

Fatal Occupational Injuries in Massachusetts

1991 - 1999

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Preface

It is not possible to issue a report on work-related fatalities at this time without acknowledging the overwhelming number of people who died at work in the recent terrorists attacks. The events of September 11th have brought a heightened and painful awareness of the tragedy wrought when loved ones leave for work never to return home. These and the subsequent fatalities of media and postal workers due to anthrax exposures in the workplace have fostered new appreciation for the contribution of workers in all walks of life.

This report tells the less dramatic but likewise painful story of individuals who have been fatally injured on the job – not in a single event but in events that occur day in and day out. It is the story of workers who have died trying to get their jobs done – of fishers who provide us with the food we eat, of carpenters who build the homes we live in, of convenience store workers who work through the night, of firefighters, police, and other first responders who routinely put their lives on the line for the greater public good. The hazards faced by these workers should not simply be accepted as part of the job. The more we know about the circumstances under which workers have been fatally injured, the better able we are to prevent similar fatalities in the future.

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Executive Summary

Work-related fatalities are a significant public health problem in Massachusetts, as they are in the United States. Information about the occupations, industries and circumstances in which these fatalities occur is essential to guide efforts to prevent future fatalities. Since 1991, the Massachusetts Department of Public Health has collected information on all fatal occupational injuries in the Commonwealth as part of the national Census of Fatal Occupational Injuries, conducted in cooperation with the Bureau of Labor Statistics in the U.S. Department of Labor. This report provides a comprehensive overview of fatal occupational injuries in Massachusetts during 1991-1999. It includes a comparison of the occupational fatality experience in Massachusetts with that of the nation as a whole. It also includes more detailed findings on three specific topics: falls to lower levels, work-related homicides, and fishing-related fatalities. Findings are intended to guide the many players – government agencies, employers, unions, safety professionals, advocacy organizations, researchers, job trainers, and equipment design engineers - who have important roles to play in preventing fatal injuries at work.

Key findings:

Overview

- A total of 633 workers died as a result of fatal occupational injuries sustained in Massachusetts during 1991-1999 – an average of between one and two workers each week.
- The annual average fatality rate was 2.3 fatalities per 100,000 workers. There was no clear-cut trend in fatality rates over the nine-year period (Chart 1).

Gender, Age, Race, and Hispanic Origin

- The great majority of victims (93%) were male, and male workers had a much higher rate of fatal occupational injury than female workers (Chart 2).
- The rate of fatal occupational injury increased markedly with the age of the workers (Chart 3).
- Workers of Hispanic origin (regardless of race) had a high rate of fatal occupational injury compared to black and white workers (Chart 4).
- Foreign-born workers accounted for a high proportion of fatal injuries among workers of color and made up a disproportionate share of the victims of workplace homicide.

Industries, Occupations, and Fatal Events

- Agriculture (excluding Fishing and Forestry) had the highest fatal occupational injury rate, more than five times the average rate for all industry divisions (Chart 5). Two thirds of the 35 fatalities in this industry division involved workers employed in landscaping and horticultural services.
- The Construction industry division had both a high number of fatal injuries (136) and the second highest fatal occupational injury rate. More than half of the construction workers fatally injured on the job died as a result of falls.
- The Farming, Forestry and Fishing occupation group had the highest fatality rate, more than thirteen times the average rate for all occupations. Most of the workers in this group (57 of 95) were fishers. Commercial fishing claimed more lives than any other single occupation (Chart 6).

- Fatal occupational injuries due to transportation-related incidents - including land, water, and air transport incidents - lead all event categories. Within this category, highway motor vehicle incidents and water vehicle incidents were the most frequent events resulting in 84 and 51 fatalities respectively.
- Falls to lower levels was the leading single fatal event in Massachusetts, accounting for 118 fatalities (Table1).

Sector, Establishment Size and Investigations by the Occupational Safety and Health Administration

- A total of 69 government employees died on the job.
- Self-employed workers had a higher occupational fatality rate (more than twice) than wage and salary workers.
- Small establishments (with 19 or fewer employees) had a high fatal occupational injury rate, more than one and a half times the average rate for establishments of all sizes (Chart 7).
- More than 60% of the occupational fatalities were not inspected by OSHA because; a) they did not fall under OHSA's jurisdiction; or b) they resulted from events that are not routinely investigated by the agency; or c) death occurred more than 30 days after the injury (Chart 8).

Falls to Lower Levels

- Most fatal falls to lower levels (61%, 72 fatalities) occurred in the construction industry division and two-thirds of these occurred in small establishments with 10 or fewer employees (Chart 11).
- The fatal fall rate in construction was as high as sixteen times the average fatal fall rate for all industries (Table 6).
- Older workers had a six-fold increased risk of fatal falls to lower levels compared to workers of all age groups (Chart 13).

Work-related Homicides

- Work-related homicide was the third leading fatal event, accounting for 82 fatalities.
- Work-related homicides were concentrated in a small number of industries and occupations (Chart 14).
- Male workers had a higher rate of workplace homicide than female workers.
- Homicide was the leading fatal event among black and Hispanic workers.
- Robbery was the leading precipitating circumstance, where motive was known, of work-related homicides (Chart 15).
- Workplace homicides are more likely to result from shooting than non-workplace homicide.

Fishing

- Most work-related fishing fatalities occurred as a result of sinking or capsizing of fishing vessels (Chart 16).

- Most (61%) fishing fatalities occurred during fall and winter seasons (Chart 17).

Comparison with national occupational fatality experience

- Massachusetts had lower annual fatal occupational injury rates than the nation for each year of the period under consideration (Chart 9). The rate difference was in part explained by the difference in the occupation composition and industry mix of the labor force between Massachusetts and the nation. Low homicide and motor vehicle related death rates in Massachusetts have also contributed to the low fatal injury rate of the state.
- Falls accounted for a much higher proportion (21%) of work-related fatal injuries in Massachusetts than in the nation (11%) (Appendix 2).

Introduction

Although the risk of dying on the job in the United States has declined since 1980¹, fatal occupational injuries continue to be a significant public health problem in Massachusetts as they are in the country as a whole. From 1991 through 1999, 633 workers died as a result of injuries sustained while at work in the Commonwealth. These fatalities were all the more tragic because they were largely preventable. Information about the circumstances in which workers were fatally injured on the job is essential to design and target efforts to prevent future fatalities.

This report provides a comprehensive overview of fatal occupational injuries in Massachusetts from 1991 to 1999. Although the Massachusetts Department of Public Health published an annual report on fatal injuries at work each year during this period, the numbers from these individual years were too small for meaningful analysis of categories of interest. Nine years of data, however, allow for a more detailed understanding of the factors associated with workplace fatalities in Massachusetts.

This report is based on data collected under two separate but complementary federal programs. The comprehensive surveillance of all fatal occupational injuries sustained in Massachusetts is conducted as part of the national Census of Fatal Occupational Injuries (CFOI), supported by the U.S. Department of Labor, Bureau of Labor Statistics. On-site investigations of selected fatalities are carried out as part of the Fatality Assessment and Control Evaluation (FACE) program sponsored by the National Institute for Occupational Safety and Health. Both of these programs are carried out in Massachusetts by the Occupational Health Surveillance Program of the Massachusetts Department of Public Health.

Section I of this report provides an overview of work-related fatalities in Massachusetts during the nine-year period. Section II compares the occupational fatality experience in Massachusetts with that of the nation. Section III includes more detailed findings on three special topics: falls to lower levels, homicides, and fishing-related fatalities. Case examples based on FACE investigations are included throughout the report. This resource document is intended to guide the many parties – government agencies, employers, unions, safety professionals and advocacy organizations, researchers, job trainers, product design engineers, and architects – who have a role to play in preventing fatal injuries at work.

¹Fatal Injuries to Civilian Workers in the United States, 1980-1995: National and State Profiles, Health and Human Services, Centers for DiseaseControl and Prevention, National Institute for Occupational Safety and Health, July 2001.

Methods

Definition of Fatal Occupational Injuries

A fatal occupational injury is defined as a death resulting from traumatic injury or other external cause that occurred while the person was at work. This definition includes fatalities due to acute exposure to toxic chemicals or physical agents as well as lack of such essentials as heat or oxygen. Examples include those events traditionally linked with factors in the work environment such as falls, electrocutions, and crushings, as well as homicides and suicides at work and motor vehicle fatalities that occur while travelling on the job. The CFOI and FACE programs do not include injuries that occur while commuting to or from work. Deaths caused by occupational illness and most fatal heart attacks are also excluded.

Included in this report are all fatal occupational injuries that occurred in Massachusetts while the victims were working or traveling for work in the state regardless of their state of residence, state of death, or state of origin of travel. The count does not include, however, fatal injuries that occurred in other states but death occurred in Massachusetts.

Fatal occupational injuries that occurred in the ocean are included in the count if (according to the CFOI criteria), either the injury occurred within the 200-miles offshore economic zone of the United States and is more proximal to Massachusetts than other states or a death certificate was issued by the state of Massachusetts. Fatal injuries that occurred beyond the 200-mile offshore economic zone of the U.S. are excluded.

Definition of Work-relatedness

For an injury to be considered work-related, the victim must have been working at the time of the event (or traveling as part of his employment) and engaged in a legal activity. Victims may have been either employed by others or self-employed, and they may have been employed for wage and salary compensation or have been volunteers working without pay or other compensation.

Sources of Data

Data on fatal occupational injuries in Massachusetts are from the Census of Fatal Occupational Injuries (CFOI) carried out by the Occupational Health Surveillance Program (OHSP) in the Massachusetts Department of Public Health. The Department has collected occupational fatality data under the CFOI program since 1991. Data on occupational fatalities throughout the United States are from the national CFOI reports published by the U.S. Bureau of Labor Statistics (BLS).

CFOI uses multiple data sources to identify and document work-related fatalities. The main sources are death certificates, Workers' Compensation records, newspapers, FARS (Fatality Accident Reporting System) reports, OSHA records, and Coast Guard reports. Other available federal and state administrative records are also used. In some cases, employers are contacted through follow-up questionnaires to obtain additional information. These records are used to compile a complete and accurate count of fatal injuries at work in a given year. For assurance of an accurate count of fatal occupational injuries, CFOI requires that the work relationship be substantiated by two or more independent sources.

Coding

Information on each fatal occupational injury is coded for different variables using different coding systems. Categorical analyses of fatal injuries by industry, occupation and event are based on the classifications of these coding systems.

Industry: Industry is the type of establishment or business in which a fatally-injured worker was employed at the time of the injury. Information is obtained from different source documents and is coded according to the *Standard Industrial Classification Manual*, Office of Management and Budget 1987 (Appendix 8).

Occupation: Occupation is the type of occupation that a fatally-injured worker assumed at the time of his/her injury. It is coded according to the *Occupational Injuries and Illnesses Occupation Coding Manual* (Adopted from the Bureau of Census 1990 *Alphabetical Index of Industries and Occupations*), 1993, Bureau of Labor Statistics, U.S. Department of Labor (Appendix 9).

Event/Exposure, Nature of Injury, Body Part Affected and Source of Injury: were coded according to *Occupational Injury and Illness Classification Manual*, 1992, BLS (Appendix 10).

Other variables: Other variables such as age, race, gender, establishment size, and ownership are coded according to the BLS, *Census of Fatal Occupational Injuries State Operating Manual*, March 1996.

Fatality Rates

Fatality rates are defined as the number of fatalities due to traumatic occupational injuries per 100,000 Massachusetts workers. Unless otherwise noted in this document, the average annual fatality rates for the nine-year period are reported. These were computed as: (a) the sum of the number of fatalities over the nine-year period, divided by (b) the sum of the number of workers employed in Massachusetts each year over the nine-year period, multiplied by (c) 100,000. For some rates, employment data from 1995 (the midyear of the study period) were used as the denominator. Information about the number of workers was obtained from the Current Population Survey (CPS) conducted by the Bureau of Labor Statistics, except where noted. Fatalities involving youth less than 16 years old were excluded from all rate calculations because employment data from the CPS are limited to workers 16 years and older. Due to lack of industry-specific data for self-employed workers, fatalities among self-employed workers (except for Agriculture) were excluded from industry-specific rate computations. Some of the rates presented in this report are based on small numbers of fatalities and should be interpreted with caution.

