Work-Related Burns in North Carolina, 2001-2011

Introduction

Burns are among the most devastating injuries affecting workers. Burns include tissue injuries caused by contact with dry heat (fire), moist heat (steam), chemicals, electricity, friction, or radiation. Thermal and chemical burns are the most frequent types of work-related burn injuries. Although work-related burn hospitalizations are unusual events, they are painful, disabling, and expensive injuries to treat. Many burn injuries result in significant disfigurement. NIOSH estimates 30-40% of burn hospitalizations are work-related, and are the most common cause of work-related hospitalizations for younger workers in the accommodation and food services industry[1–4]. Describing and tracking work-related burn hospitalizations will help identify high-risk worker groups, as well as help inform and evaluate targeted prevention efforts.

Definitions

A work-related burn case was defined as a North Carolina resident, aged 16 years or older, who was hospitalized and discharged from an acute-care clinical facility in North Carolina from 2001 through 2011, assigned a primary International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) code from 940 through 949, and whose payer source was workers' compensation. The workers' compensation payer source is a good proxy for capturing work-related cases in hospital discharge data[5].

Methods

Hospitalization counts were obtained from the North Carolina Inpatient Hospital Discharge Database. N.C. General Statute 131E-124 requires hospitals in the state to submit hospitalization data to a statewide data processor, mainly for billing purposes. Discharge data includes demographic, diagnostic, payer and cost information. The N.C. State Center for Health Statistics manages this data. The frequency of ICD-9-CM codes and E-codes were compiled from this data. ICD-9-CM codes were used to describe the types of burn injuries, and E-codes were used to describe the circumstances surrounding these injuries. The frequency of ICD-9-CM and E-codes do not correspond to the number of cases, but to the number of times each code appears in the data; one case may be assigned multiple ICD-9-CM and E-codes. Population denominators were defined as all employed persons in North Carolina during 2001 to 2011, aged 16 years or older. Counts for the employed population (denominators) were obtained from the Bureau of Labor Statistics (BLS) Current Population Survey (CPS) and the BLS Geographic Profile of Employment and Unemployment (GP). The CPS is a monthly survey of households conducted by the Bureau of Census for the BLS, and provides comprehensive employment data on the labor force.[6] The GP provides employment and unemployment annual averages from the CPS by geographic regions and selected demographic and economic characteristics.[7] Rates were calculated annually per number of employed persons. Comparisons to national data were calculated when possible.

Results

Demographics

In North Carolina, a total of 882 workers were hospitalized for burn-related injuries from 2001 through 2011, at an average of 80 work-related burn hospitalizations per year, and at an average crude rate of 2.0 hospitalizations per 100,000 employed persons (Table 1). Males accounted for 789 (90%) of burn hospitalizations, and 25 to 34 year old workers accounted for 29% of work-related burn cases over the 11-year period (Table 2). Race/ethnicity was not considered in analysis because no systematic reporting standard existed across North Carolina hospitals for reporting

race/ethnicity information until 2010. Sixty-seven percent (67%) of cases were treated and discharged from hospitals, and 41% of cases spent between two days to one week in the hospital for treatment.

Types of Work-Related Burns and Associated Mechanisms of Injury.

Burns of the wrist and hands was the most commonly reported type of work-related burn, followed by burns of the upper limbs, and burns of the face, neck and/or head (Figure 1). The most commonly recorded mechanism of injury associated with work-related burns was hot liquids/vapors, followed by electrical currents, and ignition of clothing (Figure 2).

Trends in Work-Related Burn Injuries.

The rate of work-related burns in North Carolina has not significantly changed since 2001. Rates of work-related burns have risen above the national rate since 2009 (Figure 3). The largest proportion (32%) of work-related burn hospitalizations occurred in the summer months, predominantly in August (12%) (Figure 4). The largest proportion of work-related burns occurred primarily at the beginning of the workweek on Mondays (17%), followed by Fridays and Thursdays (Figure 5).

Public Health Significance

The rate of work-related burns in North Carolina has remained consistent over the last decade. When compared with the national rate, North Carolina rates were below the national rate from 2001 through 2008, but exceeded the national rate from 2009 onward. Whether this is a true decrease in the national rate or a function of changes in the national sample population remains is uncertain.

Work-related burns are preventable. Continued surveillance and prevention strategies are important to reduce incidents of work-related burns. Linking hospital discharge data with other data sources providing employment information and data that better describe circumstances of work-related burn hospitalizations would provide more detailed information regarding high-risk industries and occupations for prevention recommendations.

