estimated to only capture about 10 percent of acute occupational pesticide-related illness cases (Calvert et al., 2003; Wolkin, Martin, Law, Schier, & Bronstein, 2012).

Limitations: PCCs rely on passive surveillance methods in which data only comes from exposure sources that chose to report exposures to PCCs, and so calls to poison centers do not include all chemical and poison exposures. Therefore, rates calculated using PCC data may underestimate the true extent of work-related pesticide and related chemical exposures. Reporting practices of chemical and poison exposures reported to PCCs tend to vary across the country, and even among different ethnic groups, due to differences in reporting laws by state, awareness levels of PCCs in different populations, and differences in levels of expertise and perceived need by healthcare professionals. For instance, more experienced healthcare professionals may manage acute pesticide poisonings onsite themselves, making them less likely to use PCCs for technical advice, and therefore certain cases may not be reported at all. It is estimated that PCC incidence of exposure calls may even be underreported by half (Calvert et al., 2003; Wolkin et al., 2012). It is necessary

for affected individuals or healthcare professionals to know about and know how to use PCCs other than just for technical consultation, and to report work-related cases.

North Carolina Central Cancer Registry (NCCCR) – (Indicator #10)

The NCCCR at the North Carolina Division of Public Health is responsible for recording all cancers diagnosed and treated in the state of North Carolina through the CCR Health Registry Network, a web-based database that collects both record-level data and North American Association of Central Cancer Registries (NAACCR) file format data. Data are submitted by all health care facilities that diagnose or treat cancer in the state, and are used for cancer surveillance, planning and evaluation of public health programs, public health research, public education, and requests from the public. A case record is defined as a recorded incidence of primary malignant cancer, coded using International Classification of Diseases, Ninth and Tenth Revisions (ICD-9 and ICD-10) for mortality codes; and International Classification of Diseases for Oncology, Second Edition (ICD-O-2) for primary site codes. Key data elements include diagnosis information, demographics, and first course of treatment.

North Carolina Industrial Commission Workers' Compensation System – (Indicators #5, and #8)

The North Carolina Industrial Commission Workers' Compensation System provides information on injury claims involving lost workdays. These claims are related to incidents in which workers missed sufficient time from work to qualify for benefits to compensate for lost wages and/or functional impairments for time loss. In North Carolina, compensation is not required for the first seven days of lost time unless the entire period of disability exceeds twenty-one days.

Limitations: Workers' Compensation Claims data are not complete sources of injury and illness information, as many workers do not file for compensation. In North Carolina, workers' compensation coverage is not required for some railroad workers, casual employees, domestic servants, many farmworkers, and federal government employees. This data has not been collected by the North Carolina Division of Public Health for any years following 2002.

North Carolina Inpatient Hospital Discharge Database (NCIHDD) – (Indicators #2, #5, #7 and #12)

The NCIHDD database contains case-specific discharge data for patients admitted to non-federal government facilities in North Carolina, and includes demographic, diagnostic, payer and cost information. The NC State Center for Health Statistics (SCHS) manages this database. A case record is defined as any inpatient discharge from an acute stay in a non-federal government hospital. Because this database does not contain specific information regarding work-relatedness of a patient's injury or illness, selection of cases where workers' compensation insurance was designated as the payer source was the method used to identify work-related hospitalizations for Indicators 5 and 7. Additionally, all pneumoconioses cases selected for analysis in Indicator 7 are considered to be work-related because it has been well established that nearly all pneumoconioses are attributable to occupational exposures (CSTE, 2016)

Limitations: Counts from database for numerators used to calculate rates for Indicators #2, #6 and #14 reflect the number of hospitalizations, not the number of patients. Therefore, individuals

hospitalized multiple times may be counted more than once in this database, and rates of hospitalization for these conditions may be overestimated when using these counts. Additionally, North Carolina residents who are hospitalized out of state for injury or illness are not included in this database. Furthermore, not all workers are covered by workers' compensation, and those who are covered may not use it as a payment source, and so use of workers' compensation payment method to select for work-related hospitalizations may underestimate the actual rates of hospitalizations for these conditions. Worker's compensation payment source may also be more sensitive in identifying occupational injuries rather than illnesses, as occupational illnesses have more non-specific markers due to long latency periods between exposure and onset of disease.

North Carolina State Center for Health Statistics – (Indicator #8)

The North Carolina Death Certificate File (NCDCF) contains information on all deaths of North Carolina residents. Funeral directors or persons burying a body are responsible for filing a death certificate or fetal death certificate with the local registrar prior to final disposition and within 72 hours after a death. Death is reported to and filed with the NC Office of Vital Records and the NC State Center for Health Statistics compiles this data. A case record is defined as the death of a North Carolina resident or a person who dies in the state of North Carolina. Fetal deaths are excluded. Data elements collected include personal identifiers and demographics, place of injury, date of death, place of occurrence (county and state), residence (complete), cause of death coded using the Tenth Revision of the International Classification of Diseases (ICD-10), manner of death, autopsy findings and work injury or not.

Limitations: Rates may be underestimated based on the accuracy level of reporting practices of funeral directors or persons burying a body. Demographic and other descriptive data acquired at the time of reporting are also limited based on accuracy of reporting practices. Deaths of North Carolina residents that take place outside the state of residence may not be counted among this data, and persons who die in North Carolina whom are also counted in this database may not necessarily be residents of the state, and can overestimate the rate calculations.

Survey of Occupational Injuries and Illnesses (SOII) – (Indicators #1, #4 and #6)

Nonfatal occupational injury and illness national estimates are derived from the Bureau of Labor Statistics annual Survey of Occupational Injuries and Illnesses (SOII). SOII provides injury and illness summary data, counts and rates for a variety of employer, employee, and case characteristics. The survey captures data from OSHA logs of workplace injuries and illnesses maintained by employers. The estimates cover nearly all private-sector industries, as well as state and local government (as of 2008 data). A case in SOII is defined as a non-fatal occupational injury or illness that involves lost work time, medical treatment other than first aid, restriction of work or motion, loss of consciousness, or transfer to another job.

Limitations: SOII data is based on sample data, not census data, of all employers in North Carolina, and therefore data are estimates subject to sampling error. The military, self-employed, household workers, small farms with fewer than 11 employees, municipal workers, and Federal government agencies, are excluded from the SOII. The SOII survey also underreports work-related injuries and illnesses with long latency periods that may not manifest symptoms until years after exposure, as SOII data are collected shortly after the end each calendar year.

Notes: BLS publishes case rates per 100 FTE (equivalent full-time workers) or per 10,000 FTE. Rates presented in this report were converted to injury/illness cases per 100,000 FTE by multiplying BLS rates by 1000 or 10, respectively.

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