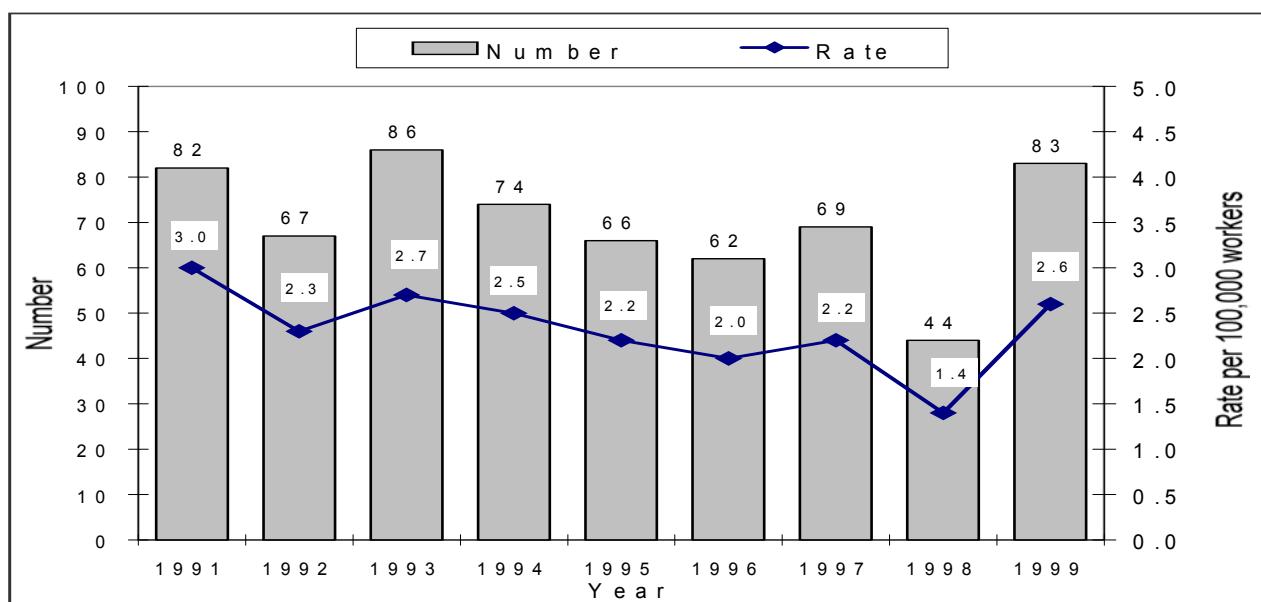
Rates indicate the probability or risk of a worker being fatally injured on the job within a year. Numbers are the count of workers who die from work-related injuries. In a large industry, many workers may be fatally injured but the rate may be low. Conversely, in a small but high-risk industry, the number of workers fatally injured may be small but the rate or risk may be high. Both rates and numbers should be taken into account when targeting prevention efforts.

1. Fatal Occupational Injuries in Massachusetts

1.1 Overview

- A total of 633 workers suffered fatal injuries at work from 1991 through 1999, an average of 70 fatalities a year, more than one worker death each week (1.3 fatalities per week).
- The average annual occupational fatality rate for the nine-year period was 2.3 fatalities per 100,000 civilian workers.
- The average age² at death was 42.4 years. These fatalities resulted in an average 33 years of potential life lost for each death (number of years before the victim reached age 75) and for a total of 20,724 years of potential life lost over the nine-year period.
- The number of work-related fatalities and fatality rates in Massachusetts fluctuated over time (Chart 1). Except for 1998, the annual number of fatalities ranged between 62 and 86 and the annual fatality rate between 2.0 and 3.0 fatalities per 100,000 workers. The lowest number of fatalities was observed in 1998 and the highest in 1993.

Chart 1. Number and Rate of Fatal Occupational Injuries by Year, Massachusetts, 1991-1999 (N=633)



A 16-year-old male part-time cleaning helper was fatally injured at a seafood processing/retail facility when the forklift he was operating overturned. The victim was operating the forklift to move a wooden pallet loaded with trash. The load was raised approximately 4 ½ feet when the victim made a right-hand turn causing the forklift to overturn. When the forklift overturned, the Falling Object Protective Structure (FOPS) of the forklift struck him in the chest. He was transported to a hospital where he died the next day from his injuries.

In order to prevent similar incidents, the Massachusetts FACE program recommended that employers should: 1) comply with federal and state child labor laws that prohibit youth less than 18-years-old from operating forklifts; 2) train all forklift operators in safe operating procedures; 3) provide adequate supervision for young workers, new

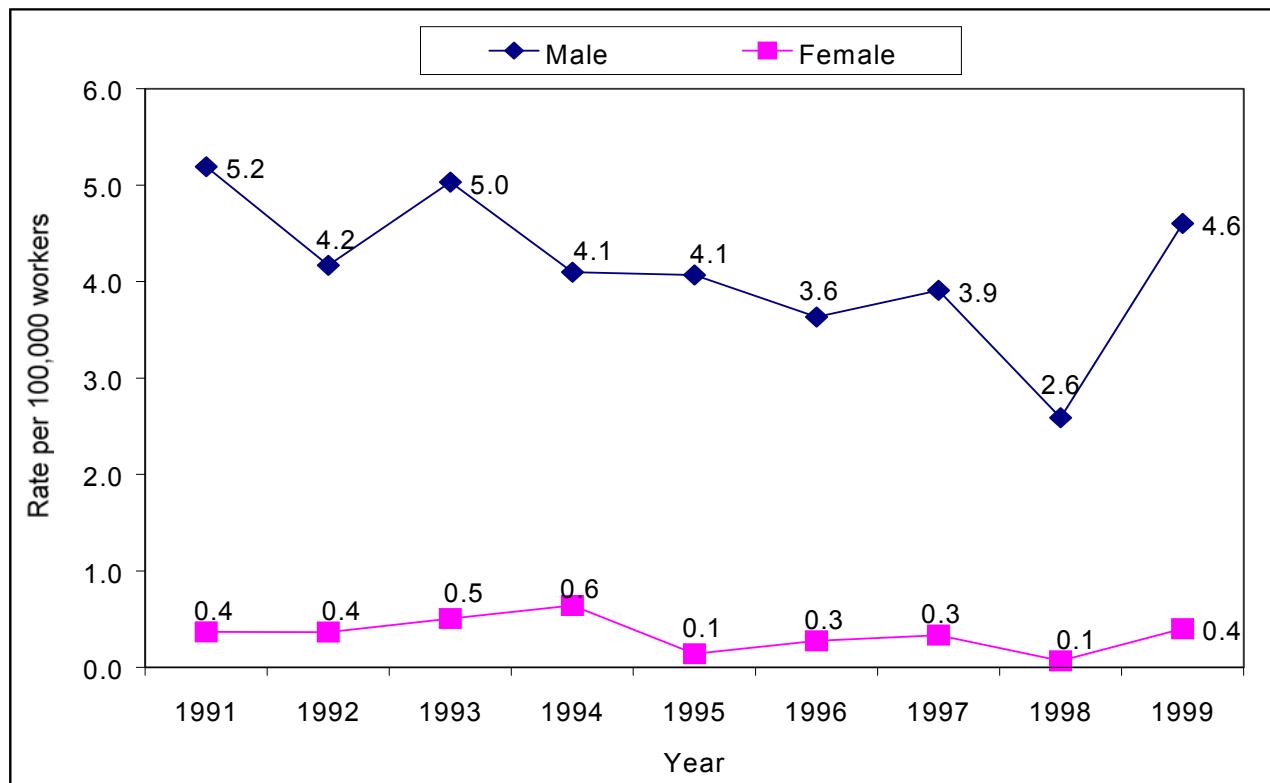
²Age Information was not available for 5 fatalities.

employees, and any inexperienced workers; and 4) develop, implement, and enforce a written comprehensive health and safety program (Massachusetts FACE report, 00MA058).

1.2 Gender

- The great majority (589 workers, 93%) of workers who died due to work-related injuries were men. Female workers accounted for the remaining 44 fatalities (7%).
- The fatal occupational injury rates for male workers were much higher than the rates for female workers for all the years under consideration (Chart 2). The average annual fatal occupational injury rate for the nine-year study period for men was 4.1 fatalities per 100,000 workers, more than thirteen times the rate for women (0.3 per 100,000). These findings are consistent with findings at the national level.
- The difference in fatality rates for men and women is likely in large part due to the fact that more men are employed in high-risk occupations. For example, in 1999, proportionately more men (18%) than women (3%) were employed in two occupation groups with high fatality rates: Farming, Forestry & Fishing occupations and Operators, Fabricators and Laborers. Conversely, 75% of female workers compared to 52% of male workers were employed in two occupation groups with low fatality rates: Managerial & Professional Specialty occupations and Technical, Sales and Administrative Support occupations.
- Fatal events varied by gender. Highway transportation incidents (16 fatalities, 36%) and homicide (12 fatalities, 27%) were the two leading events for female workers, accounting for 63% of all female fatalities. In contrast, fall to a lower level was the leading event among men (114 fatalities, 20%) followed by homicide (70 fatalities, 12%), and highway transportation incidents (68 fatalities, 12%).

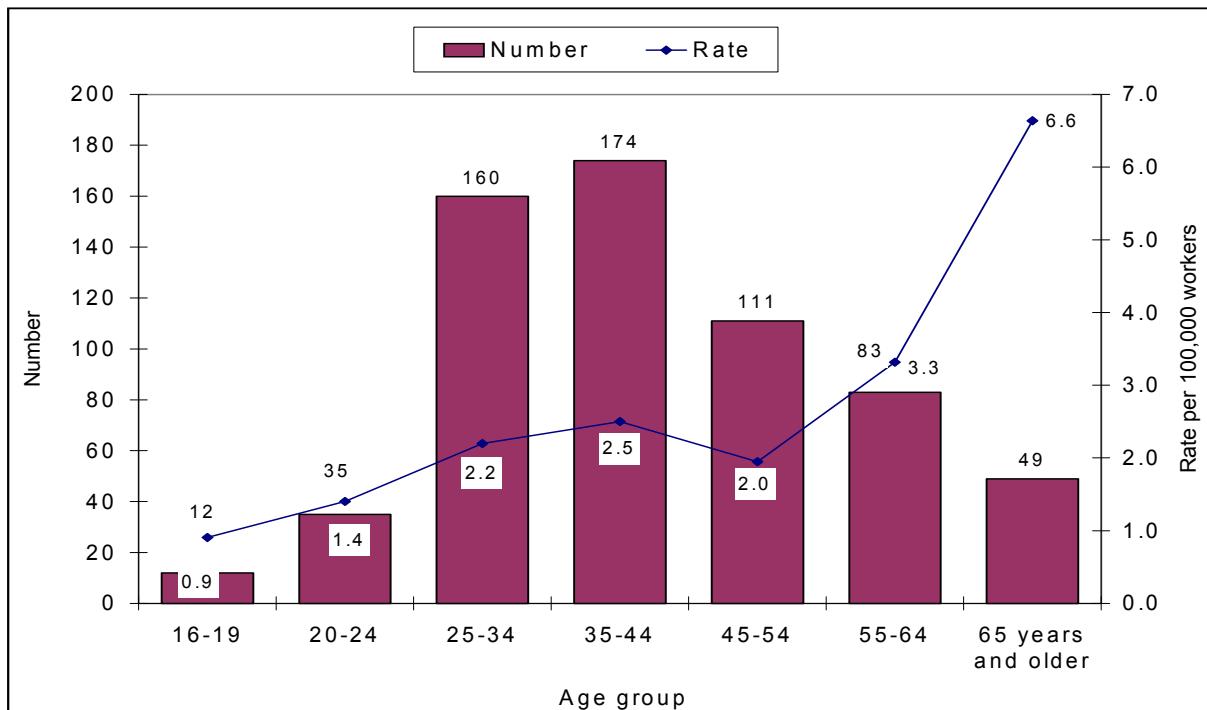
Chart 2. **Rate of Fatal Occupational Injuries by Gender, Massachusetts, 1991-1999**



1.3 Age

- The average age at death for the nine-year period was 42.4 years, with a range of 9 to 85 years. Most workers (398 fatalities, 63%) who were fatally injured on the job were 45 years old or younger.
- Six workers (1%) were less than 18 years of age. These included: 3 newspaper carriers who were struck by vehicles while delivering papers; a teen worker who was fatally injured when a trench collapsed on him; a teen worker who was crushed by a street sweeper; and another teen worker who committed suicide while at work.
- Forty-nine victims (8%) were 65 years of age or older, and the risk of being fatally injured on the job increased markedly with age (Chart 3). A similar age trend is seen in the national data.³
- Fatality rates calculated using number of workers employed underestimate the risks faced by both older (greater than 64 years) and younger (less than 18 years) workers. Workers in both these age groups are more likely to be employed part-time; therefore their rates are higher when actual total work hours are taken into account.⁴
- Fatal events varied by age. Forty-nine percent of the workers 65 years or older (24 fatalities) died as a result of falls compared to 19% (109 fatalities) of workers less than 65 years old (Appendix 8).

