

# Young Worker Injury Deaths

A Historical Summary of Surveillance and Investigative Findings



DEPARTMENT OF HEALTH AND HUMAN SERVICES  
Centers for Disease Control and Prevention  
National Institute for Occupational Safety and Health



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# Young Worker Injury Deaths: A Historical Summary of Surveillance and Investigative Findings

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July 2017

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## Foreword

The National Institute for Occupational Safety and Health (NIOSH), under the Centers for Disease Control and Prevention (CDC) within the Department of Health and Human Services, is the federal institute responsible for occupational safety and health research. The mission of NIOSH is to generate scientific knowledge and to communicate that knowledge to improve workplace safety and health. In support of its mission, NIOSH conducts on-site investigations of occupational fatalities in the United States through the Fatality Assessment and Control Evaluation (FACE) program. Under this program, FACE investigators collect detailed information on incident circumstances, identify risks related to the incident, and develop recommendations to control for or eliminate the identified risks. Due to resource constraints, FACE researchers cannot investigate every occupational fatality; therefore, NIOSH identifies priority areas based on analyses of surveillance data and input from partners and stakeholders. In 1999, occupational injury fatalities to youth (17 years old or less) were identified as a priority area for FACE investigations. Beginning in 2010, these investigations were discontinued as other priorities were identified. This document serves to officially close the young worker target with a summary of the FACE investigative findings along with a complementary summary of surveillance findings.

## Executive Summary

Youth deserve a safe introduction into the working world, but evidence suggests that young workers are at increased risk for work-related fatalities and injuries. The National Institute for Occupational Safety and Health (NIOSH) plays a lead role in advancing workplace safety for young workers through surveillance efforts, fatality investigations, risk factor research, curriculum development, intervention evaluations, and training and education. This document focuses on the surveillance and investigation efforts, providing a historical summary of NIOSH findings related to fatal injuries incurred by workers who are under the age of 18 years.

The document begins with summaries of data from the Census of Fatal Occupational Injuries of young worker fatalities that occurred between 1994 and 2013. The findings are presented by demographic characteristics, employer characteristics, incident circumstances, and temporal patterns. This section concludes with detailed surveillance findings for four selected industries, focusing on two that commonly employ youth—services and retail trade—and two known to have higher risks—construction and agriculture production.

Next, the document summarizes case information from investigations of young worker fatalities that occurred between 1982 and 2010. In addition to presentations similar to those in the surveillance section, this section includes findings related to regulatory coverage of the employer, employer compliance with regulations on work time and work hours, and employer compliance with work task regulations. As with the surveillance section, this section ends with detailed investigative findings for four selected industries: agriculture production, services, construction, and retail trade.

The surveillance data allow for a high-level assessment of the issues but lack the specificity needed to get to the root causes of these issues. The investigative data provide a richness of detail not available from the surveillance data, but they cannot be used to make generalizations about the population being studied. Collectively, though, findings from the two sets of data provide insight for identifying issues affecting youth in the workplace, recommending prevention measures, and assessing the effectiveness of child labor laws. The document concludes with a section discussing general strategies for injury prevention among young workers, including roles for employers, parents, youth, educators, researchers, and federal and state agencies.

## **Acknowledgements**

This document was created by researchers of the National Institute for Occupational Safety and Health (NIOSH). The authors wish to extend their appreciation to the reviewers for their thoughtful and discerning comments. This document draws upon their knowledge and expertise in the area of young worker safety, and without their insight, this document would be less complete in many ways.

## Abbreviations and Acronyms

BLS	Bureau of Labor Statistics
CDC	Centers for Disease Control and Prevention
CFOI	Census of Fatal Occupational Injuries
CPS	Current Population Survey
DOL	Department of Labor
FACE	Fatality Assessment and Control Evaluation
FLSA	Fair Labor Standards Act
FTE	Full-time equivalent
HOs	Hazardous Occupations Orders
ILO	International Labour Organization
IOM	Institute of Medicine
NAICS	North American Industry Classification System
NIOSH	National Institute for Occupational Safety and Health
OIICS	Occupational Injury and Illness Classification System
OSHA	Occupational Safety and Health Administration
SIC	Standard Industrial Classification
SOC	Standard Occupational Classification
U.S.	United States



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## Introduction

Youth account for a relatively small, yet important component of the United States (U.S.) workforce. For the 5-year period from 2009 to 2013, a monthly average of 2 million youth aged 15 to 17 years were employed during summer months, and 1.5 million were employed during school months [NIOSH 2016a], with a majority of youth working before they finish high school [BLS 2005]. These youth primarily worked in the services industry, which includes restaurants, and the trade industry, which includes retail establishments [NIOSH 2016b].

Through work experiences, youth learn responsibility, develop social skills, and gain independence; however, youth are at a high risk for work-related injuries due in part to unique physical and psychosocial characteristics. A youth's body proportion is not equivalent to that of an adult [Bogin and Varela-Silva 2010]. Youth may not be physically able to safely operate certain machinery and equipment at work [Chang et al. 2010; Fathallah et al. 2009], and employer-supplied personal protective equipment (e.g., safety glasses, gloves, hardhats) may not adequately protect youth due to fit issues. Further, youth, especially those at the younger end of the spectrum (i.e., less than 16 years), do not have fully developed cognitive control systems [Steinberg 2008] and are more likely to underestimate the dangers associated with work [Vladutiu et al. 2010].

Society expects increased legal protection for young workers because their age and inexperience in the work place can lead to an increased risk for work-related injuries. In response, legislation has been established in varying degrees at the international, national, and state levels.

### International

- In 1999, the International Labour Organization (ILO) adopted Convention 182, calling for the elimination of the “worst forms of child labour,” which includes work that is likely to harm the health, safety, or morals of youth [ILO 1999]. Through ratification of the Convention, 173 countries, including the United States, have committed to take immediate action to address the child labor issues covered by this international instrument.

### National

- The Occupational Safety and Health Administration (OSHA) within the U.S. Department of Labor (DOL) is the federal agency responsible for setting and enforcing standards to promote safe work environments for all workers, regardless of age. Under OSHA regulations, employers must provide a safe workplace, follow all OSHA standards, and identify and correct workplace safety problems. The regulations also include a requirement for employers to provide workers with plain language training about workplace hazards. OSHA enforces regulation compliance through inspections of

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## Definitions

*Youth—Adolescents aged 17 years or less\**

*Employed youth—Youth who worked for pay or profit or youth who worked 15 or more hours per week without pay in a family-operated enterprise\**

*Young workers—Used interchangeably with “employed youth” as defined above*

*Summer months—June through August*

*School months—January through May and September through December*

*Injury—any damage to the body resulting from acute exposure to energy or from the absence of essentials such as heat or oxygen*

*\*Unless noted otherwise*

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workplaces that are identified through a prescribed prioritization process. Employers found to be in violation of OSHA regulations are issued a citation that describes the alleged violation, lists the proposed penalty, and provides a deadline for correcting the alleged hazard. Details regarding OSHA regulations can be found on their website at [www.osha.gov/law-regs.html](http://www.osha.gov/law-regs.html) [OSHA 2016].

- Workers in the United States who are under the age of 18 have special protections under the Fair Labor Standards Act (FLSA) of 1938. The FLSA is the primary federal law governing employment of youth through child labor provisions, which are designed to protect the educational opportunities of youth and prohibit work in harmful conditions. The federal child labor provisions restrict the types of work that youth less than 18 years of age can perform and limit the number of hours and times that youth less than 16 can work. These regulations vary by age, employment status, and industry. Work that is prohibited by the FLSA is termed Hazardous Occupations Orders (HOs). These tasks were declared by the U.S. Secretary of Labor to be too dangerous for young workers. Certain businesses are exempt from the FLSA, and different standards apply to agricultural versus nonagricultural industries. The FLSA child labor provisions are enforced by DOL Wage and Hour Division investigators who are stationed throughout the United States. Employers found in violation of the provisions are subject to monetary penalties. Summarized information on the DOL nonagricultural occupational restrictions for 14- and 15-year-old youth, nonagricultural HOs for youth less than 18 years of age, and agricultural HOs for youth less than 16 years old, along with a summary of recommended changes to these regulations, can be found in Appendices A and B. Complete information regarding FLSA can be found on the DOL Wage and Hour Division website at [www.dol.gov/whd/flsa/](http://www.dol.gov/whd/flsa/) [DOL 2016].

#### State

- States may also have child labor laws that are more protective, less protective, or equivalent to the federal regulations. An employer is accountable to the most restrictive state or federal law that applies. Enforcement of state child labor laws varies by state.

This document presents surveillance data summaries on young worker fatal injuries covering the 20-year period from 1994 to 2013. These summaries provide an assessment of fatality patterns and trends by age group, sex, race, ethnicity, state, region, injury event and source, year, and industry. Complementing the summary of surveillance data is the presentation of investigative data summaries from case reports of fatal injuries to young workers for a 29-year period, 1982 to 2010. The investigations provide a richness of detail not available from the surveillance data, including worker activities prior to and at the time of the fatal injury, length of employment, workplace environment, training history, and employer safety policies. Collectively, the surveillance and investigative

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#### *Who should use this document and how?*

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*Federal and state agencies—to inform regulatory changes, enforcement strategies, and educational efforts*

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*Employers and educators—to develop policies and practices, training programs, and outreach and educational products*

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*Researchers—to guide future research efforts*

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*Equipment manufacturers, distributors, and rental companies—to guide outreach and educational efforts*

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data summaries in this document provide insight for identifying issues affecting employed youth, recommending prevention measures, and assessing the effectiveness of child labor laws.

The purpose of this document is twofold. First, it chronicles the National Institute for Occupational Safety and Health (NIOSH) surveillance and investigative findings related to young worker fatal injuries. Second, it can be used by various academic and government entities and safety professionals to guide future research, develop injury prevention programs, and inform policymaking, all of which may serve to improve young worker safety.

## Summary of Surveillance Data, 1994–2013

### Background

Since 1992, the Bureau of Labor Statistics (BLS) has conducted the Census of Fatal Occupational Injuries (CFOI) to provide for comprehensive surveillance of fatal workplace injuries nationwide. The safety and health community needs reliable surveillance data to identify life-threatening occupational safety hazards, monitor work-related fatal injuries over time, and develop profiles for specific worker groups and specific fatal circumstances that can be used to target injury prevention efforts.

The following is an introduction to CFOI methodologies; more complete information can be found in the *BLS Handbook of Methods*, Chapter 9, “Occupational Safety and Health Statistics” [BLS 2012].

CFOI data are collected from multiple, cross-referenced sources, including death certificates, workers’ compensation records, medical examiner reports, police reports, news media, and follow-up questionnaires. A fatal injury is captured in CFOI if the decedent was employed at the time of the incident, engaged in a legal work activity, and at the incident site as a job requirement. For accuracy, work-relatedness must be substantiated by two or more independent sources (i.e., two or more sources must indicate that the fatality was work-related). The following in- and out-of-scope categories further clarify the work relationship criteria in CFOI.

#### In-scope

- Volunteer workers
- Off-duty police
- Undocumented workers
- Workers in travel status

#### Out-of-scope

- Institutionalized persons
- Persons commuting to work
- Persons engaged in recreational activities not for work

For each CFOI record, over 30 data elements related to the injured worker, employer, and fatal incident are available. Using the BLS Occupational Injury and Illness Classification System (OIICS), trained personnel code each record for the event and source that are associated with the injury incident. The event describes the manner of injury (e.g., contact with object, exposure to harmful substance), and the source identifies the item that caused the injury (e.g., hammer, sulfuric acid). Two separate classification systems are used by BLS to categorize each fatality by industry: Standard Industrial Classification (SIC) and North American Industry Classification System (NAICS). CFOI data collected from 1992 to 2002 are

SIC-coded, and all data collected from 2003 forward are NAICS-coded. The resulting series break requires industry-specific data to be presented in two timeframes, 1992 to 2002 and 2003 onward. A crosswalk developed by the U.S. Census Bureau [USCB 2011] was used to determine which SIC and NAICS codes are comparable for data that cross the timeframes.

CFOI data combined with employment data are used to calculate fatality rates, which depict the risk of incurring a fatal work-related injury. These rates allow for a meaningful comparison of risks over time and across worker subpopulations. Because employment data are not available in CFOI, rates are often estimated using data from the Current Population Survey (CPS).<sup>1</sup> Rates are calculated by dividing the number of fatally injured workers (i.e., the numerator from CFOI) by the number of full-time equivalent (FTE) employees (i.e., the denominator from CPS). For accuracy, the numerator and denominator refer to the same worker group.

## Methods

For this document, NIOSH researchers analyzed BLS-provided CFOI research files<sup>2</sup> for work-related fatalities among youth from 1994 to 2013, inclusive. CPS data for these same years, also provided by BLS, were used to calculate fatality rates. The reported number of annual employed hours were converted to full-time equivalents (FTEs) using the BLS definition of an FTE (2,000 hours of work per calendar year). Rates are presented per 100,000 FTE employees for youth 15 to 17 years old. The starting point of 1994 was selected to minimize analytical complications due to revisions in the CPS data collection methodology that occurred in prior years. The end year, 2013, was the most recent data available at the time of analysis. The OIICS coding structure used for CFOI underwent a comprehensive revision that affected data beginning in 2011. The resulting series break required NIOSH researchers to complete OIICS recoding of the data for 2011 to 2013 to allow for presentation of results that crossed the series break. An additional consideration was confidentiality requirements that restricted detailed presentations of certain data by year. Restricting the data to exactly 20 years—1994 to 2013—provided the maximum flexibility for aggregating data into 4- or 5-year groups, which allowed for more detailed presentations. Twenty years of CFOI and CPS analytical results are presented in this document, with univariate frequencies and bivariate cross-tabulations displayed primarily in tables and graphs.

## Data Limitations

One limitation of CFOI that was previously discussed is the inability to present consistent industry-specific data across all years of interest due to a series break. Although helpful, the crosswalk is an imperfect tool for determining which SIC and NAICS codes are comparable across the break. A second limitation is the restricted amount of detail available in CFOI to describe each fatality. The special CFOI research file provided by BLS to NIOSH includes narrative data that adds detail, but certain information is simply not collected or was not available from the original data sources. The third limitation is

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<sup>1</sup> CPS, the primary source of labor force statistics in the United States, is collected by the U.S. Census Bureau for BLS through monthly surveys of approximately 50,000 households.

<sup>2</sup> Through a memorandum of understanding with BLS, NIOSH receives CFOI research files with restricted access requirements. Research for this document was conducted by NIOSH using these restricted access files. The views expressed herein do not necessarily reflect the views of BLS.

underreporting in CFOI. Although BLS strives for a complete capture of all work-related fatalities, some cases are undoubtedly missed for various reasons. For example, it can be particularly difficult to determine work-relatedness for fatalities that occur on farms, at sea, and on highways. Determining work-relatedness for youth is particularly problematic. Death certificate data regarding occupation could misclassify youth as students, rather than by the type of work performed in part-time jobs. Further, for youth working in agriculture, it is often difficult to differentiate work from what may be considered family chores.

CPS labor force data also have limitations. First, this analysis only used the primary industry in which a person worked. For persons with multiple jobs, this industry may not match the industry at the time of a fatality. While CPS records second job, if appropriate, the hours worked are for all other jobs (i.e., beyond primary job). A person, therefore, may have secondary job information that is not included in the denominator. Finally, CPS excludes workers under 15 years old. Thus, fatality rates can only be presented for youth 15 to 17 years old, while numbers of fatalities are presented for all youth less than 18 years.

## Results

From 1994 to 2013, CFOI data indicated that 942 youth less than 18 years old died as a result of a work-related injury, averaging 47 deaths per year. For the same time period, CPS data for youth 15 to 17 years old reported 22,993,000 FTEs, averaging 1,150,000 FTEs per year. Of the total 942 deaths, 672 were to youth 15 to 17 years old. This fatality number combined with the FTE count results in a fatality rate of 2.9 deaths per 100,000 FTEs for youth 15 to 17 years old.

## Demographic Distributions

Of the total 942 young worker deaths, 556 (59%) occurred to those who were 16 or 17 years old, another 195 (21%) occurred to youth 14 or 15 years old, and the final 191 (20%) occurred to youth younger than 14 years old. The number of fatalities and the FTE count increased steadily with age, but the fatality rate decreased, with 15-year-olds having the highest rate at 4.8 deaths per 100,000 FTEs (Table 1).

Male youth were more often the victims of fatal workplace injuries (829 males [88%] compared to 113 females [12%] [Table 1]). For both sexes, over half of the fatalities occurred to youth 15 to 17 years old. Although the FTE count for youth 15 to 17 years old by sex was similar (12,040,000 males and 10,953,000 females), male youth had a work-related fatality rate over 7 times that of female youth (Table 1).

In an analysis by race, white youth 15 to 17 years old accounted for the largest number of fatalities and FTEs and had a fatality rate of 2.9 deaths per 100,000 FTEs (Table 1). By ethnicity, Hispanic youth 15 to 17 years old accounted for approximately 12% of the FTEs and 22% of the workplace fatalities and had a fatality rate over twice that of non-Hispanic youth in the same age range (Table 1).

The highest numbers of youth fatalities occurred in states with high youth populations [USCB 2010]. Over 45 deaths were reported in each of the following states: Ohio, Pennsylvania, and Texas (Figure 1). The majority of states recorded less than 15 deaths. Some states with high overall fatality numbers, like

Pennsylvania, Texas, and Ohio, had relatively low fatality rates for youth 15 to 17 years old (Figure 2). The Midwest and South regions had the highest fatality numbers (Figure 3), and the South and West had the highest fatality rates (Figure 4) for youth 15 to 17 years old.

**Table 1: Fatalities and fatality rates by age, sex, race, and ethnicity among working youth < 18 years old in the United States, 1994–2013**

Characteristic	All Youth < 18 Years Old		Youth 15–17 Years Old				
	Fatalities	Fatality Percent	Fatalities	Fatality Percent	FTE	FTE Percent	Rate*
<b>Age</b>							
< 14	191	20	-	-	-	-	-
14	79	8	-	-	-	-	-
15	116	12	116	17	2,441,000	11	4.8
16	222	24	222	33	7,516,000	33	3.0
17	334	36	334	50	13,036,000	56	2.6
<b>Sex</b>							
Male	829	88	599	89	12,040,000	53	5.0
Female	113	12	73	11	10,953,000	47	0.7
<b>Race</b>							
White	818	87	567	84	19,800,000	86	2.9
Black	38	4	31	5	2,193,000	10	1.4
Other <sup>†</sup>	80	8	68	10	1,000,000	4	6.8
Not Reported	6	1	6	< 1	n/a	n/a	n/a
<b>Ethnicity</b>							
Non-Hispanic	732	78	492	73	20,184,000	88	2.4
Hispanic	170	18	149	22	2,810,000	12	5.3
Not Reported	40	4	31	5	n/a	n/a	n/a
<b>Total</b>	<b>942</b>	<b>100</b>	<b>672</b>	<b>100</b>	<b>22,993,000</b>	<b>100</b>	<b>2.9</b>

\*Fatality rate per 100,000 FTEs

– Rates for youth < 15 could not be calculated due to a lack of demographic data.

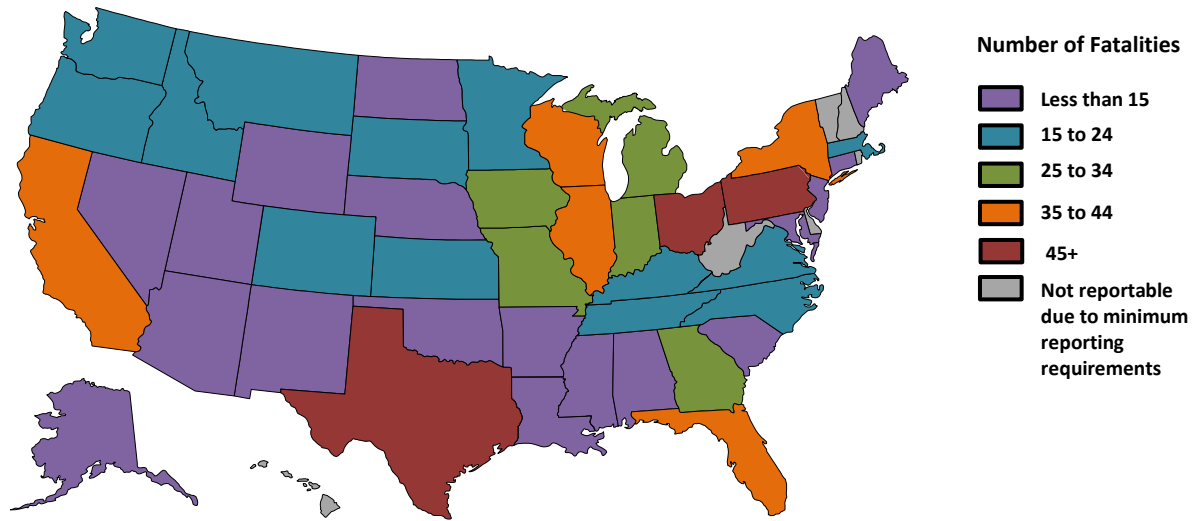
<sup>†</sup>Other includes persons of multiple races, American Indians, Alaskan Natives, Asians, Native Hawaiians, Pacific Islanders, and other.

FTE = full-time equivalent

n/a = not applicable

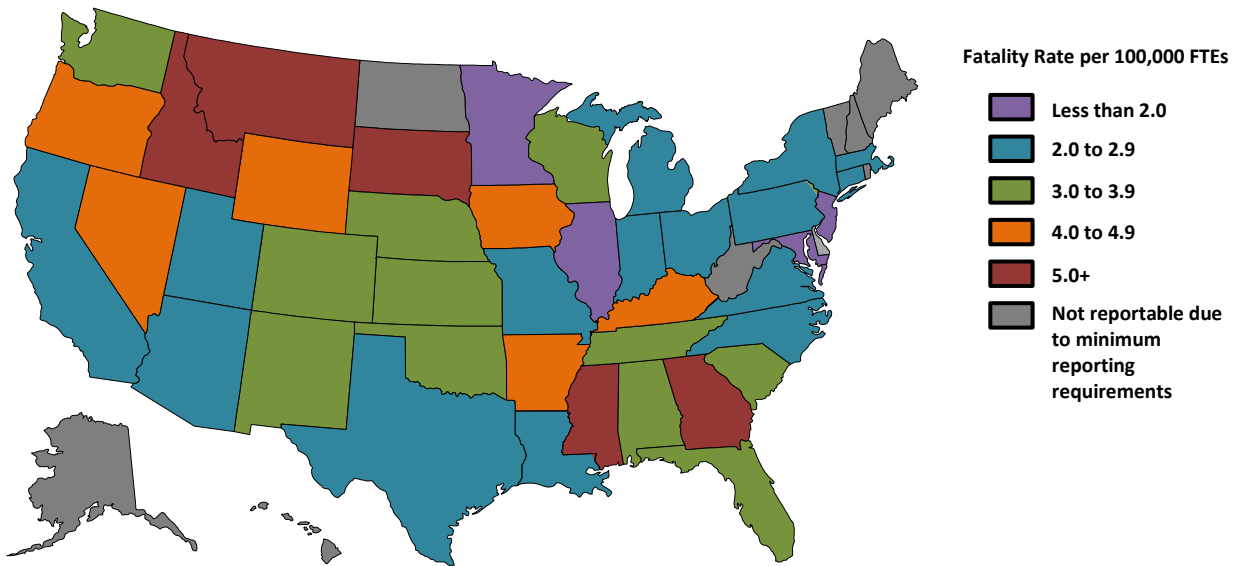
Source: Fatal injury totals and rates were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata and BLS Current Population Survey data; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm) and [www.bls.gov/cps/home.htm](http://www.bls.gov/cps/home.htm)





**Figure 1: Fatalities by state among working youth < 18 years old in the United States, 1994–2013**

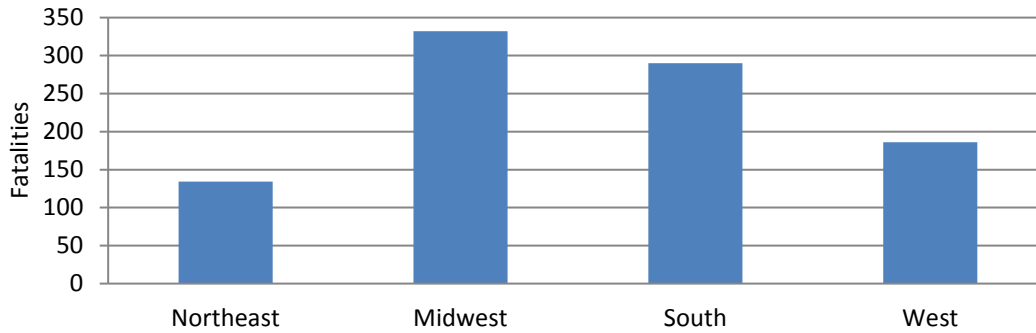
Source: Fatal injury totals were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm)



**Figure 2: Fatality rates by state among working youth 15–17 years old in the United States, 1994–2013**

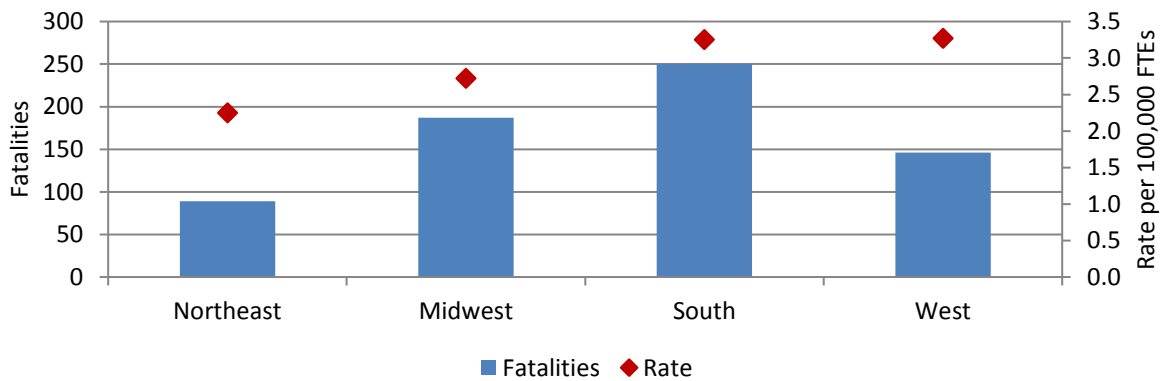
**FTE = full-time equivalent**

Source: Fatality rates were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata and BLS Current Population Survey data; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm) and [www.bls.gov/cps/home.htm](http://www.bls.gov/cps/home.htm)



**Figure 3: Fatalities by region among working youth < 18 years old in the United States, 1994–2013**

Source: Fatal injury totals were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm)



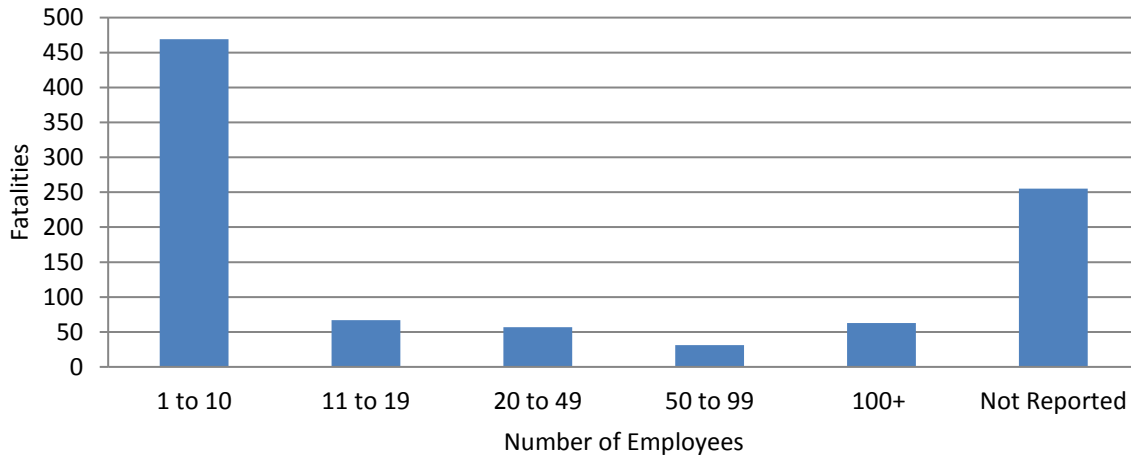
**Figure 4: Fatalities and fatality rates by region among working youth 15–17 years old in the United States, 1994–2013**

**FTE = full-time equivalent**

Source: Fatal injury totals and rates were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata and BLS Current Population Survey data; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm) and [www.bls.gov/cps/home.htm](http://www.bls.gov/cps/home.htm)

### Employment Distributions

Half of young worker deaths (469 of 942 deaths) occurred in establishments with 10 or fewer employees (Figure 5), and most of the deaths occurred to youth who were either employed as regular employees (524 of 942; 58%) or worked in a business owned by family members (329; 35%) (Figure 6). Of the 161 records that indicated length of employment, 144 youth (89%) had been employed less than a year.



**Figure 5: Fatalities by size of employer establishment among working youth < 18 years old in the United States, 1994–2013**

Source: Fatal injury totals were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm)

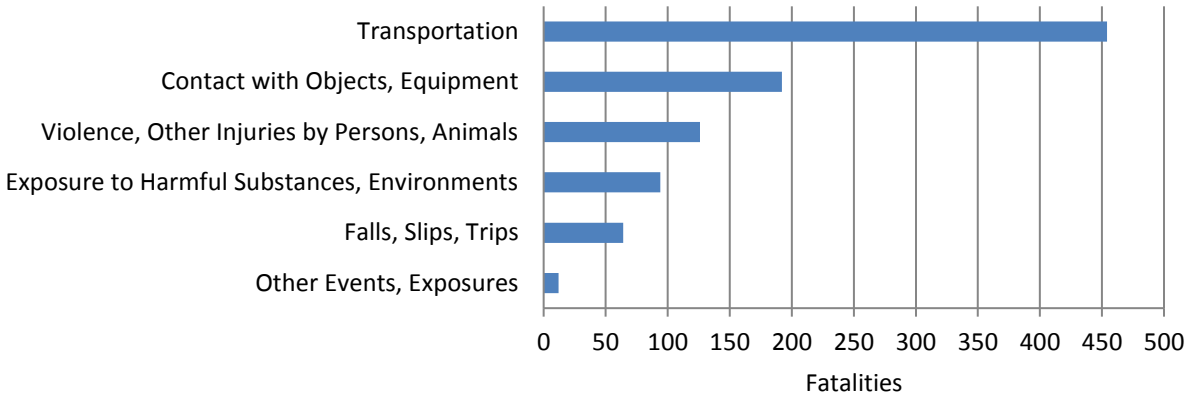


**Figure 6: Fatalities by employment type among working youth < 18 years old in the United States, 1994–2013**

Source: Fatal injury totals were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm)

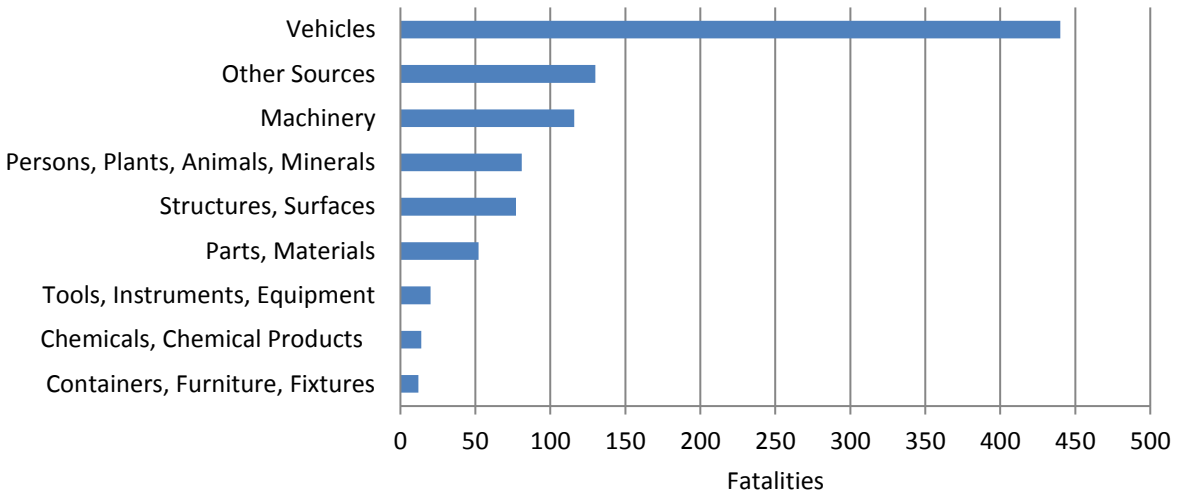
### Event and Source Distributions

The most common event associated with the 942 young worker deaths was transportation incidents (e.g., motor vehicle crash), which was reported for 454 deaths (48%) (Figure 7). The next two leading events were contact with objects and equipment (e.g., struck by a tool, caught in running machinery), which was reported in 192 deaths (20%), and violent acts (e.g., robbery, assault by animals), reported in 126 deaths (13%) (Figure 7). Consistent with transportation events, the most common injury source was vehicles, which were reported in 440 deaths (47%) (Figure 8).



**Figure 7: Fatalities by injury event among working youth < 18 years old in the United States, 1994–2013**

Source: Fatal injury totals were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm)

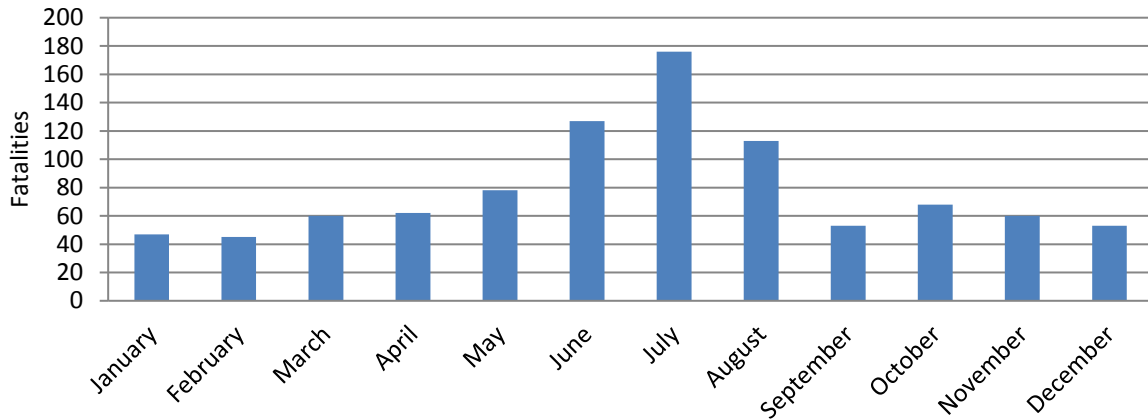


**Figure 8: Fatalities by injury source among working youth < 18 years old in the United States, 1994–2013**

Source: Fatal injury totals were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm)

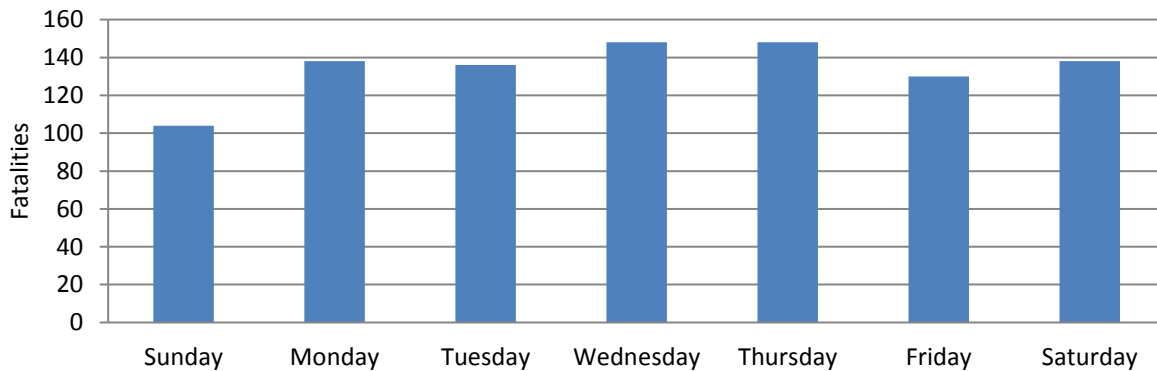
### Temporal Distributions

Of the total 942 deaths among young workers, 416 (44%) occurred in the three summer months (Figure 9). This was consistent with youth employment patterns, which showed summertime increases in the number of employed youth and in hours worked. The distribution of fatalities by day of the week was uniform, with the exception of Sunday, which had fewer fatalities (Figure 10). By time of day, 391 fatalities (42%) occurred between noon and 6 p.m. (Figure 11).



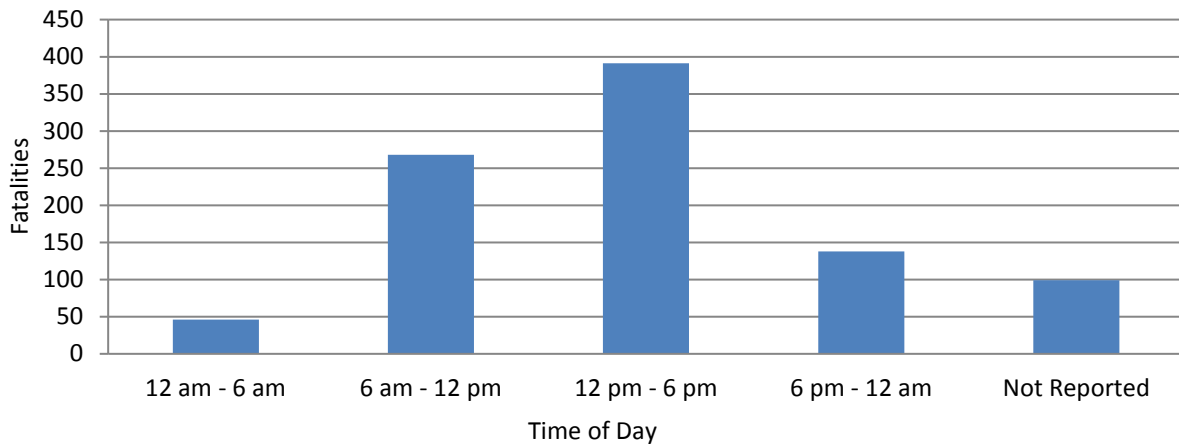
**Figure 9: Fatalities by month among working youth < 18 years old in the United States, 1994–2013**

Source: Fatal injury totals were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm)



**Figure 10: Fatalities by day of week among working youth < 18 years old in the United States, 1994–2013**

Source: Fatal injury totals were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm)



**Figure 11: Fatalities by time of day among working youth < 18 years old in the United States, 1994–2013**

Source: Fatal injury totals were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm)

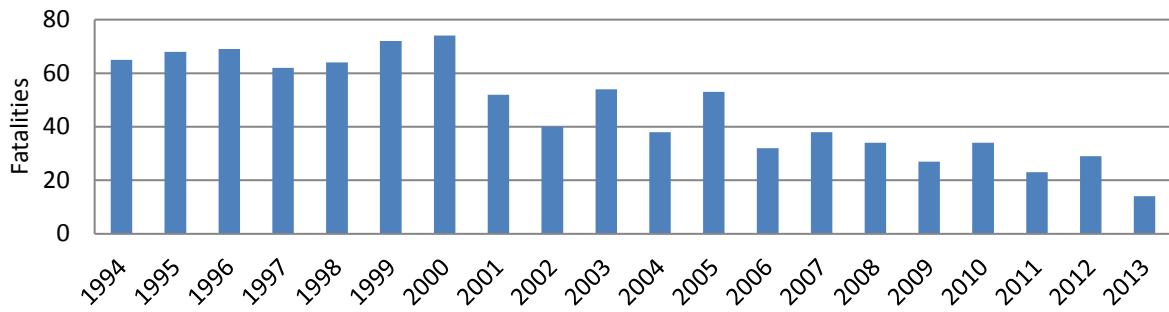
### Yearly Distributions

From 1994 to 2013, the number of deaths among working youth ranged from a low of 14 in 2013 to a high of 73 in 2000, with a general downward trend since 2000 (Figure 12). The fatality rate per 100,000 FTEs for youth 15 to 17 years old also declined over this same time period (Figure 13), indicating that the decline in fatalities between 2000 and 2013 may have been due, in part, to a decrease in the number of young workers. CPS data corroborated this interpretation, showing an 824,000 FTE decrease in the 15- to 17-year-old working population between 2000 and 2013 (1,551,000 FTEs in 2000 to 727,000 FTEs in 2013). However, the decrease in young workers does not explain all of the decrease in young worker fatalities. Other factors, such as youth working in lower risk occupations or industries, may also have an impact on fatality rates. Occupational fatalities for youth 15 to 17 years old peaked in 1999 and 2000, with 57 fatalities in each year (Figure 13). The highest rate, 3.8 fatalities per 100,000 FTEs, first occurred in 1995 and was seen again in 1999 (Figure 13). The lowest rate occurred in 2013, with 1.5 fatalities per 100,000 FTEs (Figure 13).