Employers and workers also play major roles in reducing injuries at work by implementing and following safer practices in the workplace. Initial considerations for targeted outreach include education and training of young workers, and of occupations that require working in close proximity to hot liquids or vapors.

Limitations

The number of work-related burns in this analysis may be underestimated due to hospitalization data not capturing cases treated in outpatient setting or federal acute-care facilities. Additionally, selecting cases using workers' compensation as the primary payer source does not capture workers using other sources of payment for work-related burns, or workers who chose not to report their injuries as work-related. Workers and employers may also be exempt from workers' compensation coverage or not provide it, or workers may be unaware of benefits. North Carolina residents hospitalized in other state are also not captured in hospitalization data. Hospital discharge records are based on number of hospital visits, not number of persons or injuries so data may include multiple visitations for a single person or injury event. Variables that help describe patterns of work-related burns such as race, ethnicity, type of industry, and occupation were not available in hospitalization data

Comparing North Carolina data to US data should be done with caution. US data is based on national probability estimates from state-level data rather than from actual number of cases. Additionally, there has been a significant reduction in the national sample size since 2008 that may produce large relative standard error in estimates. Finally, workers' compensation insurance programs vary from state-to-state on eligibility, reimbursement, and other requirements. Therefore, data should be used to monitor in-state trends of work-related burn hospitalizations rather than to compare rates and trends between states[8,9].

References

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9. Council of State and Territorial Epidemiologist (CSTE). Occupational Health Indicators. at <http://www.cste.org/group/?OHIndicators>.

Appendix

Table 1. Number and Crude Rate of Work-Related Burn Hospitalizations in North Carolina, 2001-2011

Year	Number of Burn Hospitalizations	Crude Rate[1] of Burn Hospitalizations
2001	82	2.2
2002	81	2.1
2003	83	2.1
2004	85	2.1
2005	75	1.8
2006	76	1.8
2007	79	1.8
2008	84	2.0
2009	81	2.0
2010	77	1.9
2011	79	1.9
Average	**80**	**2.0**

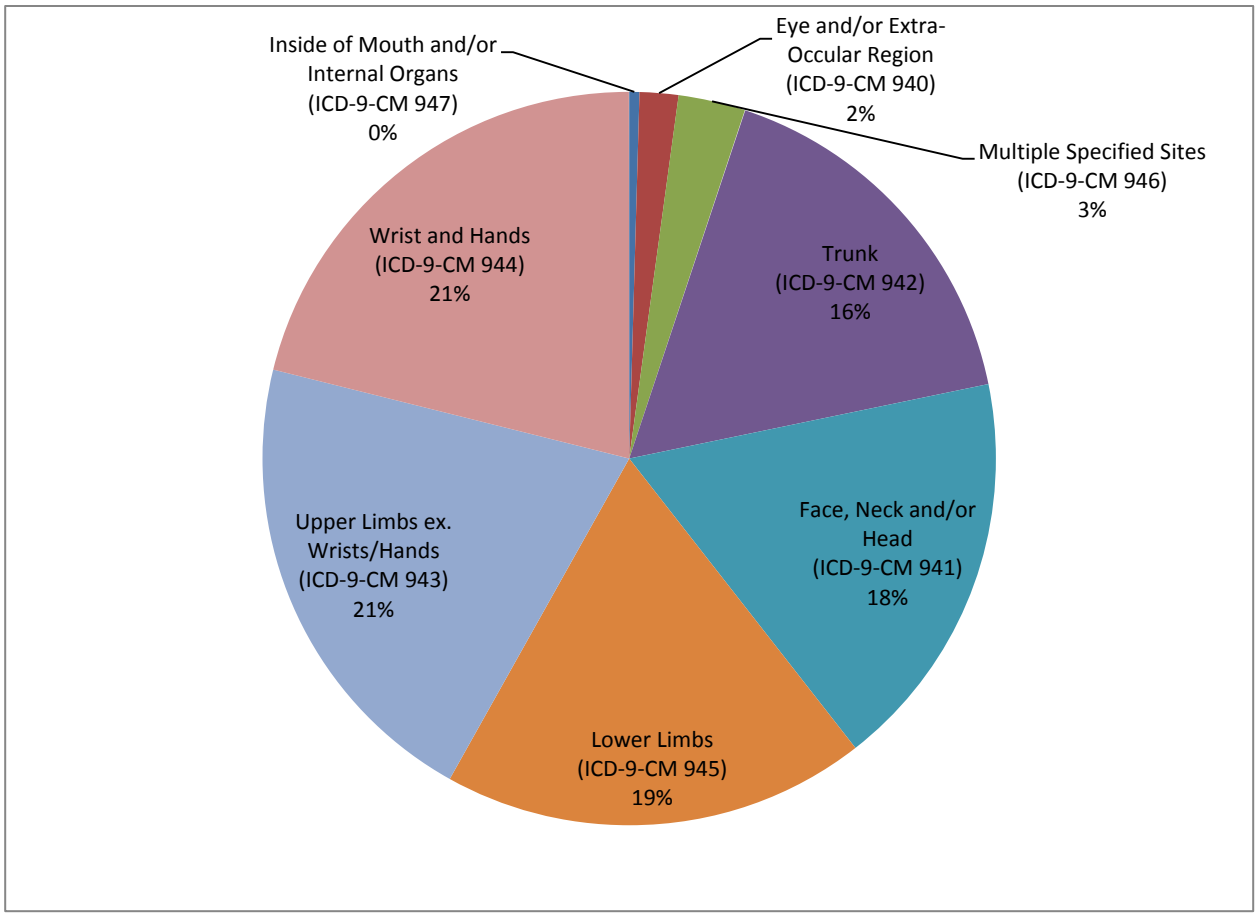
Source: North Carolina Inpatient Hospital Discharge Database. Workforce estimates from the BLS Current Population Survey and Geographic Profile of Employment and Unemployment.
[1] Rates are calculated per 100,000 employed persons aged ≥16 years in North Carolina.
Notes: Counts are of employed persons aged ≥16 years in North Carolina. Hospital discharge records are limited to records from non-federal, acute-care hospitals. This data excludes North Carolina residents hospitalized out of state. Some workers are hospitalized more than once, and due to data limitations, these secondary hospitalizations cannot be excluded, and resulting measures are of hospitalizations, not burn injuries.