Chart 3. Number and Rates of Fatal Occupational Injuries by Age Group, Massachusetts, 1991-1999 (N=624)



NOTE: Employment data for 1995 from the Current Population Survey was used for rate computation. Four fatal injuries were excluded because victims were younger than 16 years. Another 5 fatalities were excluded due to lack of age information.

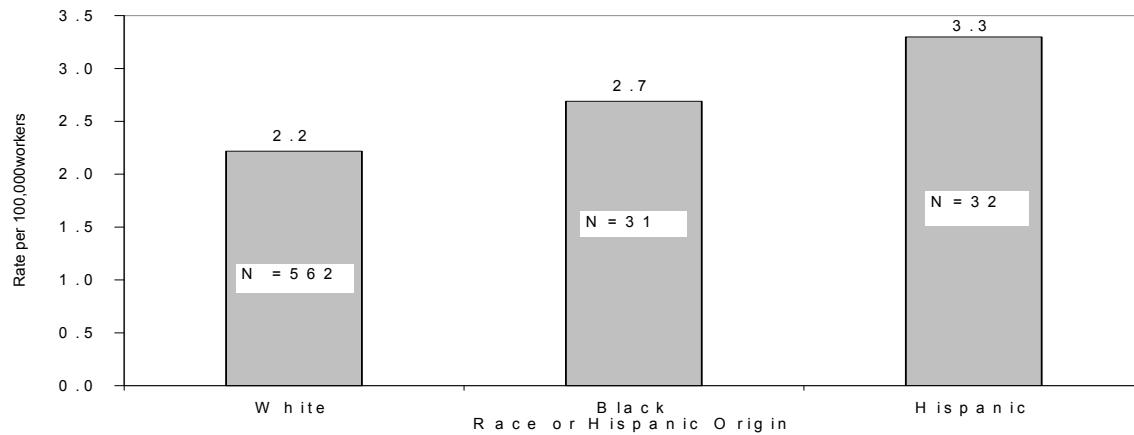
³ U.S. Department of Labor, Bureau of Labor Statistics, Census of Fatal Occupational Injuries, 1991-1999.

⁴ Ruser, J. Denominator Choice in the Calculation of Workplace Fatality Rates, Fatal Workplace Injuries in 1996: A Collection of Data and Analysis, U.S. Department of Labor, Bureau of Labor Statistics, June 1998.

1.4 Race and Hispanic Origin

- Based on data obtained from death certificates for fatally injured workers, 562 workers (89%) were white while 31 (5%) were black and 24 (4%) were of Asian or Pacific Islanders descent. Thirty-two workers (5%) were of Hispanic origin.⁵
- White workers had lower fatal occupational injury rates than other workers. The rate for black workers was 2.7 fatalities per 100,000 workers compared to a rate of 2.2 fatalities per 100,000 for white workers. Workers of Hispanic Origin had the highest rate of fatal injury (3.3 fatalities per 100,000 workers) (Chart 4). Findings are consistent with previous reports that minority workers are disproportionately employed in high-risk jobs.⁶
- Industry divisions in which high numbers of fatal injuries occurred varied by race. A high number of fatal occupational injuries among non-white workers occurred in the Trade industry whereas a high number of white workers lost their lives in the Construction industry.
- Leading fatal events also varied by race and ethnicity of victims. Falls were the leading event among white workers, while homicide was the leading event among black, Asian, Hispanic workers (Appendix 1).

Chart 4. Average Annual Rate of Fatal Occupational Injuries by Race and Hispanic Origin, Massachusetts, 1991-1999



NOTE: The Hispanic employed workforce is reportedly underestimated by 10 %.⁷ The rate is adjusted for this underestimation. The unadjusted rate was 3.7 fatalities per 100,000 workers.

A 40-year old Hispanic male laborer died when he was caught in a ribbon blender at a fish processing plant. The victim and a co-worker had stepped into the empty tank, normally used in the processing of fish gurry, carrying a hose to clean out the tank. When the victim pulled on the hose, it caught on the switch that turned on the machine. The co-worker escaped because he had not completely entered the tank, but the victim was caught in the slowly rotating blades. The machine was shut down immediately and emergency medical services were called to the scene. The victim died in the machine. The victim and the majority of his co-workers spoke Spanish or Portuguese as their only language. The victim had worked for the same company for two months at the time of his death.

In order to prevent similar incidents, Massachusetts FACE recommended that employers should: 1) develop and enforce a comprehensive lockout/tag-out program; and 2) develop and enforce a safety program that includes training for all workers in their commonly spoken language in recognizing and avoiding machinery hazards (Massachusetts FACE report, 98MA035).

⁵ Workers of Hispanic Origin may be of any race.

⁶ Frumkin H, Walker D, Friedman-Jimenez G, Minority Workers and Communities, Occupational Medicine: State of the Art Review, 14(3), 1999.

⁷ McKay, R. Cultural Factors Affecting Within Household Coverage and proxy Reporting in Hispanic Households. A Pilot study. Proceedings of the Section on Survey Research Methods. American Statistical Association. 614-618. 1992.

1.5 Events/Exposures

- Transportation related incidents (including land, water and air transport incidents) led all event categories. During the nine-year period, 221 workers (35% of fatalities) died from work-related transportation incidents. Within this category, highway motor vehicle incidents and water vehicle incidents were the most frequent, resulting in 84 and 51 fatalities respectively. Forty workers were struck by vehicles and 24 died in aircraft crashes (Table 4).
- Falls, the second leading event category, accounted for one-fifth (133 fatalities, 21%) of all fatal occupational injuries. Within this category, fall to lower levels was the single leading event; sixty percent (71 fatalities) of the falls to lower levels occurred in the construction industry division (See Special Topic: Falls to Lower Levels, page 27).
- Assaults and Violent Acts was the third leading event category, accounting for 115 fatalities (18%). Homicide, which is the major single event within this category and the third leading event overall, claimed a total of 82 workers' lives, while suicides and animal attacks accounted for 33 fatalities. In more than two-thirds (68%) of the homicides, firearms were used as a means of assault. Robbery was the primary circumstance in workplace homicides for which information about circumstance was available; 25 out of 51 (49%) of the cases occurred during robbery. (See Special Topic: Work-related Homicide, page 32).
- Contact with objects accounted for the fatalities of 88 workers (14%). Twenty-four victims died after being struck by falling objects such as trees and electrical poles. Another 21 workers died when they were caught in running equipment or machinery. About 61% (54 fatalities) of the 88 fatalities due to contact with objects occurred in the Construction, Manufacturing and Agriculture industries, whereas only 35% of all fatalities occurred in these industries.
- Fifty workers (8%) died from Exposure to Harmful Substances and Environments at their workplaces. Half (25) of them were electrocuted, 15 died from inhaling harmful substances, and 8 died from oxygen deficiency.
- Fires and Explosion events fatally injured 25 workers (4%) during the nine-year period. Fire incidents claimed the lives of 17 workers while 7 workers died from explosions. Ten victims of fire incidents were fire fighters who died in the line of duty due to an injury;⁸ six of them died in a single incident.

A 22-year old male warehouse worker was fatally injured when the forklift truck he was driving tipped over. The victim was driving the truck around the parking lot at the end of a shift after having filled the battery with water. He took a very sharp turn and the three-wheeled forklift truck tipped over. He was not wearing the available seat belt at the time of the incident. He fell from the vehicle and the truck fell on top of him. He had been driving a forklift truck in the warehouse for four years. His training had been completely on-the-job.

In order to prevent similar incidents, FACE recommended that employers: 1) assure that forklift operators are trained in the safe operation of their vehicles; 2) require that operator restraints be used; and 3) develop and implement a comprehensive safety program that includes worker training in recognizing and controlling the hazards of warehouse work (Massachusetts FACE report, 98MA033).

⁸ Firefighters who died in the line of duty from illnesses such as heart attack are not included.

Table 1. Number and Rate of Fatal Occupational Injuries by Event/Exposure, Massachusetts, 1991-1999

Event/Exposure	Number of fatalities	Percent	Rate Per 100,000 Workers
Transportation Incidents	221	35	0.8
<i>Highway motor vehicle incidents</i>	84	13	0.3
<i>Water vehicle incidents</i>	51	8	0.2
<i>Worker struck by vehicle</i>	40	6	0.2
<i>Aircraft crashes</i>	24	4	0.1
Falls	133	21	0.5
<i>Falls to lower levels</i>	118	19	0.4
Assaults and Violent Acts	115	18	0.4
<i>Homicide</i>	82	13	0.3
<i>Suicide</i>	30	5	0.1
Contact with objects	88	14	0.3
<i>Struck by falling object</i>	24	4	0.1
<i>Caught in running equipment or machinery</i>	21	3	0.1
Exposure to Harmful Substances or Environments	50	8	0.2
<i>Electrocution</i>	25	4	0.1
Fires and Explosions	25	4	0.1
Total	633	100	2.3

Table 2. Major Events/Exposures Categories and Events/Exposures with Three or More Occupational Fatalities, Massachusetts, 1991-999

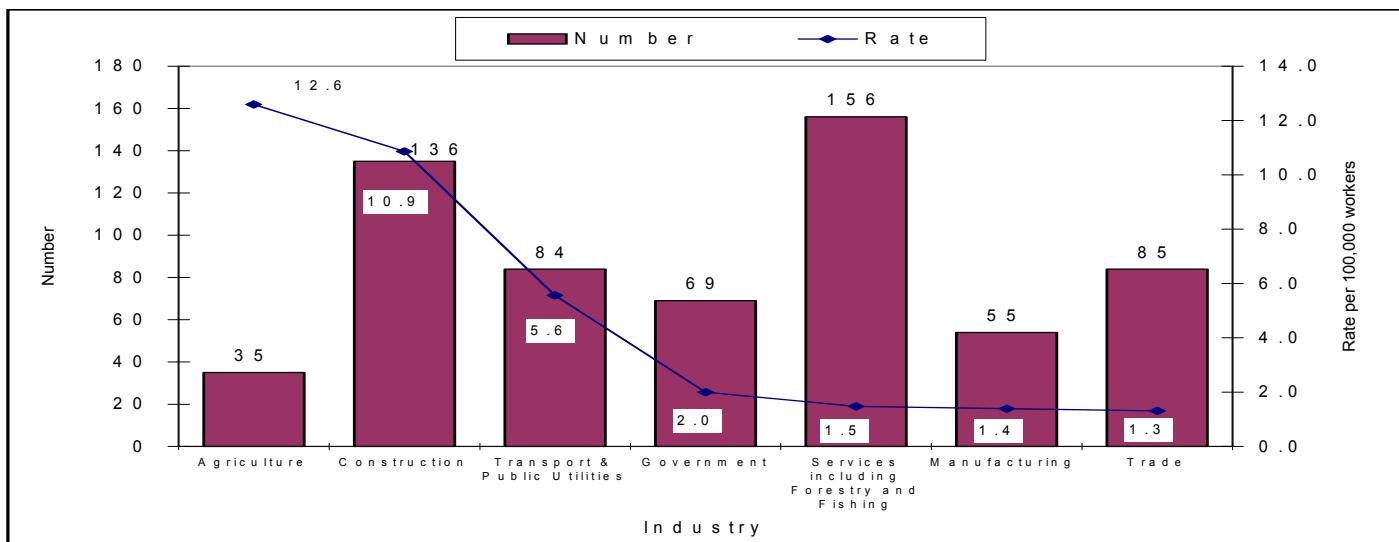
Event/Exposure Category	Events/Exposures with Three or More Occupational Fatalities
Contact with Object or Equipment (88)	Struck by falling objects (24)- [<i>trees (10) and other objects (14)</i>]; Struck by dislodged flying object (3); Struck by rolling vehicles that were not in normal operation (7); Caught in running machinery or equipment (21); Compressed or pinched by rolling or sliding objects (3); Excavation or trenching cave-in (5); and caught in or crushed in collapsing structure (3)
Falls (133)	Fall down stairs or steps (8); Fall from floor, dock, or ground level (6); Fall from ladder (21); Fall from roof (26); Fall from scaffold, staging (18); Fall from building girders or other structural steel (6); Fall from non-moving vehicle (9); and Fall to floor, walkway, or other surface (8); and Fall onto or against objects (93)
Exposure to Harmful Substances And Environments (50)	Electrocution (25); Inhalation of substance (12); Drowning, submersion (7)
Transportation Accidents (221)	Highway motor-vehicle related incidents (84) [<i>Collision between vehicles or collision between a moving vehicle and stationary objects or vehicles (70) and Non-collision incidents (11)</i>]; Non-highway motor vehicle related incidents (19); Worker struck by motor vehicle (40); Railway incidents (3); Water vehicle incidents (51)- [<i>Sinking, capsizing water vehicle (34) and Fall from ship or boat (14)</i>]; and Aircraft crashes (24)
Fires and Explosions (25)	Unintended fires (17); and Explosions (8)