Each year in the 20-year period, youth in the 16- and 17-year-old age group incurred the majority of work-related fatalities (Figure 14). Although male youth greatly outnumbered female youth in work-related fatalities over the years, fatalities of males steadily declined over time while fatalities of females declined at a much slower rate (Figure 15). By race, the fatality numbers for youth of other races declined at a slower rate over time than those for whites (Figure 16). For ethnicity, the fatality numbers for non-Hispanics youth declined at a slower rate over time than those for Hispanics (Figure 17).

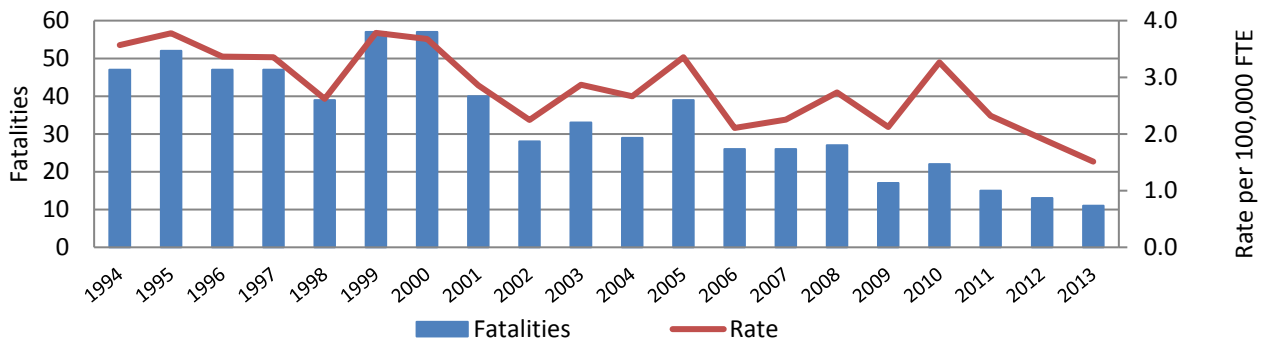
The number of young worker deaths that resulted from a transportation event (e.g., motor vehicle crash) has generally declined over time (Figure 18). Although young workers deaths resulting from

violent acts (e.g., robbery) also showed a decline over time, the most recent years indicated a slowing of the trend (Figure 18).



**Figure 12: Fatalities by year among working youth < 18 years old in the United States, 1994–2013**

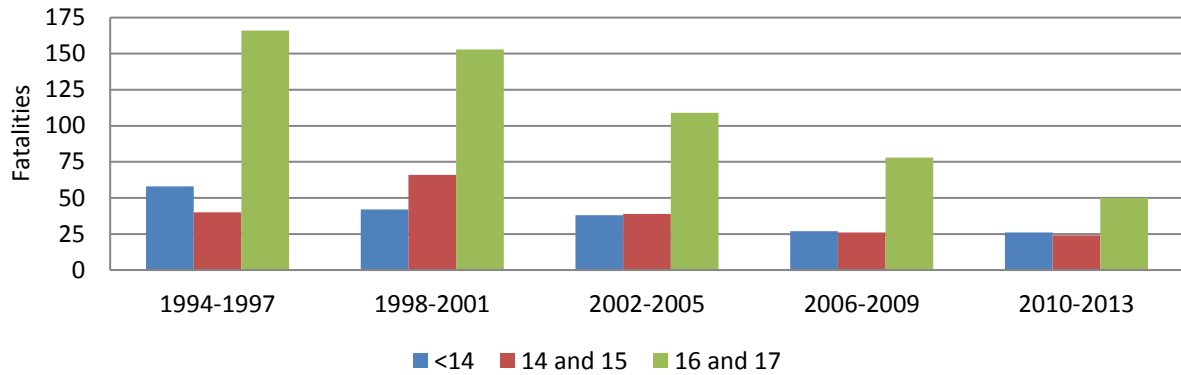
Source: Fatal injury totals were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm)



**Figure 13: Fatalities and fatality rates by year among working youth 15–17 years old in the United States, 1994–2013**

FTE = full-time equivalent

Source: Fatal injury totals and rates were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata and BLS Current Population Survey data; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm) and [www.bls.gov/cps/home.htm](http://www.bls.gov/cps/home.htm)



**Figure 14: Fatalities by age group and 4-year periods among working youth < 18 years old in the United States, 1994–2013**

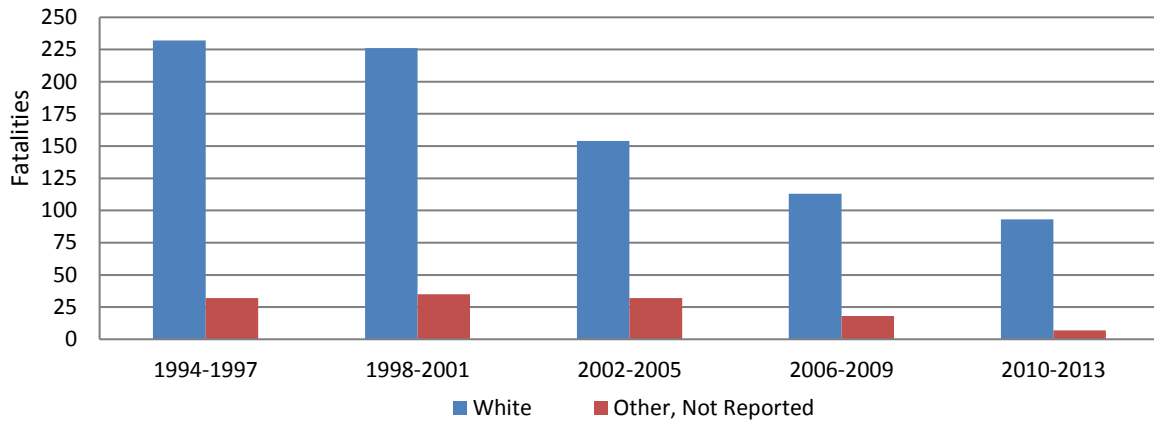
Source: Fatal injury totals were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm)



**Figure 15: Fatalities by sex and 4-year periods among working youth < 18 years old in the United States, 1994–2013**

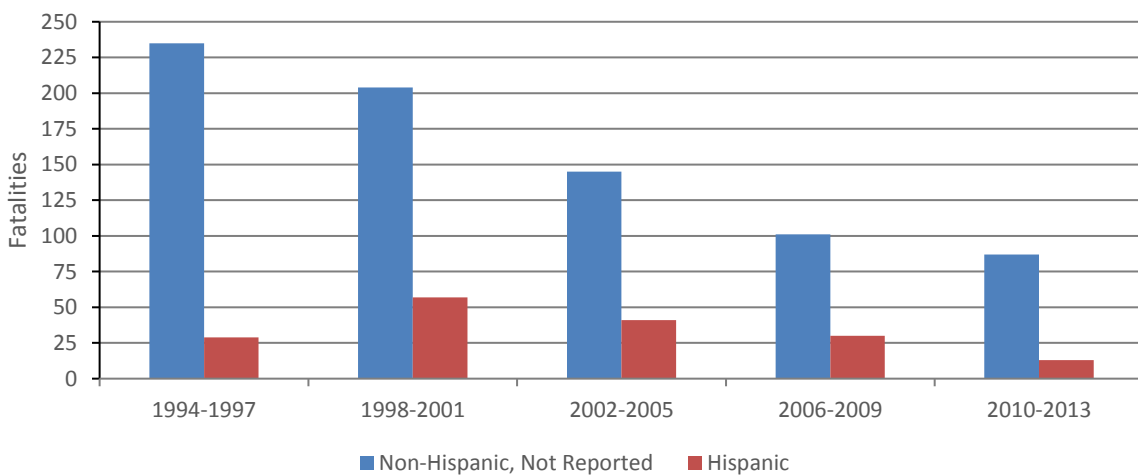
Source: Fatal injury totals were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm)





**Figure 16: Fatalities by race and 4-year periods among working youth < 18 years old in the United States, 1994–2013**

Source: Fatal injury totals were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm)



**Figure 17: Fatalities by ethnicity and 4-year periods among working youth < 18 years old in the United States, 1994–2013**

Source: Fatal injury totals were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm)



**Figure 18: Fatalities by ethnicity and 4-year periods among working youth < 18 years old in the United States, 1994–2013**

Source: Fatal injury totals were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm)

### Industry Distributions

The four industries with the highest fatality numbers for working youth from 1994 to 2013 were agriculture production (389 deaths), services (181 deaths), construction (143 deaths), and retail trade (65 deaths; Table 2). Services and retail trade industries had the highest FTE counts for youth 15 to 17 years old, with 12,821,000 and 5,851,000 FTEs, respectively; agriculture production and construction industries had the highest fatality rates for these youth, with 19.7 and 16.5 deaths per 100,000 FTEs, respectively (Table 2). Over the years, young worker fatalities in agriculture production, construction, and retail trade industries have declined; fatalities in the services industry have not shown a clear trend, although it has been declining in recent years (Figure 19).

**Table 2: Fatalities and fatality rates by industry among working youth < 18 years old in the United States, 1994–2013**

Industry*	All Youth < 18 Years Old		Youth 15–17 Years Old				
	Fatalities	Fatality Percent <sup>†</sup>	Fatalities	Fatality Percent <sup>†</sup>	FTE	FTE Percent <sup>†</sup>	Rate <sup>‡</sup>
Agriculture Production <sup>§</sup>	389	41	183	27	927,000	4	19.7
Services <sup>¶</sup>	181	19	160	24	12,821,000	56	1.2
Construction	143	15	134	20	813,000	4	16.5
Retail Trade	65	7	53	8	5,851,000	26	1.0
Manufacturing	41	4	31	5	717,000	1	4.3
Public Administration	21	2	n/r	n/r	154,000	1	n/r
All Other	102	11	n/r	n/r	1,711,000	7	n/r
<b>Total</b>	<b>942</b>	<b>100</b>	<b>672</b>	<b>100</b>	<b>22,993,000</b>	<b>100</b>	<b>2.9</b>

\*A crosswalk was used to determine comparability for Standard Industrial Classification (SIC) and North American Industry Classification System (NAICS) between the periods 1994–2002 and 2003–2013.

<sup>†</sup>May not add to 100 due to rounding.

<sup>‡</sup>Fatality rate per 100,000 FTEs

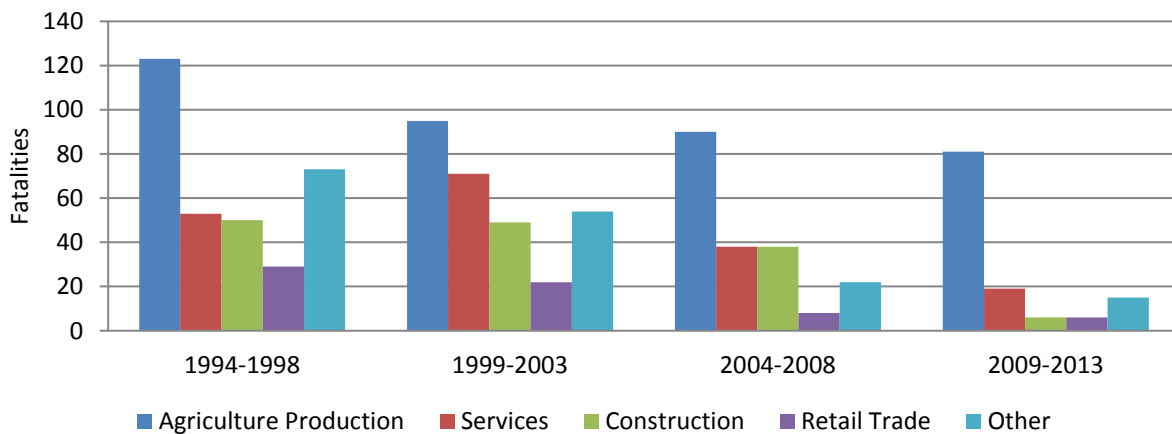
<sup>§</sup>Includes Crop Production and Livestock/Animal Production Operations

<sup>¶</sup>Includes Eating and Drinking Establishments

FTE = full-time equivalent

n/r = not reportable due to minimum reporting requirements

Source: Fatal injury totals and rates were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata and BLS Current Population Survey data; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm) and [www.bls.gov/cps/home.htm](http://www.bls.gov/cps/home.htm).



**Figure 19: Fatalities by industry and 5-year periods for working youth < 18 years old in the United States, 1994–2013**

Source: Fatal injury totals were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm)

## Agriculture Production Industry

Young worker fatalities in the agriculture production industry were identified using SIC for 1994 to 2002 and NAICS for 2003 to 2013. Although there was a break in the industry code series between 2002 and 2003, efforts were made to match the SIC and NAICS codes using a crosswalk to allow for the results to be presented in a meaningful manner across the years.

From 1994 to 2013, there were 389 fatalities to youth less than 18 years old working in agriculture production (Table 3). Youth less than 14 years old incurred the largest number of these fatalities (156; 40%), and the majority of the fatalities occurred to male youth (354; 91%), white youth (366; 94%), and youth who were either non-Hispanic or did not have ethnicity recorded (350; 90%). Rates decreased with age from 24.8 fatalities per 100,000 FTEs for 15-year-olds to 15.7 per 100,000 FTEs for 17-year-olds. The rate for Hispanic youth was more than 1.5 times higher than the rate for all youth working in this industry (Table 3).

Almost half of the 389 fatalities occurred in the Midwest (Figure 20). The South had the lowest fatality rate for 15- to 17-year-old youth, while the West had the highest fatality rate (Figure 21). The majority of the 389 fatalities occurred on farms with 10 or fewer employees (Figure 22), and most of the deaths occurred to youth working on a family-owned farm (Figure 23). Transportation incidents, including those involving a tractor, were the most common fatal event (Figure 24), with 124 of the 235 transportation events being non-roadway incidents. The primary fatality source was vehicles (Figure 25), with 102 of the 216 vehicle-related fatalities involving tractors. Most of the 389 fatalities occurred in the three summer months (Figure 26), were uniformly distributed across the days of the week (Figure 27), and occurred between noon and 6 pm (Figure 28). Across groupings of 4-year periods, the number of fatalities generally declined, with a slight increase from 2010 to 2013 (Figure 29). The fatality rate for youth 15 to 17 years old generally increased (Figure 30), and youth less than 14 years old commonly incurred the most fatalities, only surpassed by youth 16 and 17 years in the most recent time period (Figure 31).

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***Agriculture Production Industry—Industry classification codes (in parentheses below) used to identify young worker fatalities from 1994–2013***

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*SIC codes for cases from 1994–2002*  
*Crop production (01)*  
*Livestock production (02)*

*NAICS codes for cases from 2003–2013*  
*Crop production (111)*  
*Animal production (112)*

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**Table 3: Agriculture production industry fatalities and fatality rates by age, sex, race, and ethnicity among working youth < 18 years old in the United States, 1994–2013**

Characteristic	All Youth < 18 Years Old		Youth 15–17 Years Old				
	Fatalities	Fatality Percent <sup>¶</sup>	Fatalities	Fatality Percent <sup>¶</sup>	FTE	FTE Percent <sup>¶</sup>	Rate*
<b>Age</b>							
< 14	156	40	-	-	-	-	-
14	50	13	-	-	-	-	-
15	58	15	58	32	234,000	25	24.8
16	67	17	67	37	323,000	35	20.7
17	58	15	58	32	370,000	40	15.7
<b>Sex</b>							
Male	354	91	172	94	736,000	79	23.4
Female	35	9	11	6	191,000	21	5.7
<b>Race</b>							
White	366	94	167	91	902,000	97	18.5
Other <sup>‡</sup> , Not Reported	23	6	16	9	n/a	n/a	n/a
<b>Ethnicity</b>							
Non-Hispanic, Not Reported	350	90	155	85	n/a	n/a	n/a
Hispanic	39	10	28	15	84,000	91	33.4
<b>Total</b>	<b>389</b>	<b>100</b>	<b>183</b>	<b>100</b>	<b>927,000</b>	<b>100</b>	<b>19.7</b>

<sup>¶</sup> May not add to 100 due to rounding

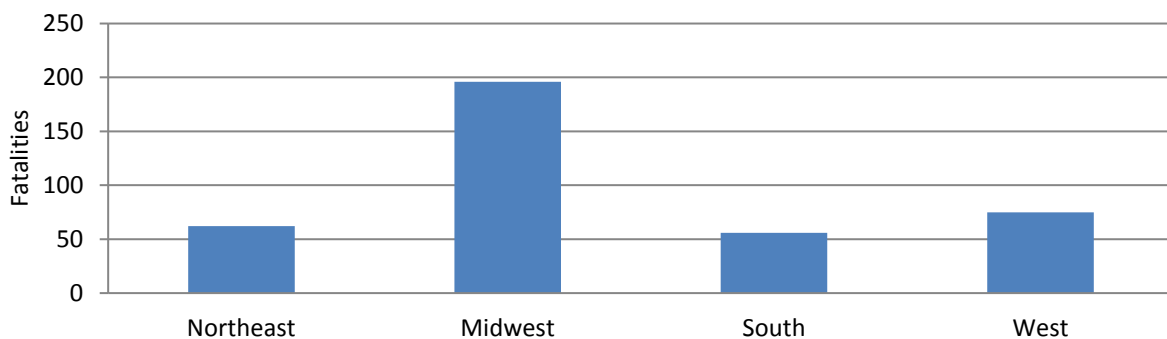
\*Fatality rate per 100,000 FTEs

<sup>‡</sup>Other includes persons of multiple races

FTE = full-time equivalent

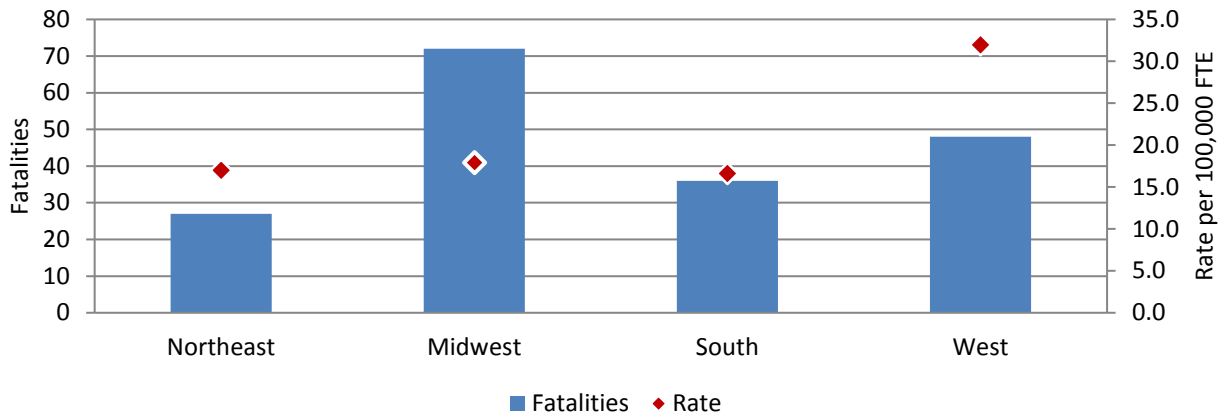
n/a = not applicable

Source: Fatal injury totals and rates were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata and BLS Current Population Survey data; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm) and [www.bls.gov/cps/home.htm](http://www.bls.gov/cps/home.htm)



**Figure 20: Agriculture production industry fatalities by region among working youth < 18 years old in the United States, 1994–2013**

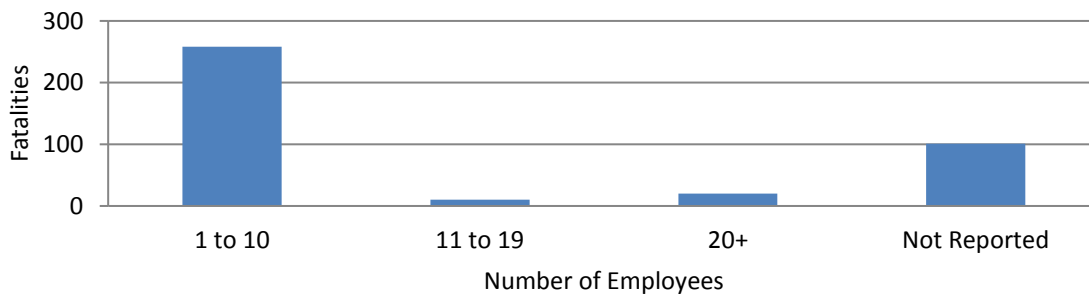
Source: Fatal injury totals were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm)



**Figure 21: Agriculture production industry fatalities and fatality rates by region among working youth 15–17 years old in the United States, 1994–2013**

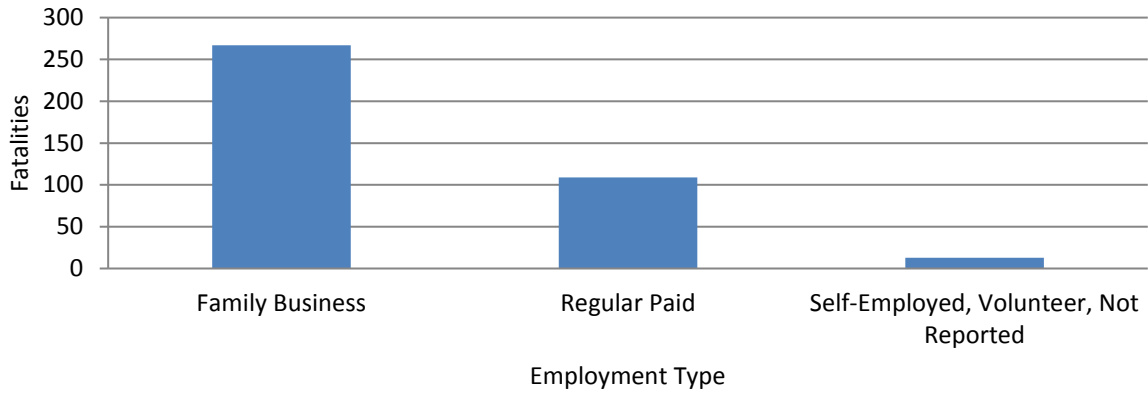
**FTE = full-time equivalent**

Source: Fatal injury totals and rates were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata and BLS Current Population Survey data; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm) and [www.bls.gov/cps/home.htm](http://www.bls.gov/cps/home.htm)



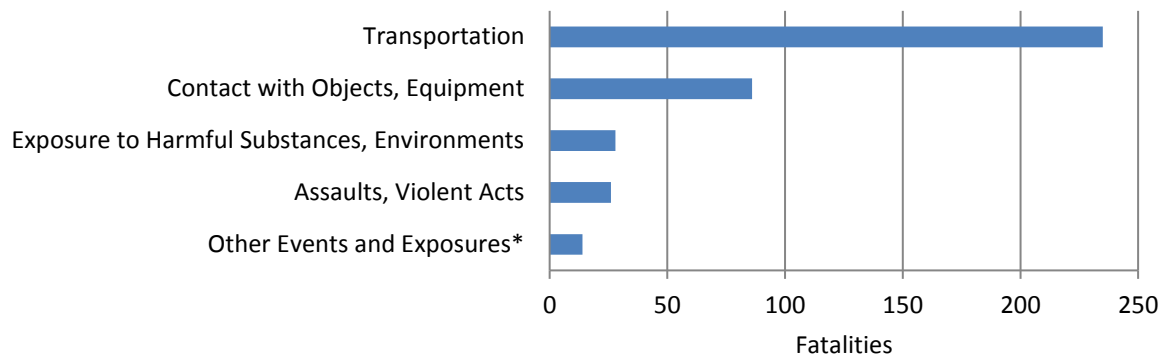
**Figure 22: Agriculture production industry fatalities by size of employer establishment among working youth < 18 years old in the United States, 1994–2013**

Source: Fatal injury totals were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm)



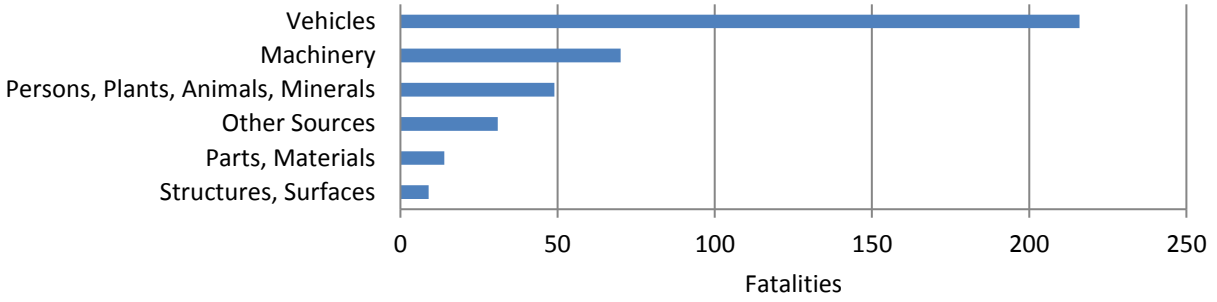
**Figure 23: Agriculture production industry fatalities by employment type among working youth < 18 years old in the United States, 1994–2013**

Source: Fatal injury totals were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm)



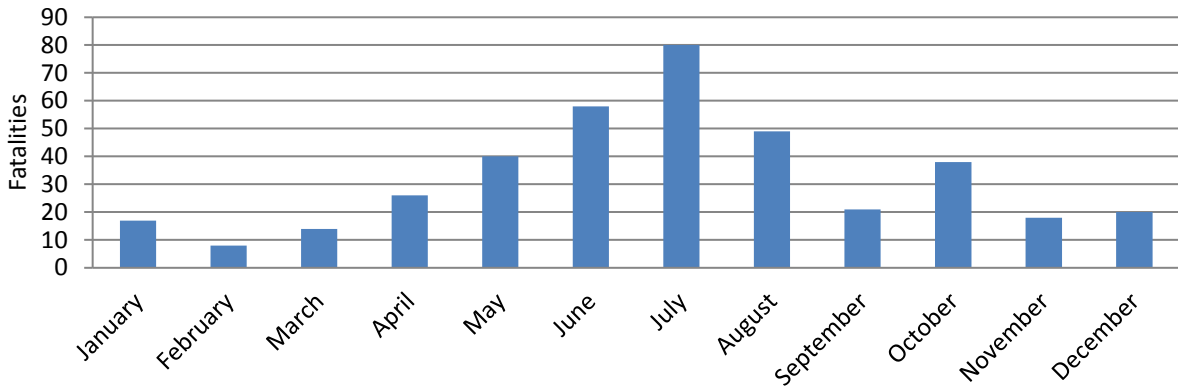
**Figure 24: Agriculture production industry fatalities by injury event among working youth < 18 years old in the United States, 1994–2013**

\*Other events and exposures include falls, bodily reaction and exertion, and fires and explosions.  
 Source: Fatal injury totals were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm)



**Figure 25: Agriculture production industry fatalities by injury source among working youth < 18 years old in the United States, 1994–2013**

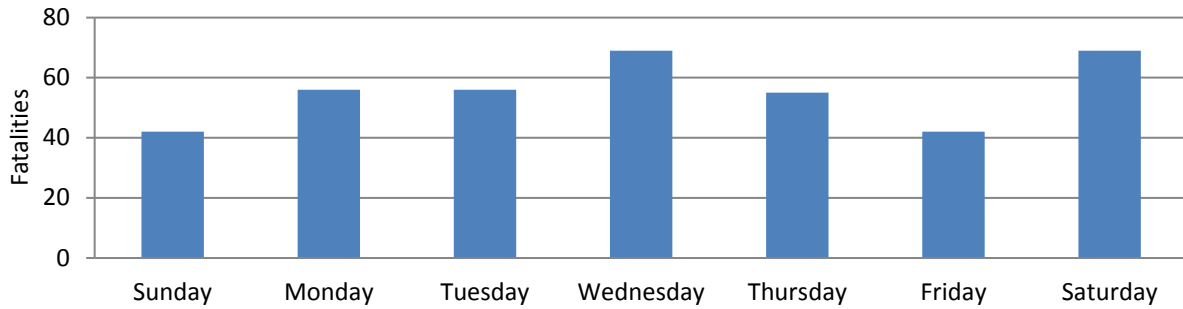
Source: Fatal injury totals were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm)



**Figure 26: Agriculture production industry fatalities by month among working youth < 18 years old in the United States, 1994–2013**

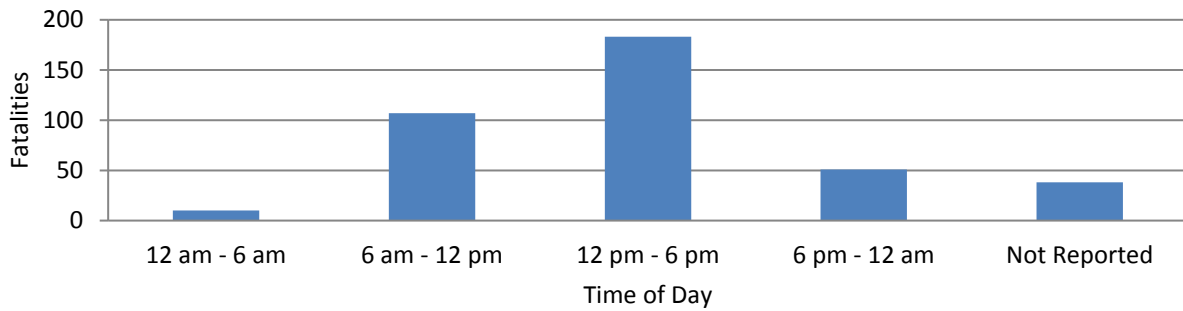
Source: Fatal injury totals were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm)





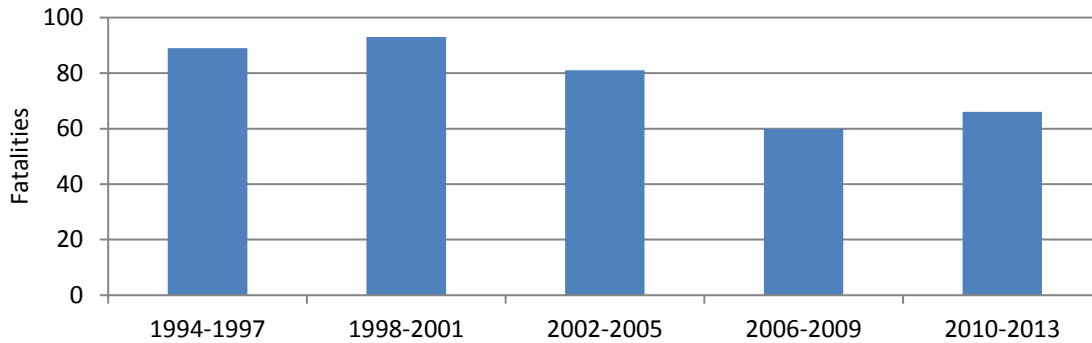
**Figure 27: Agriculture production industry fatalities by day of week among working youth < 18 years old in the United States, 1994–2013**

Source: Fatal injury totals were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm)



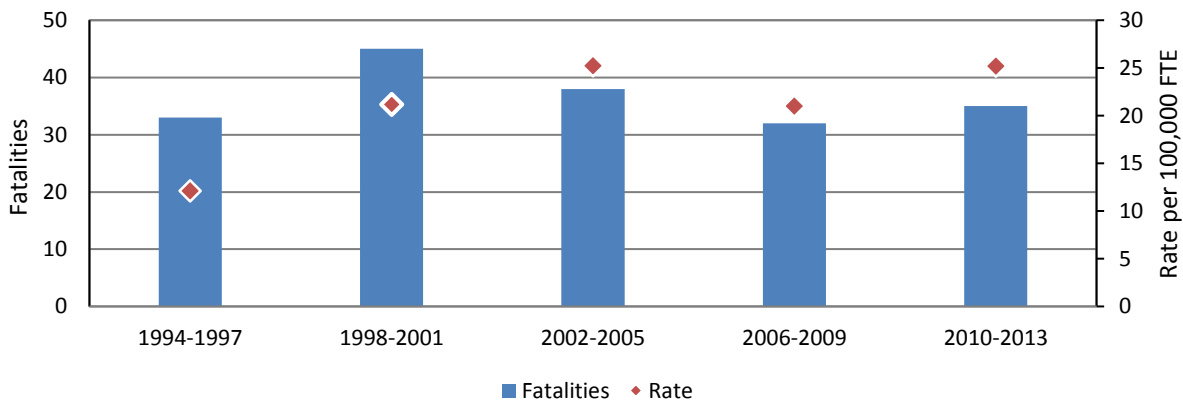
**Figure 28: Agriculture production industry fatalities by time of day among working youth < 18 years old in the United States, 1994–2013**

Source: Fatal injury totals were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm)



**Figure 29: Agriculture production industry fatalities by 4-year periods among working youth < 18 years old in the United States, 1994–2013**

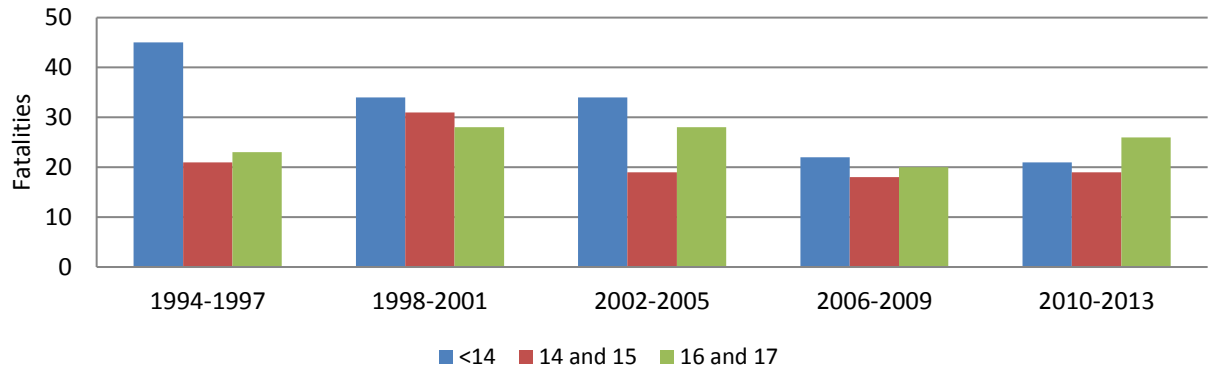
Source: Fatal injury totals were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm)



**Figure 30: Agriculture production industry fatalities and fatality rates by 4-year periods among working youth 15–17 years old in the United States, 1994–2013**

**FTE = full-time equivalent**

Source: Fatal injury totals and rates were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata and BLS Current Population Survey data; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm) and [www.bls.gov/cps/home.htm](http://www.bls.gov/cps/home.htm)



**Figure 31: Agriculture production industry fatalities by age group and 4-year periods among working youth < 18 years old in the United States, 1994–2013**

Source: Fatal injury totals were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm)

## Services Industry

Within the services industry, young worker fatalities from 1994 to 2002 were identified using SIC, and from 2003 to 2013 the fatalities were identified using NAICS. One major difference between the two coding structures is for eating and drinking establishments, which fall within the retail industry under SIC and within the services industry under NAICS. To allow for a consistent presentation of results across the years in this document, eating and drinking establishments are considered under the services industry for all years, 1994 to 2013.

Youth working in the services industry from 1994 to 2013 incurred 181 fatalities. Although the number of fatalities increased with age, the fatality rate per 100,000 FTEs was highest for 15-year-olds (1.9 fatalities per 100,000 FTEs)

(Table 4). The number of fatalities (15) for male youth less than 15 years old was more than twice the number for females (6). However, for youth 15-17 years of age, the number of male decedents (118) was almost 3 times greater than females (42) (Table 4). The majority of the 181 fatalities occurred to white youth (147; 81%) and youth who were either non-Hispanic or did not have ethnicity recorded (153; 85%) (Table 4).

Of the 181 young worker fatalities, the highest number occurred in the South (Figure 32). For the 139 fatality records with employer size recorded, 41% occurred in establishments with 10 or fewer employees (Figure 33), and most of the 181 fatalities occurred to youth who were regular paid employees (Figure 34). Violence, non-roadway transportation incidents, and roadway transportation incidents were the three leading fatal injury events among youth working in the services industry (Figure 35). Violence accounted for 52 (29%) fatal events, and the transportation events were evenly distributed between those that occurred off public roadways and those on the roadways (Figure 35). Consistent with the high number of transportation incidents, vehicles were the most common fatal injury source (Figure 36). Among events involving violence, 42 cases involved injuries caused by ammunition, most commonly bullets (Figure 36). More fatalities occurred in the summer (Figure 37), on weekends (i.e., Friday through Sunday) (Figure 38), and between noon and midnight (Figure 39). Examination of 4-year periods indicated that fatalities rose steadily from 1994 to 2001 then declined from 2002 to 2013 (Figure 40). The fatality rate for youth 15 to 17 years old, which remained steady between 1994 and 2001, has shown a consistent decrease from 2002 to 2013 (Figure 41).