Table 2. Demographics of Work-Related Burn Cases among Employed North Carolina Residents, 2001-2011

Worker Characteristics	Number of Burn Hospitalizations	%
Age (Years)		
16-19	29	3.3
20-24	110	12.5
25-34	254	28.8
35-44	201	22.8
45-54	190	21.5
55-64	79	9.0
65+	19	2.2
Sex		
Female	93	10.5
Male	789	89.5
Patient Status[1]		
Discharged	592	67.1
Discharged w/Home Healthcare	221	25.1
Transferred	49	5.6
Died	18	2.0
Hospice	2	0.2
Length of Hospital Stay		
≤ One day	166	18.82
> One day to 1 week	365	41.38
> One week to 1 month	283	32.09
> One month to 6 months	65	7.37
> Six months	3	0.34

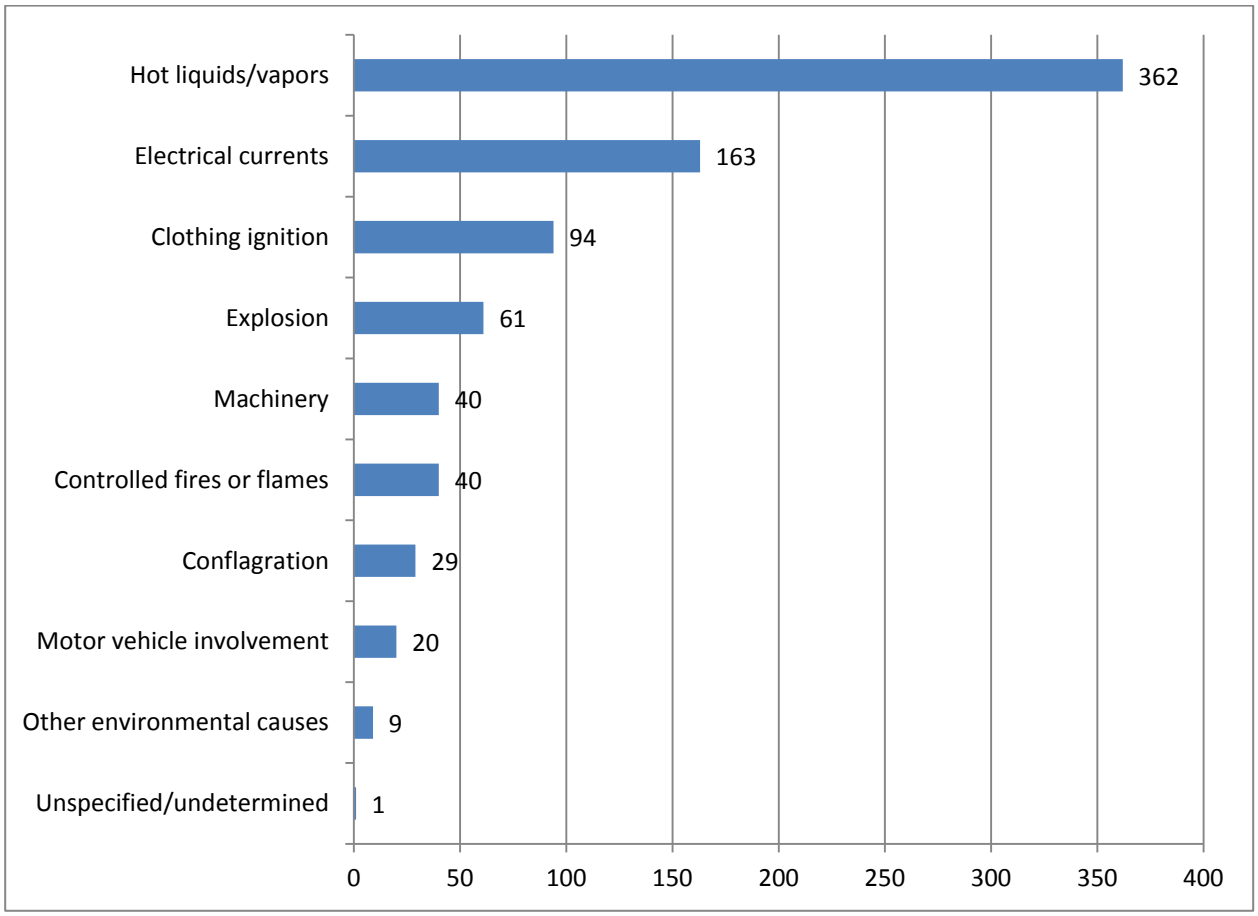
[1] Patient's status after receiving treatment at acute care facility.
Source: North Carolina Inpatient Hospital Discharge Database.
Notes: Counts are of employed persons aged ≥16 years in North Carolina. Hospital discharge records are limited to records from non-federal, acute-care hospitals. This data excludes North Carolina residents hospitalized out of state. Some workers are hospitalized more than once, and due to data limitations, these secondary hospitalizations cannot be excluded, and resulting measures are of hospitalizations, not burn injuries.

Figure 1. Frequency of Assigned Diagnosis Codes for Burn Hospitalizations in North Carolina, 2001-2011