Assaults and Violent Acts (115)	Homicides (82); Suicides (30); and Attacks by Non-venomous Animals (3)
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1.6 Industry

- The Service industry division, which includes Forestry and Fishing, lost the greatest number of workers (156 fatalities, 25%) to fatal occupational injuries (Chart 5). Within this division, Commercial Fishing had by far the largest number of fatalities (57), followed by Business Services and Health Services industries with 18 and 17 fatalities, respectively.
- The Agriculture industry division had the highest fatality rate during the nine-year period and had the second smallest number of fatalities. About two-thirds of these fatal injuries (23 fatalities) occurred in Landscaping and Horticultural Services and more than half (52%, 12 fatalities) of these 23 victims in the Landscaping and Horticultural services industry were either struck by falling trees or fell from trees.
- The Construction industry division had the second highest number of fatalities and the second highest fatal occupational injury rate. During the nine-year period, the construction industry division lost 136 workers (21%) to occupational injuries and the average annual fatality rate was 10.9 fatalities per 100,000 workers- more than four times the overall state rate. Nearly three-in-four construction workers fatally injured on the job (100 fatalities) were employed in the Special Trade Contractors sector which includes, among others, carpentry, roofing, masonry, and steel erection. More than one-half of the fatalities (53%, 71 fatalities) in this major industry group resulted from fatal falls.
- The Trade industry division, which employs about one-fifth of Massachusetts' labor force, had 85 fatalities (13%) during the nine-year period. More than half (49) of the fatalities in this industry division were the result of workplace homicides and transportation incidents.
- Sixty-nine workers employed in the Government sector suffered fatal injuries. Approximately two-thirds (67%, 46 fatalities) of those fatally injured were in Public Administration jobs such as fire protection, public safety, and security. The two leading events among government workers were highway motor vehicle incidents and homicide (Appendix 6).
- Leading fatal events varied by industry division (Table 3).

Chart 5. **Number and Rate of Fatal Occupational Injuries by Industry Division, Massachusetts, 1991–1999**



NOTE: Employment data from the Current Population Survey were used to calculate rates. Except for agriculture, fatalities among self-employed workers were excluded from rate computations. The Finance, Insurance and Real Estate industry division was excluded

due to small number of fatalities (9 fatalities). Information about industry/ownership was unavailable for two fatalities.

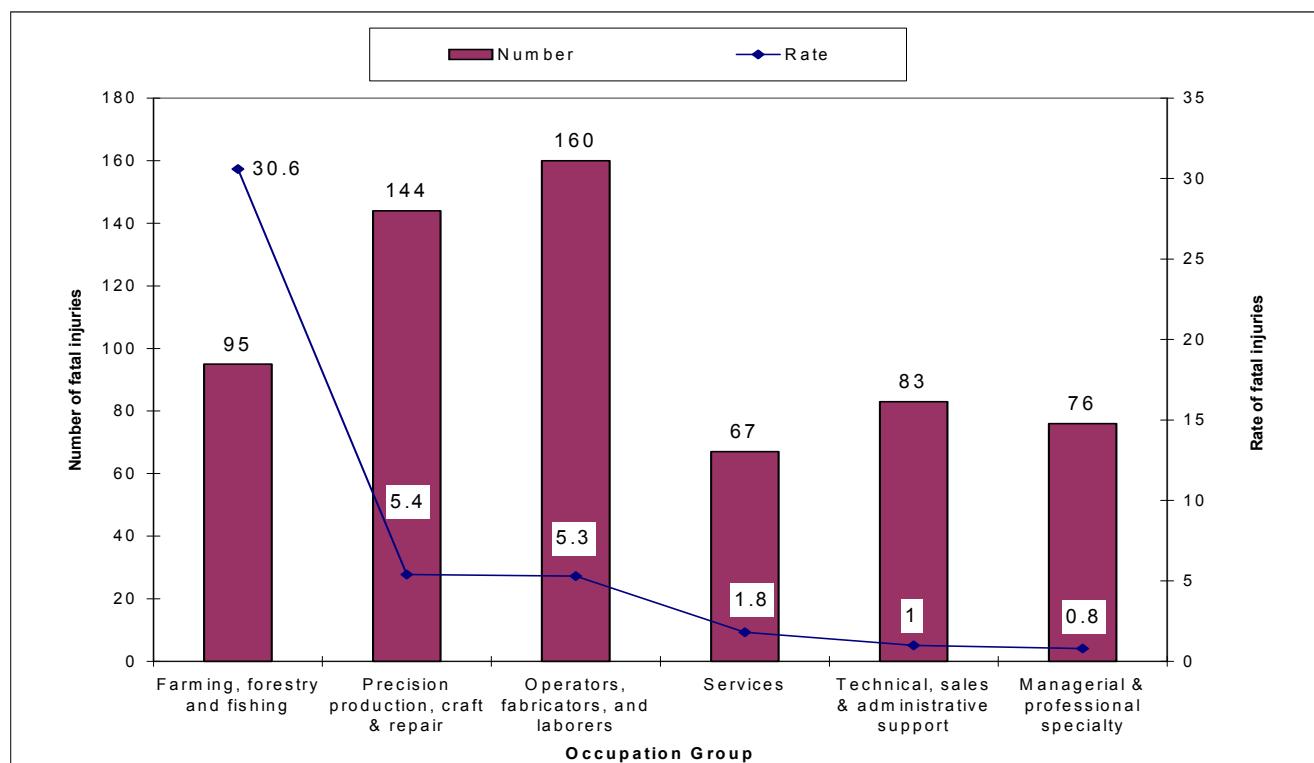
Table 3. Industry Divisions, Leading Fatal Events and Industries with Three or More Work-related Fatalities, Massachusetts, 1991-1999

Industry Division	Leading fatal events	Industries with three or more work-related fatalities
Agriculture, Forestry and Fishing (94)	- Water vehicle incidents (57) - Struck by falling objects (9) - Falls to lower levels (8)	Fruits and tree nut farms (7); landscape and horticultural services (23); and commercial fishing (57)
Construction (136)	- Falls to lower levels (71) - Electrocution (13) - Struck by object (12)	General building contractors –residential buildings (13); general building contractors-non-residential buildings (5); highway and street construction (5); heavy construction-except highway and street construction (11); and special construction trades (100)-[e.g. carpentry, masonry, roofing,...etc]
Manufacturing (55)	- Caught in running equipment/machinery (7) - Falls to lower levels (5) - Suicides (4)	Iron and steel foundries (5) and fabricated structural metal products (4)
Transportation/Communication/Public Utilities (84)	- Highway motor vehicle incidents (24) - Homicides (15) - Aircraft crashes (14)	Taxicabs (13); trucking and courier services, except air (25); public warehousing and storage (3); marine towing and tugboat services (3); air transportation, nonscheduled (8); telephone communications (6); electric services (5); and sanitary services (5)
Wholesale and Retail Trade (85)	- Homicide (29) - Highway motor vehicle Incidents (12) - Falls to lower levels (11)	Electrical goods wholesale (3); hardware, and plumbing & heating equipment and supplies wholesale (3); miscellaneous durable goods wholesale (5); groceries and related products wholesale (5); lumber and building material retail (4); grocery stores (9); gasoline service stations (3); eating and drinking places (18); liquor stores (3); used merchandise stores (3); and miscellaneous shopping good stores (3)
Finance, Insurance and Real Estate (9)	- Falls to lower levels (5)	Real estate agents and managers (5)
Services (97)	- Highway motor vehicle incidents (22) - Homicides (20) - Falls to lower levels (12)	Hotels and motels (4); laundry, cleaning, and garment services (3); building cleaning and maintenance (8); personnel supply services (6); miscellaneous business services (10); automotive repair shops (7); miscellaneous repair shops and related services (3); miscellaneous amusement and recreation services (4); hospitals (5); home health care services (4); miscellaneous health and allied services (3); colleges, universities, professional schools and junior colleges (6); religious organizations (3); engineering, architectural, and surveying services (3); and research, development, and testing services (6)
Government Sector (69)	- Highway motor vehicle incidents (14) - Homicides (14) - Suicides (6)	Highway and street construction (3); local and suburban passenger transportation (4); sanitary services (3); elementary and secondary schools (4); public order and safety (32); administration of environmental quality program (3); and national security (4)

1.7 Occupation

- Farming, Forestry & Fishing occupation group had the highest fatal occupational injury rate with 30.6 fatalities per 100,000 workers, more than thirteen times the overall state rate for all occupations (2.3 fatalities per 100,000 workers) (Chart 6). Most of the workers in this group (57 of 95) were fishers; fishing claimed more lives than any other single occupation (Table 4) (See Special Topic: Commercial Fishing, page 36).
- Operators, Fabricators, and Laborers had the highest number of occupational fatalities and the third highest fatality rate over the nine-year period (Chart 6). One-fourth (160 fatalities) of all workers fatally injured on the job were employed in this occupation group, which had a fatality rate of 5.3 fatalities per 100,000 workers.
- The Precision, Production, Craft, and Repair occupation group had the second highest fatality rate (5.4 per 100,000 workers) and more fatal falls and electrocution injuries than any other occupation group. About two-thirds (68%) of all fatal falls to lower levels and 60% (15 of 25) of all fatal electrocutions involved workers in this occupation group.
- Leading events varied by occupation group (Table 4). Water Vehicle incidents were the leading event in the Farming, Forestry and Fishing occupation group. Homicide was the leading event in three occupation groups: Service, Managerial & Professional Specialty, and Technical, Sales & Administrative Support occupation groups. Falls to Lower Levels was the leading event in Precision Production, Craft & Repair occupation group.

**Chart 6. Number and Rate of Fatal Occupational Injuries
by Occupation Groups, Massachusetts, 1991-1999**



NOTE: Employment data from the Current Population Survey (1991-1999) were used to calculate rates. The data included fatalities to both self-employed and wage and salary workers. Four fatalities were excluded because victims were younger than 16 years. Four other fatalities were excluded due to lack of information about occupation.