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### *Services Industry—Industry classification codes used (in parentheses below) to identify young worker fatalities from 1994–2013*

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#### *SIC codes for cases from 1994–2002*

*Eating and drinking establishments (58)*

*Services industries (70–89)*

#### *NAICS codes for cases from 2003–2013*

*Real estate, rental and leasing (53)*

*Professional and technological services (54)*

*Management of companies and enterprises (55)*

*Administrative and support and waste management and remediation services (56)*

*Educational services (61)*

*Health care and social assistance (62)*

*Arts, entertainment, and recreation (71)*

*Accommodation and food services (72)*

*Other services except public administration (81)*

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**Table 4: Services industry fatalities and fatality rates by age, sex, race, and ethnicity among working youth < 18 years old in the United States, 1994–2013**

Characteristic	All Youth < 18 Years Old		Youth 15–17 Years Old				
	Fatalities	Fatality Percent <sup>¶</sup>	Fatalities	Fatality Percent <sup>¶</sup>	FTE	FTE Percent <sup>¶</sup>	Rate*
<b>Age</b>							
< 14	9	5	-	-	-	-	-
14	12	7	-	-	-	-	-
15	27	15	27	17	1,442,000	11	1.9
16	46	25	46	29	4,424,000	33	1.0
17	87	48	87	54	7,381,000	56	1.2
<b>Sex</b>							
Male	133	73	118	74	6,191,000	47	1.9
Female	48	27	42	26	7,056,000	53	0.6
<b>Race</b>							
White	147	81	132	83	11,203,000	85	1.2
Other <sup>†</sup> , Not Reported	34	19	28	18	n/a	n/a	n/a
<b>Ethnicity</b>							
Non-Hispanic, Not Reported	153	85	n/r	n/r	n/a	n/a	n/a
Hispanic	28	15	n/r	n/r	1,629,000	88	n/r
<b>Total</b>	<b>181</b>	<b>100</b>	<b>160</b>	<b>100</b>	<b>13,246,000</b>	<b>100</b>	<b>1.2</b>

<sup>¶</sup>May not add to 100 due to rounding

\*Fatality rate per 100,000 FTEs

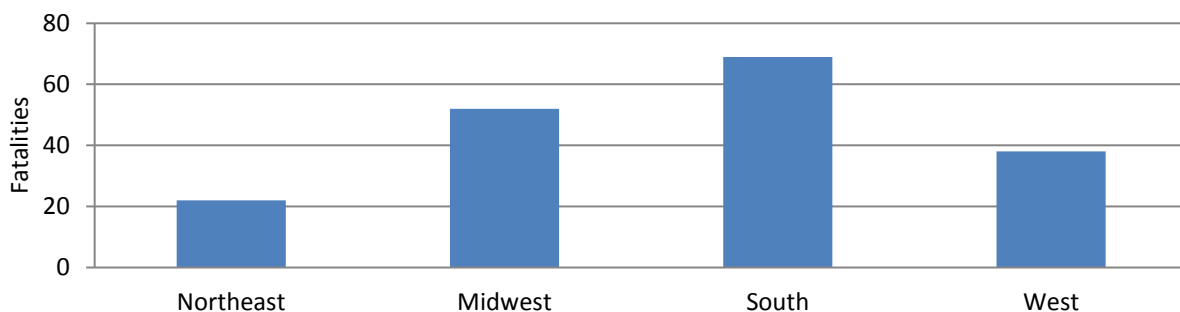
<sup>†</sup>Other includes persons of multiple races

FTE = full-time equivalent

n/a = not applicable

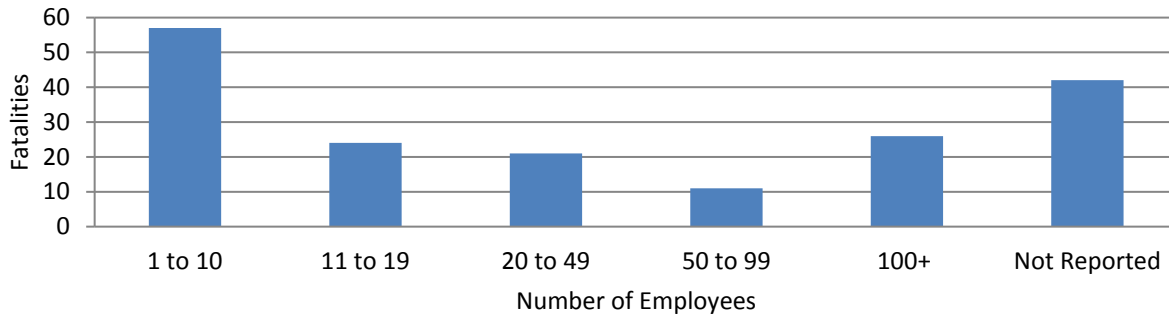
n/r = not reportable due to minimum reporting requirements

Source: Fatal injury totals and rates were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata and BLS Current Population Survey data; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm) and [www.bls.gov/cps/home.htm](http://www.bls.gov/cps/home.htm)



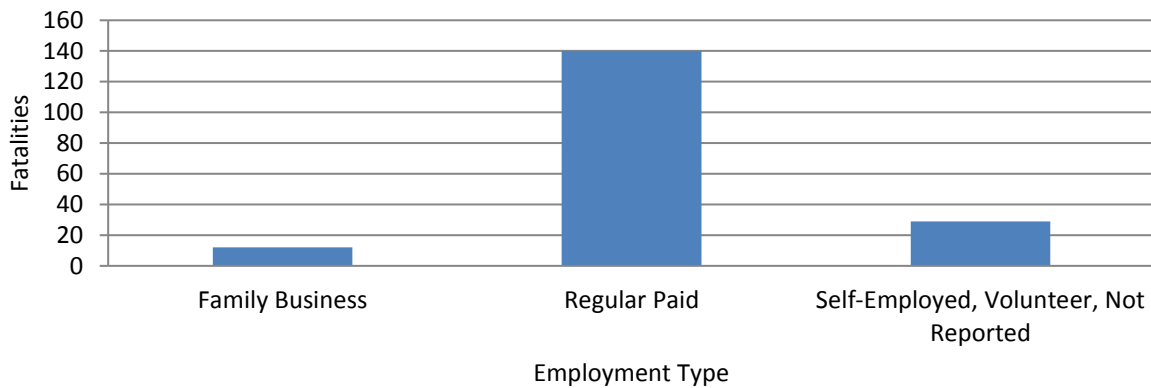
**Figure 32: Services industry fatalities by region among working youth < 18 years old in the United States, 1994–2013**

Source: Fatal injury totals were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm)



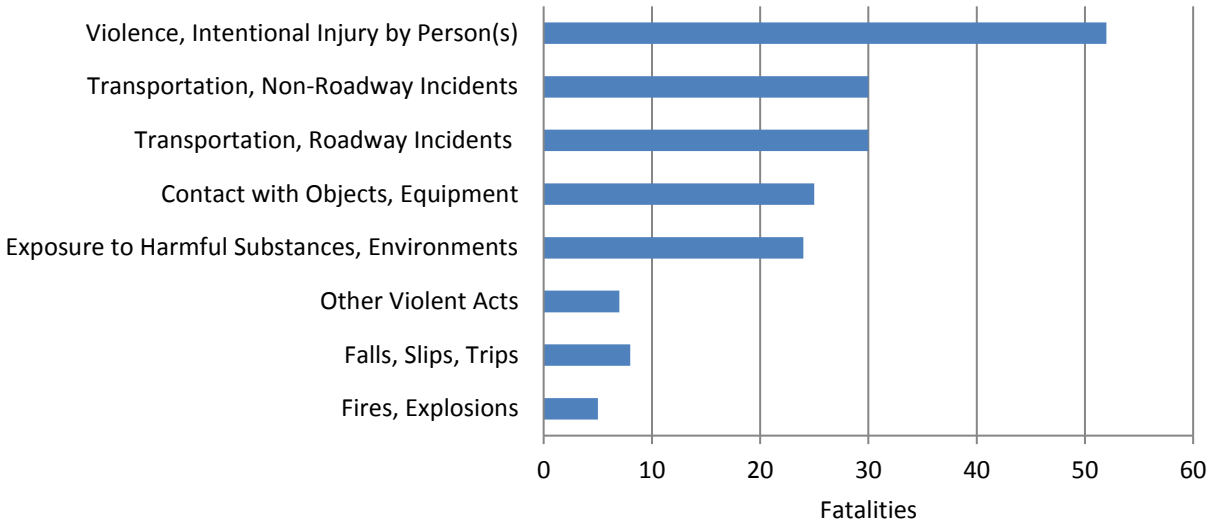
**Figure 33: Services industry fatalities by size of employer establishment among working youth < 18 years old in the United States, 1994–2013**

Source: Fatal injury totals were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm)



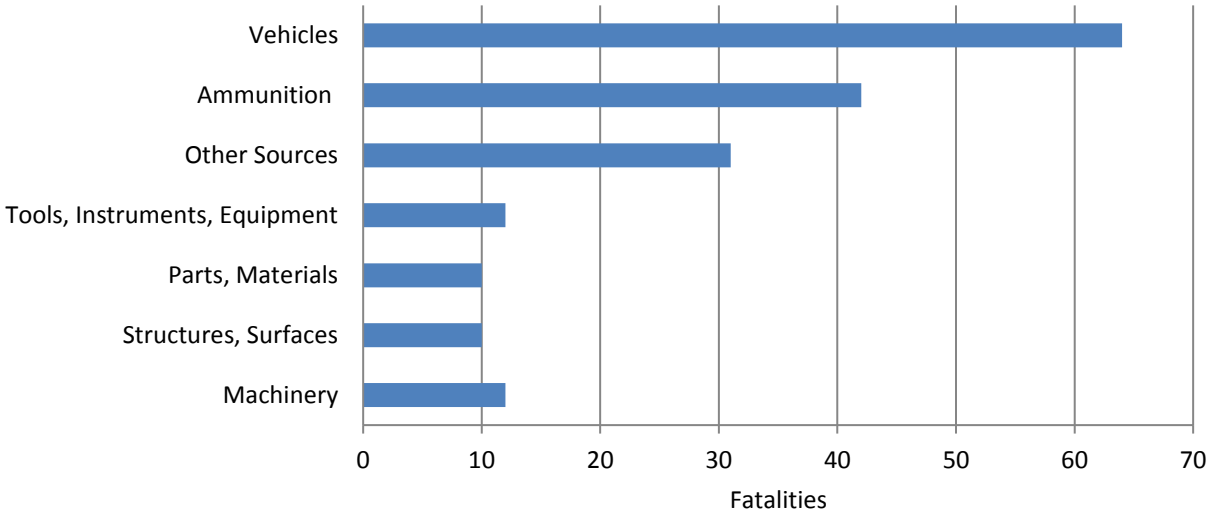
**Figure 34: Services industry fatalities by employment type among working youth < 18 years old in the United States, 1994–2013**

Source: Fatal injury totals were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm)



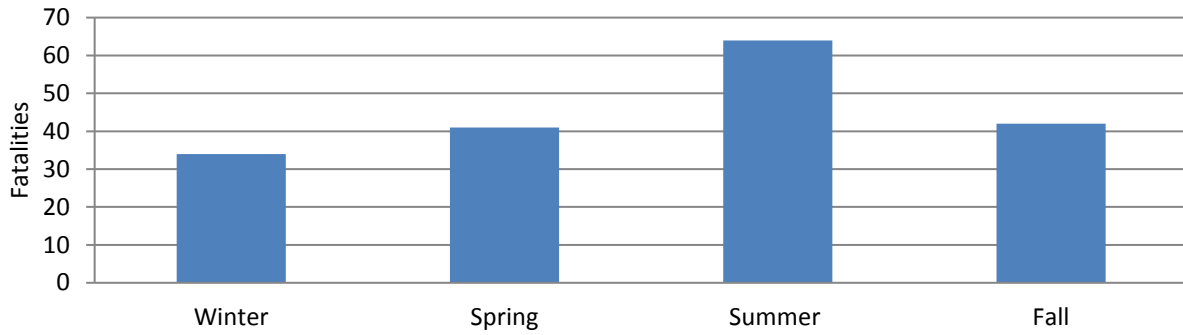
**Figure 35: Services industry fatalities by injury event among working youth < 18 years old in the United States, 1994–2013**

Source: Fatal injury totals were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm)



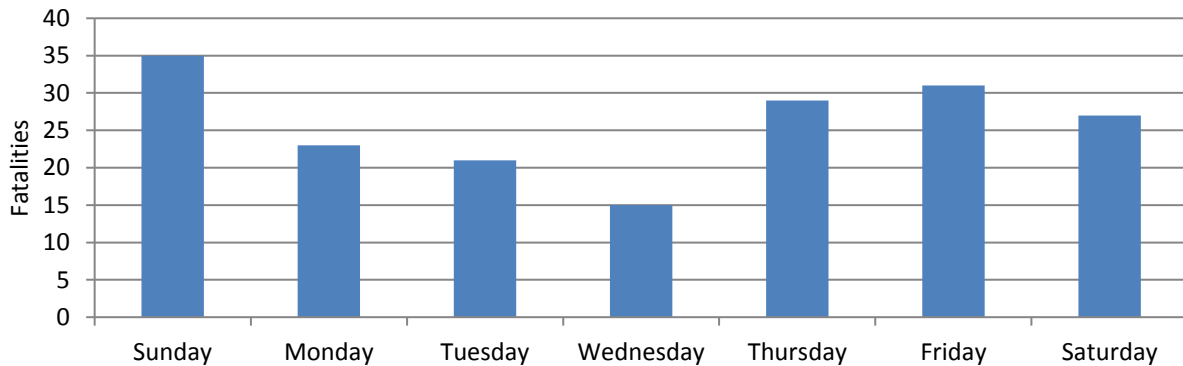
**Figure 36: Services industry fatalities by injury source among working youth < 18 years old in the United States, 1994–2013**

Source: Fatal injury totals were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm)



**Figure 37: Services industry fatalities by season among working youth < 18 years old in the United States, 1994–2013**

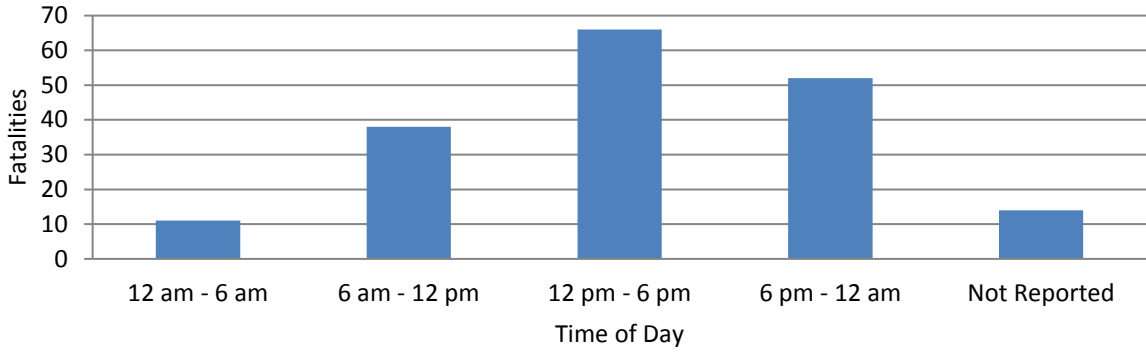
Source: Fatal injury totals were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm)



**Figure 38: Services industry fatalities by day of week among working youth < 18 years old in the United States, 1994–2013**

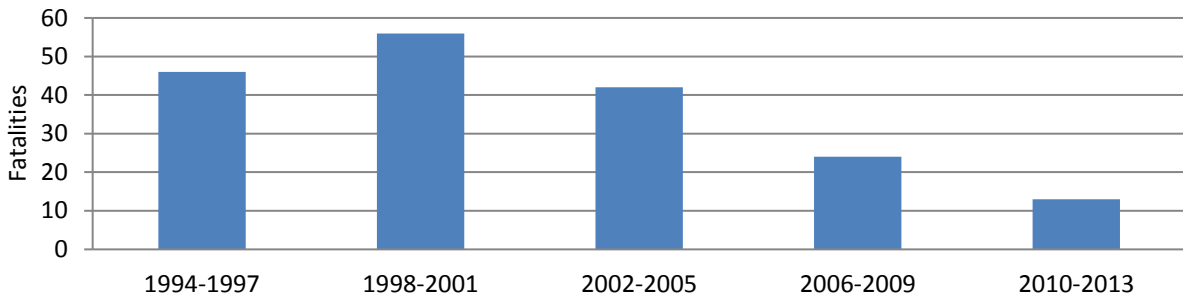
Source: Fatal injury totals were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm)





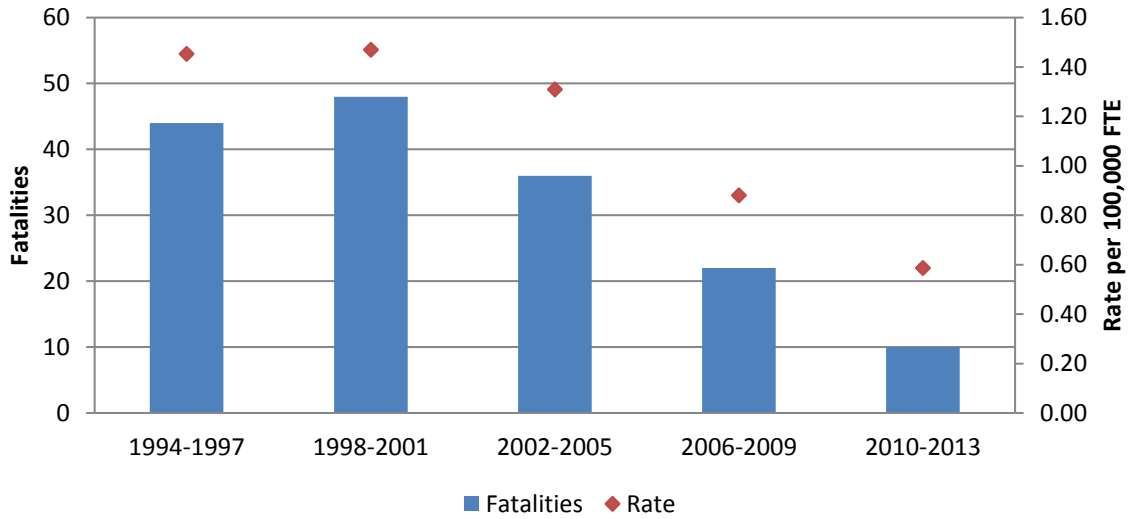
**Figure 39: Services industry fatalities by time of day among working youth < 18 years old in the United States, 1994–2013**

Source: Fatal injury totals were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm)



**Figure 40: Services industry fatalities by 4-year periods among working youth < 18 years old in the United States, 1994–2013**

Source: Fatal injury totals were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm)



**Figure 41: Services industry fatalities and fatality rates by 4-year periods among working youth 15–17 years old in the United States, 1994–2013**

**FTE = full-time equivalent**

Source: Fatal injury totals and rates were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata and BLS Current Population Survey data; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm) and [www.bls.gov/cps/home.htm](http://www.bls.gov/cps/home.htm)

## Construction Industry

Work-related fatalities among youth in the construction industry were identified using SIC for 1994 to 2002 and NAICS for 2003 to 2013. Although there was a break in the industry code series between 2002 and 2003, a crosswalk was used to match the SIC and NAICS codes to allow the results to be presented across the years.

Within the construction industry from 1994 to 2013, there were 143 fatalities to working youth. As age increased, the number of fatalities increased, with the older youth incurring the highest number of

fatalities and having the highest fatality rate (Table 5). The vast majority of the 143 fatalities occurred to male youth (138; 96%) and white youth (116; 81%) (Table 5).

Over half of the 143 fatalities occurred in the South (Figure 42), and in establishments with 10 or fewer employees (Figure 43). Most of the deaths occurred to youth who were regular paid employees (Figure 44). Transportation incidents, falls, and contact with objects and equipment were the leading fatal events (Figure 45). Out of the 44 transportation incidents, 15 involved a pedestrian being struck by a moving vehicle or equipment. All of the fall events were from a height to a lower level. Consistent with the leading injury events, the two leading sources of injury were structures or surfaces, which are often associated with fall events, and vehicles, associated with transportation events (Figure 46). Although there was not a great deal of monthly variation in the 143 fatalities, over a third occurred during the summer months (Figure 47), with the highest number recorded in July (28; 20%). Most of the 143 fatalities occurred during the normal work week of Monday through Friday (Figure 48) and between the hours of 6 am to 6 pm (Figure 49). Although the number of fatalities has shown no consistent pattern across 4-year periods (Figure 50), the fatality rates provide a clearer picture. To meet confidentiality requirements, the construction fatality rates are shown in 5-year increments. The fatality rate for 15- to 17-year olds over 5-year periods have shown a steady decline (Figure 51).

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### *Construction Industry—Industry classification codes used (in parentheses below) to identify young worker fatalities from 1994–2013*

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#### *SIC codes for cases from 1994–2002*

*Building construction by general contractors or by operative builders (15)*

*Heavy construction general contractors (16)*

*Construction by other special trade contractors (17)*

#### *NAICS codes for cases from 2003–2013*

*Construction (23)*

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**Table 5: Construction industry fatalities and fatality rates by age, sex, and race among working youth < 18 years old in the United States, 1994–2013**

Characteristic	All Youth < 18 Years Old		Youth 15–17 Years Old				Rate*
	Fatalities	Fatality Percent <sup>¶</sup>	Fatalities	Fatality Percent <sup>¶</sup>	FTE	FTE Percent <sup>¶</sup>	
<b>Age</b>							
< 15	9	6	-	-	-	-	-
15	13	9	13	10	104,000	13	12.5
16	39	27	39	29	240,000	29	16.3
17	82	57	82	61	469,000	58	17.5
<b>Sex</b>							
Male	138	96	n/r	n/r	749,000	92	n/r
Female	5	4	n/r	n/r	64,000	8	n/r
<b>Race</b>							
White	116	81	n/r	n/r	757,000	93	n/r
Other <sup>†</sup> , Not Reported	27	19	n/r	n/r	n/a	n/a	n/a
<b>Total</b>	<b>143</b>	<b>100</b>	<b>134</b>	<b>100</b>	<b>813,000</b>	<b>100</b>	<b>16.5</b>

<sup>¶</sup> May not add to 100 due to rounding

\*Fatality rate per 100,000 FTEs

<sup>†</sup>Other includes persons of multiple races

FTE = full-time equivalent

n/a = not applicable

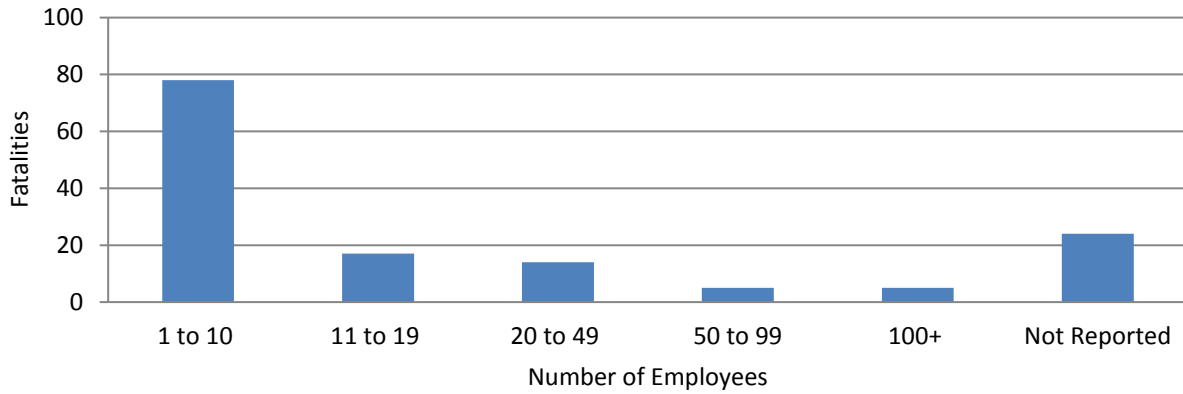
n/r = not reportable due to minimum reporting requirements

Source: Fatal injury totals and rates were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata and BLS Current Population Survey data; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm) and [www.bls.gov/cps/home.htm](http://www.bls.gov/cps/home.htm)



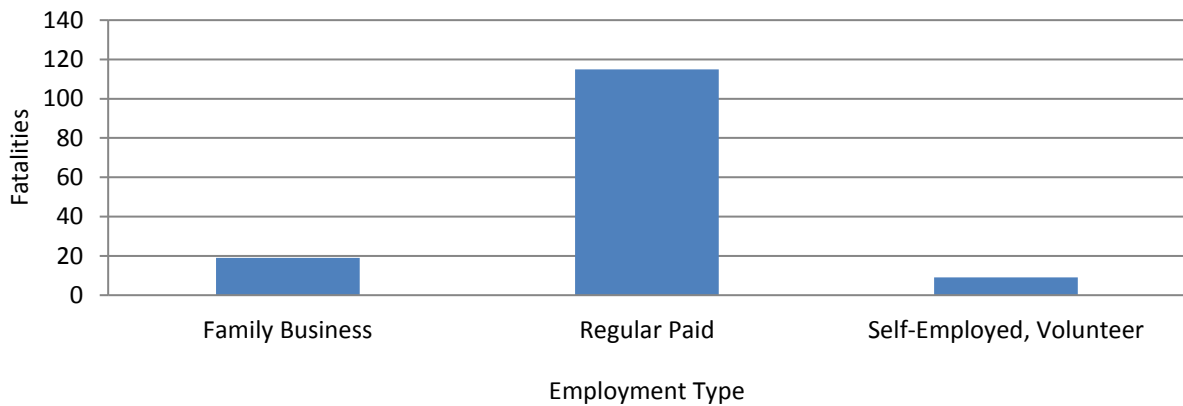
**Figure 42: Construction industry fatalities by region among working youth < 18 years old in the United States, 1994–2013**

Source: Fatal injury totals were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm)



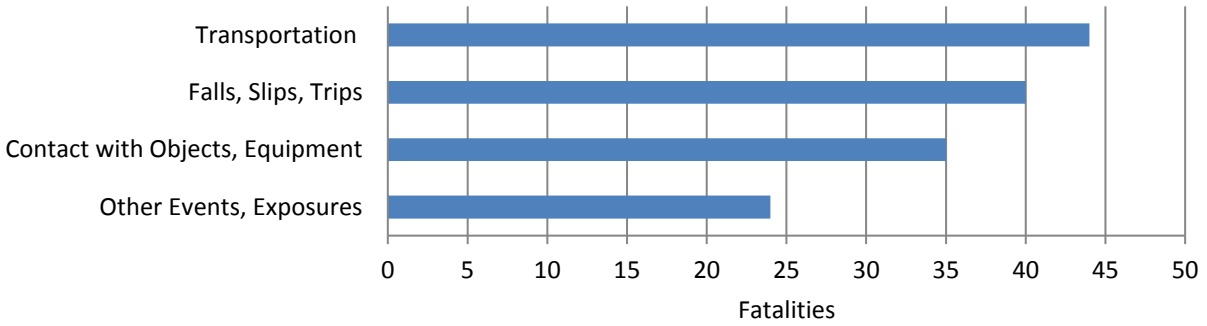
**Figure 43: Construction industry fatalities by size of employer establishment among working youth < 18 years old in the United States, 1994–2013**

Source: Fatal injury totals were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm)



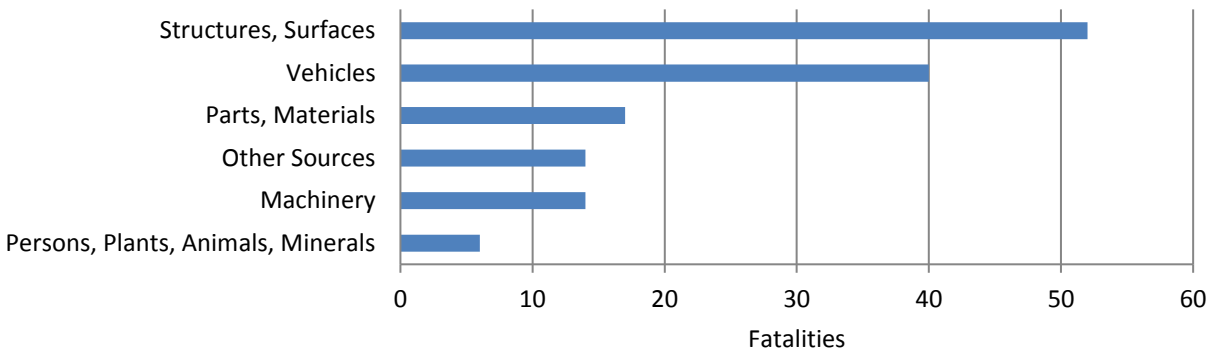
**Figure 44: Construction industry fatalities by employment type among working youth < 18 years old in the United States, 1994–2013**

Source: Fatal injury totals were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm)



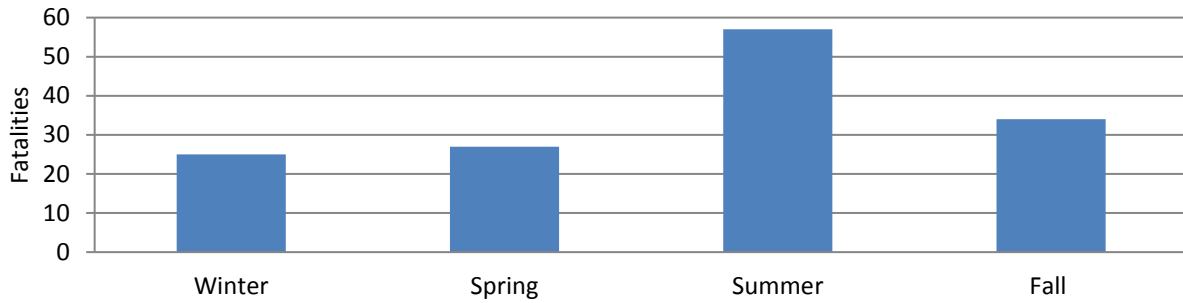
**Figure 45: Construction industry fatalities by injury event among working youth < 18 years old in the United States, 1994–2013**

Source: Fatal injury totals were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm)



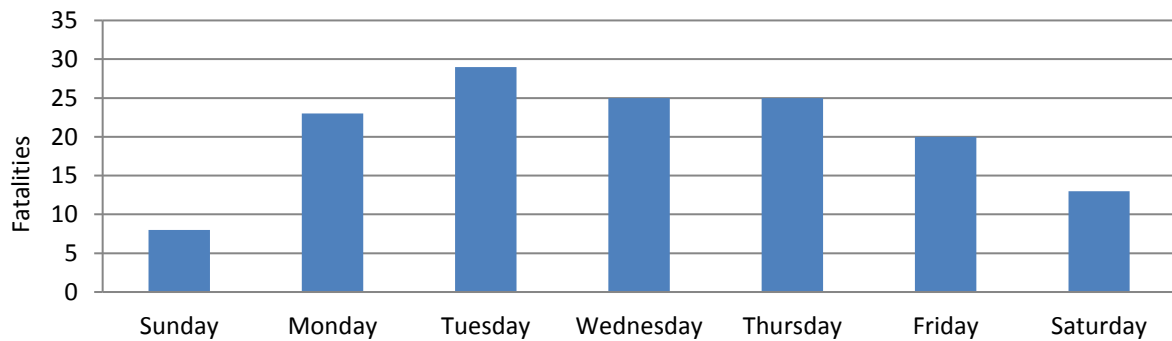
**Figure 46: Construction industry fatalities by injury source among working youth < 18 years old in the United States, 1994–2013**

Source: Fatal injury totals were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm)



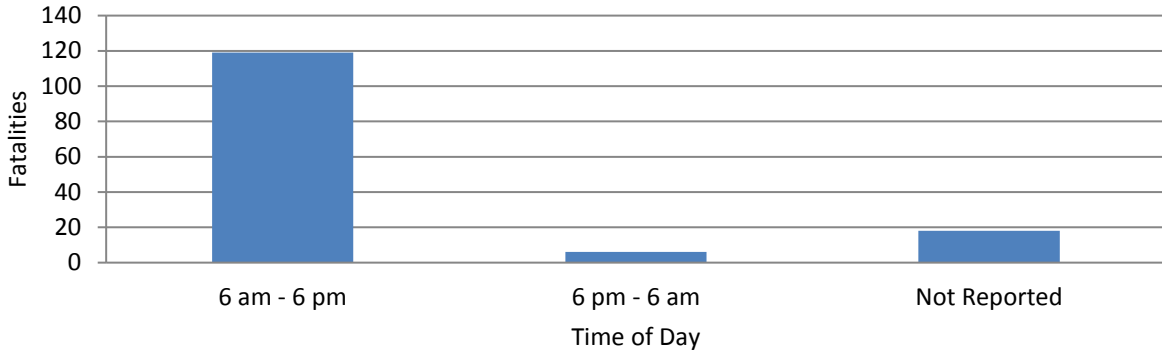
**Figure 47: Construction industry fatalities by season among working youth < 18 years old in the United States, 1994–2013**

Source: Fatal injury totals were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm)



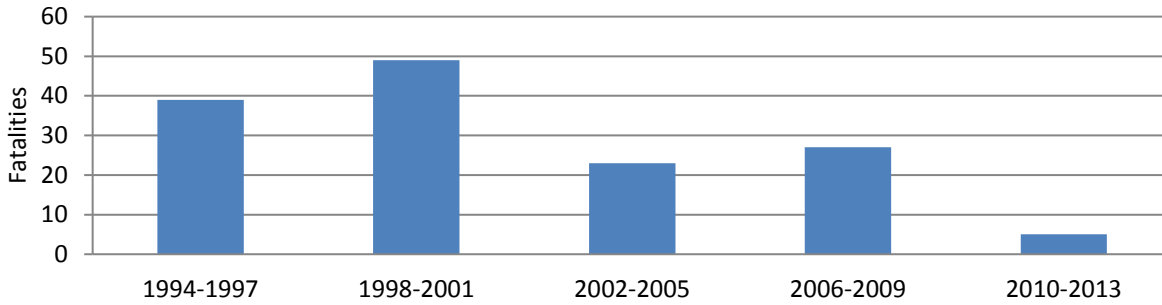
**Figure 48: Construction industry fatalities by day of week among working youth < 18 years old in the United States, 1994–2013**

Source: Fatal injury totals were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm)



**Figure 49: Construction industry fatalities by time of day among working youth < 18 years old in the United States, 1994–2013**

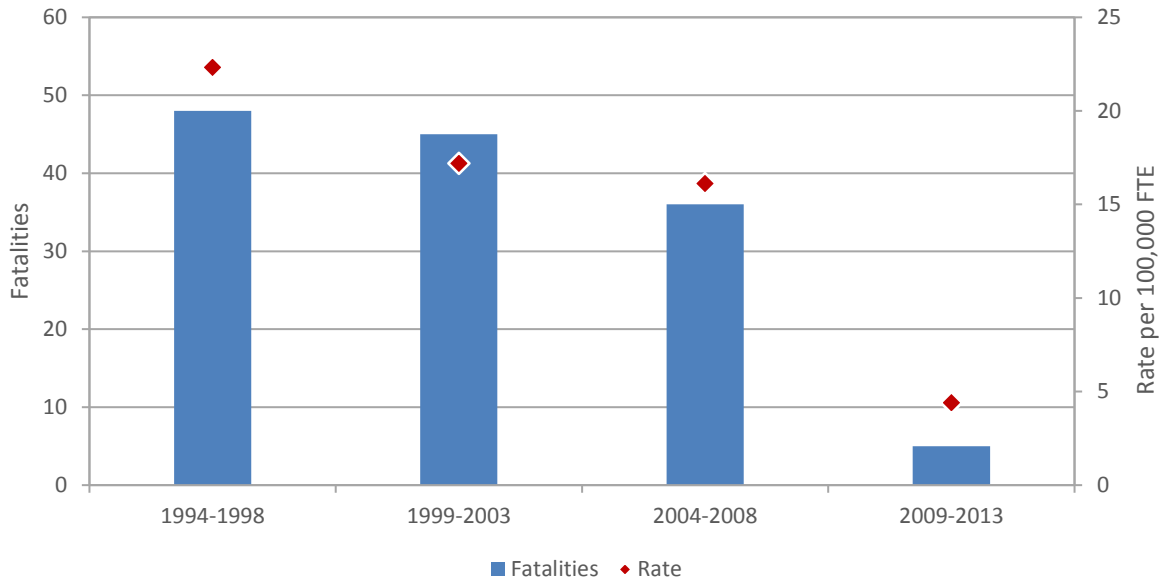
Source: Fatal injury totals were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm)



**Figure 50: Construction industry fatalities by 4-year periods among working youth < 18 years old in the United States, 1994–2013**

Source: Fatal injury totals were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm)





**Figure 51: Construction industry fatalities and fatality rates by 5-year periods among working youth 15 to 17 years old in the United States, 1994–2013**

**FTE = full-time equivalent**

Source: Fatal injury totals and rates were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata and BLS Current Population Survey data; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm) and [www.bls.gov/cps/home.htm](http://www.bls.gov/cps/home.htm)

## Retail Trade Industry

Young worker fatalities in the retail trade industry from 1994 to 2002 were identified using SIC and from 2003 to 2013 using NAICS. A critical difference between the two coding structures is for eating and drinking establishments, which fall within the retail industry under SIC and within the services industry under NAICS. For this document, eating and drinking establishments are considered under the services industry for all years, allowing for a consistent presentation of the results.

From 1994 to 2013, there were 65 young worker fatalities recorded in the retail trade industry. The majority of these fatalities occurred to youth 15 to 17 years old (54; 83%), male youth (50; 77%), and white youth (53; 82%) (Table 6).

Of the 65 fatalities to young workers, the highest number was recorded in the South (Figure 52). For the 44 fatality records with employer size recorded, almost two-thirds occurred in establishments with 10 or fewer employees (Figure 53), and most of the 65 fatalities occurred to youth who were regular paid employees (Figure 54). Violence and transportation incidents together accounted for most of the fatal injury events (Figure 55). Among the transportation events, more than half were incidents that occurred on public roadways. Consistent with the two leading events, the most common sources of fatal injury were ammunition and vehicles (Figure 56). Of the 65 fatal injuries, the greatest number occurred during the summer (Figure 57), on Fridays (Figure 58), and between noon and 6 pm (Figure 59). Across groupings of 5-year periods, fatalities have dropped consistently from 1994 to 2013 (Figure 60). Fatality rates for youth 15 to 17 years old working in retail trade are presented in 10-year periods due to confidentiality restrictions, and it is clear that there has been a dramatic decrease in both the number of fatalities and the fatality rate over the two periods (Figure 61).