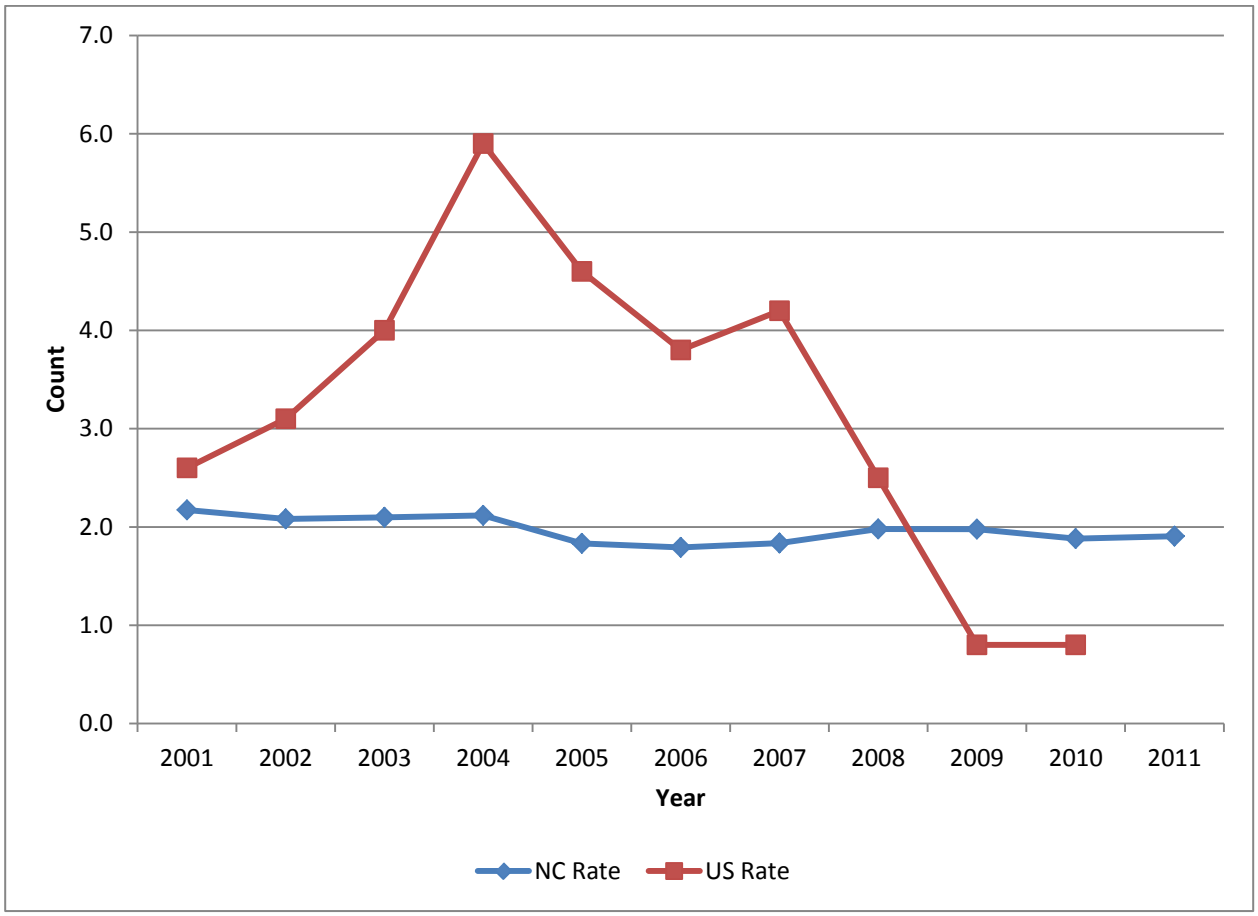
Source: North Carolina Inpatient Hospital Discharge Database.
Notes: Percentages do not correspond to number of cases, but number of times each code appears in the data; one case may be assigned multiple ICD-9-CM codes. Hospital discharge records are limited to records from non-federal, acute-care hospitals. This data excludes North Carolina residents hospitalized out of state. Some workers are hospitalized more than once, and due to data limitations, these secondary hospitalizations cannot be excluded, and resulting measures are of hospitalizations, not burn injuries.

Figure 2. Frequency of Assigned Associated Mechanism of Injury Codes for Burn Hospitalizations in North Carolina, 2001-2011