Table 4. Occupation Groups, Leading Fatal Events and Occupations with Three or More Work-related Fatalities, Massachusetts, 1991-1999

Occupation Groups	Three Leading Fatal Events	Occupations with Three or More Fatalities
Managerial and Professional Specialty (76)	<ul style="list-style-type: none"> - Homicide (17) - Highway motor vehicle incidents (15) - Falls to lower levels (8) 	Administrators, education and related fields (3); managers, food serving and lodging establishments (7); managers, property and real estate (3); other managers and administrators (14); civil engineers (3); agricultural engineers (5); physicians (3); lawyers (3); and athletes (3)
Technical, Sales and Administrative Support (86)	<ul style="list-style-type: none"> - Homicide (26) - Aircraft crashes (16) - Highway motor vehicle incidents (14) 	Electrical and electronic technicians (6); airplane pilots and navigators (12); supervisors and proprietors-sales occupations (19); sales workers (6); cashiers (5); news vendors (4); messengers (3); traffic, shipping and receiving clerks (4); and stock and inventory clerks (5)
Service (67)	<ul style="list-style-type: none"> - Homicide (19) - Highway motor vehicle incidents (15) - Falls to lower levels (8) 	Fire fighting occupations (10); police and detective-public service (16); guards and police- except public service (8); cooks (4); miscellaneous food preparation occupations (3); nursing aides, orderlies and attendants (4); and janitors and cleaners (8)
Farming, Forestry and Fishing (95)	<ul style="list-style-type: none"> - Water vehicle incidents (47) - Falls to lower levels (10) - Struck by falling objects (8) 	Farmers-except horticultural (3); horticultural specialty farmers (3); groundskeepers and gardeners-except farm (14); captains and other officers-fishing vessels (12); and fishers (45)
Precision Production, Craft and Repair (144)	<ul style="list-style-type: none"> - Falls to lower levels (67) - Electrocution (15) - Inhalation of substance (9) 	Supervisors, mechanics, and repairers (3); automobile mechanics (5); bus, truck, and stationary engine mechanics (3); industrial machine repairers (3); heating, air conditioning, and refrigeration mechanics (3); elevator installers and repairers (3); specified mechanics and repairers (3); supervisors, carpenters and related workers (4); supervisors, n.e.c. (11); brickmasons and stonemasons (6); carpenters (16); electricians (15); painters, construction and maintenance (9); plumbers, pipefitters and steamfitters (6); roofers (16); structural metal workers (7); construction trades, n.e.c. (9); and supervisors, production occupations (8)
Operators, Fabricators, and Laborers (161)	<ul style="list-style-type: none"> - Highway motor vehicle incidents (33) - Homicide (17) - Struck by vehicle (17) - Falls to lower levels (15) 	Molding and casting machine operators (3); welders and cutters (4); truck drivers (43); bus drivers (3); taxicab drivers and chauffeurs (14); sailors and deckhand operators (3); operating engineers (3); excavating and loading machine operators (6); industrial truck and tractor equipment operators (5); miscellaneous material moving equipment operators (3); construction laborers (21); garbage collectors (3); machine feeders and offbearers (3); freight, stock and material handlers, n.e.c. (4); and laborers-except construction (24)

n.e.c. – Not elsewhere classified

- As shown in Table 5, seven occupations with the highest number of fatalities accounted for nearly one-third (30%) of all occupational fatalities in Massachusetts during the nine-year period.

Table 5. Selected Occupations with High Number of Fatal Occupational Injuries, Massachusetts, 1991-1999

Occupation	Number	% of total fatalities
Fishers	57	9.0
Truck drivers	43	6.8
Construction laborers	21	3.3
Supervisors and proprietors, sales occupations	19	3.0
Police and detectives	16	2.5
Carpenters	16	2.5
Roofers	16	2.5
Total	188	30.0

1.8 Government Employed Workers

- A total of 69 (11% of total work-related fatalities) government employees died on the job. Public sector workers raise special concerns because they are not protected under the federal Occupational Safety and Health Act in Massachusetts.
- The two leading events in the sector were highway motor vehicular incidents (14 fatalities, 20% of public sector total) and homicide (14 fatalities, 20%) (Appendix 6). Nine workers were fatally injured after being struck by vehicles at their workplaces. Suicide, electrocution, fire, and other events accounted for the remaining fatalities.
- The age of victims at time of death ranged from 16 to 70 years. Nearly two-thirds (64%) of these workers were between the ages of 35 and 54 years and 99% (68 victims) were younger than 65 years. Government workers fatally injured on the job in Massachusetts were, on average, younger than all workers who suffered fatal occupational injuries in the state.
- Government workers who died from work-related injuries were employed in a wide range of industries. The majority (32 victims, 46%) of these workers were employed in the Justice, Public Order and Safety industry. Twelve (17%) fatalities occurred in the Transportation and Public Utilities division and 7 (10%) occurred in the Service industry division. Four victims were federal government employees involved in National Security and Internal Affairs Activities.
- Almost half (48%, 33 workers) of the workers were employed in service occupations which include detectives, police officers, supervisors, and firefighters. Fifteen victims were law enforcement workers and 10 were firefighters. Six of the 10 firefighters were fatally injured in a single fire.

A police officer was fatally injured when a motorist intruded into a roadway construction work zone striking him. The victim was standing at a four-way intersection directing traffic through a detour. The main flow of traffic followed the detour making a right-hand turn at the four-way intersection. The motorist failed to turn right at the construction site detour and struck the victim. The victim was transported to a local hospital where he was pronounced dead.

In order to prevent similar incidents, FACE recommended that employers/highway construction contractors should: 1) ensure that the work zone is setup, at a minimum, in accordance with the Manual on Uniform Traffic Control Devices (MUTCD), Part 6 developed by the U.S. Department of Transportation Federal Highway Administration; 2) consider portable rumble strips to alert motorist to the changed roadway conditions; and 3) consider area objects and the work site background when choosing colors for worker apparel. In addition, FACE also recommended that local and state government agencies should: 1) consider training and certifying all municipal officers who are performing traffic details on work zone construction sites; and 2)

consider developing state work zone laws to include increased fines for motorists speeding within work zones (Massachusetts FACE report, 00MA054).

1.9 Self-employed Workers

- Of the 633 workers who were fatally injured from 1991 to 1999, 111(18%) were self-employed.
- The average annual fatality rate for self-employed workers (4.4 fatalities per 100,000 workers) was more than twice the average annual fatality rate for wage and salary workers (2.0 fatalities per 100,000 workers).
- Most fatal injuries to self-employed workers occurred in high-risk industries and occupations. For example, 57% of fatalities (63 fatalities) among self-employed workers occurred in two industry divisions: Construction and Agriculture, Forestry & Fishing. Similarly, 59% (65 fatalities) of the fatalities among self-employed workers were to fishers, construction workers, sales workers, cabdrivers, and truck drivers.

1.10 Foreign-Born Workers

- One out of every 6 workers (110 fatalities) who died due to occupational injuries in Massachusetts was foreign-born (Table 6). An equal proportion (17%) of Massachusetts's labor force is comprised of immigrant workers.⁹
- Of the 99 foreign-born workers for whom race information was available, two-thirds (66) were white, 17 were black and 16 were Asian. Fifteen (15 %) of the foreign-born workers were of Hispanic origin.
- Foreign-born workers accounted for high proportion of work-related fatal injuries among Asian, black and Hispanic workers. About 89% (16 out of 18) of the fatalities among Asian workers, 55% (17 out of 31) of fatalities among black workers, and 53% (17 out of 32) of fatalities among Hispanic workers involved workers born outside the United States. In contrast, only 12% of fatalities among white workers occurred to workers born in other countries.
- Foreign-born workers who died on the job were somewhat more likely than native born to be self-employed (23% vs 18%). Nearly half of the fatalities among foreign-born workers occurred among fishers, taxi drivers, construction trade occupations, and sales occupations.
- The leading event categories among foreign-born and native workers were the same: Transportation Incidents (including water vehicle incidents), Assaults and Violent Acts, and Falls. However, these three event categories accounted for 72% of the fatalities among the foreign-born compared to 44% of the victims born in the U.S.

A 33-year old carpenter was fatally injured when he fell through the open side of the third floor of a structure being renovated from a factory into an office building. The victim was working with two co-workers to place a 300 lb. wooden box beam onto the roof 8 ½ feet above the floor using a manual hoist. The hoist mechanism let go allowing the beam to fall and strike the victim, pushing him out the opening. He fell approximately 22 ½ feet to the ground below and died from severe head injuries.

In order to prevent similar incidents, FACE recommended that the employers: 1) ensure that alternative fall protection is used when guardrails are removed to gain access for construction tasks; 2) ensure that all lifting equipment is in good working order and follow all recommended maintenance procedures; 3) develop, implement and enforce a comprehensive safety program that includes, but is not limited to, worker training in recognizing fall hazards and the hazards of the equipment used on the job; and 4) coordinate safety planning among contractors on multi-employer sites (Massachusetts FACE report 96MA023).

⁹ Rodriguez, C. Foreign-born Fuel Economic Growth: Massachusetts Immigrants Filling Labor Needs. The Boston Globe, 2001 December 30.

- Foreign-born workers also accounted for a disproportionate share of the victims of workplace homicide. About one-third (28 workers) of workplace homicide victims were foreign-born whereas only 10% of the fatalities among native-born workers were due to workplace homicides.

Table 6. **Number and percent of Fatal Occupational Injuries Among Foreign-born Workers, Massachusetts, 1991-1999**

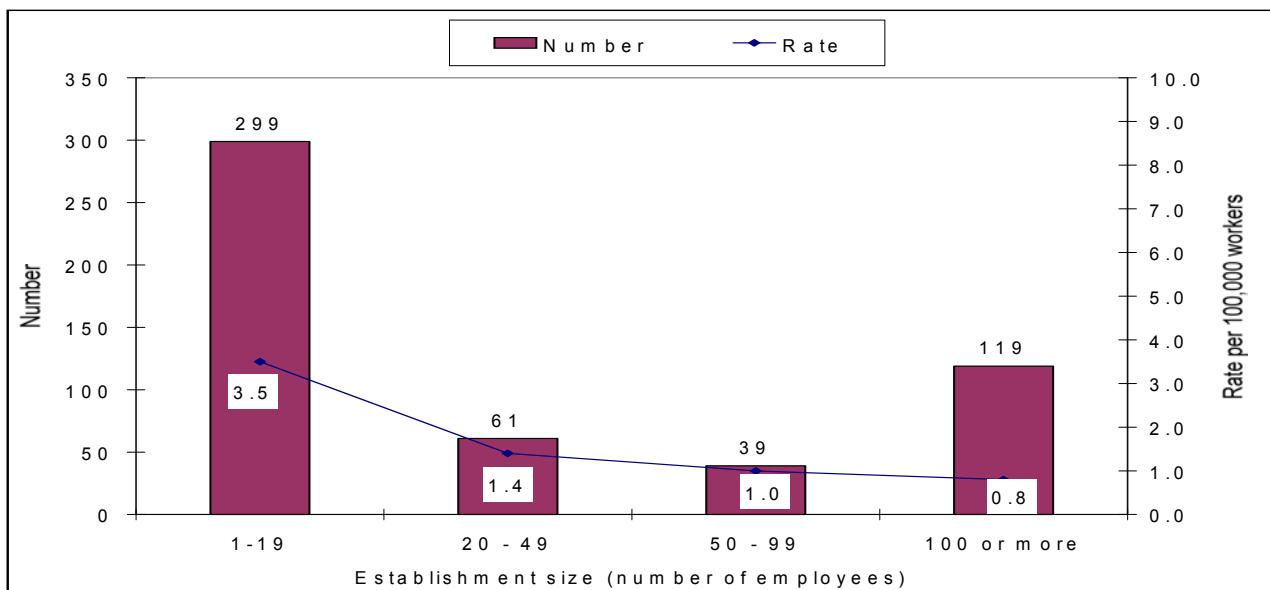
Year	Number of fatalities to foreign-born workers *	Number of total occupational fatalities	Percent
1991	13	82	16
1992	19	67	28
1993	16	86	19
1994	11	74	15
1995	12	66	18
1996	9	62	15
1997	8	69	12
1998	6	44	14
1999	16	83	19
Total	110	633	17

* Information on country of birth was obtained from death certificates.