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### *Retail Trade Industry—Industry classification codes used (in parentheses below) to identify young worker fatalities from 1994–2013*

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#### *SIC codes for cases from 1994–2002*

*Building materials, hardware, garden supply, and mobile home dealers (52)*

*General merchandise stores (53)*

*Food stores (54)*

*Automotive dealers and service stations (55)*

*Apparel and accessories stores (56)*

*Home furnishings, furniture, and equipment stores (57)*

*Miscellaneous retail (59)*

#### *NAICS codes for cases from 2003–2013*

*Retail trade (44–45)*

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**Table 6: Retail trade industry fatalities and fatality rates by age, sex, and race among working youth < 18 years old in the United States, 1994–2013**

Characteristic	All Youth < 18 Years Old		Youth 15–17 Years Old				
	Fatalities	Fatality Percent	Fatalities	Fatality Percent	FTE	FTE Percent	Rate*
<b>Age</b>							
< 15	11	17	-	-	-	-	-
15–17	54	83	54	100	5,851,000	100	0.9
<b>Sex</b>							
Male	50	77	44	81	2,976,000	51	1.5
Female	15	23	10	19	2,875,000	49	0.3
<b>Race</b>							
White	53	82	n/r	n/r	5,088,000	87	n/r
Other†, Not Reported	12	18	n/r	n/r	n/a	n/a	n/a
<b>Total</b>	<b>65</b>	<b>100</b>	<b>54</b>	<b>100</b>	<b>5,851,000</b>	<b>100</b>	<b>0.9</b>

\*Fatality rate per 100,000 FTEs

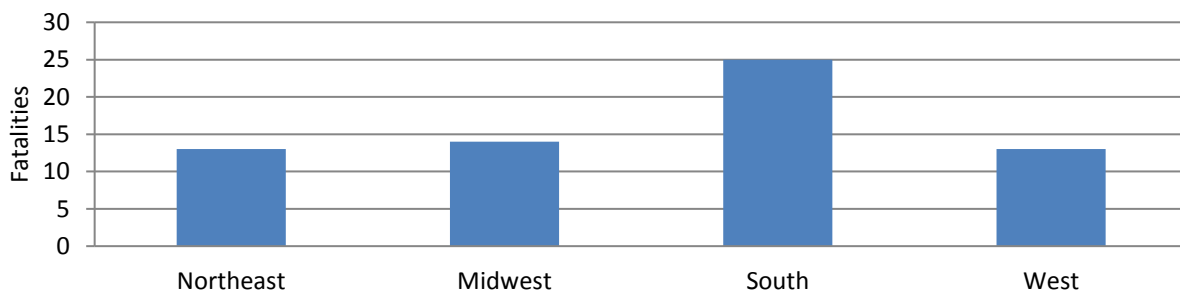
†Other includes persons of multiple races

FTE = full-time equivalent

n/a = not applicable

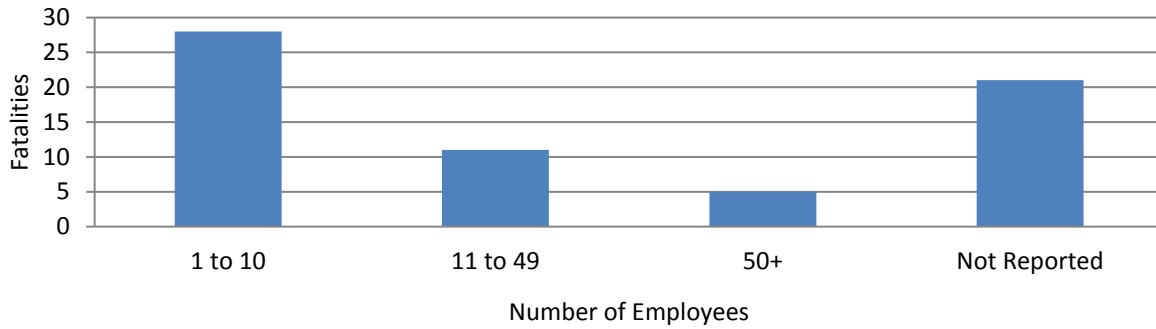
n/r = not reportable due to minimum reporting requirements

Source: Fatal injury totals and rates were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata and BLS Current Population Survey data; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm) and [www.bls.gov/cps/home.htm](http://www.bls.gov/cps/home.htm)



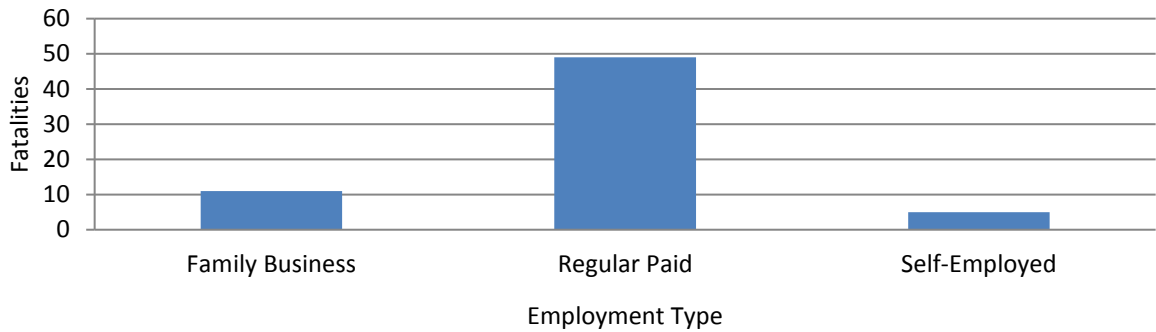
**Figure 52: Retail trade industry fatalities by region among working youth < 18 years old in the United States, 1994–2013**

Source: Fatal injury totals were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm)



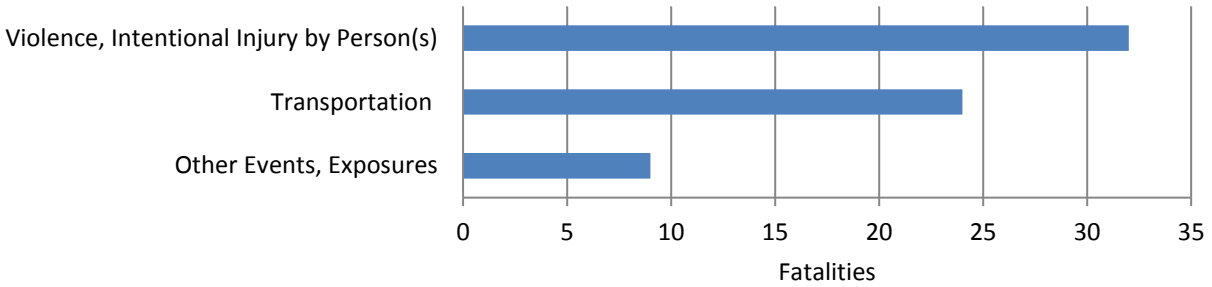
**Figure 53: Retail trade industry fatalities by size of employer establishment among working youth < 18 years old in the United States, 1994–2013**

Source: Fatal injury totals were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm)



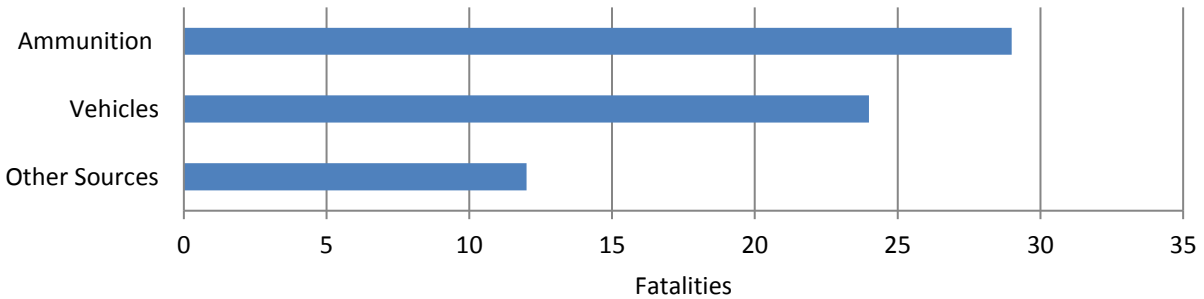
**Figure 54: Retail trade industry fatalities by employment type among working youth < 18 years old in the United States, 1994–2013**

Source: Fatal injury totals were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm)



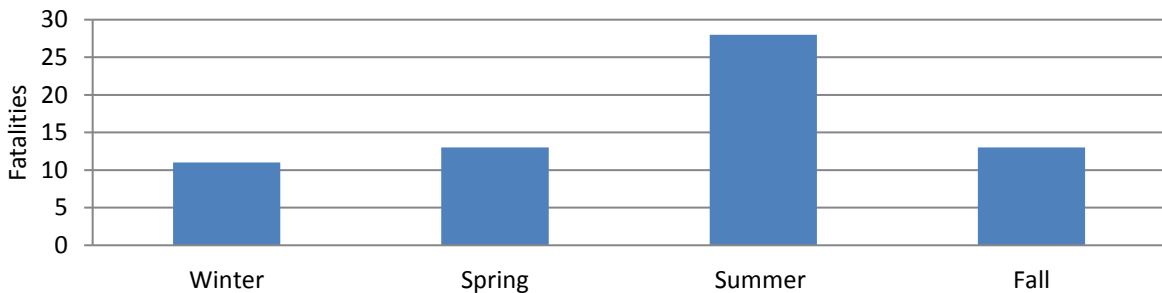
**Figure 55: Retail trade industry fatalities by injury event among working youth < 18 years old in the United States, 1994–2013**

Source: Fatal injury totals were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm)



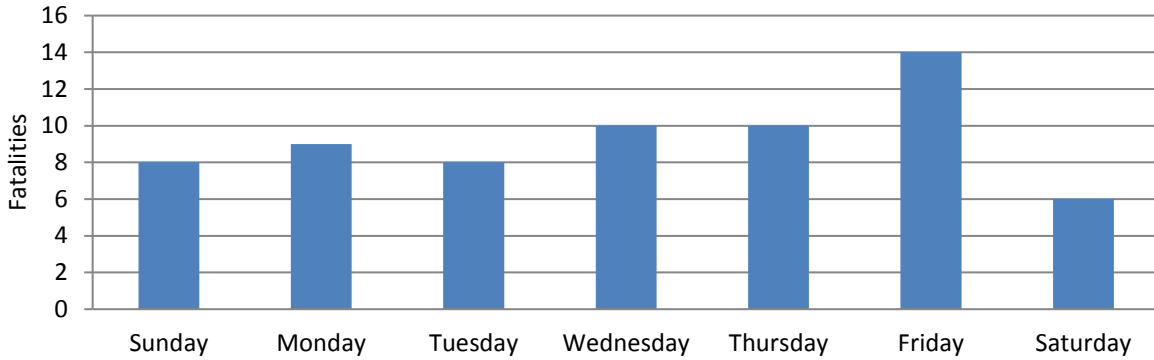
**Figure 56: Retail trade industry fatalities by injury source among working youth < 18 years old in the United States, 1994–2013**

Source: Fatal injury totals were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm)



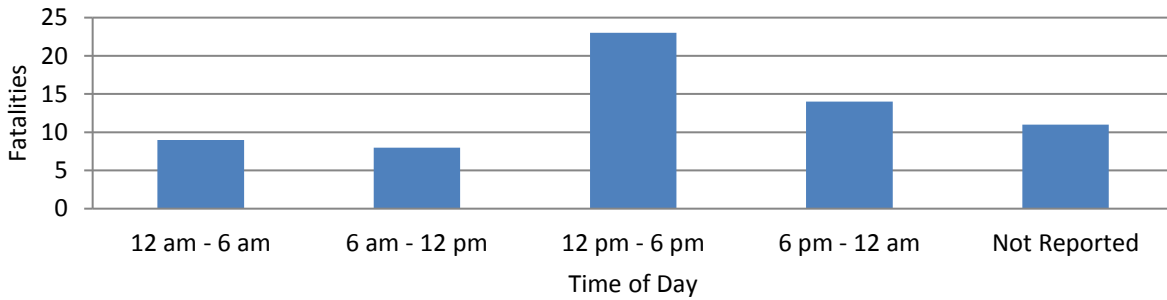
**Figure 57: Retail trade industry fatalities by season among working youth < 18 years old in the United States, 1994–2013**

Source: Fatal injury totals were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm)



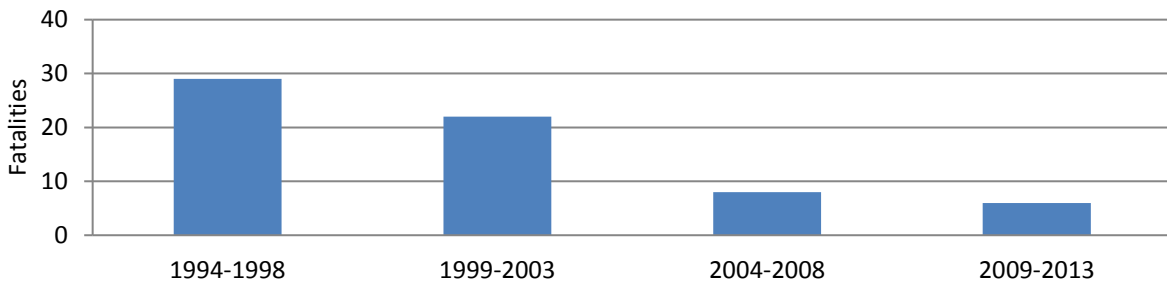
**Figure 58: Retail trade industry fatalities by day of week among working youth < 18 years old in the United States, 1994–2013**

Source: Fatal injury totals were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm)



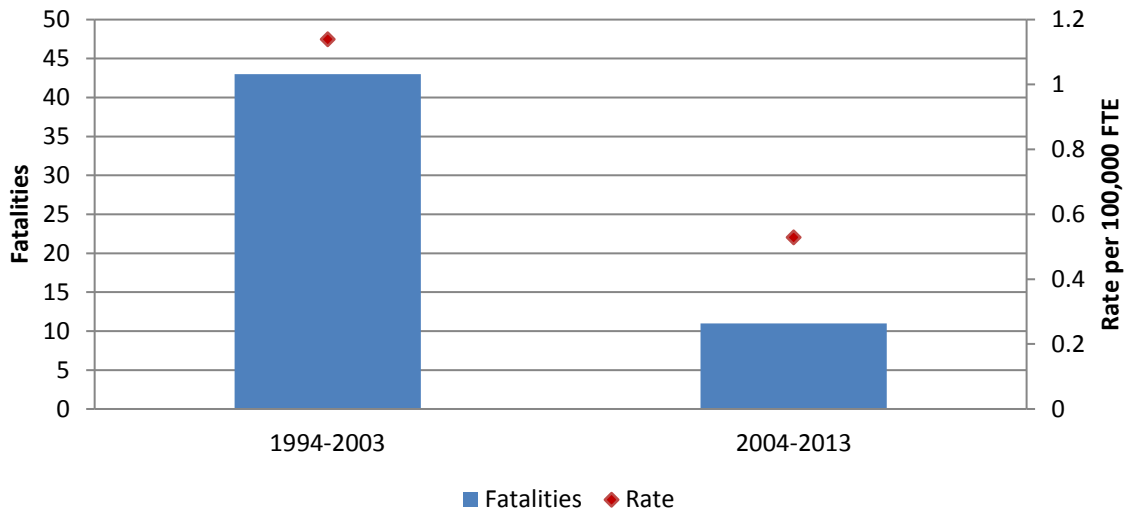
**Figure 59: Retail trade industry fatalities by time of day among working youth < 18 years old in the United States, 1994–2013**

Source: Fatal injury totals were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm)



**Figure 60: Retail trade industry fatalities by 5-year periods among working youth < 18 years old in the United States, 1994–2013**

Source: Fatal injury totals were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm)



**Figure 61: Retail trade industry fatalities and rates by 10-year periods among working youth 15 to 17 years old in the United States, 1994–2013**

FTE = full-time equivalent

Source: Fatal injury totals and rates were generated by NIOSH researchers with restricted access to the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) microdata and BLS Current Population Survey data; additional information at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm) and [www.bls.gov/cps/home.htm](http://www.bls.gov/cps/home.htm)

## Summary of Investigative Data, 1982–2010

### Background

In 1982, NIOSH initiated the Fatality Assessment and Control Evaluation (FACE) program to study work-related fatal injuries. Through this nonregulatory program, FACE researchers conduct on-site investigations of selected occupational fatalities in the United States to collect detailed information on the incident circumstances, identify injury risks related to the incident, and develop recommendations to control for or eliminate the identified risks. The resulting investigative reports, containing incident details and injury prevention information, are made available to workers, employers, industry, and safety and health professionals to improve workplace safety.

The following provides an introduction to the FACE program. Additional information is available online from the NIOSH FACE program topic page at [www.cdc.gov/niosh/face/](http://www.cdc.gov/niosh/face/) [NIOSH 2016b].

Due to resource constraints, FACE researchers are not able to investigate every occupational fatality. Therefore, targeted priority areas for investigation are identified based on surveillance data and input from partners and stakeholders. These priority areas, which are periodically reviewed and modified, cover certain causes of death, industries, occupations, and subpopulations of the workforce. Current and past FACE priority areas include confined spaces, falls, electrocutions, logging, machine-related, highway work zones, and energy production. Youth under 18 years of age were adopted as a FACE priority in 1999. As a priority area, young worker fatalities reported to NIOSH by OSHA were investigated as resources allowed. Prior to 1999, a youth fatality was only investigated if it coincided with another

priority area, such as a fall or confined space incident. Beginning in 2010, investigations of work-related fatalities to youth were limited to those not addressed by the DOL's Hazardous Occupations Orders in order to expand coverage and knowledge of these incidents beyond what was currently being addressed by the DOL.

The FACE program consists of two components: NIOSH FACE and State FACE. NIOSH FACE, which was the original component initiated in 1982, elicits assistance from participating states that voluntarily notify NIOSH of a work-related fatal injury related to one of the program's targeted priorities. Between 1982 and 2014, NIOSH researchers have published over 600 FACE investigation reports. The second component, State FACE, was initiated in 1989 with state health or state labor departments entering into cooperative agreements with NIOSH to implement FACE at the state level. In addition to the NIOSH priority areas, these states conduct investigations of fatalities related to state-based priorities, including renewable energy, agriculture, transportation, commercial aviation and fishing, suicides and homicides, semi-truck and dump truck fatalities, public sector workers, incidents involving multiple fatalities, chemical-related fatalities, workers under 25 years of age, workers over 60 years of age, asthma-related deaths, temporary workers and volunteers, and tree trimmers. Between 1989 and 2015, over 1,990 FACE investigation reports have been published by 22 cooperating states, 7 of which are current partners and 15 past partners.

Both NIOSH FACE and State FACE programs follow the same general investigative procedures. After notification of a workplace fatality, FACE researchers contact the employer to describe the program, request voluntary cooperation, and initiate an on-site investigation of the incident. During the investigation, researchers interview the employer, coworkers, incident witnesses, and other state and federal agency representatives who are investigating the incident; conduct a site visit and examine machinery and equipment; and review employer records, employee records, and records from other state and federal agency investigations. The information gathered from the interviews, site visit, and records becomes the factual basis for building a comprehensive analysis of events leading up to, at the time of, and after the incident.

FACE researchers combine the investigation information with relevant information from other sources including state and federal regulations, standards documents, operator and maintenance manuals from tool/equipment manufacturers, and literature to develop an investigation report. FACE reports are generally formatted to provide a brief summary of the incident, a description of the employer and the employee, a detailed description of the incident, and recommendations for injury prevention. The following specifics are typically provided: employer characteristics (e.g., type of industry; number of employees; safety program, policies, and practices; languages used by management to communicate with employees), demographic characteristics of the victim (e.g., age, sex, occupation, length of employment, primary language, safety training history), and incident details (e.g., date; time; sequence of events prior to, during, and immediately after; working environment; tasks being performed; tools or equipment being used; other contributing factors).



## Methods

NIOSH researchers reviewed NIOSH and State FACE reports published from 1982 (inception of FACE) to 2010 (change in target priority), inclusive, to identify FACE investigations of work-related fatalities to youth. NIOSH researchers identified 107 FACE reports (38 from NIOSH FACE and 69 from State FACE). Of the 107 reports, 10 were determined to be out-of-scope for this document because the youth was over 17 years old or the incident was not work-related. From the remaining 97 reports, NIOSH researchers abstracted information on employer characteristics, victim demographics, and incident circumstances. Key data elements were coded using existing schemes or schemes developed specifically for this project. Standard schemes included OIICS for coding the nature of the injury, the injury event, and the injury source; NAICS for coding industry; and Standard Occupational Classification (SOC) for coding occupation. Coding schemes were developed for employment type (e.g., casual, seasonal, part-time), season (i.e., winter, spring, summer, and fall), and regulatory coverage and compliance (i.e., was the employer covered by and in compliance with relevant regulations including FLSA, OSHA, HOs, and state labor laws). To simplify coding and ensure consistency, assessments regarding regulatory coverage and compliance were made with respect to laws effective in 2008. Two NIOSH researchers independently completed the data element coding. This coding was then compared and differences were reconciled. The data were analyzed, with the results presented in this document primarily using univariate frequency and bivariate cross-tabulation tables and graphs. A summary and selected prevention recommendations from each of the 97 FACE reports are provided in Appendix C.

## Data Limitations

The primary limitation related to an analysis of FACE program data is that the results cannot be generalized. By design, the FACE program does not provide a census or statistical sample of occupational fatalities in the United States or within the investigative targets. Therefore, data abstracted from FACE investigations are not intended to be statistically valid for the working population and cannot be used for statistical estimations. A second limitation is that the results from the FACE program data analysis cannot be directly compared to analysis of data from other surveillance systems including CFOI. The FACE program and comprehensive surveillance systems such as CFOI have vastly different purposes and scopes, which makes most comparisons invalid. The third limitation relates to the retrospective nature of the methods used in abstracting data from the FACE reports. In many instances, the information being sought was simply not provided or was provided on a limited basis. For example, NIOSH researchers were interested in analyzing the FACE program data by ethnicity. However, ethnicity was only mentioned in the reports where the youth was Hispanic; most reports made no reference to ethnicity. If information on ethnicity was not provided in the report, no assumptions were made and ethnicity for that report was recorded as “not reported.” Due to the large number of these unknowns, NIOSH researchers were only able to conduct a limited analysis by ethnicity. The final limitation relates to the results presented for regulatory coverage and compliance. To the extent possible, NIOSH researchers objectively evaluated employer coverage and compliance based on information provided in the report; however, subjective determinations for certain cases were unavoidable. Caution should be used in comparing coverage and compliance results provided in this document to those from other studies.

## Results

From its inception in 1982 through the change in target priority in 2010, FACE researchers conducted investigations on 99 occupational fatalities to youth less than 18 years of age. From these fatalities, 97 FACE reports were published, with two reports each covering an incident that involved two youth fatalities. Of the 99 fatalities, NIOSH FACE conducted 38 investigations in 18 states, resulting in 38 published reports; and State FACE conducted 61 investigations in 15 states, resulting in 59 published reports.

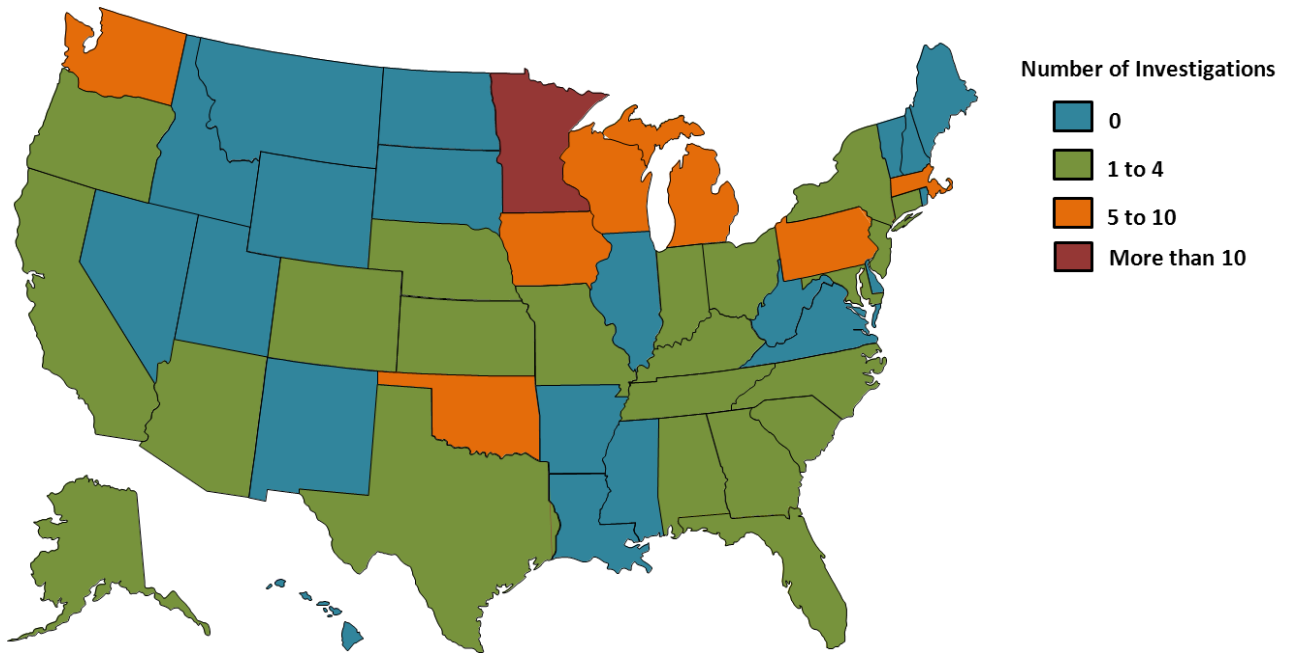
### Demographic Distributions

The majority of the 99 fatalities were to youth 16 to 17 years old (57; 58%), and most of the youth were male (92; 93%) (Table 7). Of the 99 investigated fatalities, 12 were for youth reported to be of Hispanic origin (Table 7). Minnesota had the highest number of investigations (11; 11%), followed by Wisconsin (9; 9%), Massachusetts (7; 7%), and Iowa (6; 6%). Washington, Pennsylvania, Oklahoma, and Michigan each had 5 investigations. Of the remaining states, 22 had 1 to 4 investigated incidents, and 20 states had none (Figure 62).

**Table 7: Investigations by age, sex, and ethnicity among fatalities to working youth < 18 years old in the United States 1982–2010**

Characteristic	Investigations	Percent
<b>Age</b>		
< 14	19	19
14–15	23	23
16–17	57	58
<b>Sex</b>		
Male	92	93
Female	7	7
<b>Ethnicity</b>		
Hispanic	12	12
Non-Hispanic	0	0
Not Reported	87	88
<b>Total</b>	<b>99</b>	<b>100</b>

Source: NIOSH Fatality Assessment and Control Evaluation program; additional information at [www.cdc.gov/niosh/face/](http://www.cdc.gov/niosh/face/)

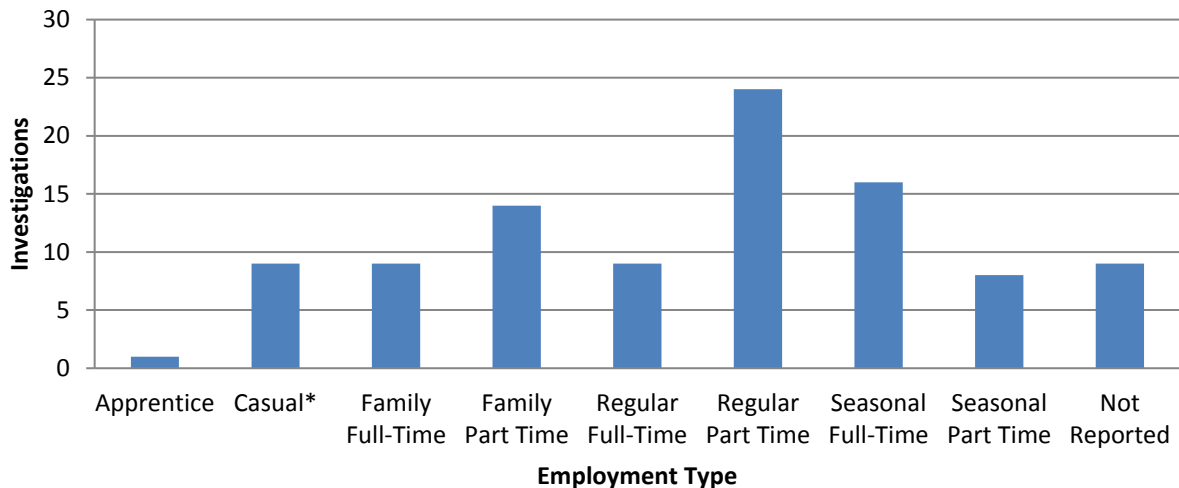


**Figure 62: Investigations by state among fatalities to working youth < 18 years old in the United States, 1982–2010**

Source: NIOSH Fatality Assessment and Control Evaluation program; additional information at [www.cdc.gov/niosh/face/](http://www.cdc.gov/niosh/face/)

### Employment Distributions

Of the 99 fatality investigations of young worker deaths, the greatest number involved youth who were employed part-time as a regular employee (24; 24%), followed by seasonally employed youth working full-time (16; 16%) and youth employed part-time in the family business (14; 14%) (Figure 63). In 31 investigations, the youth had received documented training on how to safely perform the job; in 38 investigations, the youth was working alone; and in 19 investigations, the employer was known to be the youth’s parent or guardian (data not shown).



**Figure 63: Investigations by employment type among fatalities to working youth < 18 years old in the United States, 1982–2010**

\*Employer and employee did not have a formal employment agreement

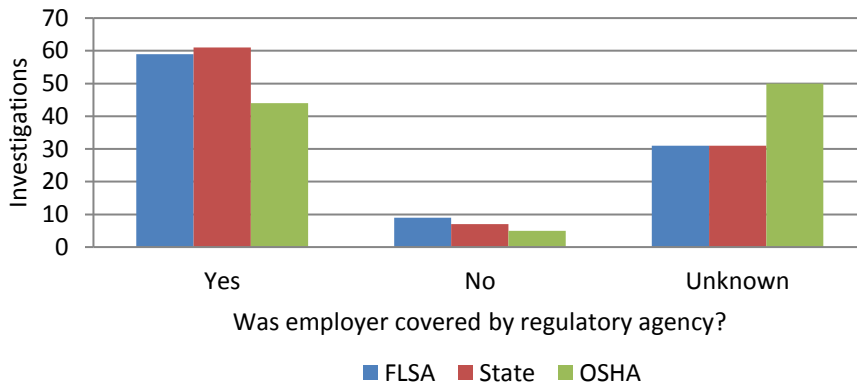
Source: NIOSH Fatality Assessment and Control Evaluation program; additional information at [www.cdc.gov/niosh/face/](http://www.cdc.gov/niosh/face/)

### Regulatory Coverage and Compliance Distributions

The employer in most of the FACE investigations of youth fatalities was determined to be covered by child labor legislations or regulations (Figure 64). Considering age and industry, without regard to employer coverage, the majority of youth were working during times and for numbers of hours that were permissible by regulations (Figure 65), but many were performing tasks that were not permissible (Figure 66).

In 58 investigations, the fatally injured youth was performing a task prohibited by HOs. Of these, 37 involved an employer who was covered by FLSA, 4 involved an employer who was not covered by FLSA, and 17 involved an employer whose coverage could not be determined. Excluding investigations within the agriculture production industry (which are covered by separate HOs) and regardless of an employer’s coverage by FLSA, the most commonly violated HO for 16- and 17-year-old youth was operating power-driven hoisting equipment, including forklifts (Table 8). For investigations that involved 14- and 15-year-old youth outside the agriculture production industry, the most commonly violated HO, regardless of employer coverage, was working in roofing operations (Table 8). The most common violation for prohibited occupations for all 14- and 15-year olds was operation of power-driven machinery (Table 8).

Excluding youth working in agriculture production, 27 investigations involved youth performing tasks permissible under the HOs. The four leading injury events for these fatalities were transportation incidents (9; 33%), exposure to harmful substances and environments (7; 26%), contact with objects and equipment (5; 19%), and falls (5; 19%); the leading injury sources were vehicles (7; 26%) and machinery (7; 26%).



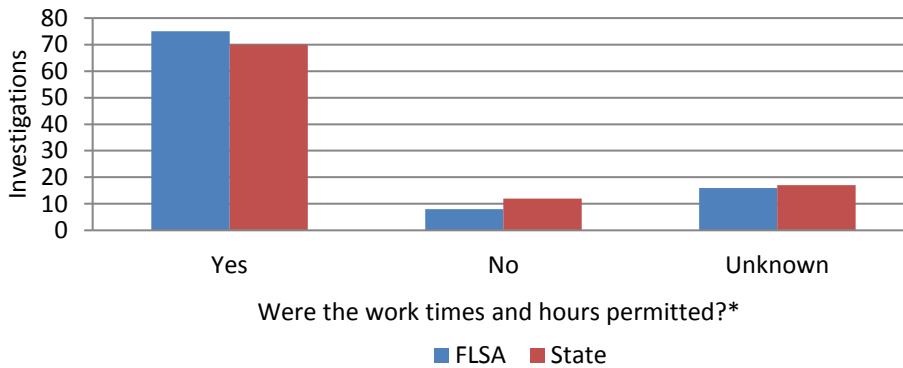
FLSA = Fair Labor Standards Act

State = State child labor Laws

OSHA = Occupational Safety and Health Administration

Source: NIOSH Fatality Assessment Control and Evaluation program; additional information at [www.cdc.gov/niosh/face/](http://www.cdc.gov/niosh/face/)

**Figure 64: Investigations by regulatory coverage of employer among fatalities to working youth < 18 years old in the United States, 1982–2010**



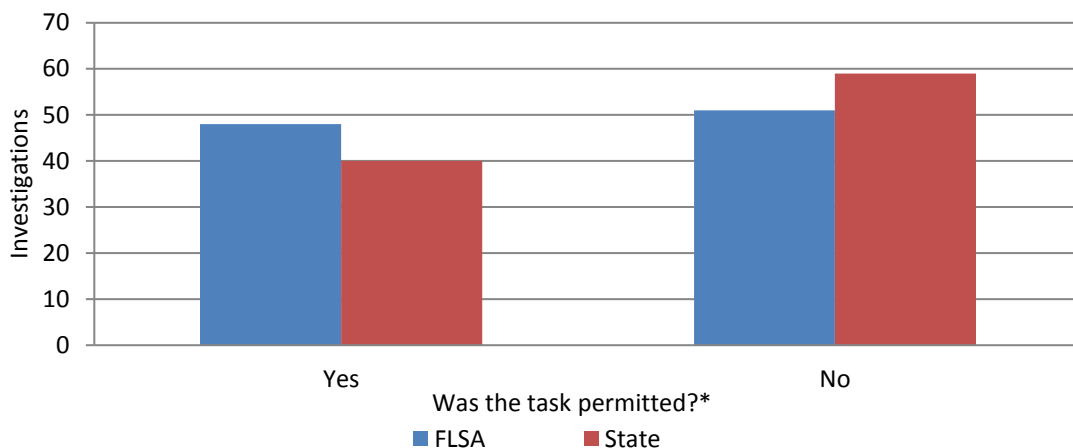
\*Considering age and industry, but not considering an employer's regulatory coverage

FLSA = Fair Labor Standards Act

State = State child labor laws

Source: NIOSH Fatality Assessment Control and Evaluation program; additional information at [www.cdc.gov/niosh/face/](http://www.cdc.gov/niosh/face/)

**Figure 65: Investigations by employer compliance with work time and hours regulations among fatalities to working youth < 18 years old in the United States, 1982–2010**



**Figure 66: Investigations by employer compliance with work task regulations among fatalities to working youth < 18 years old in the United States, 1982–2010**

\*Considering age and industry, but not considering an employer's regulatory coverage

FLSA = Fair Labor Standards Act

State = State child labor laws

Source: NIOSH Fatality Assessment and Control Evaluation program; additional information at [www.cdc.gov/niosh/face/](http://www.cdc.gov/niosh/face/)

**Table 8: Investigations by regulatory noncompliance among nonagricultural fatalities to working youth < 18 years old in the United States, 1982–2010**

Fair Labor Standards Act Provisions	Investigations with Noncompliance* 16–17 years old	Investigations with Noncompliance* 14–15 years old
<b>Hazardous Orders for All Youth in Nonagricultural Employment</b>		
Operating power-driven hoisting apparatus, including forklifts	11	2
Excavation operations	5	1
Roofing operations	4	4
Driving a motor vehicle or being an outside helper on a motor vehicle	4	3
Wrecking, demolition, shipbreaking operations	4	0
Logging and sawmilling	3	0
Operating power-driven circular saws, band saws, guillotine shears	2	0
Operating power-driven wood-working machines	1	1
Operating power-driven paper products machines	1	1
Operating power-driven bakery machines	0	1
<b>Prohibited Occupations for Youth Less than 16 Years Old</b>		
Operation of any power-driven machinery	-	8
Work in connection with construction	-	3
Operation or tending of hoisting apparatus	-	2
Working in warehouse and storage	-	1

\*Considering age and industry, but not considering an employer's regulatory coverage; counts are not mutually exclusive; noncompliance of multiple regulations possible

Source: NIOSH Fatality Assessment and Control Evaluation program; additional information at [www.cdc.gov/niosh/face/](http://www.cdc.gov/niosh/face/)

### Nature, Event, and Source Distributions

The most common nature of injury for the FACE investigations of work-related fatalities to youth was “other traumatic injuries” (48; 48%), the largest number of which were internal injuries of the trunk (19; 40%) (Table 9). The second most common nature of injury classification was intracranial injuries (28; 28%) (Table 9).

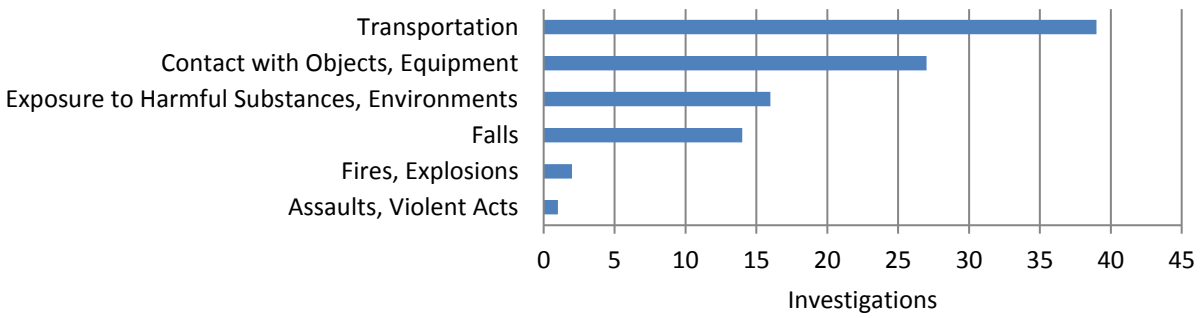
The leading events were transportation incidents (39; 39%), contact with objects and equipment (27; 27%), and exposure to harmful substances and environments (16; 16%) (Figure 67). Of the 39 transportation incidents, 21 (54%) were non-highway events including forklift overturns (7; 33%) and tractor overturns (5; 24%). The primary source was vehicles, which accounted for 34 (34%) incidents (Figure 68). Other common sources were machinery (23; 23%) and surfaces or structures (13; 13%) (Figure 68).

Nature of Injury	Investigations	Percent*
<b>Other Traumatic Injuries</b>	<b>48</b>	<b>48</b>
Internal Injuries of the Trunk	19	40
Asphyxiations, Strangulations	9	19
Electrocutions	8	17
Poisonings, Toxic Effects	5	10
Drowning	4	8
Non-specified, Not Classified	3	6
<b>Intracranial Injuries</b>	<b>28</b>	<b>28</b>
<b>Multiple Traumatic Injuries</b>	<b>19</b>	<b>19</b>
<b>Open Wounds</b>	<b>3</b>	<b>3</b>
<b>Injuries to Bones, Nerves, Spinal Cord</b>	<b>1</b>	<b>1</b>
<b>Total</b>	<b>99</b>	<b>100</b>

**Table 9: Investigations by nature of injury among fatalities to working youth < 18 years old in the United States, 1982–2010**

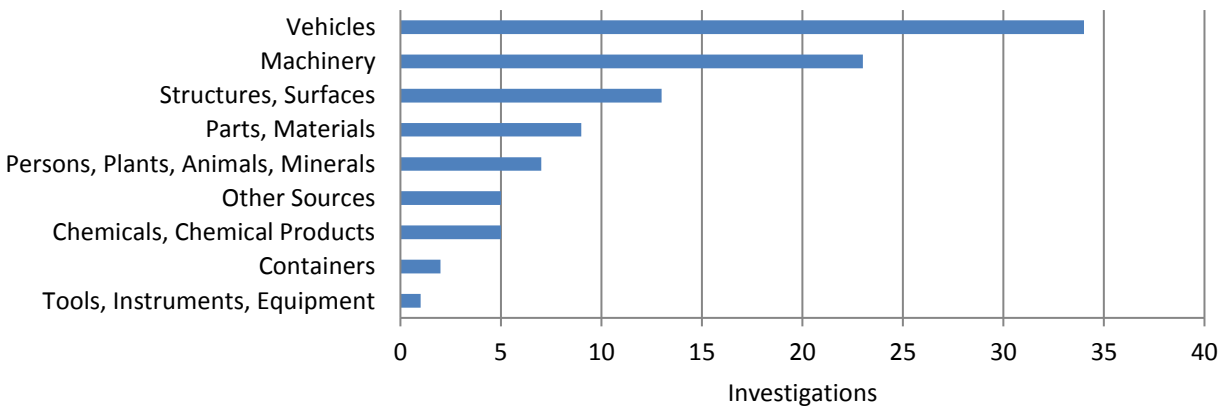
\*May not add to 100 due to rounding

Source: NIOSH Fatality Assessment and Control Evaluation program; additional information at [www.cdc.gov/niosh/face/](http://www.cdc.gov/niosh/face/)



**Figure 67: Investigations by injury event among fatalities to working youth < 18 years old in the United States, 1982–2010**

Source: NIOSH Fatality Assessment and Control Evaluation program; additional information at [www.cdc.gov/niosh/face/](http://www.cdc.gov/niosh/face/)



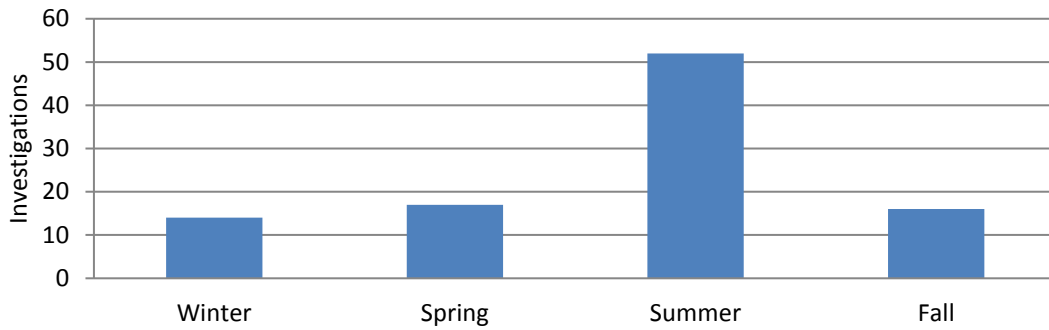
**Figure 68: Investigations by injury source among fatalities to working youth < 18 years old in the United States, 1982–2010**

Source: NIOSH Fatality Assessment and Control Evaluation program; additional information at [www.cdc.gov/niosh/face/](http://www.cdc.gov/niosh/face/)

### Temporal Distributions

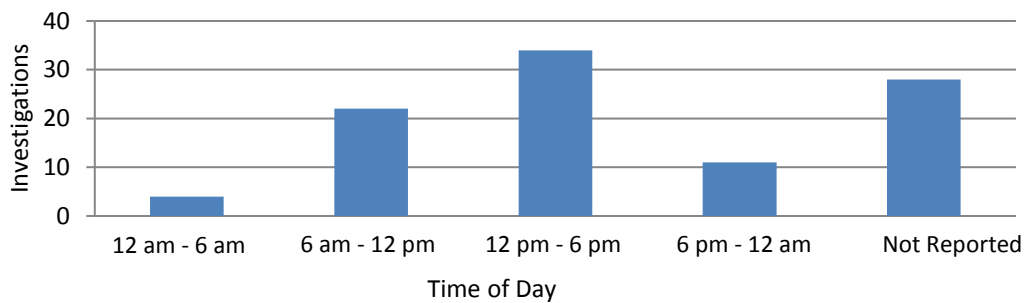
Over half of the 99 FACE investigations of young worker deaths were for fatalities that occurred in the summer (Figure 69), and over one-third of the 99 fatalities occurred during the peak working hours of 12:00 pm to 6:00 pm (Figure 70).