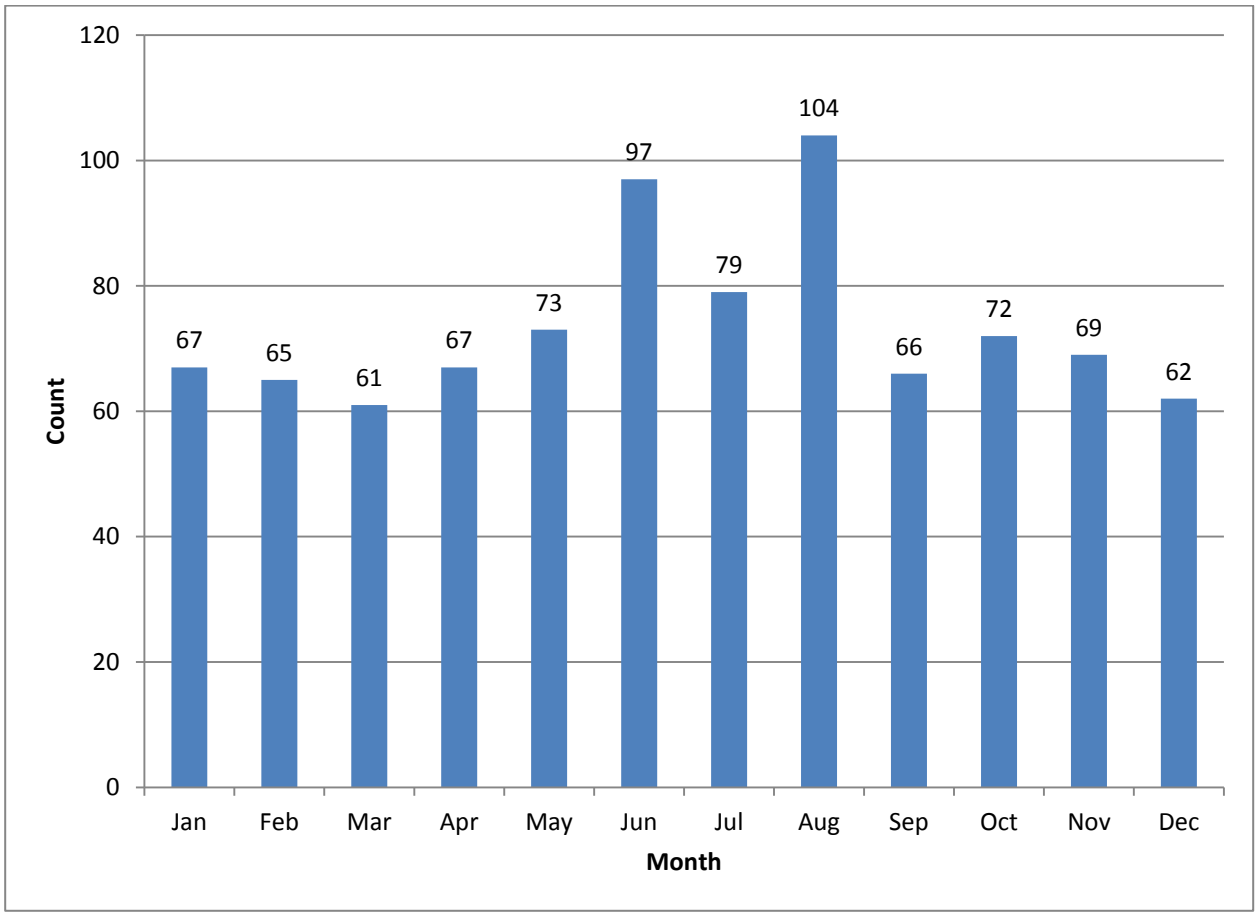
Source: North Carolina Inpatient Hospital Discharge Database.
Notes: Counts represent primary e-code assigned to discharge case, but does not necessarily reflect primary mechanism of injury. Patients may be assigned multiple e-codes that describe other mechanisms of injury not captured by this data. Hospital discharge records are limited to records from non-federal, acute-care hospitals. This data excludes North Carolina residents hospitalized out of state. Some workers are hospitalized more than once, and due to data limitations, these secondary hospitalizations cannot be excluded, and resulting measures are of hospitalizations, not burn injuries.

Figure 3. Annual Crude Rate[1] of Work-Related Burn Hospitalizations, North Carolina and the US, 2001-2011