1.11 Establishment size

- Out of 518 fatal injuries for which employers' establishment size information was available, more than one-half (299 fatalities) occurred in small establishments with 19 or fewer employees (Chart 7). One-third (102 fatalities) of these occurred in the Construction industry division, followed by the Agriculture, Forestry, and Fishing (69 fatalities) and the Service (43 fatalities) industry divisions.
- Small establishments also suffered the highest fatality rate (3.5 fatalities per 100,000 workers), more than one and half times the average rate for all establishments (2.3 fatalities per 100,000 workers).
- Forty-nine percent (256 fatalities) of fatalities for which establishment size information was available occurred in establishments with 10 or fewer employees. About one-third (35%, 89 fatalities) of these occurred in the Construction industry division while 25% (64 fatalities) occurred in the Agriculture, Fishing & Forestry industry division, and 14% (37 fatalities) occurred in the Services industry division.
- Self-employed workers accounted for 32% (81 fatalities) of fatal injuries in small establishments (with 10 or fewer employees) while they accounted for 17% of all fatal occupational injuries.
- Occupational fatalities in establishments with more than 50 employees were concentrated in two industry divisions: Manufacturing and Service industry divisions. These two industry divisions accounted for more than half (54%, 56 fatalities) of fatalities in these establishments while they only accounted for about 24% of all fatal occupational injuries.

**Chart 7. Number and Rate of Fatal Occupational Injuries
by Establishment Size, Massachusetts, 1991-1999**
(N = 518)



NOTE: Rates calculated using year 2000 employment data from the Massachusetts Division of Employment and Training. To maintain consistency with the denominator data, fatalities among self-employed workers are excluded from rate computation. Establishment size information was not available for 115 fatalities.

1.12 Distribution of Occupational Fatalities by County

- Number of fatal occupational injuries varied by county ranging from 3 fatalities in Nantucket County to 100 in Middlesex County (Table 7).
- Four counties, namely, Middlesex, Suffolk, Worcester, and Bristol accounted for over half (55%, 337 fatalities) of the total occupational fatalities (for which county was determined) in the state during the 9-year period.

**Table 7. Fatal Occupational Injuries by County
Massachusetts, 1991-1999
(N = 611)**

County	Number of fatal injuries	Percent
Barnstable	30	4.9
Berkshire	29	4.8
Bristol	70	11.5
Dukes	7	1.2
Essex	57	9.3
Franklin	14	2.3
Hampden	38	6.2
Hampshire	13	2.1
Middlesex	100	16.4
Nantucket	3	0.5
Norfolk	47	7.7
Plymouth	36	5.9
Suffolk	91	14.9
Worcester	76	12.4
Total	611	100

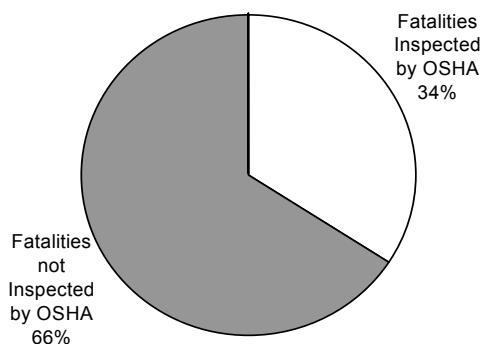
NOTE: County was undetermined for 22 fatalities.

1.12 Fatal Occupational Injuries Inspected by OSHA

The Occupational Safety and Health Administration conducts inspections of workplace fatalities to determine if safety standards have been violated. However, fatalities in some industries and circumstances fall outside OSHA jurisdiction. These include fatalities among fishing workers at sea, public sector workers in many states, including Massachusetts, and the self-employed. Also, certain other types of fatalities (such as homicides and highway motor vehicle incidents) are not routinely inspected by OSHA. In addition, since 1994, OSHA did not conduct fatality investigations when the fatalities occur more than 30 days after the injury events.

Out of the total 633 fatal occupational injuries, OSHA inspected 215 (34%) fatalities (Chart 8). The remaining 418 fatalities were not inspected because; a) they did not fall under OSHA's jurisdiction; b) they resulted from events that are not routinely inspected by the agency; or c) the fatalities occurred more than 30 days after the injury. These included 203 occupational fatalities that occurred among self-employed workers, commercial fishers and among government workers. They also included 193 occupational fatalities due to homicide, suicide, motor vehicle related incidents, and air transportation incidents. Twenty-two fatalities were not inspected by OSHA because fatalities occurred more than 30 days after the occurrence of the injuries. Eleven of these 22 fatalities occurred within the same year (but more than thirty days after the injury) while the other 11 fatalities occurred more than a year after the workers were injured.

Chart 8. **Fatal Occupational Injuries Inspected by OSHA
Massachusetts, 1991-1999
(N=633)**



SOURCE: U.S. Department of Labor, OSHA, Region I Office.

In addition to OSHA's enforcement inspections, the Massachusetts Department of Public Health conducted research-oriented investigations of 145 occupational fatalities between 1990 and 2001 as part of the national Fatality Assessment and Control Evaluation (FACE) program. The events covered in these investigations include, but are not limited to, falls to lower level, machine-related incidents, fatalities to teen workers, electrocutions, explosions, and highway work-zone incidents.

2. Comparison of Massachusetts and the U.S.

Each year in the United States more than 6,000 workers are fatally injured on the job. In this section, data on fatal occupational injuries in Massachusetts from 1991-1999 are compared with the CFOI findings for the country as a whole. National data from 1992 - 1999 were used for this comparison where indicated. National employment estimates from the Current Population Survey were used to calculate the national rates.

2.1 Rates of Fatal Occupational Injuries

Massachusetts compares favorably to the nation in terms of many different health outcomes¹⁰ and our occupational fatality experience is no exception. The annual occupational fatality rate for Massachusetts was lower than the national rate for each year of the period under consideration (Chart 9). In most years, the state rate was approximately half that of the nation.

This difference in fatality rates is likely explained in part by differences in the industrial composition of Massachusetts' workforce as compared to that of the nation. For example, 32% of the Massachusetts workforce was employed in the service sector between 1991 and 1999 as compared to 27% of the U.S. workforce. Nationally, proportionately more workers were employed in higher risk industry divisions such as Agriculture, Construction, and Transportation and Public Utilities (Table 8).

However, industry-specific fatality rates, except in the Agriculture industry division, were also lower in Massachusetts than in the nation as a whole. Massachusetts's rates for the Manufacturing, Trade, and Transportation and Public Utilities divisions were less than half the national rates for these industry divisions.

An overall standardized fatality rate¹¹ for Massachusetts (standardized by the direct method to the 1992-1999 industrial composition of the nation) was calculated to determine how much of the difference in rates could be attributed to the difference in industry mix. The overall standardized fatality rate for Massachusetts was 2.6 fatalities per 100,000, still substantially lower than the national rate of 4.8 fatalities per 100,000 workers. State and national differences in workforce composition *within* industry sectors were not accounted for and could also contribute to the differences in state and national rates. These findings, however, do suggest that the difference in industrial composition of the workforce between Massachusetts and the nation alone cannot explain the observed rate differences.

A review of fatalities by occupation yielded similar findings. Massachusetts had lower fatal occupational injury rates than the nation for all occupation groups (Table 9). As with industry, some but not all of this difference was explained by differences in the workforce composition of the state compared to that of the nation. Proportionately more of the nation's workforce was employed in high-risk occupation groups such as Farming, Forestry and Fishing and Operators, Fabricators and Laborers. An overall occupation-standardized fatality rate for Massachusetts was also calculated taking into consideration these differences in the occupation composition of the state and national workforce; this standardized rate was 3.0 fatalities per 100,000 workers, still much lower than the national rate of 4.8 fatalities per 100,000 workers.

Another important factor contributing to lower occupational fatality rates in Massachusetts is that homicide and highway motor vehicle related fatalities, two events that contribute substantially to the occupational fatality burden, are low in the Massachusetts general population compared to the nation. The average crude homicide rate in the general Massachusetts population for the eight-year period between 1991 and 1998 was 3.4 fatalities per 100,000 population while the comparable rate

¹⁰ The Henry J. Kaiser Family Foundation, State Health Facts online, [WWW.statehealthfacts.kff.org](http://www.statehealthfacts.kff.org), July 17, 2002.

¹¹ The Mining and Finance, Insurance & Real Estate industry divisions were excluded from rate computation.

for the nation was 8.7 fatalities per 100,000 population.¹² Massachusetts also had a lower traffic fatality rate of 0.8 fatalities per 100 million vehicle miles traveled as compared to a national rate of 1.5 fatalities per 100 million vehicle miles traveled.¹³

This general experience is reflected in low fatal occupational injury rates due to homicide and transportation incidents for Massachusetts. The annual average work-related homicide rate in Massachusetts was 0.3 fatalities per 100,000 workers between 1992 and 1999; while the national rate was 0.8 fatalities per 100,000 workers. Similarly, the rate of fatal work-related highway transportation incidents in Massachusetts was lower at 0.3 fatalities per 100,000 as compared to a national rate of 1.0 fatalities per 100,000 workers.

The low overall homicide and traffic fatality rates in Massachusetts, however, provide only a partial explanation for the difference in the occupational fatality rates between Massachusetts and the nation. Occupational fatality rates computed excluding homicide and highway traffic fatalities reduced, but did not eliminate, the gap between the state and national rates (Chart 10).

Likely, numerous additional factors such as the comparatively high levels of education and socioeconomic status in Massachusetts, the higher proportion of unionized workers in the state (15%), and greater access to emergency medical services also contribute to the low occupational fatality rates in Massachusetts. Further research is needed to examine factors accounting for the difference between the national and state rates.

2.2 Fatal Events

As discussed above, the contribution of homicide and highway motor vehicle incidents to the occupational fatality burden is low in Massachusetts as compared to the nation. As a consequence, falls accounted for a much higher proportion of the work-related fatalities in Massachusetts during the study period (21%) than they did in the country as a whole (11%) (Appendix 2). Falls to a lower level stood out as the single leading event in Massachusetts.

2.3 Age, Gender, Race and Hispanic Origin

The distribution of fatal occupational injuries in Massachusetts was similar to national findings with respect to gender, age, and employment status. However, Massachusetts' victims were more likely to be white and less likely to be Hispanic than victims in the country as a whole, which likely reflects differences in the underlying racial and ethnic composition between the nation and Massachusetts workforce (Appendix 2). As mentioned previously, the high fatal occupational injury rates for Hispanic workers and older workers observed in Massachusetts have also been reported for Hispanic and older workers nationwide.¹⁴

¹² U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, Injury Mortality reports, <http://www.cdc.gov>, July 18, 2002.

¹³ National Highway Traffic Safety Administration (NHTSA), Traffic Safety Facts 1999, U.S. Department of Transportation.

¹⁴ Rates calculated from CFOI annual reports indicate that fatality rates for older workers and Hispanic workers are higher compared to younger workers and workers of other races and ethnicity.