**Figure 69: Investigations by season among fatalities to working youth < 18 years old in the United States, 1982–2010**

Source: NIOSH Fatality Assessment and Control Evaluation program; additional information at [www.cdc.gov/niosh/face/](http://www.cdc.gov/niosh/face/)

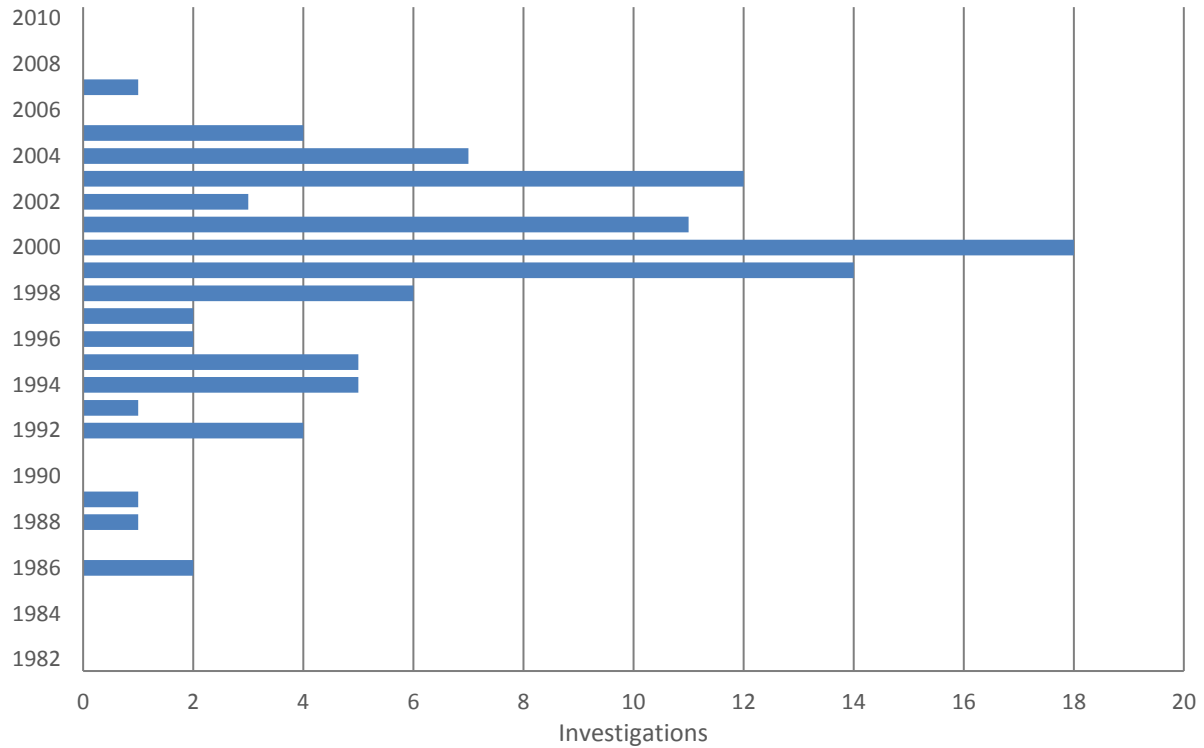


**Figure 70: Investigations by time of day among fatalities to working youth < 18 years old in the United States, 1982–2010**

Source: NIOSH Fatality Assessment and Control Evaluation program; additional information at [www.cdc.gov/niosh/face/](http://www.cdc.gov/niosh/face/)

### Yearly Distributions

The first FACE investigation of a young worker fatality was conducted in 1986. Following that year, the number of investigations fluctuated until 1999, which marked the year young workers were identified as a FACE priority. The number of investigations peaked in 2000 with 18 investigations and then decreased through 2010 (Figure 71).



**Figure 71: Investigations by year among fatalities to working youth < 18 years old in the United States, 1982–2010**

Source: NIOSH Fatality Assessment Control and Evaluation program; additional information at [www.cdc.gov/niosh/face/](http://www.cdc.gov/niosh/face/)

### Industry and Occupation Distributions

Almost a third of the 99 FACE investigations were for fatalities to youth working in the agriculture production industry (Table 10). The distribution of the 99 investigations by occupation of the youth was relatively consistent with the industry distribution, with farming (31%) and construction/extraction (20%) among the leading occupations (Table 11).

**Table 10: Investigations by industry among fatalities to working youth < 18 years old in the United States, 1982–2010**

Industry	Investigations	Percent*
Agriculture Production <sup>†</sup>	31	31
Services <sup>‡</sup>	22	22
Construction	18	18
Retail Trade	12	12
Manufacturing	10	10
Wholesale Trade	2	2
All Other	4	4
<b>Total</b>	<b>99</b>	<b>100</b>

\*May not add to 100 due to rounding

<sup>†</sup>Includes Crop Production and Livestock/Animal Production Operations

<sup>‡</sup>Includes Eating and Drinking Establishments

Source: NIOSH Fatality Assessment and Control Evaluation program; additional information at [www.cdc.gov/niosh/face/](http://www.cdc.gov/niosh/face/)

**Table 11: Investigations by occupation among fatalities to working youth < 18 years old in the United States, 1982–2010**

Occupation	Investigations	Percent*
Farming	31	31
Construction, Extraction	20	20
Building and Grounds Cleaning, Maintenance	15	15
Transportation, Material Moving	11	11
Production	6	6
Office and Administrative Support	4	4
Sales and Related	3	3
Business and Financial Operations	2	2
All Other	7	7
<b>Total</b>	<b>99</b>	<b>100</b>

\*May not add to 100 due to rounding

Source: NIOSH Fatality Assessment and Control Evaluation program; additional information at [www.cdc.gov/niosh/face/](http://www.cdc.gov/niosh/face/)

### Agriculture Production Industry

Between 1982 and 2010, there were 31 FACE investigations conducted for youth fatalities that occurred in the agriculture production industry. Of these, 13 involved youth less than 14 years old (Table 12), 8 of whom were under 12, and 29 involved male youth (Table 12). The 31 investigations were conducted in 13 states, with the most in Minnesota (9; 29%) and Iowa (5; 16%) (data not shown).

**Table 12: Agriculture production industry investigations by age and sex among fatalities to working youth < 18 years old in the United States, 1982–2010**

Characteristic	Investigations	Percent
<b>Age</b>		
< 14	13	42
14–15	5	16
16–17	13	42
<b>Sex</b>		
Male	29	94
Female	2	6
<b>Total</b>	<b>31</b>	<b>100</b>

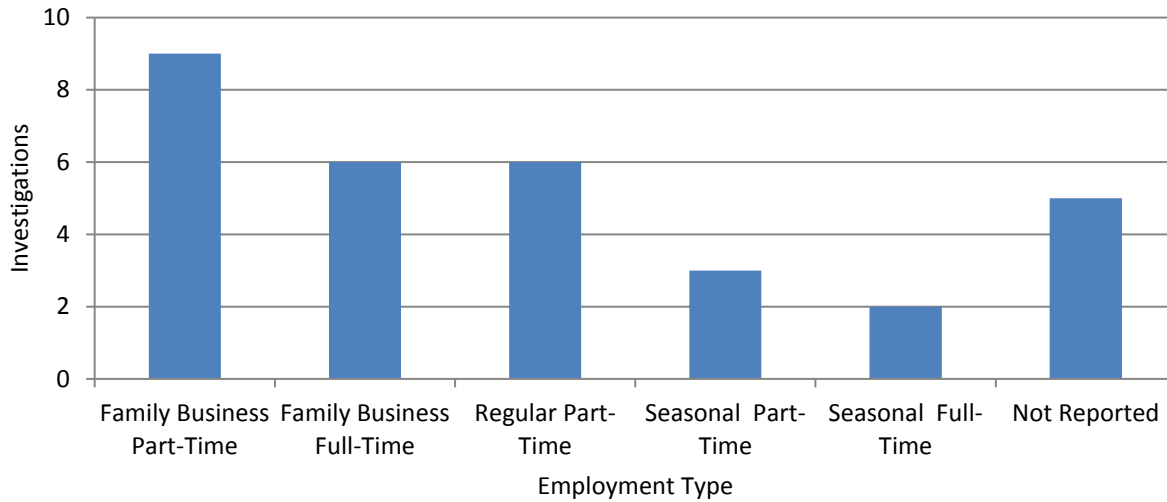
Source: NIOSH Fatality Assessment and Control Evaluation program; additional information at [www.cdc.gov/niosh/face/](http://www.cdc.gov/niosh/face/)

In almost half of the 31 investigations, the youth was working part- or full-time in a business owned by a family member (Figure 72); and in 14 investigations, the employer was reported to be the youth’s parent or guardian. Documentation of formal training was rare, with 2 of the 31 investigated fatalities reporting that the youth received formal training. The youth was working alone in 12 of the investigated incidents and was not within view of a supervisor in 20 incidents.

Most of the 31 investigated fatalities occurred on operations not covered by child labor regulations or on operations where coverage could not be determined. Without consideration of an employer’s coverage by FLSA (including working on a family-owned farm), the young worker was performing tasks determined to be noncompliant with FLSA and/or state regulations in 17 of the 18 investigations that involved youth less than 16 years of age. The most commonly violated agricultural HO for these youth, without consideration of regulatory coverage of specific employers, involved operating a tractor with over 20 power take-off horsepower or connecting or disconnecting implements to or from a tractor (Table 13).

The most common nature-of-injury classification for the 31 investigations was “other traumatic injuries” (Table 14). Transportation incidents, the majority of which involved tractor overturns, were the most common fatality event investigated (Figure 73). Consistent with the transportation events, the leading primary fatal injury source was vehicles (Figure 74).

Over half of the 31 investigated fatalities occurred during the summer months (Figure 75). Investigations where incident times were reported showed a uniform distribution of incidents occurring between 6 am and 12 am, with the fewest occurring between 12 am and 6 am (Figure 76).



**Figure 72: Agriculture production industry investigations by employment type among fatalities to working youth < 18 years old in the United States, 1982–2010**

Source: NIOSH Fatality Assessment and Control Evaluation program; additional information at [www.cdc.gov/niosh/face/](http://www.cdc.gov/niosh/face/)

**Table 13: Agriculture production industry investigations by regulatory noncompliance among fatalities to working youth < 18 years old in the United States, 1982–2010**

Fair Labor Standards Act Provisions	Investigations with Noncompliance*
<b>Prohibited Occupations in Agriculture Production for Youth Less Than 16 Years Old</b>	
Operating a tractor with greater than 20 power take-off horsepower, connecting, disconnecting implements	8
Operating or assisting to operate machinery	5
Working inside a grain storage area or manure pit	3
Driving a motor vehicle	1

\*Considering age, but not considering an employer's regulatory coverage; counts are not mutually exclusive; noncompliance of multiple regulations possible

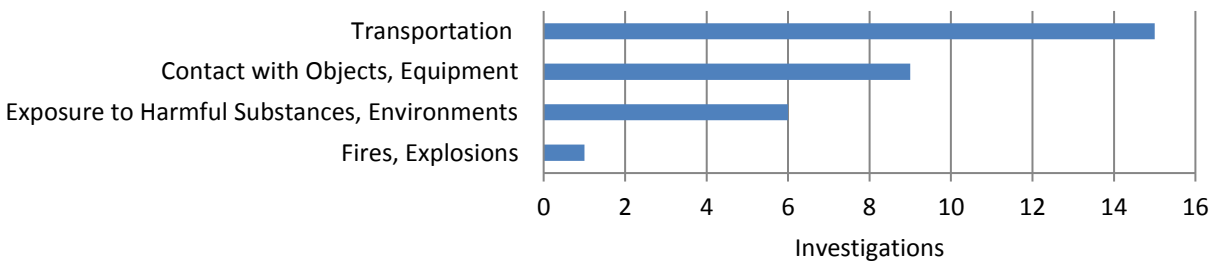
Source: NIOSH Fatality Assessment and Control Evaluation program; additional information at [www.cdc.gov/niosh/face/](http://www.cdc.gov/niosh/face/)

**Table 14: Agriculture production industry investigations by nature of injury among fatalities to working youth < 18 years old in the United States, 1982–2010**

Nature of Injury	Investigations	Percent*
<b>Other Traumatic Injuries</b>	<b>17</b>	<b>55</b>
Asphyxiations, Strangulations	7	41
Internal Injuries of the Trunk	4	24
Poisonings, Toxic Effects	3	18
Drowning	2	12
Electrocutions	1	6
<b>Intracranial Injuries</b>	<b>6</b>	<b>19</b>
<b>Multiple Traumatic Injuries</b>	<b>6</b>	<b>19</b>
<b>Open Wounds</b>	<b>2</b>	<b>6</b>
<b>Total</b>	<b>31</b>	<b>100</b>

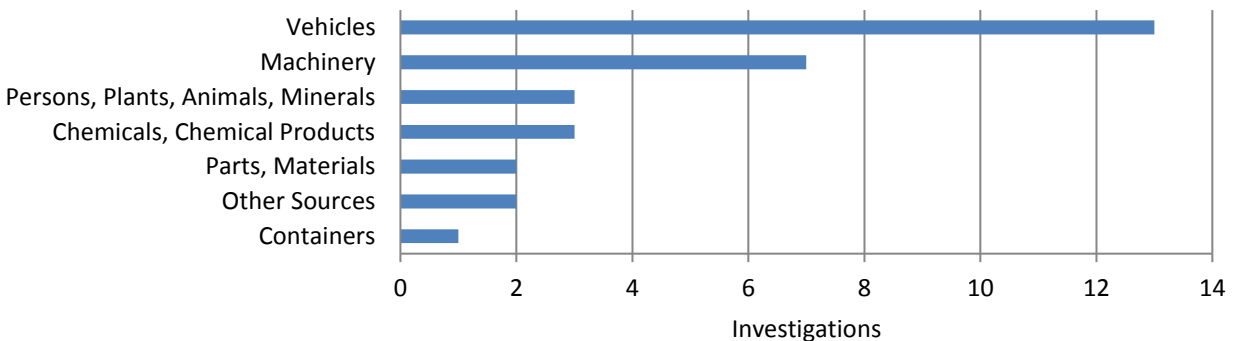
\*May not add to 100 due to rounding

Source: NIOSH Fatality Assessment and Control Evaluation program; additional information at [www.cdc.gov/niosh/face/](http://www.cdc.gov/niosh/face/)



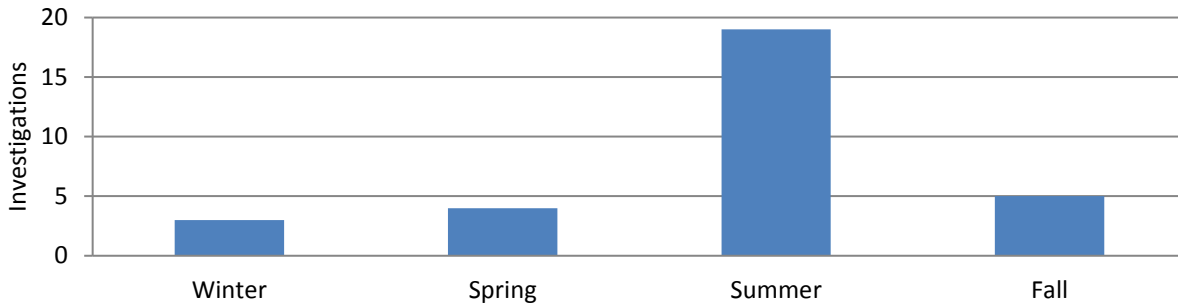
**Figure 73: Agriculture production industry investigations by injury event among fatalities to working youth < 18 years old in the United States, 1982–2010**

Source: NIOSH Fatality Assessment and Control Evaluation program; additional information at [www.cdc.gov/niosh/face/](http://www.cdc.gov/niosh/face/)



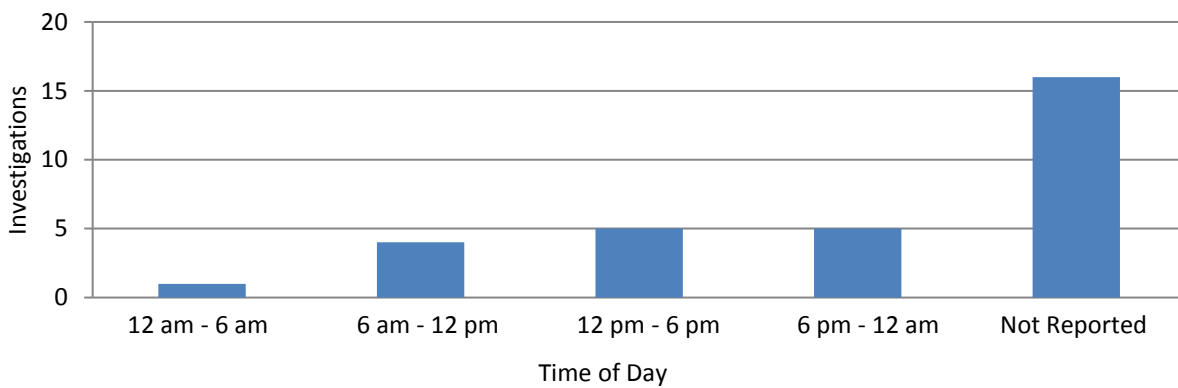
**Figure 74: Agriculture production industry investigations by injury source among fatalities to working youth < 18 years old in the United States, 1982–2010**

Source: NIOSH Fatality Assessment and Control Evaluation program; additional information at [www.cdc.gov/niosh/face/](http://www.cdc.gov/niosh/face/)



**Figure 75: Agriculture production industry investigations by season among fatalities to working youth < 18 years old in the United States, 1982–2010**

Source: NIOSH Fatality Assessment and Control Evaluation program; additional information at [www.cdc.gov/niosh/face/](http://www.cdc.gov/niosh/face/)



**Figure 76: Agriculture production industry investigations by time of day among fatalities to working youth < 18 years old in the United States, 1982–2010**

Source: NIOSH Fatality Assessment and Control Evaluation program; additional information at [www.cdc.gov/niosh/face/](http://www.cdc.gov/niosh/face/)

### Services Industry

Between 1982 and 2010, the FACE program conducted 22 investigations that involved youth who were working in the services industry. These youth were most commonly working in services to buildings and dwellings (8; 36%). Nineteen (19) fatalities involved male youth and 12 involved 16- and 17-year olds (Table 15). The 22 investigations were conducted in 16 states, with the most in Pennsylvania (3; 14%).

Almost half of the investigations involved youth who were employed on a seasonal basis (Figure 77). Documented formal training was reported in 10 incidents, the youth was working alone in 10 incidents,

and was not within view of a supervisor in 18 incidents, and the employer was the youth’s parent or guardian in 2 incidents.

Out of the 22 investigations, 17 employers were determined to be covered by FLSA or state regulations. Considering the restrictions by age and relevancy to the industry, without regard to employer coverage, 19 incidents occurred during times and hours that were permissible, and 12 incidents involved youth performing tasks that were not permissible. The most commonly violated HO, regardless of employer coverage, involved operation of a motor vehicle or working as an outside helper on a motor vehicle (Table 16).

The most common nature of injury classification for the 22 investigations was ‘other traumatic injuries’ (Table 17). Almost one-third of the incidents involved contact with objects or equipment (Figure 78). Consistent with these events, the most common primary source of injury was machinery (Figure 79).

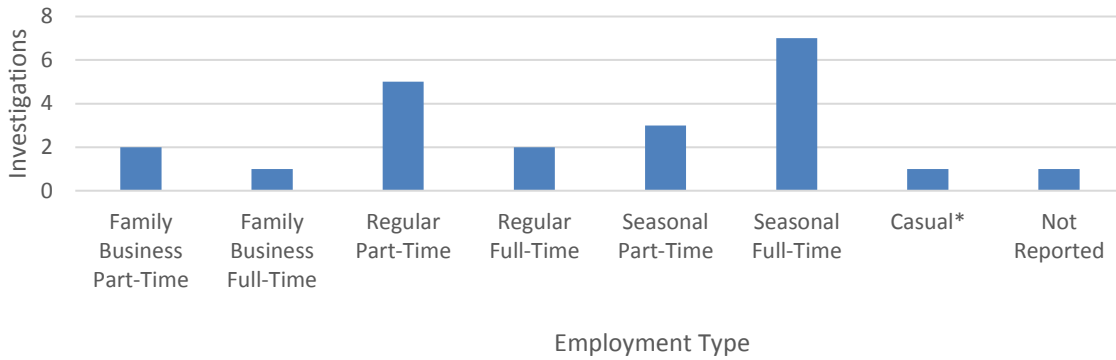
The majority of fatalities occurred in the summer months (Figure 80) and between 6 am and 6 pm (Figure 81).

**Table 15: Services industry investigations by age and sex among fatalities to working youth < 18 years old in the United States, 1982–2010**

Characteristic	Investigations	Percent
<b>Age</b>		
14-15	10	45
16-17	12	55
<b>Sex</b>		
Male	19	86
Female	3	14
<b>Total</b>	<b>22</b>	<b>100</b>

Source: NIOSH Fatality Assessment and Control Evaluation program; additional information at [www.cdc.gov/niosh/face/](http://www.cdc.gov/niosh/face/)





**Figure 77: Services industry investigations by employment type among fatalities to working youth < 18 years old in the United States, 1982–2010**

\* Employer and employee did not have a formal employment agreement

Source: NIOSH Fatality Assessment and Control Evaluation program; additional information at [www.cdc.gov/niosh/face/](http://www.cdc.gov/niosh/face/)

**Table 16: Services industry investigations by regulatory noncompliance among fatalities to working youth < 18 years old in the United States, 1982–2010**

Fair Labor Standards Act Provisions	Investigations with Noncompliance*
<b>Hazardous Orders for All Youth in Nonagricultural Employment</b>	
Driving a motor vehicle or being an outside helper on a motor vehicle	5
Operating power-driven wood-working machines	2
Operating power-driven hoisting apparatus, including forklifts	2
Operating power-driven bakery machines	1
Wrecking, demolition, shipbreaking operations	1
Roofing operations	1

\*Considering age, but not considering an employer's regulatory coverage; counts are not mutually exclusive; noncompliance of multiple regulations possible

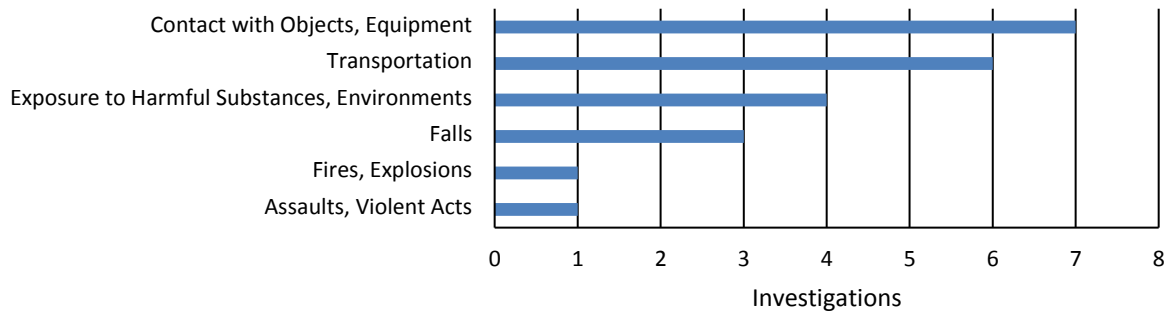
Source: NIOSH Fatality Assessment and Control Evaluation program; additional information at [www.cdc.gov/niosh/face/](http://www.cdc.gov/niosh/face/)

**Table 17: Services industry investigations by nature of injury among fatalities to working youth < 18 years old in the United States, 1982–2010**

Nature of Injury	Investigations	Percent*
<b>Other Traumatic Injuries</b>	<b>12</b>	<b>55</b>
Internal injuries of the Trunk	6	50
Electrocutions	3	36
Asphyxiations, Strangulations	1	12
Poisonings, Toxic Effects	1	12
Other Traumatic Injuries, Disorders	1	12
<b>Intracranial Injuries</b>	<b>5</b>	<b>23</b>
<b>Multiple Traumatic Injuries</b>	<b>4</b>	<b>18</b>
<b>Open Wounds</b>	<b>1</b>	<b>5</b>
<b>Total</b>	<b>22</b>	<b>100</b>

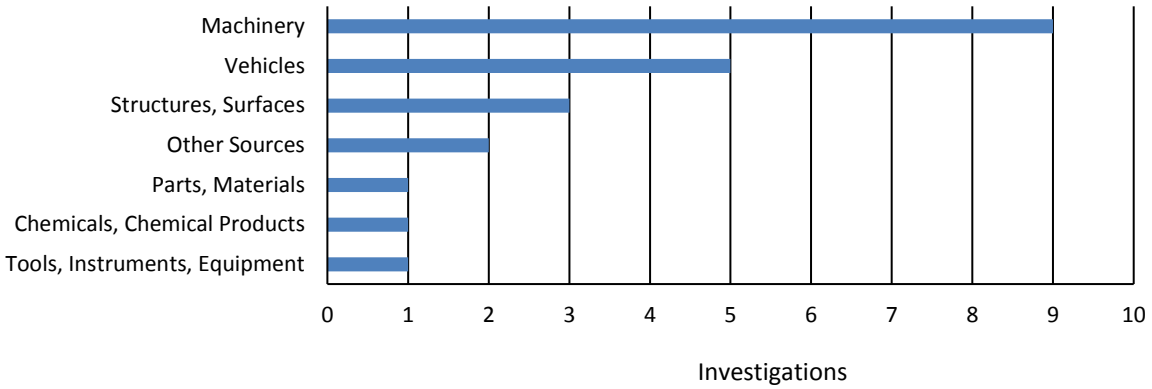
\*May not add to 100 due to rounding

Source: NIOSH Fatality Assessment and Control Evaluation program; additional information at [www.cdc.gov/niosh/face/](http://www.cdc.gov/niosh/face/)



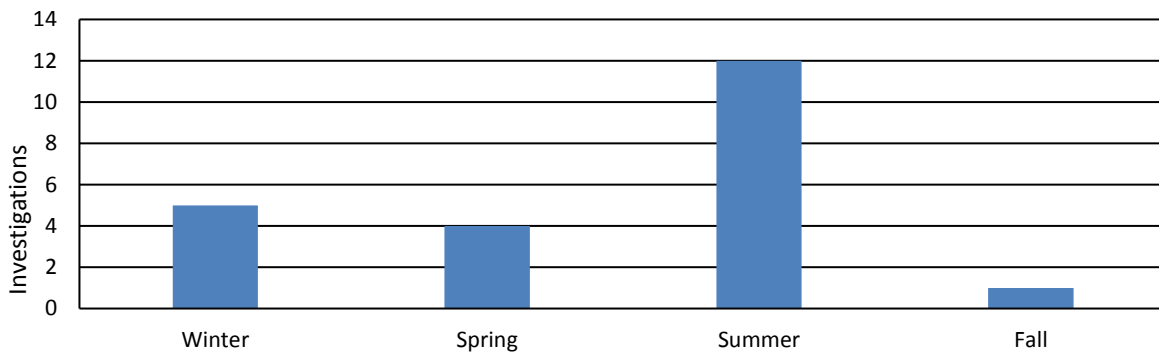
**Figure 78: Services industry investigations by injury event among fatalities to working youth < 18 years old in the United States, 1982–2010**

Source: NIOSH Fatality Assessment and Control Evaluation program; additional information at [www.cdc.gov/niosh/face/](http://www.cdc.gov/niosh/face/)



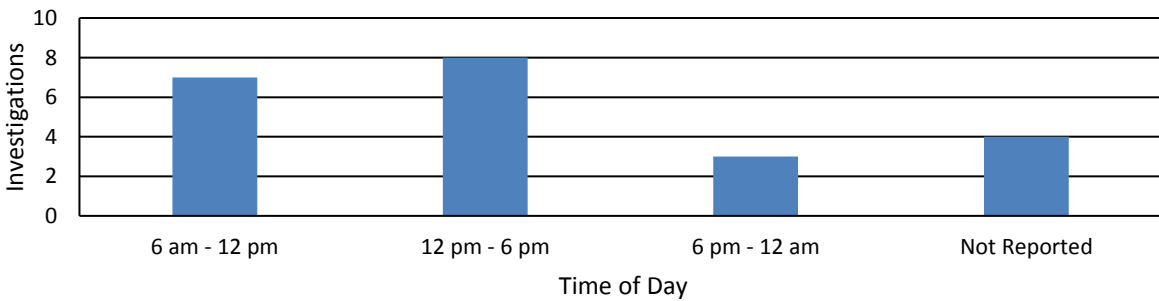
**Figure 79: Services industry investigations by injury source among fatalities to working youth < 18 years old in the United States, 1982–2010**

Source: NIOSH Fatality Assessment and Control Evaluation program; additional information at [www.cdc.gov/niosh/face/](http://www.cdc.gov/niosh/face/)



**Figure 80: Services industry investigations by season among fatalities to working youth < 18 years old in the United States, 1982–2010**

Source: NIOSH Fatality Assessment and Control Evaluation program; additional information at [www.cdc.gov/niosh/face/](http://www.cdc.gov/niosh/face/)



**Figure 81: Services industry investigations by time of day among fatalities to working youth < 18 years old in the United States, 1982–2010**

Source: NIOSH Fatality Assessment and Control Evaluation program; additional information at [www.cdc.gov/niosh/face/](http://www.cdc.gov/niosh/face/)

## Construction Industry

The FACE program conducted 18 fatality investigations between 1982 and 2010 that involved youth who were working in the construction industry. The majority of these fatalities occurred to 16- and 17-year-old youth (12; 67%) and to male youth (17; 94%) (Table 18). In 5 of the 18 investigations, the youth was reported to be of Hispanic origin (Table 18). The 18 investigations were conducted in 14 states, with the most in South Carolina (3; 17%).

The most common employment type for the 18 investigations was casual, meaning that the youth and employer did not have a formal employment agreement (Figure 82). In 2 investigations, the employer was the youth's parent or guardian. Documented formal training was reported in 4 investigations. In 16 investigations, the youth was working in the presence of others; in 7 investigations, the youth was in sight of a supervisor.

Most of the employers in the 18 investigations were covered by FLSA or state regulations (Figure 83). Considering the restrictions by age and those relevant to this industry, without consideration to an employer's FLSA coverage, most incidents involved the youth working at hours that were permissible (Figure 84) but performing tasks that were not (Figure 85). The most commonly violated HO for all youth, regardless of employer coverage, involved working on or about a roof and excavation operations (Table 19).

Head injuries were the most common nature of injury for the 18 investigations (Table 20). Consistent with this classification, falls were the most common injury event (Figure 86) and structures and surfaces, which includes floors and the ground, were the most common injury source (Figure 87).

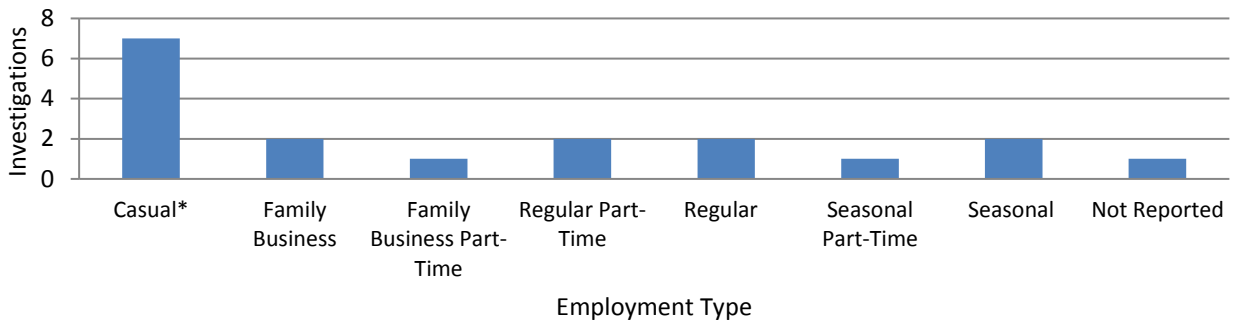
The 18 fatalities were fairly evenly distributed across the seasons (Figure 88). In all investigations where time of day was reported, the fatality occurred between 6 am and 6 pm (Figure 89).

**Table 18: Construction industry investigations by age, sex, and ethnicity among fatalities to working youth < 18 years old in the United States, 1982–2010**

Characteristic	Investigations	Percent*
<b>Age</b>		
< 14	1	6
14–15	5	28
16–17	12	67
<b>Sex</b>		
Male	17	94
Female	1	6
<b>Ethnicity</b>		
Hispanic	5	28
Non-Hispanic	0	0
Not Reported	13	72
<b>Total</b>	<b>18</b>	<b>100</b>

\*May not add to 100 due to rounding

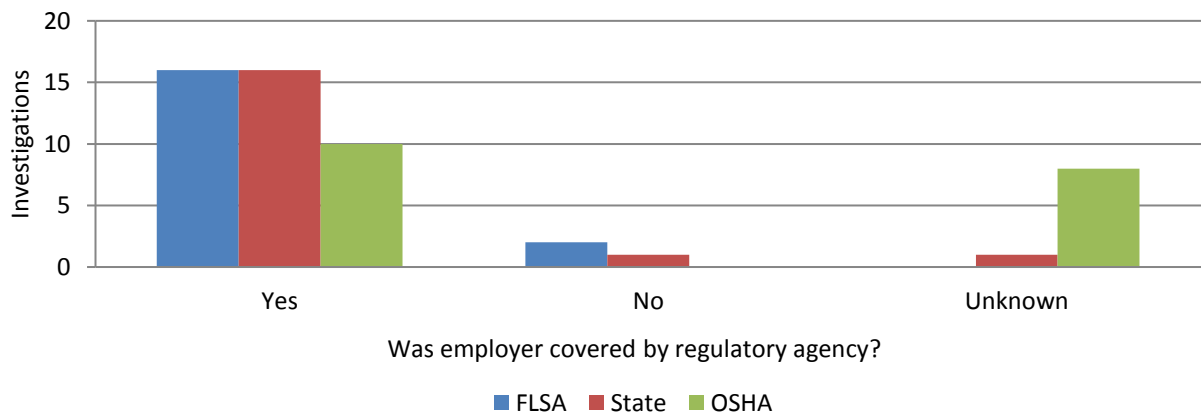
Source: NIOSH Fatality Assessment and Control Evaluation program; additional information at [www.cdc.gov/niosh/face/](http://www.cdc.gov/niosh/face/)



**Figure 82: Construction industry investigations by employment type among fatalities to working youth < 18 years old in the United States, 1982–2010**

\*Employer and employee did not have a formal employment agreement

Source: NIOSH Fatality Assessment and Control Evaluation program; additional information at [www.cdc.gov/niosh/face/](http://www.cdc.gov/niosh/face/)



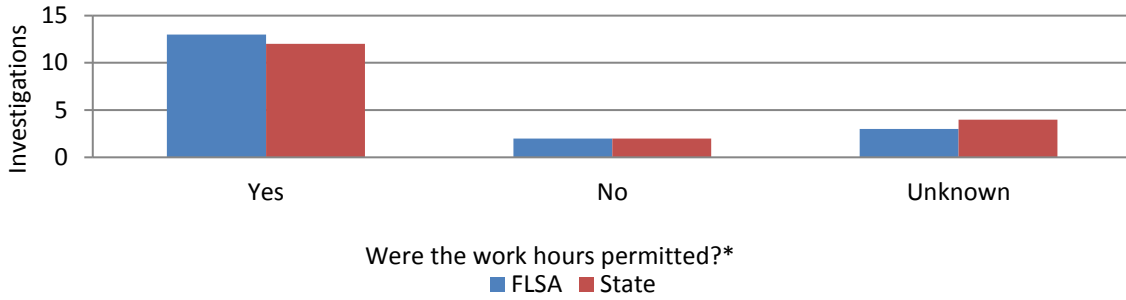
**Figure 83: Construction industry investigations by regulatory coverage of employer among fatalities to working youth < 18 years old in the United States, 1982–2010**

FLSA = Fair Labor Standards Act

State = State child labor laws

OSHA = Occupational Safety and Health Administration

Source: NIOSH Fatality Assessment Control and Evaluation program; additional information at [www.cdc.gov/niosh/face/](http://www.cdc.gov/niosh/face/)



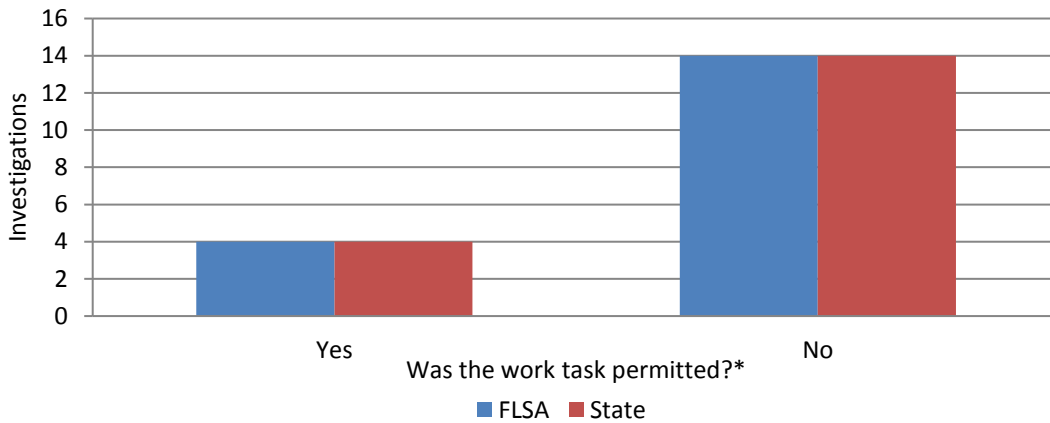
**Figure 84: Construction industry investigations by employer compliance with work hour regulations among fatalities to working youth < 18 years old in the United States, 1982–2010**

\*Considering age and industry, but not considering an employer's regulatory coverage

FLSA = Fair Labor Standards Act

State = State child labor Laws

Source: NIOSH Fatality Assessment Control and Evaluation program; additional information at [www.cdc.gov/niosh/face/](http://www.cdc.gov/niosh/face/)



**Figure 85: Construction industry investigations by employer compliance with work task regulations among fatalities to working youth < 18 years old in the United States, 1982–2010**

\*Considering age and industry, but not considering an employer's regulatory coverage

FLSA = Fair Labor Standards Act

State = State child labor Laws

Source: NIOSH Fatality Assessment Control and Evaluation program; additional information at [www.cdc.gov/niosh/face/](http://www.cdc.gov/niosh/face/)

**Table 19: Construction industry investigations by regulatory noncompliance among fatalities to working youth < 18 years old in the United States, 1982–2010**

Fair Labor Standards Act Provisions	Investigations with Noncompliance*
<b>Hazardous Orders for All Youth in Nonagricultural Employment</b>	
Roofing operations	5
Excavation operations	5
Wrecking, demolition, shipbreaking operations	2
Operating power-driven hoisting apparatus, including forklifts	1
Operating power-driven circular saws, band saws, guillotine shears	1
Driving a motor vehicle or being an outside helper on a motor vehicle	1

\*Considering age and industry, but not considering an employer's regulatory coverage; counts are not mutually exclusive; noncompliance of multiple regulations possible