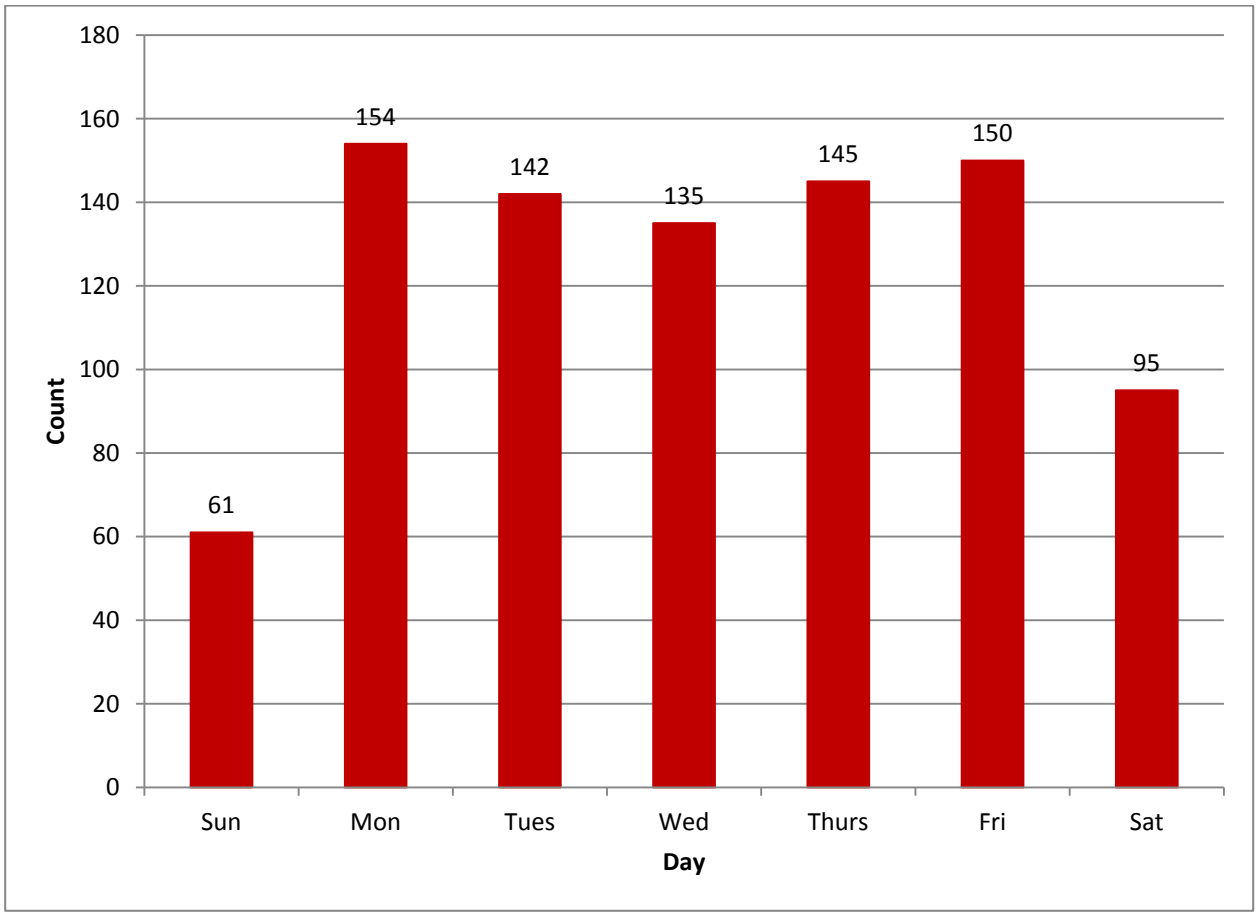
Source: North Carolina Inpatient Hospital Discharge Database and the U.S. National Center for Health Statistics' National Hospital Discharge Survey. Workforce estimates from the BLS Current Population Survey and Geographic Profile of Employment and Unemployment.
[1] Rates are calculated per 100,000 employed persons aged ≥16 years for North Carolina.
Notes: Hospital discharge records are limited to records from non-federal, acute-care hospitals. This data excludes North Carolina residents hospitalized out of state. Some workers are hospitalized more than once, and due to data limitations, these secondary hospitalizations cannot be excluded, and resulting measures are of hospitalizations, not burn injuries. Sample size of the National Hospital Discharge Survey data has been reduced significantly since 2008, which can produce large relative standard errors. Caution is advised when interpreting estimates. In order to meet standards for reliability, the National Center for Health Statistics recommends that estimates should be based on at least 30 discharge records and having a relative standard error of <30%. Any statistical comparisons with estimates of <5,000 should not to be done, and comparisons with estimates of 5,000 to 10,000 should be done with caution.

Figure 4. Number of Work-Related Burn Hospitalizations among Employed Persons in North Carolina by Month of Injury, 2001-2011



Source: North Carolina Inpatient Hospital Discharge Database.
Notes: Counts are of employed persons aged ≥16 years in North Carolina. Hospital discharge records are limited to records from non-federal, acute-care hospitals. This data excludes North Carolina residents hospitalized out of state. Some workers are hospitalized more than once, and due to data limitations, these secondary hospitalizations cannot be excluded, and resulting measures are of hospitalizations, not burn injuries.

Figure 5. Number of Work-Related Burn Hospitalizations among Employed Persons in North Carolina by Day of Injury, 2001-2011



Source: North Carolina Inpatient Hospital Discharge Database.
Notes: Counts are of employed persons aged ≥16 years in North Carolina. Hospital discharge records are limited to records from non-federal, acute-care hospitals. This data excludes North Carolina residents hospitalized out of state. Some workers are hospitalized more than once, and due to data limitations, these secondary hospitalizations cannot be excluded, and resulting measures are of hospitalizations, not burn injuries.

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