Chart 9. **Fatal Occupational Injury Rates by Year, Massachusetts and U.S., 1992-1999**

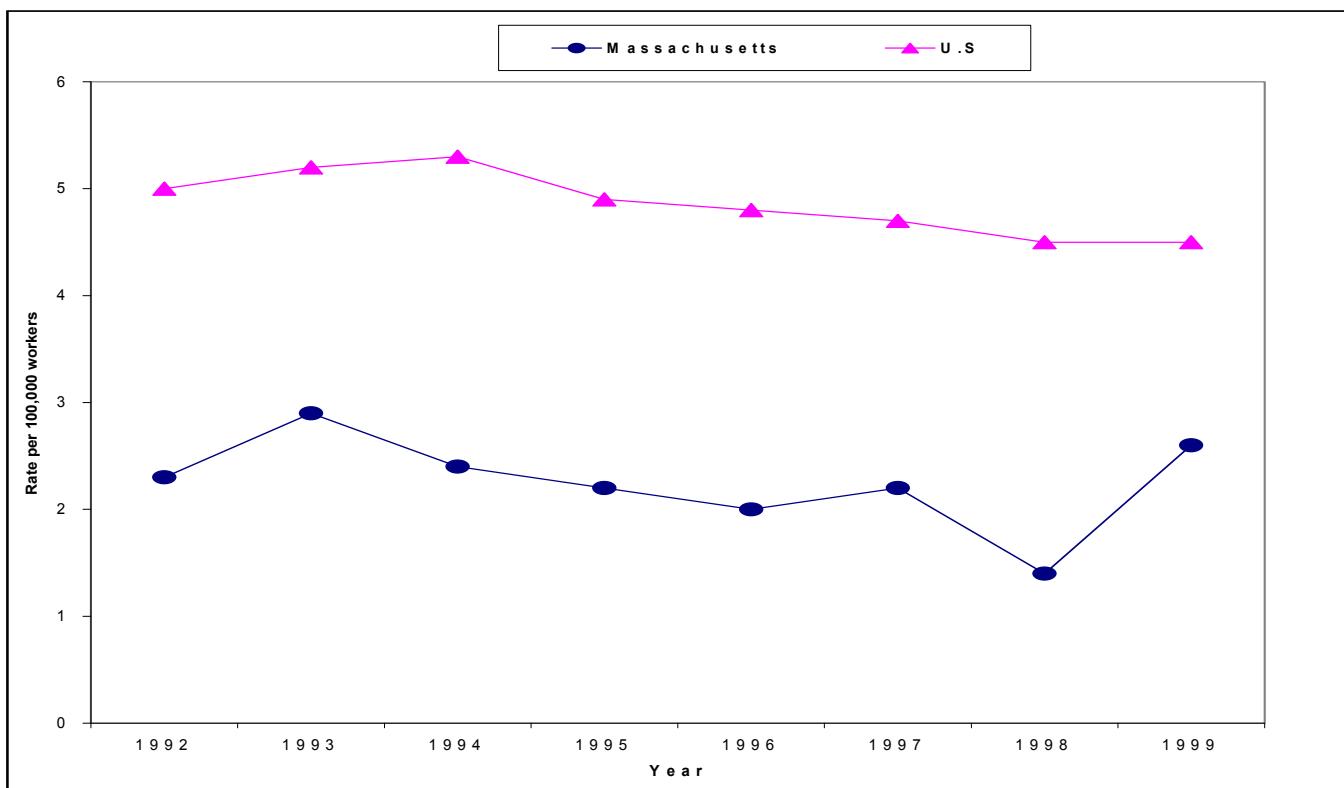


Table 8. **Percent of Labor Force and Percent & Rate of Fatal Occupational Injuries by Industry Division, Massachusetts and U.S.**

Industry Division	Massachusetts			U.S.		
	% of Labor Force (1991-1999) Average	% of Fatalities (1991-1999)	Fatality Rate	% of Labor Force (1992-1999) Average	% of Fatalities (1992-1999 Average)	Fatality Rate
Agriculture *	1.1	5.5	12.6	2.7	5.6	8.2
Mining	-	-	-	0.5	2.9	23.3
Construction	4.1	21.5	10.9	5.8	18.1	16.0
Manufacturing	17.2	8.9	1.3	15.9	13.2	3.3
Transportation ,and Public Utilities	5.1	13.3	5.6	5.7	16.8	12.5
Trade	20.1	13.4	1.3	20.5	13.9	2.9
Finance, Insurance, and Real Estate	7.6	1.3	**	6.3	1.8	1.3
Services including Forestry and Fishing	31.7	24.6	1.5	27.1	13.1	2.1
Government	13.2	10.9	2.1	15.5	14.7	3.7
Overall Average	100	100	2.3	100	100	4.8

* Includes the self-employed and family workers. Excludes Forestry & Fishing.

** Rate not presented due to small number of fatal injuries (fewer than 10).

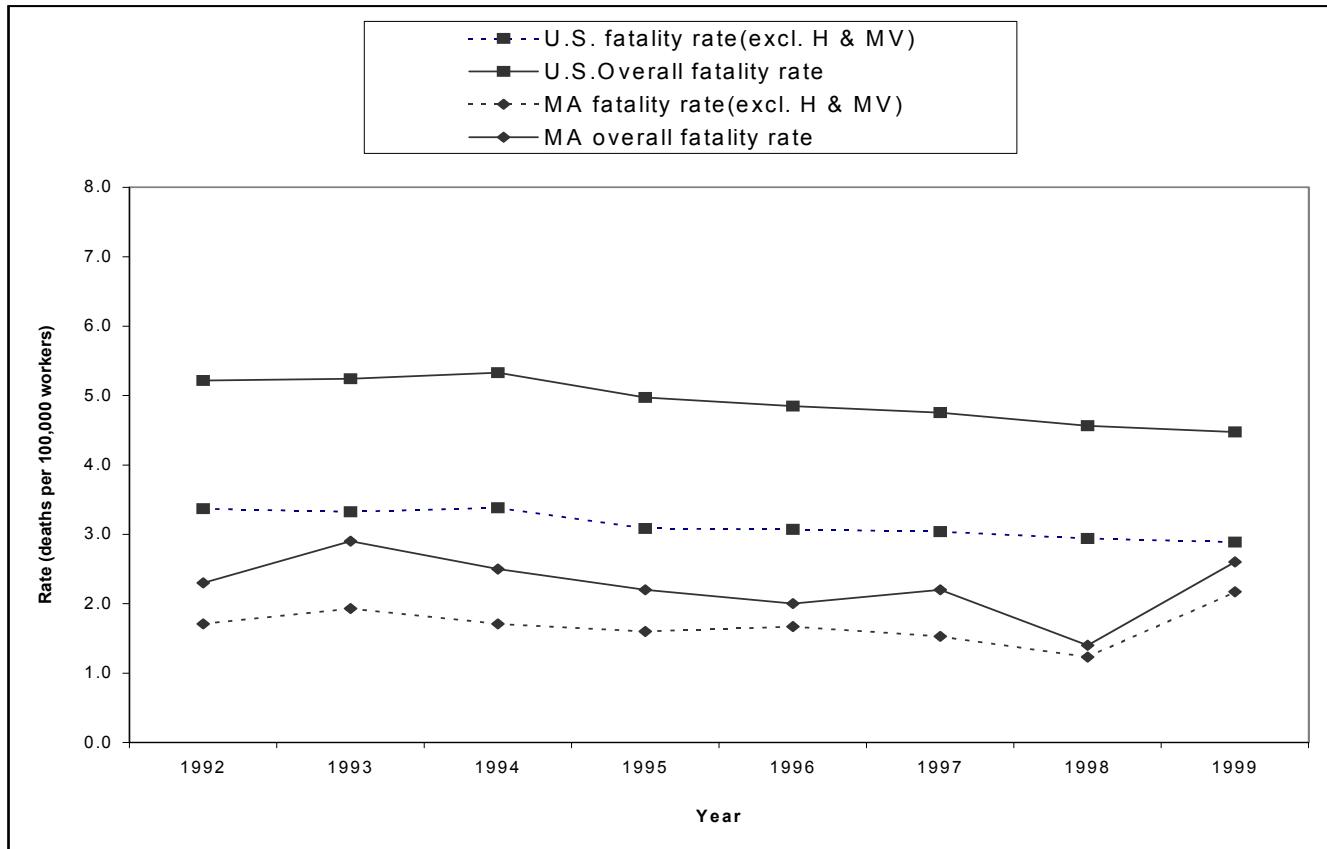
NOTE: Dashes indicate that there were no fatalities during the period.

Employment estimates from Current Population Survey were used to compute percent of labor force and fatality rates.

Table 9. **Rates of Fatal Occupational Injuries by Occupation Groups**
Massachusetts, 1991-1999 and U.S., 1992-1999

Occupation Groups	Massachusetts, 1991-1999			United States, 1992-1999		
	% of Fatality (1991-99) Average	% of Labor Force (1991-1999) Average	Fatality Rate 1991-1999	% of Fatality (1992-99) Average	% of Labor Force (1992-1999) Average	Fatality Rate 1992-1999
Managerial and Professional	12	34.9	0.8	11	28.4	1.9
Technical, Sales and Administrative Support	14	30.0	1.0	12.5	30.0	2.1
Service	11	13.7	1.8	8.3	13.6	3.0
Farming, Forestry and Fishing	15	1	30.6	14.7	2.8	31.1
Precision Production, Craft and Repair	23	9.9	5.4	17.5	11.0	6.7
Operators, Fabricators and Laborers	25	10.5	5.3	33.1	14.2	11.6
All occupations	-	-	2.3	-	-	4.8

Chart 10. **Rates of Fatal Occupational Injuries Including and Excluding Homicide and Highway Traffic Fatalities, Massachusetts and U.S., 1992-1999**



3 Special Topics

3.1 Fatal Falls to Lower Levels

Workplace falls claimed the lives of 133 Massachusetts workers between 1991-1999 accounting for 21% of all fatal occupational injuries during this period. The average annual fall fatality rate was 0.5 per 100,000 workers, similar to the 1999 fall fatality rate of 0.5 per 100,000 workers for the nation. Fatal workplace falls in Massachusetts occurred in a wide range of circumstances. The great majority (118 fatalities, 89%) were falls to lower levels. Falls from roofs (26), ladders (21), and scaffolds and staging (18) were the most common. This special topic section focuses on fatal falls to lower levels.

Most fatal falls to lower levels occurred in the construction industry division.

- Most fatal falls to lower levels (71 fatalities, 60%) occurred in the Construction industry division, an average of 8 fatalities per year (Table 10). The Service industry division had the second highest number of fatal falls to lower levels (13 fatalities).
- Within the Construction industry division, the Special Trade Contractors major industry group accounted for 81% (58 fatalities) of fatal fall injuries. Contractors engaged in roofing and sheet metal work, carpentry and floor work, structural steel erection, and masonry work led all other groups in the number of fatalities.
- The construction industry division also had a high annual average rate of fatal falls to lower levels (6.6 fatalities per 100,000 workers), more than sixteen times the overall rate for all industry divisions (0.4 fatalities per 100,000 workers).

Table 10. **Number and Average Annual Rate of Fatal Falls to Lower Levels in the Construction Industry Division, Massachusetts, 1991-1999**

Industry Division	Number of Falls to Lower Levels (1991-99)	Percent	Average Annual Fall Fatality Rate
Construction	71	60	6.6
Special trade contractors	58	49	
- Roofing, siding and sheet metal work	14	12	
- Carpentry work	11	9	
- Structural steel erection	9	8	
- Masonry, stone setting, tile setting and plastering	7	6	
All industry divisions	118	100.0	0.4

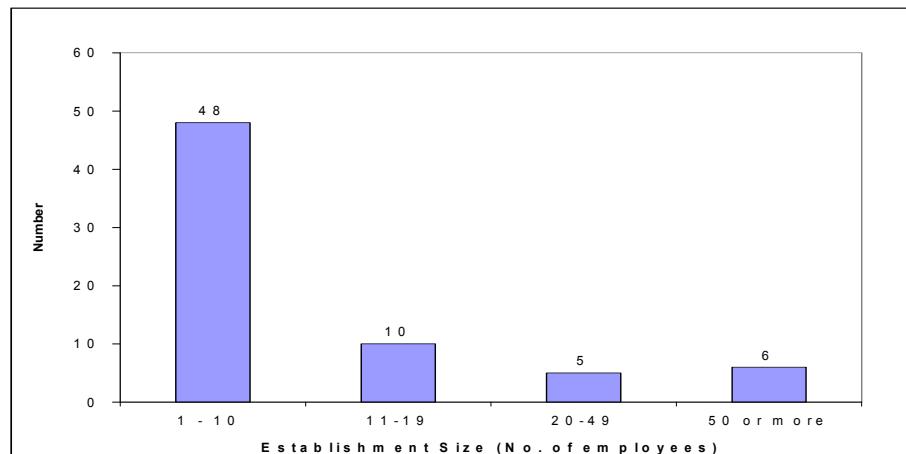
A pest control technician died when he fell from the roof of an apartment building. The technician was spraying for spiders in the vents and other parts of the roof when the incident occurred. While spraying along a gutter of a rooftop penthouse, the technician walked off the edge of the roof and fell nine stories to the parking lot below. Emergency medical services were called immediately. The victim was given CPR and transported to a local hospital emergency room where he died.

In order to prevent similar incidents in the future, FACE recommended that employers: 1) should develop and implement a site specific health and safety plan for each site under contract; and 2) employ alternative controls for fall hazards when personal fall arrest systems are not required or appropriate. Building owners should consider installation of guardrails at the perimeter of flat roofs wherever possible (Massachusetts FACE report 97MA038).