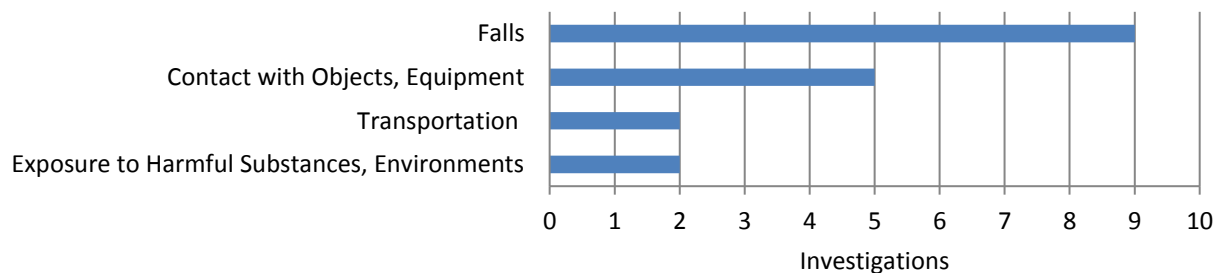
Source: NIOSH Fatality Assessment and Control Evaluation program; additional information at [www.cdc.gov/niosh/face/](http://www.cdc.gov/niosh/face/)

**Table 20: Construction industry investigations by nature of injury among fatalities to working youth < 18 years old in the United States, 1982–2010**

Nature of Injury	Investigations	Percent*
<b>Intracranial Injuries</b>	<b>8</b>	<b>44</b>
Multiple Intracranial Injuries	5	63
Not Classified	2	25
Cerebral Hemorrhages	1	13
<b>Other Traumatic Injuries</b>	<b>6</b>	<b>33</b>
Internal Injuries of the Trunk	3	50
Drowning	1	17
Electrocutions	1	17
Not Classified	1	17
<b>Multiple Traumatic Injuries</b>	<b>4</b>	<b>22</b>
<b>Total</b>	<b>18</b>	<b>100</b>

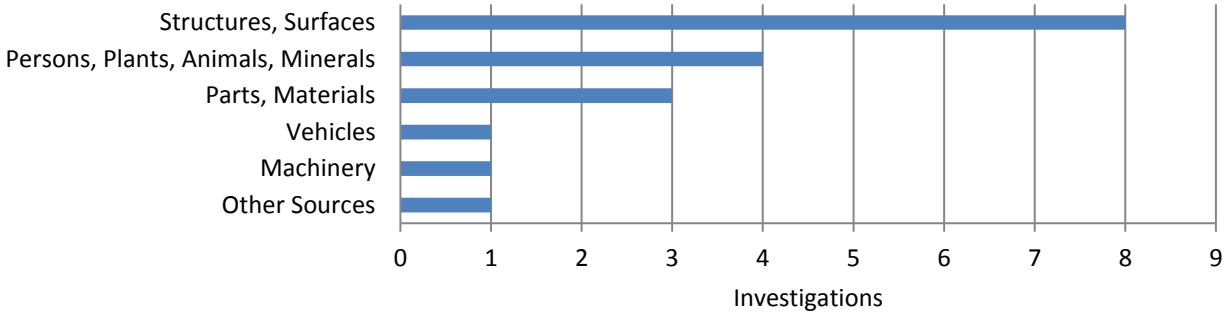
\*May not add to 100 due to rounding

Source: NIOSH Fatality Assessment and Control Evaluation program; additional information at [www.cdc.gov/niosh/face/](http://www.cdc.gov/niosh/face/)



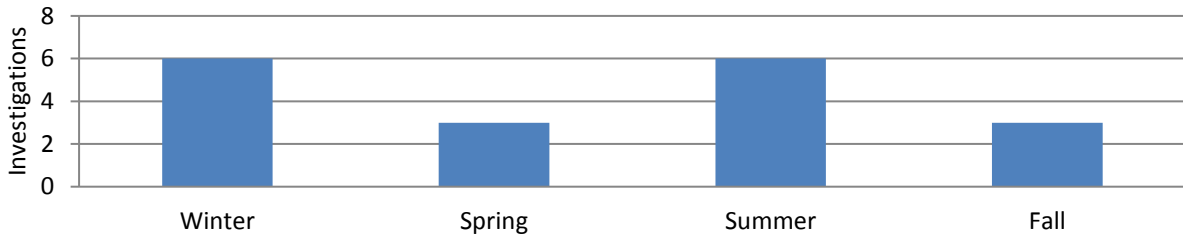
**Figure 86: Construction industry investigations by injury event among fatalities to working youth < 18 years old in the United States, 1982–2010**

Source: NIOSH Fatality Assessment and Control Evaluation program; additional information at [www.cdc.gov/niosh/face/](http://www.cdc.gov/niosh/face/)



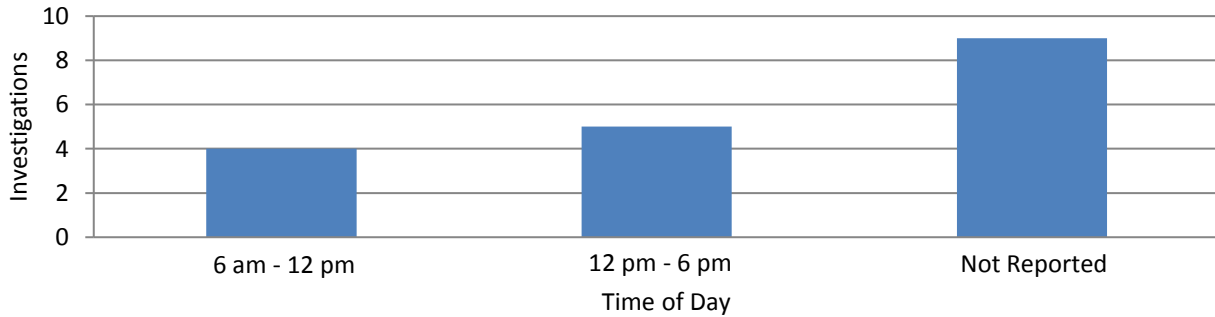
**Figure 87: Construction industry investigations by injury source among fatalities to working youth < 18 years old in the United States, 1982–2010**

Source: NIOSH Fatality Assessment and Control Evaluation program; additional information at [www.cdc.gov/niosh/face/](http://www.cdc.gov/niosh/face/)



**Figure 88: Construction industry investigations by season among fatalities to working youth < 18 years old in the United States, 1982–2010**

Source: NIOSH Fatality Assessment Control and Evaluation program; additional information at [www.cdc.gov/niosh/face/](http://www.cdc.gov/niosh/face/)



**Figure 89: Construction industry investigations by time of day among fatalities to working youth < 18 years old in the United States, 1982–2010**

Source: NIOSH Fatality Assessment Control and Evaluation program; additional information at [www.cdc.gov/niosh/face/](http://www.cdc.gov/niosh/face/)



## Retail Trade Industry

Within the retail trade industry between 1982 and 2010, there were 12 FACE investigations of young worker fatalities. Of these, 3 investigations involved youth less than 14 years old, and 11 involved male youth (Table 21). The 12 investigations were conducted in 7 states.

In 8 of the 12 investigations, the youth was working part-time as a regular employee (Figure 90). None of the incidents involved a family business or an employer who was reported to be the youth's parent or guardian. In 8 investigations, the youth had received safety training related to the work being performed. In 10 investigations, the youth was working in an area alone and could not be seen by a supervisor.

The employer was determined to be covered by regulations in all incidents where coverage could be determined. Considering both FLSA and state regulations, without regard to employer coverage, the youth was working during permissible hours in 9 incidents and was performing permissible tasks in 6 incidents. Violated HOs, disregarding employer coverage, included 4 incidents involving power-driven hoisting machinery and 1 incident involving a power-driven paper-product machine.

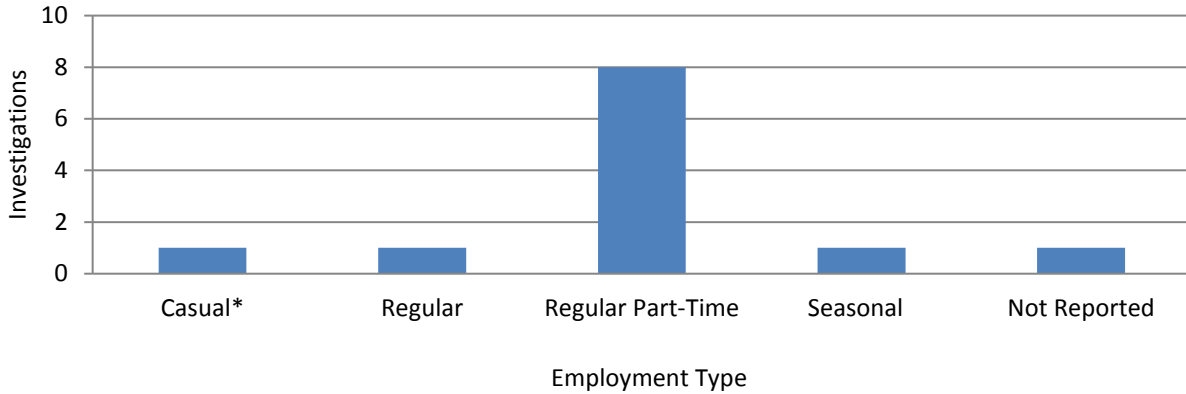
An intracranial injury was the nature-of-injury classification for 5 of the 12 investigations (Table 22). Injury event and injury source classifications were consistent, with 9 investigations involving a transportation event (Figure 91) with a vehicle source (Figure 92). Of these 9, automobiles were involved in 5 incidents and forklifts were involved in 4.

Of the 12 investigations, 5 fatalities occurred in the summer, with the remaining fatalities evenly distributed across the other seasons (Figure 93). The majority of the 12 investigations were for fatalities that occurred during the peak work hours of 12 pm to 6 pm (Figure 94).

**Table 21: Retail trade industry investigations by age and sex among fatalities to working youth < 18 years old in the United States, 1982–2010**

Characteristic	Investigations	Percent
<b>Age</b>		
< 14	3	25
14–15	1	8
16–17	8	67
<b>Sex</b>		
Male	11	92
Female	1	8
<b>Total</b>	<b>12</b>	<b>100</b>

Source: NIOSH Fatality Assessment and Control Evaluation program; additional information at [www.cdc.gov/niosh/face/](http://www.cdc.gov/niosh/face/)



**Figure 90: Retail trade industry investigations by employment type among fatalities to working youth < 18 years old in the United States, 1982–2010**

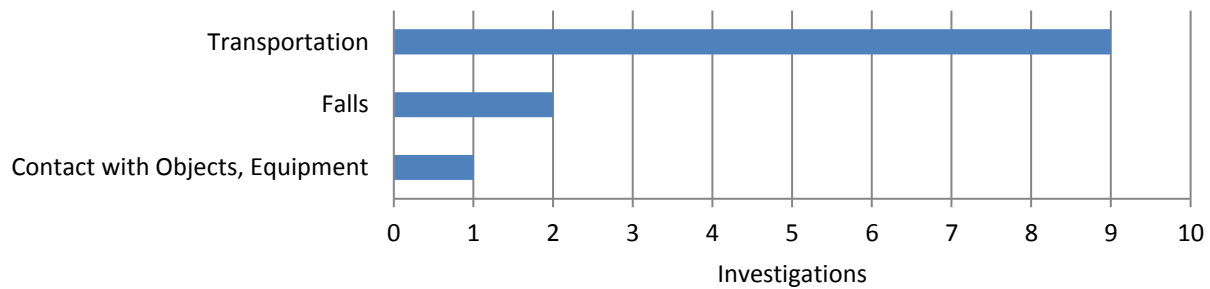
\*Employer and employee did not have a formal employment agreement

Source: NIOSH Fatality Assessment and Control Evaluation program; additional information at [www.cdc.gov/niosh/face/](http://www.cdc.gov/niosh/face/)

**Table 22: Retail trade industry investigations by nature of injury among fatalities to working youth < 18 years old in the United States, 1982–2010**

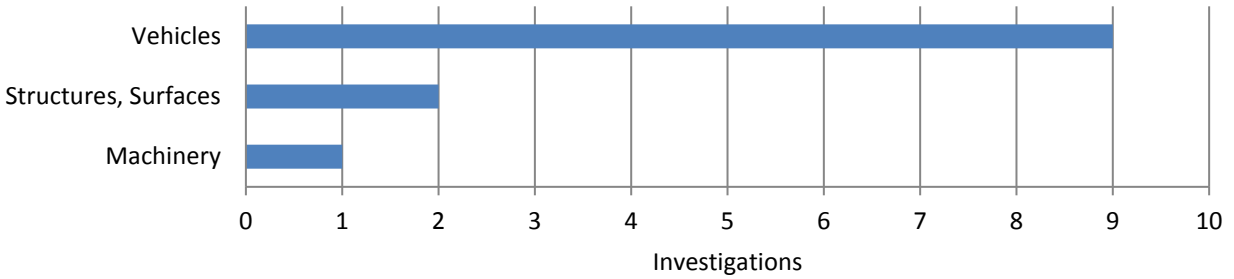
Nature of Injury	Investigations	Percent
<b>Intracranial Injuries</b>	<b>5</b>	<b>42</b>
<b>Other Traumatic Injuries</b>	<b>4</b>	<b>33</b>
Internal Injuries of the Trunk	3	75
Not Specified	1	25
<b>Multiple Traumatic Injuries</b>	<b>3</b>	<b>25</b>
<b>Total</b>	<b>12</b>	<b>100</b>

Source: NIOSH Fatality Assessment and Control Evaluation program; additional information at [www.cdc.gov/niosh/face/](http://www.cdc.gov/niosh/face/)



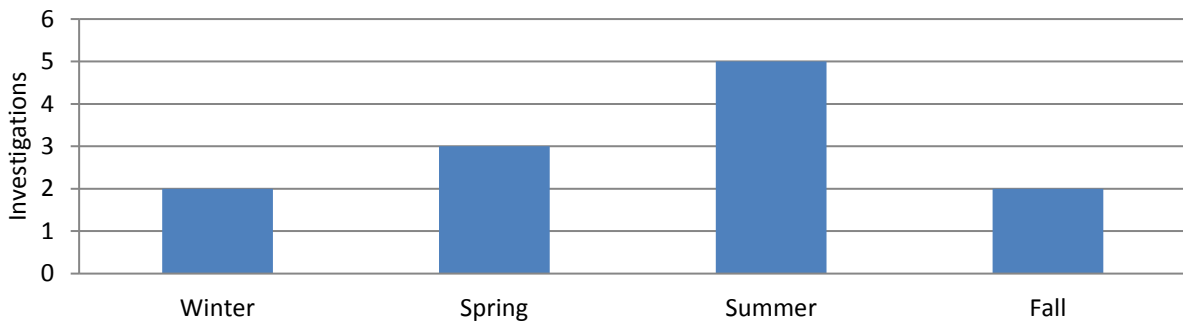
**Figure 91: Retail trade industry investigations by injury event among fatalities to working youth < 18 years old in the United States, 1982–2010**

Source: NIOSH Fatality Assessment and Control Evaluation program; additional information at [www.cdc.gov/niosh/face/](http://www.cdc.gov/niosh/face/)



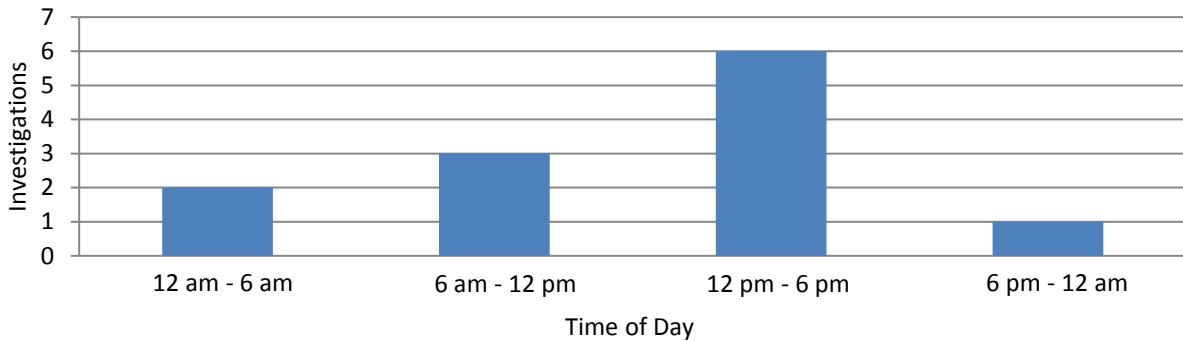
**Figure 92: Retail trade industry investigations by injury source among fatalities to working youth < 18 years old in the United States, 1982–2010**

Source: NIOSH Fatality Assessment and Control Evaluation program; additional information at [www.cdc.gov/niosh/face/](http://www.cdc.gov/niosh/face/)



**Figure 93: Retail trade industry investigations by season among fatalities to working youth < 18 years old in the United States, 1982–2010**

Source: NIOSH Fatality Assessment and Control Evaluation program; additional information at [www.cdc.gov/niosh/face/](http://www.cdc.gov/niosh/face/)



**Figure 94: Retail trade industry investigations by time of day among fatalities to working youth < 18 years old in the United States, 1982–2010**

Source: NIOSH Fatality Assessment and Control Evaluation program; additional information at [www.cdc.gov/niosh/face/](http://www.cdc.gov/niosh/face/)

## Moving Forward in Prevention

### Background

Many youth in the United States enter the workforce temporarily, seasonally, or part-time prior to graduating from high school [IOM 1998; Morisi 2008]. Although recent studies have shown a decrease in the number of working youth [Smith 2011; Sum 2008], there are still millions who work to earn money, autonomy, socialization, and job skills [Ferrari 2003; Ferrari et al. 2008; IOM 1998]. Skills learned on the job are valuable in daily life and help youth transition from being a student to being an employee [Ferrari 2003; Ferrari et al. 2008]. Generally, working youth do not develop highly technical skills. Instead, they develop fundamental skills related to time management, interpersonal communication, and a heightened sense of responsibility [IOM 1998]. These skills are transferable to any employment situation. According to the Institute of Medicine (IOM) [1998], youth in well-supervised employment that promotes “job skills and work involvement” tend to develop more positive relationships with peer groups and families.

When an employer appropriately assigns tasks to young workers and provides a safe workplace, both the youth and society in general benefit. These benefits include workforce skill development, physical and social advancement outside the home, and increased employer emphasis on the safety and work experience for all workers. Parents also reported that employment provides valuable life lessons for their children [Runyan et al. 2009], indicating that the value of work was found in the development of occupational skills and positive socialization.

While parents generally supported the concept of employment for their children, most seemed unaware of the potential for serious work-related injuries or death. Runyan et al. [2009] found that 98% of parents believed working youth knew how to keep themselves safe at work and less than 15% indicated concern for their child’s safety at work. The most common parental concerns focused on how time spent at work might affect their child’s schoolwork and social life. Parents cited concerns for fatigue, time away from family and friends, and a negative impact on schoolwork. Although parents indicated they would aggressively address workplace hazards their children might encounter, in reality, most did not [Runyan et al. 2011]. Most parents were not well-informed regarding child labor laws [Rauscher et al. 2010; Runyan et al. 2009]. Rauscher et al. [2010] found that parents and youth were aware of child labor laws but did not know the specifics of these laws.

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#### *What did NIOSH investigations reveal?*

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*Inadequate training for both the youth and their supervisors*

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*Inadequate supervision of young workers*

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*Inadequate experience or maturity to recognize workplace hazards*

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*Employer’s disregard for or inadequate knowledge of child labor laws*

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*Performance of unassigned tasks undertaken at the worker’s own initiative*

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## Recommendations for Protecting Young Workers

Employers, parents, and youth themselves all play a large role in ensuring that young workers are protected from harm in the workplace. The following sections provide recommendations for these groups and others who can all help to ensure that young workers, as well as their older counterparts, have a safe and healthy work environment.

### Employers

When hiring youth, employer recognition of the potential for serious injury or death to young workers is important. Employers may be positioned to address workplace safety issues by:

- Knowing and complying with federal, state, and local regulations associated with youth employment.
- Ensuring that all employees have access to and are aware of relevant federal, state, and local regulations and rights, particularly employees who supervise young workers, as well as the young workers themselves.
- Providing training developed specifically for young workers and their supervisors in a language they can understand.
- Supervising working youth appropriately.
- Assessing and, if possible, eliminating hazards in the workplace.
- Ensuring equipment used by young workers is both safe and permitted.
- Establishing methods for identifying young workers in the workplace, for example, using a specific uniform color or style for young workers.
- Establishing methods of identifying equipment that young workers cannot use, for example, labelling equipment to indicate that young workers are not allowed to use it.
- Training all employees in workplace hazard recognition and control.
- Encouraging young workers to report safety and health concerns.
- Ensuring young workers demonstrate an ability to safely perform job functions as assigned.
- Developing safety and health management program for all employees. Visit [www.osha.gov/dcsp/smallbusiness/consult.html](http://www.osha.gov/dcsp/smallbusiness/consult.html) and <https://www.osha.gov/shpguidelines/> for more information.
- Seeking information about safe work practices for young workers. Visit [www.youthrules.dol.gov](http://www.youthrules.dol.gov) and [www.cdc.gov/niosh/topics/youth/](http://www.cdc.gov/niosh/topics/youth/) for more information.

### Parents

Parents have a unique role in their child's safety in the workplace. Parents may help ensure their child's safety by educating themselves on child labor laws, communicating with their child about his/her work, and assisting their child in asserting his/her right to a safe workplace. Specifically, parents may be able to help their child by:

- Knowing the name and location of their child's employer.
- Talking frequently with their child about his/her employment.
- Asking their child about the type of work being done, specific tasks assigned, equipment being used, and whether or not safety training has been completed.
- Knowing federal, state, and local child labor laws.
- Being aware of young workers' rights and assuring that their child is aware of these rights.
- Encouraging their child to express any safety and health concerns they may have related to their work.

- Sharing information regarding labor laws and workplace safety with other parents.

### Young Workers

Young workers themselves may increase workplace safety by proactively gaining knowledge of applicable labor laws and requesting safety training relevant to specific workplace hazards. It is important for youth to understand that they have the right to a safe workplace, including the right to refuse to perform work prohibited by law or in unsafe conditions. Young workers may help ensure their own safety by:

- Recognizing that work-related injuries and illnesses are predictable and can be prevented.
- Knowing what tasks or equipment may and may not be legally performed or used.
- Knowing not to perform unsafe tasks.
- Asking questions about workplace hazards.
- Knowing not to perform tasks that have not been assigned.
- Asking about and participating in safety training programs.
- Knowing about workers' rights to a safe work environment and right to refuse unsafe work.
- Refusing to perform unsafe tasks, perform tasks that are prohibited by law, and work in unsafe conditions.
- Discussing job responsibilities and work environment with parents to jointly problem solve and determine if safety concerns exist.

### Educators

Educators may also play a role in keeping young workers safe in the workplace by:

- Including safety and health training in all school-based work experience programs.
- Incorporating worker safety and health in educational curriculums to ensure that all young people enter the labor force with basic knowledge of occupational safety and health, and the right to a safe workplace.
- Seeking information to augment curriculum in occupational safety and health. Visit [www.cdc.gov/niosh/talkingsafety](http://www.cdc.gov/niosh/talkingsafety) for more information.
- Knowing federal, state, and local regulations associated with youth employment.

### Researchers

Researchers have a continuing role in monitoring and affecting the safety of young workers. Evidence-based advancements in young worker safety may be made by:

- Assessing and understanding the impact of youth employment on youth, parents, employers, and the economy.
- Conducting intervention evaluations to encompass:
  - Policy approaches (e.g., effectiveness of child labor laws)
  - Organizational approaches (e.g., effectiveness of company safety programs)
  - Translational approaches (e.g., effectiveness of translating a proven intervention from one setting to another)
- Monitoring injury and fatality trends associated with youth employment.
- Assessing and understanding injury and fatality undercounts in current young worker surveillance data.
- Establishing a mechanism to collect employment data for youth under 15 years of age.

### **Federal and State Agencies**

Multiple federal and state agencies share some level of responsibility for protecting young workers. It is vital that all young people, before they enter the labor force, have the basic workplace safety and health knowledge and skills they need to stay safe and healthy on the job. Through coordinated efforts, these agencies may provide a safer workplace environment for youth by:

- Integrating workplace health and safety knowledge and skills across all federal and state-based career readiness and workforce development initiatives and programs.
- Continuing to give attention to issues affecting safety for youth in the workplace.
- Identifying and addressing regulatory gaps within and across agencies.
- Supporting the enforcement of child labor laws.
- Continuing to support small and/or family businesses in their obligations to comply with child labor laws.
- Continuing to educate employers and the public about worker safety.

### **Equipment Manufacturers, Distributors, and Rental Companies**

Equipment manufacturers, distributors, and rental companies may be uniquely positioned to raise awareness about regulations related to the operation of certain equipment, including regulations relevant to employers of young workers. Equipment providers may help to protect young workers by:

- Distributing information about safe and legal use of equipment by young workers.
- Identifying and labelling equipment to indicate that youth under a specified age should not be allowed to use it.

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## Appendix A: Federal Employment Standards for Youth

The Fair Labor Standards Act (FLSA) of 1938 is the primary federal law that governs youth employment through its child labor regulations. These regulations include Hazardous Occupations Orders (HOs) that identify jobs that youth are prohibited from performing, with different regulations applying to agricultural versus nonagricultural industries and exemptions applying to certain HOs. Presented here are summaries of the child labor regulations and HOs that were effective at the time of this publication for youth working in agricultural and nonagricultural industries. Current and complete information on the child labor provisions, coverage, and applicable exemptions is available from the U.S. Department of Labor website at <http://www.dol.gov/whd/childlabor.htm>.

**Nonagricultural jobs that 14- and 15-year-old youth may not perform:**

- Manufacturing occupations
- Mining occupations
- Processing occupations
- Occupations requiring the performance of duties in workrooms or workplaces where goods are manufactured, mined, or otherwise processed
- Occupations declared to be hazardous by the Secretary of Labor under the Hazardous Orders
- Occupations that involve use of hoisting apparatus
- Work performed in or about boiler or engine rooms or in connection with the maintenance or repair of the establishment, machines, or equipment
- Occupations that involve use of power-driven machinery
- Operation of motor vehicles or service as helpers on motor vehicles
- Riding on a motor vehicle inside or outside the passenger compartment
- Outside window washing that involves working from window sills
- Work requiring use of ladders, scaffolds, or their substitutes
- Baking and cooking activities
- Work in freezers and meat coolers and work that involves processing meat for sale
- Youth peddling
- Loading and unloading goods or property onto or from motor vehicles, railroad cars, and conveyors
- Catching and cooping poultry in preparation for transport or for market
- Public messenger services
- Occupations in connection with transportation, warehousing, storage, communications, public utilities, and construction

**Nonagricultural employment standards**, called Hazardous Occupations Orders (**HOs**), indicating jobs that **youth less than 18 years** may not perform:

- HO 1 – Manufacturing and storing of explosives
- HO 2 – Motor-vehicle driving and outside helper on a motor vehicle
- HO 3 – Coal mining

- HO 4 – Occupations in forest fire fighting, forest fire prevention, timber tract operations, forestry service, logging, and sawmilling
- HO 5 – Power-driven woodworking machines
- HO 6 – Exposure to radioactive substances
- HO 7 – Power-driven hoisting apparatus, including forklifts
- HO 8 – Power-driven metal-forming, punching, and shearing machines
- HO 9 – Mining, other than coal mining
- HO 10 – Operating power-driven meat processing equipment in retail establishments and wholesale establishments, and most occupations in meat and poultry slaughtering, packing, processing, or rendering
- HO 11 – Power-driven bakery machines including vertical dough or batter mixers
- HO 12 – Power-driven balers, compactors, and paper processing machines
- HO 13 – Manufacturing bricks, tile, and kindred products
- HO 14 – Power-driven circular saws, band-saws, chain saws, guillotine shears, wood chippers, and abrasive cutting discs
- HO 15 – Wrecking, demolition, and shipbreaking operations
- HO 16 – Roofing operations and all work on or about a roof
- HO 17 – Excavation operations

**Agricultural employment standards**, called Hazardous Occupations Orders for Agriculture (**AgHOs**), indicating jobs that youth **less than 16 years old** may **not** perform:

- HO 1 – Operating a tractor of over 20 power take-off (PTO) horsepower, or connecting or disconnecting an implement or any of its parts to or from such a tractor
- HO 2 – Operating or assisting to operate any of the following machines:
  - corn picker, cotton picker, grain combine, hay mower, forage harvester, hay baler, potato digger, mobile pea viner
  - feed grinder, crop dryer, forage blower, auger conveyer, or the unloading mechanism of a nongravity-type self-unloading wagon or trailer
  - power post hole diggers, power post driver, or nonwalking type rotary tiller
- HO 3 – Operating or assisting to operate any of the following machines:
  - trencher or earthmoving equipment
  - forklift
  - potato combine
  - power-driven circular, band, or chain saw
- HO 4 – Working on a farm in a yard, pen, or stall occupied by any of the following animals:
  - bull, boar, or stud horse maintained for breeding purposes
  - sow with suckling pigs, or a cow with a newborn calf
- HO 5 – Felling, bucking, skidding, loading, or unloading timber with butt diameter of more than 6 inches
- HO 6 – Working from a ladder or scaffold at a height of over 20 feet

- HO 7 – Driving a bus, truck, or automobile when transporting passengers or riding on a tractor as a passenger or helper
- HO 8 – Working inside any of the following structures:
  - fruit, forage, or grain storage designed to retain an oxygen deficient or toxic atmosphere
  - upright silo within 2 weeks after silage has been added or when a top unloading device is in operating position
  - manure pit
  - horizontal silo while operating a tractor for packing purposes
- HO 9 – Handling or applying toxic agricultural chemicals identified by the word “poison,” or “warning,” or identified by a “skull and crossbones” on the label
- HO 10 – Handling or using a blasting agent, including but not limited to, dynamite, black powder, sensitized ammonium nitrate, blasting caps, and primer cord
- HO 11 – Transporting, transferring, or applying anhydrous ammonia

## Appendix B: NIOSH-recommended Changes to Hazardous Occupations Orders

At the request of the U.S. Department of Labor (DOL), NIOSH presented DOL with a report in 2002, available at <http://www.cdc.gov/niosh/docs/NIOSHRecsDOLHaz/pdfs/DOL-recomm.pdf>, detailing recommended changes to the Hazardous Occupations Orders (HOs). The NIOSH recommendations were based on a thorough review of data and scientific literature. In a final rule published by DOL in 2010, six of the nonagricultural HOs were revised, with consideration given to the 2002 NIOSH recommendations. The tables presented here provide a summary of the HOs (nonagricultural and agricultural) that were effective during the 2002 NIOSH review, a summary of the 2002 NIOSH recommendations for each HO (nonagricultural and agricultural), and a summary of major revisions to each HO (nonagricultural) based on the 2010 final rule. Current and complete information on DOL child labor provisions is available at <http://www.dol.gov/whd/childlabor.htm>.

Nonagricultural Hazardous Order (HO) Prior to 2010	NIOSH Recommendations Presented in 2002	Nonagricultural Hazardous Order (HO) Effective at Publication Time (HOs revised in 2010 shown in red)
HO 1 – Manufacturing and storing of explosives	Revise the definition to include the current Bureau of Alcohol, Tobacco, and Firearms list of explosive materials	HO 1 – unchanged
HO 2 – Motor-vehicle driving and outside helper on a motor vehicle	Incorporate provisions of the Drive for Teen Employment Act; provide guidance on “urgent, time-sensitive deliveries” and “incidental and occasional driving;” delete exemption for school bus driving	HO 2 – unchanged
HO 3 – Coal mining	None	HO 3 – unchanged
HO 4 – Logging and sawmilling	Expand to cover similar work in operation of timber tracts, tree farms, and forestry services; remove the current exemptions for construction work for living or administrative quarters	HO 4* – Expanded to include occupations in forest fire fighting, forest fire prevention, timber tract operations, forestry service, logging, and sawmilling.
HO 5 – Power-driven woodworking machines	Expand to include similar power-driven machines used on materials other than wood	HO 5 – unchanged
HO 6 – Exposure to radioactive substances	Revise to reflect current risks to youth for occupational radiation exposures	HO 6 – unchanged
HO 7 – Power-driven hoisting equipment	Expand to cover repairing, servicing, disassembling, and assisting; expand to prohibit youth from riding on any part of a forklift as a passenger and from working from forks, platforms, buckets, or cages attached to a moving or stationary forklift; expand to prohibit work from truck-mounted bucket or basket hoists; expand to include commonly used man-lifts that do not meet the current definition	HO 7* – Expanded to include work on forklifts, truck-mounted hoists and man lifts and riding as a passenger or tending to any of this equipment.

HO 8 – Power-driven metal-forming, punching, and shearing machines	Expand to include several types of metalworking machinery currently excluded	HO 8 – unchanged
HO 9 – Mining, other than coal mining	Expand to include all work performed in connection with petroleum and natural gas extraction; remove exemptions permitting repair and maintenance of roads and work on track crews	HO 9 – unchanged
HO 10 – Meat processing and power-driven meat processing machines	Expand to prohibit work in all meats products manufacturing industries; consider allowing use of meat and food slicers in retail, wholesale, and service industries; allow learner exemptions in retail, wholesale, or service industries	<b>HO 10*</b> – Expanded to include most occupations in meat and poultry slaughtering, packing, processing, or rendering.
HO 11 – Power-driven bakery equipment	Consider allowing the use of “counter-top models” of power-driven bakery machines	<b>HO 11*</b> – Changed to exempt the operation and maintenance of small, ‘counter-top’ mixers comparable to those intended for household use.
HO 12 – Balers, compactors, and paper processing machines	Incorporate provisions of the Compactor and Baler Act; expand to include similar power-driven machines used on materials other than paper products	<b>HO 12*</b> – Expanded to include the operation, repair, and maintenance of balers or compactors that are used to process materials other than paper.
HO 13 – Manufacturing bricks, tile, and kindred products	None	HO 13 – unchanged
HO 14 – Band-saws, circular saws, and guillotine shears	Include other machines that perform cutting and sawing functions through direct contact between the cutting surface and the material	<b>HO 14*</b> – Expanded to include other machinery, such as power-driven circular saws, band-saws, chain saws, guillotine shears, wood chippers, and abrasive cutting discs that perform similar functions.
HO 15 – Wrecking, demolition, and shipbreaking operations	None	HO 15 – unchanged
HO 16 – Roofing operations and all work on or about a roof	Expand to include all work performed on roofs; remove the learner exemption	HO 16 – unchanged
HO 17 – Excavation operations	Remove the learner exemption	HO 17 – unchanged

\*Revised by the 2010 final rule from the U.S. Department of Labor

Agricultural Hazardous Order (HO)	NIOSH Recommendations Presented in 2002
HO 1 – Operating a tractor of over 20 power take-off (PTO) horsepower, or connecting or disconnecting an implement or any of its parts to or from such a tractor	Remove the 20 power take-off (PTO) horsepower threshold; revise exemption for 14- and 15-year-olds with tractor certification to require tractors to be equipped with a rollover protective structure (ROPS) and mandate the use of seatbelts.
HO 2 – Operating or assisting to operate any of the following machines: corn picker, cotton picker, grain combine, hay mower, forage harvester, hay baler, potato digger, mobile pea viner, feed grinder, crop dryer, forage blower, auger conveyer, the unloading mechanism of a nongravity-type self-unloading wagon or trailer, power post hole diggers, power post driver, nonwalking type rotary tiller	Combine HO 2 and HO 3, and expand prohibition from lists of specific machines to machines that perform general functions (e.g., harvesting and threshing machinery; mowing machinery; plowing, planting, and fertilizing machinery; excavating machinery; loaders; wood processing machinery; sawing machinery; and mobile equipment).
HO 3 – Operating or assisting to operate any of the following machines: trencher, earthmoving equipment, forklift, potato combine, power-driven circular, band, chain saw	Combine HO 2 and HO 3 and expand prohibition from lists of specific machines to machines that perform general functions (e.g., harvesting and threshing machinery; mowing machinery; plowing, planting, and fertilizing machinery; excavating machinery; loaders; wood processing machinery; sawing machinery; and mobile equipment).
HO 4 – Working on a farm in a yard, pen, or stall occupied by any of the following animals: bull, boar, or stud horse maintained for breeding purposes; sow with suckling pigs; or a cow with a newborn calf	None
HO 5 – Felling, bucking, skidding, loading, or unloading timber with butt diameter of more than 6 inches	Remove 6-inch-diameter threshold.
HO 6 – Working from a ladder or scaffold at a height of over 20 feet	Expand to include work on roofs and on farm structures including silos, grain bins, windmills, and towers; on vehicles, machines, and implements; reduce the maximum height from 20 feet to 6 feet.
HO 7 – Driving a bus, truck, or automobile when transporting passengers or riding on a tractor as a passenger or helper	Expand to prohibit driving of all motor vehicles and off-road vehicles (including all-terrain vehicles), with or without passengers, on or off the highway; expand to prohibit work as an outside helper on a motor vehicle; move to HO 1 the provision prohibiting riding on a tractor as a passenger or helper.
HO 8 – Working inside any of the following structures: fruit, forage, or grain storage designed to retain an oxygen deficient or toxic atmosphere; upright silo within 2 weeks after silage has been added or when a top unloading device is in operating position; manure pit; horizontal silo while operating a tractor for packing purposes	Expand to prohibit all work inside fruit, forage, or grain storage structures and manure pits.
HO 9 – Handling or applying toxic agricultural chemicals identified by the word “poison,” or “warning,” or identified by a “skull and crossbones” on the label	Revise to be consistent with the Environmental Protection Agency Worker Protection Standard for pesticides, encompassing prohibitions against pesticides with chronic health effects as well as pesticides with recognized acute toxicity.

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HO 10 – Handling or using a blasting agent, including but not limited to, dynamite, black powder, sensitized ammonium nitrate, blasting caps, and primer cord	None
HO 11 – Transporting, transferring, or applying anhydrous ammonia	None

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## Appendix C: Investigation Summaries

The NIOSH and State Fatality Assessment and Control Evaluation (FACE) programs have published 97 investigation reports covering 99 youth fatalities that occurred in the United States between 1982 and 2010. Summaries of the 97 reports are presented chronologically from the most recent within industry (i.e., agriculture production, services, construction, retail trade, manufacturing, wholesale trade, and other). Also presented are prevention recommendations for employers and workers as provided in the published reports. Full reports are available from the NIOSH website at <http://www.cdc.gov/niosh/face/> or can be requested by phone at 800-CDC-INFO (800-232-4636).

Report Number	Program	State	Industry	Report Title	Brief Description of Incident (injury nature shown in red)	Prevention Recommendations for Employers and Workers
2005MN036	State	MN	Agriculture Production	Farm youth dies after becoming entangled in the unloading beaters of a forage wagon	A 13-year-old male farm laborer died after becoming <b>entangled</b> in the beaters of a forage wagon. The victim was attempting to dislodge material with his feet when his pants got caught by the rotating beaters. He died at the hospital on arrival of chest penetration injuries.	<ul style="list-style-type: none"> <li>• Assign age-appropriate tasks to youth</li> <li>• Disengage the power take-off before dismounting machinery</li> <li>• Do not wear loose clothing near machinery</li> </ul>
2005MN010	State	MN	Agriculture Production	Farm youth dies after becoming entangled in the unloading beaters of a forage wagon	A 17-year-old male farm laborer died after becoming <b>entangled</b> in the beaters of a forage wagon. The victim had leaned over the beaters to determine if more material was needed when his jacket got caught by the rotating beaters. He died at the hospital several hours after the incident of blunt force and shearing injuries.	<ul style="list-style-type: none"> <li>• Disengage the power take-off before dismounting machinery</li> <li>• Assign age-appropriate tasks to youth</li> <li>• Do not wear loose clothing near machinery</li> </ul>

2004MI176	State	MI	Agriculture Production	6-year-old youth dies when he was run over by a skid-steer loader driven by his 9-year-old brother	A 6-year-old male farm laborer died after being <b>run over</b> by a skid-steer loader. The victim was running behind the skid-steer, operated by his 9-year-old brother, when it suddenly turned, knocked him down, and ran over him. He died on-site of a skull fracture.	<ul style="list-style-type: none"> <li>• Restrict operation of heavy machinery to persons over 15</li> <li>• Implement a health and safety plan for workers</li> <li>• Assign age-appropriate tasks to youth</li> <li>• Never approach machinery before making eye-contact with the operator</li> <li>• Maintain machinery according to manufacturer instructions</li> <li>• Do not allow extra passengers on machinery</li> <li>• Lower machinery attachments to the lowest position during transport trips</li> </ul>
2004IA019	State	IA	Agriculture Production	Farm boy dies in ATV rollover while helping father chop silage	An 8-year-old male farm laborer died after the all-terrain vehicle ( <b>ATV</b> ) he was operating <b>overturned</b> . He died at an unreported location an unreported time after the incident of asphyxia from chest compression.	<ul style="list-style-type: none"> <li>• Comply with ATV laws</li> <li>• Ensure ATV size is appropriate for the size and age of the operator</li> <li>• Restrict operation of full-sized ATVs to persons over 15</li> <li>• Ensure operators complete ATV safety courses</li> </ul>
2004IA017	State	IA	Agriculture Production	12-year-old farm boy dies while hitching up hay wagon	A 12-year-old male farm laborer died after being <b>crushed between</b> a hay wagon and a truck. The victim was attempting to hitch the wagon to the truck when the wagon began rolling toward the truck, crushing his head between the two. He died on-site of blunt force injury to the head.	<ul style="list-style-type: none"> <li>• Chock wheels of wagons that do not have parking brakes</li> <li>• Stand safely to one side when hitching wagons to towing vehicles</li> </ul>

2003WA038	State	WA	Agriculture Production	Two teen workers asphyxiate in an agricultural silo	Two 16-year-old male farm laborers died after entering a silo that had an <b>oxygen-deficient atmosphere</b> . Both died on-site of asphyxia due to suffocating gases and chemicals.	<ul style="list-style-type: none"> <li>• Implement an entry plan for confined spaces</li> <li>• Use alternative methods to minimize confined space entry</li> <li>• Consult with experts for help on confined space issues</li> <li>• Maintain structures according to manufacturer instructions</li> <li>• Implement a process to prevent unauthorized confined space entry</li> <li>• Maintain close supervision of working youth</li> <li>• Develop plans for confined space rescues</li> </ul>
2003MN021	State	MN	Agriculture Production	Farm youth dies after tractor she was driving rolled over on her	A 12-year-old female farm laborer died after the <b>tractor</b> she was operating <b>overturned</b> . She died at the hospital 3 days after the incident of multiple blunt force injuries.	<ul style="list-style-type: none"> <li>• Ensure tractors have a rollover protective structure and seatbelt</li> <li>• Assign age-appropriate tasks to youth</li> </ul>
2003MI052	State	MI	Agriculture Production	Farm youth died when he became entangled in an unguarded PTO shaft	A 13-year-old male farm laborer died after becoming <b>entangled</b> in an unguarded power take-off (PTO) shaft attached to the rear of a tractor. The victim had dismounted the tractor he had been operating when his sweatshirt sleeve got caught by the engaged PTO shaft. He died on-site of multiple blunt injuries.	<ul style="list-style-type: none"> <li>• Cover rotating machine components with a guard</li> <li>• Disengage the power take-off, shut off the engine, and remove key before dismounting machinery</li> <li>• Do not wear loose clothing near machinery</li> </ul>
2003IA020	State	IA	Agriculture Production	Teenager dies in tractor overturn when home-made rollbar fails	A 14-year-old male farm laborer died after the utility <b>tractor</b> he was operating <b>overturned</b> . The victim was removing fence posts using a utility tractor that was equipped with a roll-bar and seatbelt. The roll-bar, engineered and installed by the tractor owner, withstood the overturn, but the mounting points failed. He died on-site of asphyxia due to chest compression.	<ul style="list-style-type: none"> <li>• Do not remove factory installed rollover protective structures</li> <li>• Retrofit tractors with approved rollover protective structures</li> <li>• Do not install self-made roll-bars</li> <li>• Do not use the rear wheel of a tractor to remove fence posts</li> <li>• Restrict operation of heavy machinery to persons over 15</li> </ul>

2002WI058	State	WI	Agriculture Production	Youth killed in tractor roll-over while moving large hay bales	An 11-year-old male farm laborer died after the <b>tractor</b> he was operating <b>overturned</b> . He died on-site of massive head and chest injuries.	<ul style="list-style-type: none"> <li>• Ensure tractors have a rollover protective structure and seatbelt</li> <li>• Train workers to recognize machinery hazards</li> <li>• Ensure machinery is appropriate for the size and age of the operator</li> <li>• Maintain close supervision of working youth</li> <li>• Comply with child labor laws</li> <li>• Use attachments designed for task performance</li> </ul>
2002-10	NIOSH	OH	Agriculture Production	Youth farm worker dies after falling into operating feed grinder/mixer	A 14-year-old male farm laborer died after becoming <b>entangled</b> in an operating feed grinder/mixer. The victim was on top of a hay bale stack using a handheld hook to drop bales into the grinder when he fell into the grinder. He died on-site of multiple injuries.	<ul style="list-style-type: none"> <li>• Position machinery away from upper-level work areas</li> <li>• Do not operate machinery during manual loading</li> <li>• Restrict access to machinery keys</li> <li>• Comply with child labor laws</li> <li>• Maintain close supervision of working youth</li> <li>• Use a conveyor to elevate material to the machinery loading point</li> <li>• Implement a health and safety plan for workers</li> <li>• Post warning signs on machines that should not be operated by persons under 16</li> </ul>
2001KY062	State	KY	Agriculture Production	Youth riding as passenger on tractor killed by overturn	A 16-year-old female farm laborer died after the <b>tractor</b> she was riding on <b>overturned</b> . The victim was seated on the tractor fender when it overturned. She died at the hospital 4 hours after the incident of asphyxia from compression.	<ul style="list-style-type: none"> <li>• Do not allow extra passengers on machinery</li> <li>• Ensure tractors have a rollover protective structure and seatbelt</li> <li>• Use caution in operating machinery when visibility is reduced</li> <li>• Equip tractors with front-end counterweights</li> <li>• Ensure operators complete machinery safety courses</li> </ul>

2000WI025	State	WI	Agriculture Production	Youth farm worker pinned under overturned horse-drawn manure sled	A 16-year-old male farm laborer died after being <b>crushed by</b> an overturned manure sled. The victim was standing on top of material that he was unloading from a stationary, horse-drawn sled when the sled overturned and pinned him. He died on-site of multiple internal injuries.	<ul style="list-style-type: none"> <li>• Attach sled boxes securely to runners</li> <li>• Maintain a low center of gravity on loaded sled boxes</li> </ul>
2000OK045	State	OK	Agriculture Production	A 17-year-old on a hay hauling crew died from injuries received when he fell from a moving hay truck and was apparently run over by the vehicle's tire	A 17-year-old male farm laborer died after being <b>run over</b> by a hay truck. The victim was a passenger standing behind the driver's seat when he fell from and was run over by the moving vehicle. He died on-site of blunt injuries to the head.	<ul style="list-style-type: none"> <li>• Equip vehicles with seating and seatbelts for all passengers</li> <li>• Install rails on open-sided vehicles that carry passengers</li> <li>• Train workers to recognize hazards</li> </ul>
2000-18	NIOSH	PA	Agriculture Production	A 15-year-old male farm laborer dies after the tractor he was operating overturned into a manure pit	A 15-year-old male farm laborer died after the <b>tractor</b> he was operating <b>overturned</b> into a manure pit. The victim was pinned under the tractor that had come to rest upside down in the pit. He died at the hospital on arrival of asphyxia.	<ul style="list-style-type: none"> <li>• Mark manure pits as hazardous</li> <li>• Barricade manure pit entrances to prevent inadvertent entry</li> <li>• Ensure machinery attachments do not compromise operation</li> <li>• Comply with child labor laws</li> <li>• Assign age-appropriate tasks to youth</li> <li>• Train workers on task performance</li> <li>• Do not allow extra passengers on machinery</li> </ul>
2000-06	NIOSH	GA	Agriculture Production	Sixteen-year-old farmworker dies in a cotton packing machine after being covered with a load of cotton	A 16-year-old male farm laborer died after being <b>engulfed by</b> a load of harvested cotton. The victim was inside a cotton packing machine when a coworker, who was not aware of the victim's location, loaded 3,500 pounds of cotton into the machine. He died at the hospital 2 hours after the incident of compression asphyxia and suffocation.	<ul style="list-style-type: none"> <li>• Do not allow workers to enter packing machines</li> <li>• Visually inspect packing machines prior to loading</li> <li>• Implement a communication system for use during machine loading</li> <li>• Implement a health and safety plan for workers</li> </ul>

1999WA056	State	WA	Agriculture Production	Tractor overturn kills 16-year-old farm worker in Washington State	A 16-year-old male farm laborer died after the <b>tractor</b> he was operating <b>overturned</b> . He died on-site of crushing chest injuries.	<ul style="list-style-type: none"> <li>• Ensure tractors have a rollover protective structure and seatbelt</li> <li>• Wear a seatbelt when operating a tractor with a rollover protective structure</li> <li>• Ensure operators complete tractor safety courses</li> <li>• Be familiar with the tractor operation manual</li> <li>• Use caution when operating tractors on uneven surfaces</li> </ul>
1999NE028	State	NE	Agriculture Production	Farm youth suffocated in corn bin	A 15-year-old male farm laborer died after being <b>engulfed by</b> collapsing corn. The victim had entered an upper door of a grain bin to clear a 7-foot pile of corn away from the lower door area when the corn collapsed and engulfed him. He died on-site of compressive hypoxia.	<ul style="list-style-type: none"> <li>• Mark grain storage bins as confined spaces</li> <li>• Follow confined space entry procedures</li> <li>• Wear appropriate personal protective equipment for confined space entry</li> <li>• Station an observer outside the confined space for entries</li> <li>• Implement a communication system for use during confined space entry</li> <li>• Implement a process to prevent unauthorized confined space entry</li> <li>• Develop plans for confined space rescues</li> <li>• Implement a health and safety plan for workers</li> </ul>
1999MO022	State	MO	Agriculture Production	Eleven-year-old farm boy dies following tractor accident	An 11-year-old male farm laborer died after the <b>tractor</b> he was operating <b>overturned</b> into a drainage ditch filled with approximately 2 feet of water. The victim was pinned under the tractor in the water. He died at an unreported location an unreported time after the incident of asphyxia due to drowning.	<ul style="list-style-type: none"> <li>• Ensure tractors have a rollover protective structure and seatbelt</li> <li>• Ensure operators complete tractor safety courses</li> <li>• Train workers to recognize machinery hazards</li> </ul>

1999IA003	State	IA	Agriculture Production	Youth farm worker is killed when he becomes entangled in PTO driveline of an old grinder-mixer	A 17-year-old male farm laborer died after becoming <b>entangled</b> in an unshielded power take-off (PTO) driveline of a grinder/mixer. The victim was standing next to the driveline when his jacket got caught on the rotating PTO shaft. He died on-site of decapitation.	<ul style="list-style-type: none"> <li>• Cover rotating machine components with a guard</li> <li>• Train workers to recognize machinery hazards</li> <li>• Repair damaged machinery components</li> </ul>
1998OK025	State	OK	Agriculture Production	Farm worker dies of burn-related injuries while trapped in a burning hay baler - Oklahoma	A 17-year-old male farm laborer died after becoming <b>caught in</b> a baler that ignited and burned. The victim had removed a blockage of wheat from the operating baler when he got caught in the baler. A fire started in the baler near his feet, and he was not able to free himself. He died on-site of smoke inhalation and burns.	<ul style="list-style-type: none"> <li>• Disengage the power take-off and shut off the engine before working on machinery</li> <li>• Follow safe practices when working on machinery</li> <li>• Maintain and operate machinery according to manufacturer instructions</li> <li>• Provide a communication means for solitary workers</li> </ul>
1998-15	NIOSH	MI	Agriculture Production	9-year-old child helping with blueberry harvest dies after being run over by cargo truck on field road – Michigan	A 9-year-old male farm laborer died after being <b>run over</b> by a cargo truck. The victim, riding in the back of the truck that was going in reverse, either jumped from or fell off the vehicle and was run over. He died at the hospital 1 hour after the incident of a lacerated liver.	<ul style="list-style-type: none"> <li>• Comply with child labor laws</li> <li>• Restrict ground worker access to areas that have vehicular traffic and machine use</li> <li>• Equip vehicles with seating and seatbelts for all passengers</li> <li>• Equip vehicles with back-up alarm systems</li> <li>• Identify safe routes for vehicular and machinery travel</li> <li>• Implement a health and safety plan for workers</li> </ul>
1997MN038	State	MN	Agriculture Production	Farmer youth dies after being run over by a grass seeder	A 13-year-old male farm laborer died after being <b>run over</b> by a grass seeder. The victim was riding on the hitch of the seeder that was being pulled by a tractor when he fell from the hitch and was run over by the seeder. He died on-site of unreported injuries.	<ul style="list-style-type: none"> <li>• Do not allow extra passengers on machinery</li> </ul>

1995MN046	State	MN	Agriculture Production	Farmer youth dies after being struck by a loader bucket	A 17-year-old male farm laborer died after being <b>struck by</b> a bucket that fell from a front-end loader. The victim was riding in the bucket when it detached from the loader, fell with him approximately 5 feet to the ground, and landed on top on him. He died on-site of a fractured skull.	<ul style="list-style-type: none"> <li>• Do not allow extra passengers on machinery</li> <li>• Ensure machinery locking devices are properly installed before use</li> </ul>
1995MN045	State	MN	Agriculture Production	Farm youth dies after being engulfed in corn inside a steel grain bin	A 13-year-old male farm laborer died after becoming <b>engulfed</b> in corn inside a grain bin. The victim was sitting on the roof ladder looking through the roof opening as corn was being discharged out the bottom when he either fell into or entered the bin and became engulfed. He died at the hospital 2 days after the incident of complications due to anoxic encephalopathy.	<ul style="list-style-type: none"> <li>• Stay clear of storage bin openings during grain transfers</li> <li>• Follow confined space entry procedures</li> <li>• Mark grain storage bins as confined spaces</li> <li>• Post warning signs at confined space entrances</li> </ul>
1995IA009	State	IA	Agriculture Production	12-year-old boy dies from a tractor rollover in a roadside ditch	A 12-year-old male farm laborer died after the <b>tractor</b> he was operating <b>overturned</b> . He died on-site of asphyxia due to a crush injury.	<ul style="list-style-type: none"> <li>• Ensure tractors have a rollover protective structure and seatbelt</li> <li>• Comply with child labor laws</li> <li>• Ensure machinery is in safe working condition</li> <li>• Adjust machinery to meet requirements of the operator</li> <li>• Train workers on task performance</li> <li>• Maintain close supervision of working youth</li> </ul>
1994MN041	State	MN	Agriculture Production	Farm youth dies after tractor he was driving rolled over on him	A 10-year-old male farm laborer died after the <b>tractor</b> he was operating <b>overturned</b> . He died on-site of skull fractures.	<ul style="list-style-type: none"> <li>• Ensure tractors have a rollover protective structure and seatbelt</li> <li>• Maintain safe speeds when operating a tractor</li> <li>• Do not tow more than one machine in tandem</li> </ul>



1994MN039	State	MN	Agriculture Production	Farm youth dies after tractor he was driving rolled over on him	A 16-year-old male farm laborer died after the <b>tractor</b> he was operating <b>overturned</b> . He died on-site of pulmonary edema and congestion.	<ul style="list-style-type: none"> <li>• Ensure tractors have a rollover protective structure and seatbelt</li> <li>• Maintain safe speeds when operating a tractor</li> <li>• Do not allow extra passengers on machinery</li> </ul>
1994MN030	State	MN	Agriculture Production	Farm youth dies after being crushed by a "run away" chopper wagon	A 13-year-old male farm laborer died after being <b>struck by</b> a rolling chopper wagon. The victim, after noticing that the recently disconnected wagon was rolling uncontrolled toward a garage, was attempting to pick up the wagon hitch to steer it when he was stuck by the wagon. He died at the hospital on arrival of massive chest injuries.	<ul style="list-style-type: none"> <li>• Do not attach quick-release hitch ropes to a fixed point on tractors</li> <li>• Stay clear of vehicles, wagons, and machinery that are moving uncontrolled</li> </ul>
1992WY013	State	WY	Agriculture Production	Shepherd struck by lightning in Wyoming	A 17-year-old male farm laborer died after being struck by <b>lightning</b> . The victim, monitoring sheep during a rain storm, was found under a tree that had been struck by lightning. He died 4 hours after the incident of cardiac arrest due to a lightning strike.	<ul style="list-style-type: none"> <li>• Implement inclement weather procedures</li> <li>• Implement a communication system for use during inclement weather</li> </ul>
1989-46	NIOSH	MI	Agriculture Production	Five family members die after entering manure waste pit on dairy farm, July 26, 1989	A 15-year-old male farm laborer died after entering a manure waste pit that had an <b>oxygen-deficient atmosphere</b> . He died at the hospital 6 hours after the incident of asphyxia due to methane gas exposure.	<ul style="list-style-type: none"> <li>• Mark manure waste pits as confined spaces</li> <li>• Construct manure waste systems to allow for outside maintenance of the pit</li> <li>• Equip manure waste pits with powered ventilation</li> <li>• Follow confined space entry procedures</li> <li>• Cover manure waste pit entrances with a grate to prevent inadvertent entry</li> <li>• Develop plans for confined space rescues</li> </ul>

2004OK046	State	OK	Services	Hispanic youth laborer died after being struck by lightning	A 16-year-old male Hispanic laborer working for a landscape company died after being struck by lightning. The victim was in the bed of a dump truck unloading rocks when lightening stuck. He died at the hospital 11 days after the incident due to lack of oxygen to the brain.	<ul style="list-style-type: none"> <li>• Implement a health and safety plan for workers</li> <li>• Implement inclement weather procedures</li> <li>• Train workers using appropriate literacy levels and languages</li> <li>• Conduct a hazard analysis of worksite conditions</li> </ul>
2004-08	NIOSH	MD	Services	Fifteen-year-old Hispanic youth dies after entering the hopper of a bark blower – Maryland	A 15-year-old male Hispanic laborer working for a landscape company died after becoming entangled in the auger of a bark-blower machine. The victim, part of a crew dispensing landscape mulch, had entered the bark-blower hopper while it was operating. He died on-site of multiple injuries.	<ul style="list-style-type: none"> <li>• Conduct a hazard analysis of machinery</li> <li>• Implement a health and safety plan for workers</li> <li>• Train workers using appropriate literacy levels and languages</li> <li>• Implement an entry plan for confined spaces</li> <li>• Comply with child labor laws</li> <li>• Operate machinery according to manufacturer instructions</li> <li>• Train workers about unsafe behaviors</li> <li>• Maintain close supervision of working youth</li> <li>• Provide access to restroom facilities</li> </ul>

2003OR020	State	OR	Services	Young camp counselor killed when cannon bursts to pieces	A 16-year-old male camp counselor died after being <b>struck by</b> cannon fragments. The victim was attempting to fire the cannon, which was used for flag ceremonies, when it exploded. He died at the hospital 4 days after the incident of head injuries.	<ul style="list-style-type: none"> <li>• Comply with child labor laws which prohibit the operation of cannons or handling of explosives</li> <li>• Implement procedures to address cannon operation</li> <li>• Operate cannons according to manufacturer instructions</li> <li>• Ensure workers complete cannon operation courses</li> <li>• Use solid steel or seamless steel-lined cast-iron cannons</li> <li>• Do not obstruct the bore when operating a cannon</li> <li>• Use correct grade and quantity of black powder for cannons</li> <li>• Inspect cannons regularly</li> <li>• Review cannon operation processes periodically to ensure adherence to safe practices</li> </ul>
2002NJ021	State	NJ	Services	17-year-old pizza delivery driver killed in a motor vehicle accident	A 17-year-old male pizzeria deliverer died in a single-car <b>crash</b> . The victim was driving to a delivery when he lost control of the vehicle. He died at the hospital five hours after the incident of abdominal and head injuries.	<ul style="list-style-type: none"> <li>• Do not allow persons under 18 to drive a motor vehicle</li> <li>• Ensure vehicles are in proper operating condition</li> <li>• Use resources on safety standards and safe work practices</li> </ul>

2001NJ118	State	NJ	Services	15-year-old youth crushed while cleaning a dough mixing machine	A 15-year-old male Hispanic pizzeria laborer died after becoming <b>entangled</b> in the fork of a large, dough mixer. The victim was cleaning the mixer while it was operating when he became entangled in the rotating fork. He died on site of multiple head and neck injuries.	<ul style="list-style-type: none"> <li>• Comply with child labor laws which prohibits the operation or maintenance of power-driven bakery equipment</li> <li>• Maintain machinery according to manufacturer instructions</li> <li>• De-energize machinery before cleaning or maintaining</li> <li>• Conduct a hazard analysis for work activities</li> <li>• Use resources on safety standards and safe work practices</li> </ul>
2001NE026	State	NE	Services	Youth landscaper pinned underneath front end loader	A 16-year-old male laborer working for a landscape company died after the <b>tractor</b> he was operating <b>overturned</b> . He died on-site of asphyxia from compression.	<ul style="list-style-type: none"> <li>• Comply with child labor laws</li> <li>• Ensure tractors have a rollover protective structure and seatbelt</li> <li>• Establish a maintenance program for machinery</li> <li>• Ensure operators complete machinery safety courses</li> <li>• Train workers on task performance</li> </ul>
2001-13	NIOSH	CO	Services	Fourteen-year-old rental equipment worker dies from asphyxiation after becoming entangled in an electric chain hoist – Colorado	A 14-year-old male working at an equipment rental company died after becoming <b>entangled</b> in an electric chain hoist that he was operating without a load. He died at the hospital 6 days after the incident of asphyxia by hanging.	<ul style="list-style-type: none"> <li>• Maintain close supervision of working youth</li> <li>• Train workers about unsafe behaviors</li> <li>• Assign age-appropriate tasks to youth</li> <li>• Place return chain containers on chain hoists</li> </ul>
2000WI080	State	WI	Services	Youth camp counselor dies of carbon monoxide poisoning	A 15-year-old male camp counselor died after being <b>overexposed to carbon monoxide</b> from a cabin furnace that malfunctioned while he was sleeping. He died on-site of carbon monoxide poisoning.	<ul style="list-style-type: none"> <li>• Install and maintain appliances to prevent carbon monoxide buildup</li> <li>• Implement a schedule to ensure expert inspection of appliances</li> <li>• Install carbon monoxide detectors</li> </ul>

2000WI012	State	WI	Services	Youth restaurant cashier shot to death during attempted robbery	A 16-year-old female cashier working for a restaurant died after being <b>shot</b> in the face during an armed robbery attempt. She died at the hospital on arrival of gunshot injuries.	<ul style="list-style-type: none"> <li>• Implement a violence prevention program</li> <li>• Arrange for post-incident treatment of victimized employees</li> </ul>
2000MA050	State	MA	Services	Youth killed while driving golf cart at country club – Massachusetts	A 16-year-old male laborer working for a country club died after the <b>golf cart</b> he was operating <b>collided</b> with a deck. He died at the hospital on arrival of blunt chest injuries.	<ul style="list-style-type: none"> <li>• Do not allow persons under 16 to operate motorized vehicles</li> <li>• Assign age-appropriate tasks to youth</li> <li>• Comply with child labor laws</li> <li>• Implement a health and safety plan for workers</li> </ul>
2000KY119	State	KY	Services	15-year-old dies in utility golf cart overturn	A 15-year-old male laborer working for a golf course clubhouse died after the utility <b>golf cart</b> he was operating <b>overturned</b> . He died on-site of an intra-cranial hemorrhage.	<ul style="list-style-type: none"> <li>• Do not allow persons under 16 to operate motorized vehicles</li> <li>• Ensure utility golf carts have a rollover protective structure and seatbelt</li> <li>• Post warning signs on machines that should not be operated by persons under 16</li> </ul>
2000-21	NIOSH	FL	Services	Fourteen-year-old youth pulled into operating wood chipper – Florida	A 14-year-old male working with a tree-trimming crew died after becoming <b>entangled</b> in a drum-type wood chipper. The victim was feeding material into the chipper when he was caught by a limb and pulled into the knives. He died on-site of fragmentation.	<ul style="list-style-type: none"> <li>• Maintain close supervision of working youth</li> <li>• Train workers to recognize machinery hazards</li> <li>• Do not allow person under 18 to operate or tend chippers</li> <li>• Use a self-feeding chipper</li> </ul>
2000-17	NIOSH	PA	Services	Seventeen-year-old lifeguard dies after falling into a nearly empty swimming pool – Pennsylvania	A 17-year-old female swimming pool lifeguard died in a <b>fall</b> incident that occurred while preparing a swimming pool for the summer. The victim fell approximately 12 feet from an unsecured diving board into a nearly empty pool. She died at the hospital 3 days after the incident of blunt force injuries to the head.	<ul style="list-style-type: none"> <li>• Conduct a hazard analysis for pool maintenance activities</li> <li>• Use set procedures to eliminate or minimize exposures to hazards</li> <li>• Train workers to recognize hazards</li> </ul>

2000-14	NIOSH	CT	Services	Sixteen-year-old mechanic's assistant dies after being run over by the rear wheels of a tub grinder – Connecticut	A 16-year-old male mechanic assistant working for a wood-waste company died after being <b>run over</b> by a trailer-mounted grinder. The victim was under the trailer making repairs when the truck operator pulled the trailer forward. He died on-site from blunt force injuries to the chest.	<ul style="list-style-type: none"> <li>• Use set procedures for vehicle repair</li> <li>• Train workers to recognize hazards</li> <li>• Train workers on task performance</li> <li>• Comply with child labor laws</li> </ul>
2000-08	NIOSH	PA	Services	Seventeen-year-old window washer dies after falling 180 feet due to a rigging anchor failure – Pennsylvania	A 17-year-old male window washer died in a <b>fall</b> incident that occurred while cleaning windows at a 20-story condominium complex. The victim fell approximately 180 feet to the concrete below when his rigging anchors failed. He died at the hospital on arrival of multiple blunt force injuries.	<ul style="list-style-type: none"> <li>• Use a separate, independent fall arrest system when using a descent control device</li> <li>• Assign a competent person to assess anchor points prior to use</li> <li>• Train workers on task performance</li> <li>• Operate descent control devices according to manufacturer instructions</li> </ul>
2000-04	NIOSH	PA	Services	Fourteen-year-old laborer dies after a stored piece of hoisting apparatus fell on him at an automobile repossession yard – Pennsylvania	A 14-year-old male laborer working at an automobile repossession yard died after being <b>crushed by</b> a damaged, out-of-service hoisting apparatus part that fell on him. The victim, who was pulling weeds around the yard, tried to move the 300-pound part when it fell and pinned him. He died on-site of a cranial hinge fracture.	<ul style="list-style-type: none"> <li>• Secure out-of-service machinery</li> <li>• Comply with child labor laws</li> <li>• Maintain close supervision of working youth</li> <li>• Implement a health and safety plan for workers</li> </ul>
1999-06	NIOSH	CT	Services	16-year-old ride attendant dies after being caught and dragged by amusement park ride – Connecticut	A 16-year-old ride attendant working at an amusement park died after he was <b>dragged by</b> an operating ride. The victim, who was attempting to board the ride operating at full speed, fell and was dragged across the concrete floor. He died at the hospital 1 day after the incident of blunt force injuries.	<ul style="list-style-type: none"> <li>• Ensure work environment can be monitored</li> <li>• Implement a health and safety plan for workers</li> <li>• Train workers about unsafe behaviors</li> <li>• Encourage workers to report unsafe conditions or practices</li> <li>• Use engineering controls to minimize or eliminate exposures to hazards</li> </ul>

1999-05	NIOSH	OH	Services	15-year-old campground laborer dies after striking a camper trailer hitch while operating a utility vehicle – Ohio	A 15-year-old male laborer working at a campground died after the <b>utility vehicle</b> he was operating <b>collided</b> with the hitch of a fifth-wheel camper. The victim turned the vehicle sharply in front of an unhitched camper and collided with its hitch. He died at the hospital on arrival of blunt force injuries to the chest.	<ul style="list-style-type: none"> <li>• Comply with child labor laws</li> <li>• Operate utility vehicles according to manufacturer instructions</li> <li>• Do not allow persons under 16 to operate motorized vehicles</li> <li>• Use set procedures when performing routine tasks</li> <li>• Implement a health and safety plan for workers</li> <li>• Train workers to recognize hazards</li> </ul>
1998WA113	State	WA	Services	Fifteen-year-old worker falls from roof of building in Washington State	A 15-year-old male laborer working for a building maintenance company died in a <b>fall</b> incident that occurred while assisting a coworker wash exterior windows on a commercial building. The victim fell approximately 40 feet from the roof to the asphalt parking lot below. He died on-site of a skull fracture.	<ul style="list-style-type: none"> <li>• Use safety lines when working on or from a roof</li> <li>• Use counterweights and tie-backs with portable support devices</li> <li>• Attach safety lines and tie-backs to engineered anchorage points</li> <li>• Train workers on task performance</li> <li>• Train workers to recognize hazards</li> <li>• Implement fall-protection plans</li> <li>• Maintain close supervision of inexperienced workers</li> <li>• Comply with child labor laws</li> <li>• Conduct a hazard analysis of worksite conditions and review job requirements</li> <li>• Identify safer methods to conduct high-risk tasks</li> </ul>

1995CO054	State	CO	Services	A car wash employee is electrocuted while working on equipment	A 15-year-old male laborer working for an automated car wash died after being <b>electrocuted</b> by conduit wires that became energized. The victim was removing a disconnected, defective washer motor when he came in contact with wires that were connected to a 460-volt power source, which became energized. He died at an unreported location an unreported time after the incident of acute cardiorespiratory failure due to electrocution.	<ul style="list-style-type: none"> <li>• Deactivate power sources before repairing or adjusting machinery</li> <li>• Implement a health and safety plan for workers</li> <li>• Implement a lock-out/tag-out policy for machinery</li> <li>• Do not allow inexperienced persons to work on machinery</li> </ul>
1992MN009	State	MN	Services	Landscape laborer dies after being struck by the bucket of a Case skid steer loader	A 16-year-old male laborer working for a landscape company died after being <b>struck by</b> the bucket of a skid steer loader. The victim, standing next to the loader that had its bucket raised, fell under and was struck by the bucket as it was being quickly lowered by the operator to stabilize the loader. He died at the hospital an unreported time after the incident of chest injuries.	<ul style="list-style-type: none"> <li>• Ensure machinery operators are proficient before working near ground workers</li> <li>• Train workers to recognize machinery hazards</li> </ul>
1988-35	NIOSH	NC	Services	Assistant pool manager electrocuted in North Carolina, July 25, 1988	A 17-year-old female assistant manager of a swimming pool died after being <b>electrocuted</b> by an electric motor that had a faulty ground. The victim was in the pump room adding chemicals to a mixing drum when she came in contact with the mixer's operating motor. She died at the hospital on arrival of electrocution.	<ul style="list-style-type: none"> <li>• Maintain machinery according to manufacturer instructions</li> <li>• Employ qualified electricians to install circuits</li> <li>• Keep work environment hazard free</li> <li>• Wear appropriate personal protective equipment for tasks</li> </ul>



2007-10	NIOSH	CT	Construction	Seventeen-year-old female laborer falls from residential roof and dies 9 days later – Connecticut	A 17-year-old female construction laborer died in a <b>fall</b> incident that occurred while unloading shingle bundles for a residential roof replacement job. The victim fell approximately 26 feet from a wooden plank at the roof edge to the stone patio below. She died at the hospital 9 days after the incident of blunt force injuries.	<ul style="list-style-type: none"> <li>• Comply with child labor laws</li> <li>• Use fall-protection systems when working at heights</li> <li>• Implement a health and safety plan for workers</li> <li>• Train workers to recognize hazards</li> <li>• Ensure that personnel platforms have safety features</li> <li>• Use a buddy system when transferring roofing materials</li> </ul>
2004-06	NIOSH	SC	Construction	Sixteen-year-old Hispanic youth dies after falling from a job-made elevated work platform during construction – South Carolina	A 16-year-old male Hispanic construction laborer died in a <b>fall</b> from a job-made, elevated, work platform. The victim fell approximately 10 feet, striking his head on a concrete slab. Almost 5 hours after the incident, the victim, who had yet to receive any medical attention, presented at a hospital emergency room. He died at the hospital 6 hours after the incident of head injuries.	<ul style="list-style-type: none"> <li>• Ensure elevated work platforms meet safety requirements</li> <li>• Use fall-protection systems when working at heights</li> <li>• Provide medical services to injured workers</li> <li>• Implement a health and safety plan for workers</li> <li>• Train workers to recognize hazards</li> <li>• Ensure workers complete fall-protection courses</li> <li>• Train workers using appropriate literacy levels and languages</li> <li>• Authenticate worker documentation</li> <li>• Comply with child labor laws</li> <li>• Comply with injury reporting laws</li> <li>• Ensure subcontractors follow best practices regarding worker safety</li> </ul>

2003-07	NIOSH	SC	Construction	Two Hispanic construction laborers (ages 15 and 16) die after trench collapse – South Carolina	A 15- and 16-year-old, both of whom were male Hispanic construction laborers, died in a <b>trench collapse</b> . The victims were part of a crew installing conduit in an 8-foot-deep by 2-foot-wide, unprotected trench. Both died on-site from skull fractures.	<ul style="list-style-type: none"> <li>• Conduct a hazard analysis of worksite conditions</li> <li>• Use protective systems when working in trenches</li> <li>• Implement a health and safety plan for workers</li> <li>• Train workers to recognize hazards</li> <li>• Authenticate worker documentation</li> <li>• Comply with child labor laws</li> <li>• Train workers using appropriate literacy levels and languages</li> <li>• Develop plans for trench rescues</li> <li>• Ensure subcontractors follow best practices regarding worker safety</li> </ul>
2001OK076	State	OK	Construction	A 13-year-old construction laborer died when he fell from a scaffold board and struck a scaffold cross-brace	A 13-year-old male Hispanic construction laborer died in a <b>fall</b> incident that occurred while laying brick at a new residential site. The victim fell approximately 5 feet from a scaffold plank to the dirt below, striking a scaffold brace in mid-fall. He died at the hospital 1 hour after the incident of blunt injury to the abdomen.	<ul style="list-style-type: none"> <li>• Ensure subcontractors follow best practices regarding worker safety</li> <li>• Comply with scaffold erection laws</li> <li>• Develop plans for medical emergency responses</li> <li>• Implement a health and safety plan for workers</li> <li>• Comply with child labor laws</li> </ul>
2001AK027	State	AK	Construction	A 14-year-old laborer crushed under 5-ton beam	A 14-year-old male construction laborer died after being <b>crushed by</b> a 5-ton beam. The victim was using an airbag to lift the beam when it rolled off the bag and pinned him to the ground. He died at the hospital on arrival of crushing blunt force injuries.	<ul style="list-style-type: none"> <li>• Conduct a hazard analysis of worksite conditions</li> <li>• Modify practices to address hazards</li> <li>• Implement a health and safety plan for workers</li> <li>• Conduct a hazard analysis for work activities</li> <li>• Assign age-appropriate tasks to youth</li> <li>• Train workers on task performance</li> </ul>

2001-10	NIOSH	IN	Construction	Seventeen-year-old part-time road construction laborer dies after being run over by a water truck – Indiana	A 17-year-old male road construction laborer died after being <b>run over</b> by a water truck. The victim was walking beside the moving truck checking a gauge when he was run over. He died on-site of blunt force injury to the head.	<ul style="list-style-type: none"> <li>• Use set procedures for working near operating machinery</li> <li>• Implement a health and safety plan for workers</li> <li>• Train workers to recognize machinery hazards</li> <li>• Remove malfunctioning machinery from service</li> <li>• Consult with manufacturers to improve machinery safety</li> </ul>
2001-07	NIOSH	AL	Construction	Fourteen-year-old laborer dies after falling through a skylight – Alabama	A 14-year-old male construction laborer died in a <b>fall</b> incident that occurred while removing existing roofing materials from a flat, commercial roof. The victim fell approximately 12 feet through a skylight to the concrete level below. He died at the hospital 1 day after the incident of head injuries.	<ul style="list-style-type: none"> <li>• Conduct a hazard analysis of worksite conditions</li> <li>• Implement a health and safety plan for workers</li> <li>• Train workers to recognize fall hazards</li> <li>• Consult with regulatory authorities for help on worker safety issues</li> <li>• Ensure subcontractors follow best practices regarding worker safety</li> </ul>
2001-04	NIOSH	FL	Construction	Fifteen-year-old laborer dies after falling through a skylight – Florida	A 15-year-old male construction laborer died in a <b>fall</b> incident that occurred while repairing a flat, commercial roof. The victim fell approximately 24 feet through a skylight to the dirt floor below. He died at the hospital on arrival of multiple injuries.	<ul style="list-style-type: none"> <li>• Conduct a hazard analysis of worksite conditions</li> <li>• Implement a health and safety plan for workers</li> <li>• Train workers to recognize fall hazards</li> <li>• Consult with regulatory authorities for help on worker safety issues</li> </ul>

2000OK037	State	OK	Construction	A 17-year old laborer for a boat dock construction company drowned while attempting to swim approximately 35 yards to shore from a construction barge in Oklahoma	A 17-year-old male laborer working for a boat dock construction company died in a <b>drowning</b> incident that occurred while attempting to swim approximately 35 yards from a barge to the shore of a lake. He died at the hospital on arrival of drowning.	<ul style="list-style-type: none"> <li>• Implement a health and safety plan for workers</li> <li>• Wear a life jacket or buoyant work vest when drowning potential exists</li> </ul>
2000-23	NIOSH	PA	Construction	A 16-year-old roofer helper dies after 28-foot fall down an unguarded elevator shaft opening – Pennsylvania	A 16-year-old male construction laborer died in a <b>fall</b> incident that occurred while cutting and stacking lumber for roof trusses. The victim fell approximately 28 feet through an elevator shaft opening to the dirt floor below. He died at the hospital on arrival of multiple injuries.	<ul style="list-style-type: none"> <li>• Use fall-protection systems when working at heights</li> <li>• Train workers to recognize hazards</li> <li>• Comply with child labor laws</li> </ul>
2000-16	NIOSH	AL	Construction	A 16-year-old died after falling 27 feet at a residential construction site – Alabama	A 16-year-old male construction laborer died in a <b>fall</b> incident that occurred while moving roof trusses at a residential dormitory site. The victim fell approximately 27 feet from an 8-inch wide beam to the dirt floor below. He died at the hospital on arrival of severe blunt force injuries to the head.	<ul style="list-style-type: none"> <li>• Use fall-protection systems when working at heights</li> <li>• Implement a health and safety plan for workers</li> <li>• Train workers to recognize hazards</li> <li>• Train workers using appropriate literacy levels and languages</li> <li>• Comply with child labor laws</li> <li>• Ensure subcontractors follow best practices regarding worker safety</li> </ul>
2000-07	NIOSH	NC	Construction	Three tower painters die after falling 1,200 feet when riding the hoist line – North Carolina	A 16-year-old male construction laborer working for a tower painting company died in a <b>fall</b> incident that occurred while painting a 1,500-foot radio tower. The victim fell approximately 1,200 feet to the ground below when the hoist line, which was being used to raise workers up the tower slipped. He died at the hospital on arrival of massive injuries.	<ul style="list-style-type: none"> <li>• Use hoisting machinery rated for intended use and designed to prevent uncontrolled descent</li> <li>• Comply with tower maintenance and construction laws</li> <li>• Inspect machinery regularly</li> <li>• Use fall-protection systems when working at heights</li> <li>• Comply with child labor laws</li> </ul>

2000-03	NIOSH	MI	Construction	Youth laborer dies in trench collapse – Michigan	A 17-year-old male construction laborer died in a <b>trench collapse</b> . The victim was part of a crew installing a sewer system in an 11-foot-deep by 8-foot-wide, unprotected trench. He died at the hospital 5 hours after the incident of abdominal injuries.	<ul style="list-style-type: none"> <li>• Use protective systems when working in trenches</li> <li>• Comply with child labor laws</li> <li>• Ensure co-employers know worker ages and comply with child labor laws</li> <li>• Establish a worksite system that visibly identifies youth under 18</li> <li>• Assign age-appropriate tasks to youth</li> <li>• Conduct a hazard analysis of worksite conditions</li> <li>• Train workers to recognize hazards</li> <li>• Follow directions of emergency responders who have assumed control of rescue operations</li> </ul>
1999-02	NIOSH	AZ	Construction	Youth dies in trench collapse – Arizona	A 17-year-old male construction laborer died in a <b>trench collapse</b> . The victim was part of a crew installing sewer pipe in a 12-foot-deep by 5-foot-wide, unprotected trench. He died on-site of blunt force injuries.	<ul style="list-style-type: none"> <li>• Comply with child labor laws</li> <li>• Use protective systems when working in trenches</li> <li>• Move machinery that is not in use away from open trenches</li> <li>• Provide trench access and egress systems</li> <li>• Conduct a hazard analysis of worksite conditions</li> <li>• Train workers to recognize hazards</li> </ul>
1998MN044	State	MN	Construction	Laborer dies after being crushed by caterpillar that fell from railroad trestle	A 17-year-old male construction laborer died after being <b>crushed by</b> a track loader that fell on him. The victim was riding outside the cab of a track loader when it fell with him 10 feet from a railroad trestle and landed on top of him. He died on-site of unreported injuries.	<ul style="list-style-type: none"> <li>• Comply with child labor laws</li> <li>• Do not allow extra passengers on machinery</li> <li>• Implement a health and safety plan for workers</li> </ul>

1998-16	NIOSH	KS	Construction	Roofer helper dies after falling 16.5 feet from roof to concrete basement way – Kansas	A 15-year-old male construction laborer died in a <b>fall</b> incident that occurred while removing shingles from a residential roof. The victim, attempting to prevent a bundle of new shingles from sliding off the roof, fell approximately 16 feet from the roof to a concrete basement below. He died at the hospital 1 day after the incident of a closed head injury.	<ul style="list-style-type: none"> <li>• Comply with child labor laws</li> <li>• Use fall-protection systems when working at heights</li> <li>• Implement a health and safety plan for workers</li> <li>• Train workers to recognize hazards</li> <li>• Conduct scheduled and unscheduled worksite safety inspections</li> <li>• Actively participate in workplace safety</li> </ul>
1997MA031	State	MA	Construction	Construction laborer dies in trench cave-in at oil tank removal site in Massachusetts	A 17-year-old male construction laborer died in a <b>trench collapse</b> . The victim was using a gas-powered saw to cut rods off an oil tank in the 12-foot-deep and 8-foot-wide, unprotected trench. He died at the hospital on arrival of head injuries.	<ul style="list-style-type: none"> <li>• Use protective systems when working in trenches</li> <li>• Conduct a hazard analysis of worksite conditions</li> <li>• Comply with child labor laws</li> </ul>
1996-19	NIOSH	TX	Construction	Sixteen-year-old electrical-contractor laborer electrocuted – Texas, June 18, 1996	A 16-year-old male construction laborer died after being <b>electrocuted</b> by an overhead power line. The victim was on the ground coiling a de-energized power line that came in contact with an energized overhead line. He died at the hospital on arrival of electrocution.	<ul style="list-style-type: none"> <li>• Conduct a hazard analysis of worksite conditions</li> <li>• Train workers to recognize hazards</li> <li>• Implement a health and safety plan for workers</li> <li>• Comply with child labor laws</li> </ul>
2004CA007	State	CA	Retail Trade	A youth dies when a forklift rolls over on him	A 17-year-old male Hispanic laborer working for a feed store died after the <b>forklift</b> he was operating <b>overturned</b> . He died at the hospital an unreported time after the incident of compression injuries to the chest.	<ul style="list-style-type: none"> <li>• Do not allow persons under 18 to operate forklifts</li> <li>• Implement a system to restrict access to forklifts</li> <li>• Post warning signs on machines that should not be operated by persons under 18</li> <li>• Provide orientation and safety training prior to workers beginning work</li> </ul>

2004-03	NIOSH	TN	Retail Trade	Seventeen-year-old high school student working as a warehouse laborer in work-based learning program dies after forklift tips over and crushes him – Tennessee	A 17-year-old male laborer working for an agricultural cooperative died after the forklift he was operating overturned. The victim was employed through his high school's work-based learning program. He died at the hospital 1 hour after the incident of severe chest injuries.	<ul style="list-style-type: none"> <li>• Wear a seatbelt when operating a forklift</li> <li>• Identify safe routes for forklift travel</li> <li>• Comply with child labor laws</li> <li>• Implement a health and safety plan for workers</li> <li>• Train workers to recognize hazards</li> <li>• Ensure operators complete forklift safety courses</li> <li>• Post warning signs on machines that should not be operated by persons under 18</li> </ul>
2003WI020	State	WI	Retail Trade	Youth newspaper carrier dies after being struck by an automobile while delivering newspapers on a bicycle	A 12-year-old male newspaper carrier died after being struck by a vehicle while delivering his route from a bicycle. He died at the hospital 1 day after the incident of head injuries.	<ul style="list-style-type: none"> <li>• Wear a helmet when riding a bicycle</li> <li>• Conduct regular safety training for workers</li> <li>• Train workers on bicycle safety</li> </ul>
2003MA034	State	MA	Retail Trade	Youth killed while operating a forklift at a plumbing supply company	A 16-year-old male stock clerk working for a plumbing supply store died after the forklift he was operating overturned. He died at the hospital on arrival of blunt force abdominal injuries.	<ul style="list-style-type: none"> <li>• Maintain close supervision of working youth</li> <li>• Comply with child labor laws</li> <li>• Restrict access to forklift keys</li> <li>• Implement a health and safety plan for workers</li> <li>• Ensure operators complete forklift safety courses</li> <li>• Post warning signs on machines that should not be operated by persons under 18</li> </ul>

2000WI106	State	WI	Retail Trade	Youth newspaper delivery assistant dies in motor vehicle collision	A 17-year-old male laborer working for a newspaper carrier died in a two-car <b>crash</b> . The victim, assisting with newspaper delivery, was a front-seat passenger in a vehicle that caught fire after being struck from behind by another vehicle. He died on-site of thermal burn injuries.	<ul style="list-style-type: none"> <li>• Install high-visibility, flashing lights on slowly moving, frequently stopping vehicles</li> <li>• Train workers on vehicle safety features</li> <li>• Train workers in safe driving practices</li> </ul>
2000WI048	State	WI	Retail Trade	Youth newspaper delivery person killed when he fell out of the open door of a minivan and was run over	A 9-year-old male laborer working for a newspaper carrier died after being <b>run over</b> by a minivan. The victim, assisting with newspaper delivery, was seated in the back of a moving minivan with the door partially open when he fell from and was run over by the vehicle. He died at the hospital 1 day after the incident of multiple injuries.	<ul style="list-style-type: none"> <li>• Keep doors of a moving vehicle closed and locked</li> <li>• Comply with child labor laws</li> </ul>
2000-19	NIOSH	NY	Retail Trade	Sixteen-year-old produce-market worker dies from crushing injuries after being caught in a vertical down-stroke baler – New York	A 16-year-old male produce store laborer died after being <b>caught by</b> the hydraulic ram of a vertical down-stroke baling machine. The victim was crushing cardboard boxes when he reached into the compression chamber and was caught by the downward-moving ram. He died on-site of multiple injuries due to compression.	<ul style="list-style-type: none"> <li>• Repair damaged machinery components</li> <li>• Train workers on machinery safety features</li> <li>• Comply with child labor laws</li> <li>• Implement a health and safety plan for workers</li> </ul>
2000-09	NIOSH	OH	Retail Trade	Sixteen-year-old laborer at a building supply center crushed by forklift that tipped over – Ohio	A 16-year-old male laborer working at a building supply store died after the <b>forklift</b> he was operating <b>overturned</b> . He died at the hospital on arrival of crushing injuries.	<ul style="list-style-type: none"> <li>• Ensure operators complete forklift safety courses</li> <li>• Wear a seatbelt when operating a forklift</li> <li>• Comply with child labor laws</li> </ul>



1995IA021	State	IA	Retail Trade	Youth falls from ladder and dies while changing light bulb – Iowa	A 17-year-old male laborer working for a building supply store died in a <b>fall</b> incident that occurred while changing a light bulb. The victim fell approximately 18 feet from a ladder to the tiled floor below. He died at the hospital on arrival from massive head injuries.	<ul style="list-style-type: none"> <li>• Implement procedures for changing light bulbs</li> <li>• Do not allow unqualified workers to change light bulbs</li> <li>• Train workers on task performance</li> <li>• Access high elevations using aerial platforms or similar devices</li> <li>• De-energize fixtures before changing light bulbs</li> <li>• Use tools designed for electrical work when changing light bulbs</li> <li>• Do not perform unassigned work</li> </ul>
1994MA016	State	MA	Retail Trade	Massachusetts newspaper girl dies after being struck by a jeep while delivering her route from a bicycle	A 12-year-old female newspaper carrier died after being <b>struck by</b> a vehicle while delivering her route from a bicycle. She died at the hospital 1 hour after the incident of head injuries.	<ul style="list-style-type: none"> <li>• Wear a helmet when riding a bicycle</li> <li>• Consider traffic patterns and carrier safety when making delivery route assignments</li> <li>• Conduct regular safety training for workers</li> </ul>
1994MA008	State	MA	Retail Trade	Massachusetts newspaper boy dies when struck by a van while crossing the street on his bicycle	A 14-year-old male newspaper carrier died after being <b>struck by</b> a vehicle while delivering his route from a bicycle. He died at the hospital 2 days after the incident of brain injuries.	<ul style="list-style-type: none"> <li>• Wear a helmet when riding a bicycle</li> <li>• Locate newspaper drop-off points away from high traffic areas</li> <li>• Do not wear a hood when riding a bicycle</li> <li>• Conduct regular safety training for workers</li> <li>• Ensure managers complete safety training courses</li> <li>• Include a safety clause in worker agreements</li> </ul>
1992CA017	State	CA	Retail Trade	Courtesy clerk at grocery store falls from a ladder and dies in California	A 17-year-old male courtesy clerk working for a grocery store died in a <b>fall</b> incident that occurred while moving a ladder to its storage place. The victim fell approximately 8 feet from the ladder to the concrete floor below. He died at the hospital 5 days after the incident of cerebral injuries.	<ul style="list-style-type: none"> <li>• Train workers on ladder safety</li> <li>• Install non-slip devices on the top and bottom of ladders</li> <li>• Implement procedures for equipment storage</li> <li>• Train managers on basic first aid</li> </ul>

2005CA005	State	CA	Manufacturing	A 17-year-old Hispanic laborer died when crushed by concrete and stone castings	A 17-year-old male Hispanic laborer working for a concrete/stone product manufacturing plant died after being <b>crushed by</b> falling castings. The victim was guiding a forklift operator when a nearby pallet of castings collapsed, causing the castings to fall. He died at the hospital an unreported time after the incident of blunt force injuries to the head.	<ul style="list-style-type: none"> <li>• Use pallets designed to support material weight</li> <li>• Train workers on task performance</li> <li>• Comply with child labor laws</li> </ul>
2005-05	NIOSH	TN	Manufacturing	Hispanic youth dies in densifier at a plastics recycling plant – Tennessee	A 14-year-old male Hispanic laborer working for a plastics processing plant died after coming <b>in contact</b> with the blade of a densifier, a large machine that shreds/grinds plastic bags into a recyclable product. The victim had entered the densifier, apparently to remove a blockage, when the machine became energized. He died on-site of multiple injuries.	<ul style="list-style-type: none"> <li>• Implement a lock-out/tag-out policy for machinery</li> <li>• Inspect machinery regularly</li> <li>• Remove malfunctioning machinery from service</li> <li>• Implement a health and safety plan for workers</li> <li>• Implement an entry plan for confined spaces</li> <li>• Train workers to recognize hazards</li> <li>• Train workers in task performance</li> <li>• Train workers using appropriate literacy levels and languages</li> <li>• Post warning signs in languages understood by workers</li> <li>• Post warning signs at confined space entrances</li> <li>• Retrofit machinery and surrounding areas with barriers to prevent inadvertent entry</li> <li>• Comply with child labor laws</li> </ul>

2000MO063	State	MO	Manufacturing	Child laborer electrocuted while working at sawmill in Missouri	A 16-year-old male laborer working for a sawmill operation died after being <b>electrocuted</b> by an outdoor electric saw that was improperly grounded. The victim was cleaning the non-operating saw, which was plugged into 440-volt power source, when he came in contact with the saw's metal frame. He died at the hospital 4 hours after the incident of electrocution.	<ul style="list-style-type: none"> <li>• Properly install and ground machinery</li> <li>• Inspect machinery regularly</li> <li>• Comply with child labor laws</li> <li>• Implement a health and safety plan for workers</li> </ul>
2000MA058	State	MA	Manufacturing	Massachusetts youth killed while operating forklift at seafood processing facility	A 16-year-old male laborer working for a seafood processing facility died after the <b>forklift</b> he was operating <b>overturned</b> . He died at the hospital 1 day after the incident of crushing injuries to the chest and abdomen.	<ul style="list-style-type: none"> <li>• Comply with child labor laws</li> <li>• Ensure operators complete forklift safety courses</li> <li>• Maintain close supervision of working youth</li> <li>• Implement a health and safety plan for workers</li> </ul>
2000-22	NIOSH	NY	Manufacturing	Seventeen-year-old laborer at salvage lumber operation crushed by forklift that tipped over – New York	A 17-year-old male laborer working at a salvage lumber operation died after the <b>forklift</b> he was operating <b>overturned</b> . He died at the hospital on arrival of severe blunt force injury to the head.	<ul style="list-style-type: none"> <li>• Ensure operators complete forklift safety courses</li> <li>• Ensure forklifts are equipped with operator restraint systems</li> <li>• Do not allow extra passengers on forklifts</li> <li>• Comply with child labor laws</li> </ul>
1998WI074	State	WI	Manufacturing	Youth worker dies after being pinned under tractor at a food processing plant	A 14-year-old male laborer working for a food processing plant died after being <b>crushed by</b> a tractor that rolled on him. The victim turned off the tractor he had been operating and was attempting to push it out of some mud when the tractor rolled on him. He died in the hospital 1 day after the incident of asphyxia.	<ul style="list-style-type: none"> <li>• Shift tractor into park, set brakes, and turn off the engine before dismounting</li> <li>• Comply with child labor laws</li> <li>• Train workers to recognize hazards</li> <li>• Train workers on task performance</li> </ul>

1996MA031	State	MA	Manufacturing	Construction laborer crushed by unattended rolling street sweeper at asphalt plant in Massachusetts	A 13-year-old male laborer working for an asphalt plant died after being <b>run over</b> by an unattended street sweeper. The victim was walking away from the parked, unattended sweeper when it began to roll down the slightly inclined road. He died at the hospital on arrival of a fractured/dislocated cervical spine.	<ul style="list-style-type: none"> <li>• Remove malfunctioning machinery from service</li> <li>• Ensure operators complete machinery safety courses</li> <li>• Implement a health and safety plan for workers</li> <li>• Conduct a hazard analysis of worksite conditions</li> <li>• Do not allow youth under 16 on industrial or construction worksites</li> </ul>
1994CO006	State	CO	Manufacturing	17-year-old worker at a plastic products manufacturing plant died as a result of an overexposure to tetrachloroethylene	A 17-year-old male laborer working for a plastic products manufacturing plant died after being <b>overexposed to tetrachloroethylene</b> . The victim was using 4 ounces of tetrachloroethylene on a cloth rag to clean the interior surface of a metal mold used in forming 40-gallon containers. He died on-site an unreported time after the incident of asphyxia due to toxic fume exposure.	<ul style="list-style-type: none"> <li>• Use less toxic cleaning chemicals</li> <li>• Use proper tools for task performance</li> <li>• Implement a health and safety plan for workers</li> </ul>
1986-32	NIOSH	NC	Manufacturing	General laborer electrocuted in North Carolina	A 17-year-old male laborer working at a pickle manufacturing plant died after being <b>electrocuted</b> by 440-volt power cord that had a faulty splice. The victim was walking across a brine-saturated platform when he stepped on the cord, which was plugged into a pole-mounted power box. He died on-site of electrocution.	<ul style="list-style-type: none"> <li>• Implement a preventive maintenance program for machinery</li> <li>• Train workers to recognize hazards</li> </ul>
1986-27	NIOSH	OH	Manufacturing	Part-time laborer electrocuted in Ohio	A 17-year-old male laborer working for a manufacturing company died after being <b>electrocuted</b> when the metal scraper he was carrying contacted a 7,200-volt power line. The victim was on the facility roof cleaning smoke stacks when his 13-foot-long scraper contacted the overhead power line. He died on-site of electrocution.	<ul style="list-style-type: none"> <li>• Evaluate safety programs regularly</li> <li>• Comply with new regulations even when grandfather clauses exist</li> <li>• Conduct a hazard analysis for work activities</li> </ul>

2003WA039	State	WA	Wholesale Trade	A 16-year-old worker dies when struck by a portable gantry crane used as an engine hoist in Washington State	A 16-year-old male laborer working at an automobile recycling company died after being <b>struck by</b> a portable crane. The victim was struck in the back of his head by the crane's support arm when the crane overturned after it had rolled into a shallow depression. He died on-site of a skull fracture.	<ul style="list-style-type: none"> <li>• Use machinery certified for task performance</li> <li>• Operate machinery according to manufacturer instructions</li> <li>• Understand and control worksite conditions for crane lifts and travel</li> <li>• Use portable cranes on surfaces that can support lift and travel capabilities</li> <li>• Ensure operators complete crane safety courses</li> <li>• Train workers to recognize crane hazards</li> <li>• Maintain close supervision of working youth</li> </ul>
2002-02	NIOSH	AZ	Wholesale Trade	Seventeen-year-old warehouse laborer dies after the forklift he was operating tipped over and crushed him – Arizona	A 17-year-old male laborer working for an insulation wholesale company died after the <b>forklift</b> he was operating <b>overturned</b> . He died at the hospital less than 1 hour after the incident of blunt force injuries to the chest/neck and asphyxia.	<ul style="list-style-type: none"> <li>• Comply with child labor laws</li> <li>• Implement a health and safety plan for workers</li> <li>• Train workers to recognize hazards</li> <li>• Ensure operators complete forklift safety courses</li> <li>• Post warning signs on machines that should not be operated by persons under 18</li> <li>• Restrict access to forklift keys</li> </ul>
2001WI002	State	WI	Other	Youth reserve recruit killed in automobile collision while traveling on duty	A 17-year-old male Marine Reserve recruit died in a two-car <b>crash</b> . The victim, traveling to a reserve training meeting, was a front-seat passenger in a vehicle that went out of control and collided with another vehicle. He died on-site of a fracture to the cervical vertebra.	<ul style="list-style-type: none"> <li>• Implement inclement weather procedures</li> <li>• Postpone nonessential travel during hazardous conditions</li> <li>• Consult with regulatory authorities for help on young worker issues</li> <li>• Train workers on vehicle safety features</li> <li>• Train workers in safe driving practices</li> </ul>

1992-32	NIOSH	AK	Other	Commercial fisherman drowned after fishing vessel capsized – Alaska, August 31, 1992	A 16-year-old male commercial fisherman died in a <b>drowning</b> incident that occurred after he was trapped under his fishing vessel that had capsized while under tow. He died on-site of drowning.	<ul style="list-style-type: none"> <li>• Obtain training in vessel stability</li> <li>• Maintain a constant watch during towing operations</li> <li>• Wear personal flotation devices during towing operations</li> <li>• Implement a preventive maintenance program for vessels</li> <li>• Remove nonessential personnel from vessels being towed</li> </ul>
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## Appendix D: Bibliography of NIOSH-authored Articles and Documents

Presented here, chronologically from most recent, are articles and documents related to young worker safety and health that were authored or coauthored by NIOSH researchers. Included with each reference is a brief product description and identification of the product's primary audience. Note that this bibliography excludes NIOSH and State Fatality Assessment and Control Evaluation (FACE) reports, which are presented elsewhere in this document.

Reference	Description (type shown in red)	Primary Audience
NIOSH [2015]. Youth@Work—talking safety: giving youth work readiness skills to keep them safe and healthy. Cincinnati, OH: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 2015-110, <a href="http://www.cdc.gov/niosh/docs/2015-110/pdfs/2015-110.pdf">www.cdc.gov/niosh/docs/2015-110/pdfs/2015-110.pdf</a> .	<b>Pamphlet</b> (tri-fold) describing the NIOSH Youth@Work curriculum.	Educators
NIOSH [2015]. Youth@Work—talking safety: a safety & health curriculum for young workers, {state, District of Columbia, U.S. territory} edition. Cincinnati, OH: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 2015-{121–124, 126–174}, <a href="http://www.cdc.gov/niosh/talkingsafety/">www.cdc.gov/niosh/talkingsafety/</a> .	<b>Curriculum</b> (304-page) providing occupational safety and health lessons for youth. A total of 53 publications customized for each state, District of Columbia, Puerto Rico, and U.S. Virgin Islands.	Educators
NIOSH, ASSE [2015]. Overlapping vulnerabilities: the occupational health and safety of young immigrant workers in small construction firms. By Flynn MA, Cunningham TR, Guerin RJ, Keller B, Chapman LJ, Hudson D, Salgado C. Cincinnati, OH: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 2015-178, <a href="http://www.cdc.gov/niosh/docs/2015-178/pdfs/2015-178.pdf">www.cdc.gov/niosh/docs/2015-178/pdfs/2015-178.pdf</a> .	<b>Document</b> (40-page) exploring trends, risk factors, and prevention efforts related to vulnerable groups of construction workers.	Health and safety specialists
Hard DL [2014]. Youth injury on farms: a complex problem. <i>J Adolesc Health</i> 54(3):243–244.	<b>Journal editorial</b> (2-page) discussing the complexities of keeping youth safe in the farming environment.	Researchers
NIOSH [2013]. Work-related motor vehicle crashes: preventing injuries to young drivers - what employers should know. By Pratt SG, Rodríguez-Acosta RL. Morgantown, WV: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 2013-153, <a href="http://www.cdc.gov/niosh/docs/2013-153/pdfs/2013-153.pdf">www.cdc.gov/niosh/docs/2013-153/pdfs/2013-153.pdf</a> .	<b>Fact sheet</b> (8-page) providing guidance on keeping young workers safe when they drive for work.	Employers

NIOSH [2013]. Work-related motor vehicle crashes: preventing injuries to young drivers—what parents should know. By Pratt SG, Rodríguez-Acosta RL. Morgantown, WV: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 2013-152, <a href="http://www.cdc.gov/niosh/docs/2013-152/pdfs/2013-152.pdf">www.cdc.gov/niosh/docs/2013-152/pdfs/2013-152.pdf</a> .	<b>Fact sheet</b> (5-page) providing guidance on keeping young workers safe when they drive for work.	Parents
NIOSH [2013]. Health and safety of young workers: proceedings of a U.S. and Canadian series of symposia. By Runyan CW, Lewko J, Rauscher K, Castillo D, Brandspigel S. Morgantown, WV: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 2013-144, <a href="http://www.cdc.gov/niosh/docs/2013-144/pdfs/2013-144.pdf">www.cdc.gov/niosh/docs/2013-144/pdfs/2013-144.pdf</a> .	<b>Proceedings</b> (218-page) presenting information from a series of symposia focused on young workers that took place between 2007 and 2010.	Researchers
NIOSH [2012]. Are you a working teen? Cincinnati, OH: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 2012-130, <a href="http://www.cdc.gov/niosh/docs/2012-130/pdfs/2012-130.pdf">www.cdc.gov/niosh/docs/2012-130/pdfs/2012-130.pdf</a> . Available in Spanish at <a href="http://www.cdc.gov/spanish/niosh/docs/2012-130_sp/">www.cdc.gov/spanish/niosh/docs/2012-130_sp/</a> .	<b>Booklet</b> (5-page) discussing teen worker rights, hazard recognition, and work hours.	Young workers
Waters TR [2012]. Ergonomics in design: interventions for youth working in the agricultural industry. <i>Theor Issues Ergon Sci</i> 13(2)(II):270–285.	<b>Journal article</b> (15-page) describing musculoskeletal disorders in farm youth.	Researchers
Waters TR, Davis KG, Kotowski SE [2012]. Ergonomics in the agricultural industry. In: Bhattacharya A, McGlothlin JD, eds. <i>Occupational ergonomics: theory and applications</i> . 2nd ed. Boca Raton, FL: CRC Press, pp. 695–719.	<b>Book chapter</b> (24-page) discussing ergonomics for farm workers, including youth.	Health and safety specialists
NIOSH [2011]. A story of impact: guidelines for children’s agricultural tasks demonstrates effectiveness. Cincinnati, OH: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 2011-129, <a href="http://www.cdc.gov/niosh/docs/2011-129/pdfs/2011-129.pdf">www.cdc.gov/niosh/docs/2011-129/pdfs/2011-129.pdf</a> .	<b>Fact sheet</b> (2-page) describing the impact of the NIOSH-supported effort to develop the North American Guidelines for Children’s Agricultural Tasks.	Stakeholders
Castillo DN [2011]. Parents: an under-realized resource for protecting working adolescents (editorial). <i>J Adolesc Health</i> 49(1):5–6.	<b>Journal editorial</b> (1-page) discussing parental roles in young worker safety.	Researchers
Hendricks KJ, Goldcamp EM [2010]. Injury surveillance for youth on farms in the U.S., 2006. <i>J Agric Saf Health</i> 16(4):279–291.	<b>Journal article</b> (12-page) presenting injury statistics for farm youth.	Researchers
NIOSH [2011]. Evaluating teen farmworker education: an evaluation of a high school ESL health and safety curriculum. Cincinnati, OH: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 2011-113, <a href="http://www.cdc.gov/niosh/docs/2011-113/pdfs/2011-113.pdf">www.cdc.gov/niosh/docs/2011-113/pdfs/2011-113.pdf</a> .	<b>Fact sheet</b> (2-page) describing the impact of a NIOSH-supported evaluation of a school-based English as a Second Language (ESL) Curriculum.	Stakeholders



Waters TR, Garg A [2010]. Two-dimensional biomechanical model for estimating strength of youth and adolescents for manual material handling tasks. <i>Appl Ergon</i> 41(1):1–7.	<b>Journal article</b> (6-page) presenting a model to assess if a task is appropriate for youth.	Researchers
Layne LA, Goldcamp EM, Myers JR, Hendricks KJ [2009]. Youth living on Hispanic-operated farms: injuries and population estimates in the U.S., 2000. <i>J Agric Saf Health</i> 15(4):377–388.	<b>Journal article</b> (11-page) presenting injury statistics for youth on Hispanic-operated farms.	Researchers
CDC [2010]. Occupational injuries and deaths among younger workers—United States, 1998–2007. <i>MMWR</i> 59(15):449–455.	<b>Report article</b> (6-page) presenting injury statistics for young workers.	Researchers
Hendricks KJ, Hendricks SA [2010]. Changing farm injury trends by sex for youth living on U.S. farms, 1998–2006. <i>J Rural Health</i> 26(2):182–188.	<b>Journal article</b> (6-page) presenting injury trend statistics for farm youth.	Researchers
NIOSH [2009]. Injuries to youth on farms and safety recommendations, U.S. 2006. Cincinnati, OH: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 2009-117, <a href="http://www.cdc.gov/niosh/docs/2009-117/pdfs/2009-117.pdf">www.cdc.gov/niosh/docs/2009-117/pdfs/2009-117.pdf</a> .	<b>Pamphlet</b> (tri-fold) describing farm risks and providing prevention recommendations for farm youth.	Farm operators
Morata TC [2009]. The risk of hearing loss in young adults. <i>Commun Ear Hear Health</i> 6(9):2–4.	<b>Journal article</b> (2-page) describing hearing loss risks for young adults.	Practitioners
Kotowski SE, Davis KG, Waters TR [2009]. Investigation of select ergonomic interventions for farm youth, part 1: shovels. <i>J Agromed</i> 19(1):33–43.	<b>Journal article</b> (10-page) presenting results from an ergonomic intervention evaluation for farm youth.	Researchers
Kotowski SE, Davis KG, Waters TR [2009]. Investigation of select ergonomic interventions for farm youth, part 2: wheelbarrows. <i>J Agromed</i> 19(1):44–57.	<b>Journal article</b> (13-page) presenting results from an ergonomic intervention evaluation for farm youth.	Researchers
Bhattacharya A, Watts NB, Gordon J, Shukla R, Waters T, Bartels S, Coleman R [2008]. Bone quantity and quality of youths working on a farm—a pilot study. <i>J Agromed</i> 12(4):27–38.	<b>Journal article</b> (11-page) presenting results from a bone study of farm youth.	Researchers
Syاملal G, Mazurek JM [2008]. Prevalence of asthma among youth on Hispanic-operated farms in the United States, 2000. <i>J Agromed</i> 13(3):155–164.	<b>Journal article</b> (9-page) presenting asthma statistics for youth on Hispanic-operated farms.	Researchers
FedNet, NASDAF [2007]. Can you dig it? Washington, DC: Federal Network for Young Worker Safety and Health (FedNet) and National Association of State Departments of Agriculture Foundation (NASDAF), <a href="http://www.epa.gov/pesticides/health/can-u-digit.pdf">www.epa.gov/pesticides/health/can-u-digit.pdf</a> . Available in Spanish at <a href="http://www.epa.gov/pesticides/health/canudigit-spanish.pdf">www.epa.gov/pesticides/health/canudigit-spanish.pdf</a> .	<b>Pamphlet</b> (tri-fold) discussing child labor laws, workplace hazards, and young worker rights.	Young workers

NIOSH [2007]. Injuries to youth on Hispanic farm operations, 2003. Cincinnati, OH: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 2007-162, <a href="http://www.cdc.gov/niosh/docs/2007-162/pdfs/2007-162.pdf">www.cdc.gov/niosh/docs/2007-162/pdfs/2007-162.pdf</a> .	<b>Pamphlet</b> (tri-fold) describing farm risks and providing prevention recommendations for youth on Hispanic-operated farms.	Farm operators
NIOSH [2007]. Injuries to youth on racial minority farm operations, 2003. Cincinnati, OH: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 2007-163, <a href="http://www.cdc.gov/niosh/docs/2007-163/pdfs/2007-163.pdf">www.cdc.gov/niosh/docs/2007-163/pdfs/2007-163.pdf</a> .	<b>Pamphlet</b> (tri-fold) describing farm risks and providing prevention recommendations for youth on racial minority-operated farms.	Farm operators
Allread WG, Waters TR [2007]. Interventions to reduce low-back injury risk among youth who perform feed handling and scooping tasks on farms. <i>J Agric Saf Health</i> 13(4):375–393.	<b>Journal article</b> (18-page) presenting results from an ergonomic intervention evaluation for farm youth.	Researchers
NIOSH [2007]. School chemistry laboratory safety guide. By Brundage P, Palassis J. Cincinnati, OH: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 2007-107, <a href="http://www.cdc.gov/niosh/docs/2007-107/pdfs/2007-107.pdf">www.cdc.gov/niosh/docs/2007-107/pdfs/2007-107.pdf</a> .	<b>Document</b> (86-page) presenting guidelines for laboratory safety in schools.	Educators
NIOSH [2007]. Injuries to youth on U.S. farm operations - 2004. Cincinnati, OH: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 2007-161, <a href="http://www.cdc.gov/niosh/docs/2007-161/pdfs/2007-161.pdf">www.cdc.gov/niosh/docs/2007-161/pdfs/2007-161.pdf</a> .	<b>Pamphlet</b> (tri-fold) describing farm risks and providing prevention recommendations for farm youth.	Farm operators
Waters TR [2007]. Preventing work-related musculoskeletal disorders for youth working on farms. In: Lueder R, Berg Rice VJ, eds. <i>Ergonomics for children: designing products and places for toddlers to teens</i> . Boca Raton, FL: CRC Press, pp. 623–650.	<b>Book chapter</b> (27-page) discussing the prevention of work-related musculoskeletal disorders for farm youth.	Health and safety specialists
Goldcamp EM, Hendricks KJ, Layne LA, Myers JR [2007]. Nonfatal injuries to household youth on Native American operated farms in the U.S., 2000. <i>J Agromed</i> 11(3/4):61–69.	<b>Journal article</b> (8-page) presenting injury statistics for youth on Native American-operated farms.	Researchers
Goldcamp EM, Hendricks KJ, Layne LA, Myers JR [2006]. Nonfatal injuries to household youth on racial minority-operated farms in the U.S., 2000. <i>J Agric Saf Health</i> 12(4):315–324.	<b>Journal article</b> (9-page) presenting injury statistics for youth on racial minority-operated farms.	Researchers

Hard DL, Myers JR [2006]. Fatal work-related injuries in the agriculture production sector among youth in the United States, 1992-2002. <i>J Agromed</i> 11(2):57–65.	<b>Journal article</b> (8-page) presenting fatality statistics for farm youth.	Researchers
NIOSH [2006]. Injury and asthma among youth less than 20 years of age on minority farm operations in the United States, 2000: volume II: Hispanic national data. By Myers JR, Hendricks KJ, Layne LA, Goldcamp EM. Cincinnati, OH: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 2006-109, <a href="http://www.cdc.gov/niosh/docs/2006-109/pdfs/2006-109.pdf">www.cdc.gov/niosh/docs/2006-109/pdfs/2006-109.pdf</a> .	<b>Document</b> (127-page) presenting injury, asthma, and population statistics for youth on Hispanic-operated farms.	Researchers
NIOSH [2005]. Injury and asthma among youth less than 20 years of age on minority farm operations in the United States, 2000: volume I: racial minority national data. By Myers JR, Hendricks KJ, Goldcamp EM, Layne LA. Cincinnati, OH: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 2005-147, <a href="http://www.cdc.gov/niosh/docs/2005-147/pdfs/2005-147.pdf">www.cdc.gov/niosh/docs/2005-147/pdfs/2005-147.pdf</a> .	<b>Document</b> (289-page) presenting injury, asthma, and population statistics for youth on racial minority-operated farms.	Researchers
Hendricks KJ, Myers JR, Layne LA, Goldcamp EM [2005]. Household youth on minority operated farms in the United States, 2000: exposures to and injuries from work, horses, ATVs and tractors. <i>J Saf Res</i> 36(2):149–157.	<b>Journal article</b> (8-page) presenting injury and exposure statistics for youth living on farms.	Researchers
Hendricks KJ, Layne LA, Goldcamp EM, Myers JR [2005]. Injuries to youth living on U.S. farms in 2001 with comparison to 1998. <i>J Agromed</i> 10(4):19–26.	<b>Journal article</b> (7-page) presenting injury statistics for youth living on farms.	Researchers
Palassis J, Geraci C, Stephenson CM [2005]. Promoting students' and young workers' health and safety by NIOSH/CDC and other U.S. organizations. <i>The Global Occupational Health Network (GOHNET) Newsletter</i> 9:4–6.	<b>Newsletter article</b> (2-page) describing NIOSH efforts to address young worker safety and health.	Health and safety specialists
NIOSH [2005]. Working together for safety: a state team approach to preventing occupational injuries in young people. By Posner M. Cincinnati, OH: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 2005-134, <a href="http://www.cdc.gov/niosh/docs/2005-134/pdfs/2005-134.pdf">www.cdc.gov/niosh/docs/2005-134/pdfs/2005-134.pdf</a> .	<b>Document</b> (52-page) discussing the value of working collaboratively to address young worker safety and health.	Stakeholders
NIOSH [2004]. Injuries among youth on farms, 2001. Cincinnati, OH: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 2004-172, <a href="http://www.cdc.gov/niosh/docs/2004-172/pdfs/2004-172.pdf">www.cdc.gov/niosh/docs/2004-172/pdfs/2004-172.pdf</a> .	<b>Pamphlet</b> (tri-fold) describing farm risks and providing prevention recommendations for farm youth.	Farm operators
Higgins DN, Teirney J, Lins M, Hanrahan L [2004]. School nurses: a resource for young worker safety. <i>J Sch Nurs</i> 20(6):317–323.	<b>Journal article</b> (6-page) discussing school nurse roles in young worker safety.	Practitioners

Allread WG, Wilkins JR III, Waters TR, Marras WS [2004]. Physical demands and low-back injury risk among children and adolescents working on farms. <i>J Agric Saf Health</i> 10(4):255–272.	<b>Journal article</b> (17-page) describing back injury risk to farm youth.	Researchers
NIOSH [2004]. NIOSH safety checklist program for schools and other databases. By Palassis J. Cincinnati, OH: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 2004-101, <a href="http://www.cdc.gov/niosh/docs/2004-101/">www.cdc.gov/niosh/docs/2004-101/</a> . Available in and Spanish at <a href="http://www.cdc.gov/spanish/niosh/docs/2004-101_sp/">www.cdc.gov/spanish/niosh/docs/2004-101_sp/</a> .	<b>Website</b> presenting guidelines for safe classrooms, shops, and labs.	Educators
NIOSH [2004]. Injuries to youth on Hispanic farm operations. Cincinnati, OH: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 2004-157, <a href="http://www.cdc.gov/niosh/docs/2004-157/pdfs/2004-157.pdf">www.cdc.gov/niosh/docs/2004-157/pdfs/2004-157.pdf</a> . Available in and Spanish at <a href="http://www.cdc.gov/spanish/niosh/docs/2004-157_sp/">www.cdc.gov/spanish/niosh/docs/2004-157_sp/</a> .	<b>Pamphlet</b> (tri-fold) describing farm risks and providing prevention recommendations for youth on Hispanic-operated farms.	Farm operators
NIOSH [2004]. Asthma among household youth on Hispanic farm operations. Cincinnati, OH: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 2004-158, <a href="http://www.cdc.gov/niosh/docs/2004-158/pdfs/2004-158.pdf">www.cdc.gov/niosh/docs/2004-158/pdfs/2004-158.pdf</a> . Available in Spanish at <a href="http://www.cdc.gov/spanish/niosh/docs/2004-158_sp/">www.cdc.gov/spanish/niosh/docs/2004-158_sp/</a> .	<b>Pamphlet</b> (tri-fold) describing asthma risks and providing prevention recommendations for youth on Hispanic-operated farms.	Farm operators
NIOSH [2004]. Injuries to youth on minority farm operations. Cincinnati, OH: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 2004-117, <a href="http://www.cdc.gov/niosh/docs/2004-117/pdfs/2004-117.pdf">www.cdc.gov/niosh/docs/2004-117/pdfs/2004-117.pdf</a> .	<b>Pamphlet</b> (tri-fold) describing farm risks and providing prevention recommendations for youth on minority-operated farms.	Farm operators
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Hendricks KJ, Goldcamp EM, Myers JR [2004]. On-farm falls among youth less than 20 years old in the U.S. <i>J Agric Saf Health</i> 10(1):27–38.	<b>Journal article</b> (11-page) presenting statistics on fall incidents among farm youth.	Researchers
Brevard TA, Calvert GM, Blondell JM, Mehler LN [2003]. Acute occupational disinfectant-related illness among youth, 1993-1998. <i>Environ Health Perspect</i> 111(13):1654–1659.	<b>Journal article</b> (5-page) describing illnesses to young workers due to disinfectant exposures.	Researchers
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Mardis AL, Pratt SG [2003]. Nonfatal injuries to young workers in the retail trades and services industries in 1998. <i>J Occup Environ Med</i> 45(3):316–323.	<b>Journal article</b> (7-page) describing injuries to youth working in retail trades and services industries.	Researchers
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<p>NIOSH [1997]. Hazard controls: control of scrap paper baler crushing hazards. Cincinnati, OH: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 97-113, <a href="http://www.cdc.gov/niosh/docs/hazardcontrol/pdfs/hc14.pdf">www.cdc.gov/niosh/docs/hazardcontrol/pdfs/hc14.pdf</a>.</p>	<p><b>Document</b> (4-page) presenting information on a child labor law amendment that allows some youth to operate and maintain paper balers.</p>	<p>Employers</p>
<p>CDC [1996]. Work-related injuries and illnesses associated with child labor—United States, 1993. <i>MMWR</i> 45(22):464–468.</p>	<p><b>Report article</b> (4-page) presenting injury and illness statistics for young workers.</p>	<p>Researchers</p>

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