Fatal falls in the construction industry division were concentrated in small establishments.

- About two-thirds of the fatal falls to lower levels in the construction industry division occurred in small establishments with 10 or fewer employees (Chart 11).
- Establishments with fewer than 11 employees are not regularly inspected by OSHA unless a fatality occurs. Therefore, they are likely to have less contact with safety inspectors than large establishments and less knowledge about safety precautions should be taken to prevent fall injuries.

**Chart 11. Number of Fatal Falls to Lower Levels in Construction Industry Division by Establishment Size, Massachusetts, 1991-1999
(N = 69)**



Roofers and Carpenters had the highest number of fatal falls to lower levels.

- Construction occupations accounted for 60% of all falls to lower levels. Roofers and carpenters had the highest number of fatal falls followed by construction laborers, and structural metal workers (Table 11).

Table 11. Number and Percent of Fatal Falls to Lower Levels by Selected Occupations, Massachusetts, 1991-1999

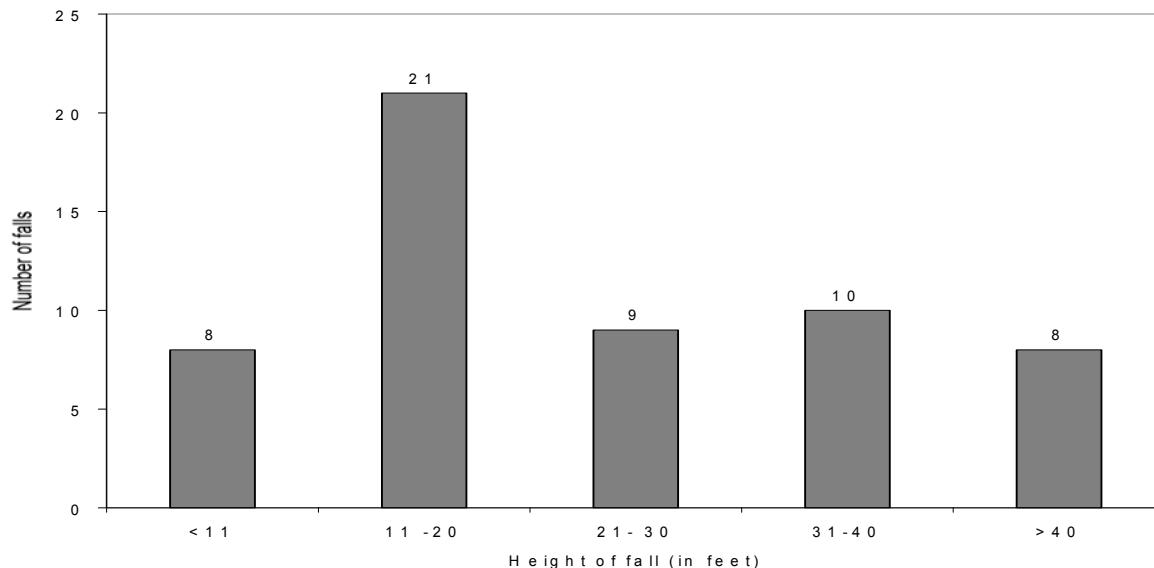
Occupation	No. of Fatal Falls	Total Fatal Injuries	% of Fatal Injuries Due to Falls
Roofers	14	16	88
Carpenters	11	16	59
Construction laborers	7	21	33
Structural metal workers	7	7	100
Brick and stone masons	6	6	100
Painters	6	9	75
All occupations	118	633	19

- Falls to lower levels accounted for a high proportion of fatalities (52%, 71 fatalities) among construction workers, whereas only 19% of total fatal injuries in the state were due to falls to lower levels. All of the occupational fatalities among the brick and stone masons and structural metal workers were due to falls.

Majority of fatal falls to lower levels in construction occurred from heights of less than 20 feet.

- Height information was available for 56 out of 71 fatal falls to lower levels in the construction industry division. Of these 56 fatal falls, 52% (29 fatalities) occurred from heights of 20 feet or less (Chart 12). Eight fatal falls (14%) occurred from heights of 10 feet or lower and another 8 falls occurred from heights of over 30 feet. The heights ranged from 3 feet to 130 feet.

**Chart 12. Fatal Falls to Lower Levels in the Construction Industry Division by Height of Fall, Massachusetts, 1991-1999
(N = 56)**



NOTE: Height information was not available for 15 fatal falls to lower levels.

Falls to lower levels were the leading event among older workers.

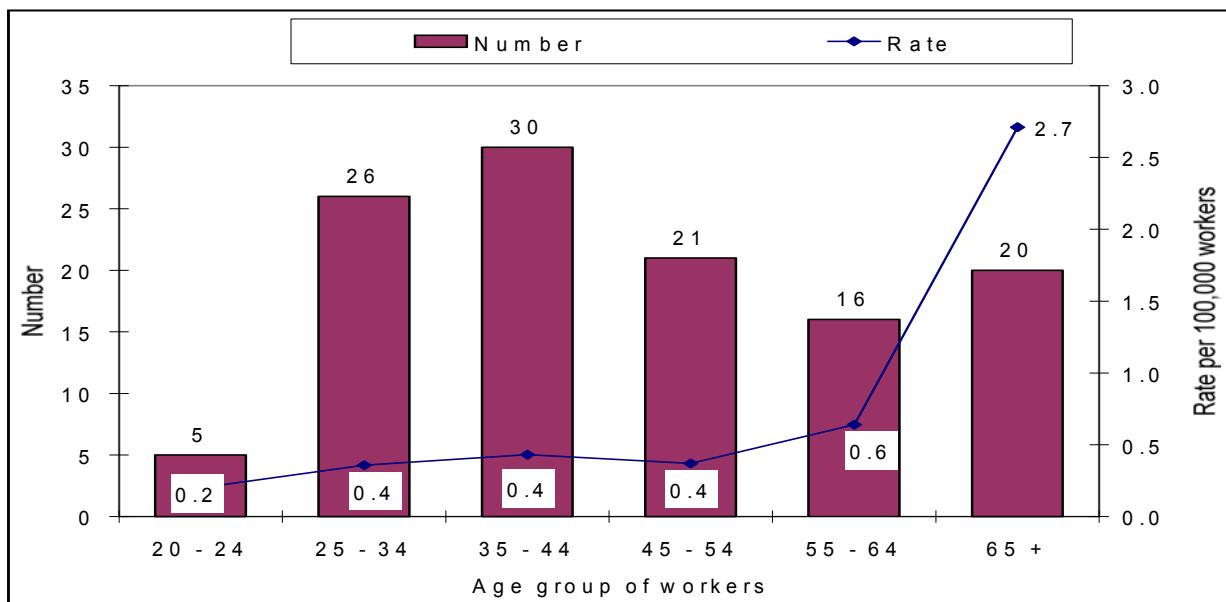
- Falls to lower levels accounted for 41% (20 fatalities) of all work-related fatal injuries among workers age 65 years and older. The annual average fatal fall rate for these workers was 2.7 per 100,000, more than six times higher than the average rate for all age groups (Chart 13). This rate would be even higher if hours of work were used as a denominator instead of number of workers employed because older workers are more likely to work part time.¹⁵

A 23-year old ironworker was fatally injured when he fell approximately 20 feet through a roof opening to ice-covered ground. The victim was part of a crew that was building the flat roof on a new building, and he fell through an uncovered opening while he was capping the roof's expansion joists with its center plate. The victim was not wearing any fall protection.

In order to prevent future similar incidents, FACE recommended that employers: 1) require floor openings to be adequately protected; 2) provide and require use of fall protection equipment; and 3) design, develop and implement a comprehensive safety program that includes, but is not limited to, fall protection (Massachusetts FACE report, 94MA011).

Chart 13. Number and Rate of Fatal Falls to Lower Levels by Age of Workers, Massachusetts, 1991-1999

¹⁵Ruser, J. Denominator Choice in the Calculation of Workplace Fatality Rates. Fatal Workplace Injuries in 1996: A Collection of Data and Analysis, U.S. Department of Labor, Bureau of Labor Statistics, June 1998.



NOTE: Rates are not presented for age groups with fewer than 5 fatalities. Employment data from the Current Population Survey for 1995 is used to calculate rates.

Preventing Falls to Lower Levels in the Workplace

Surveillance findings underscore falls in construction as a priority for prevention in Massachusetts. Falls in this industry division should not simply be accepted as part of the job. Comprehensive work-site fall prevention programs, including the use of fall protection systems, can reduce the risk of fall injuries in construction. The Occupational Safety and Health Administration has established standards for fall protection in construction workplaces (Subpart M, Fall Protection, 29 CFR 126.500-1926.503). Employers should develop and implement comprehensive fall protection programs that, at a minimum, meet these OSHA requirements. The National Institute of Occupational Safety and Health (NIOSH) recommends the following elements as a guide for employers and workers in developing fall-protection programs:¹⁶

- Address all aspects of safety and hazards in the planning phase of projects
- Train employees in the recognition and avoidance of unsafe conditions and the OSHA regulations applicable to their work environment
- Provide appropriate fall protection equipment
- Train workers on the proper use of fall protection equipment, enforce its use, and inspect equipment daily
- Conduct scheduled and unscheduled safety inspections of the work-site
- Address environmental conditions, language differences, alternative methods/equipment to perform assigned tasks, and establish medical and rescue programs
- Encourage workers to participate actively in workplace safety

In addition to these general recommendations, NIOSH also recommends specific strategies to prevent falls from ladders, scaffolds, and roofs, common fall hazards both in Massachusetts and across the nation.

To prevent falls from ladders:

¹⁶ U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, Worker Deaths by Falls: A Summary of Surveillance Findings and Investigative Case Reports, November 2000.

- Select and use the proper type of ladder (get the right size and check the duty rating)
- Inspect ladder, prior to using, for structural damage, missing or damaged safety devices, substances that could cause slips or falls, and paint or stickers that could hide defects
- Tag and remove defective ladders from the work-site
- Wear approved fall protection equipment, if applicable
- Use ladders only on solid, stable and level surfaces unless secured to prevent accidental displacement
- Use ladders only as recommended by manufacturer (do not use ladder in a horizontal position as a scaffold, do not have more than one person on the ladder at a time, do not overload, do not work from the top rungs of an extension ladder or the top of a step ladder)
- Maintain ladders regularly (change shoes and lubricate metal bearings, locks and pulleys)
- Train workers on safe use and make sure that they understand and follow safe use of ladders

To prevent falls from scaffolds:

- Select and use the proper type of scaffold for the job
- Provide access ladder to scaffolds
- Use scaffold grade lumber for all platforms
- Install guardrails and toe-boards on all open sides and ends of platforms more than 10 feet above the ground
- Make sure that the footing or anchorage for scaffolds is sound, rigid, and capable of carrying four times the maximum intended load, including its own weight
- Inspect the scaffolding after erection and before first use
- Inspect the scaffolds routinely for consideration of footing (anchorage), parts of the scaffolds, and slippery conditions
- Train workers on the safe way to use scaffoldings

To prevent falls from roofs and buildings:

- Install guarding and/or fall protection on all roof openings
- Put warning signs on all roof openings
- Make cutting the roof openings a last action on the roof
- Provide fall protection measures along unguarded roof perimeters and balconies
- Install a cover (for roof and floor openings) capable of supporting the maximum intended load

Innovative efforts are needed to reach employers and workers in small construction businesses. The Massachusetts Department of Public Health has developed a series of educational brochures on prevention of falls in residential construction, and distributes these through building permit offices in cities and towns throughout the Commonwealth. These materials are available in English, Spanish, Portuguese and Haitian Creole from the Occupational Health Surveillance Program upon request.

A 49-year-old male inventory control clerk died when he fell approximately 12 feet from a high-lift order-picker truck while applying barcode labels in a warehouse freezer. The order picker truck was not positioned next to the desired location due to boxes in the aisle. He fell as he stepped from the raised order picker truck onto a stacked box of product in an attempt to reach the next higher shelf. He was wearing a body harness and lanyard that was not secured to an anchor point on the order picker truck.

In order to prevent future similar incidents, FACE recommended that employers should: 1) adopt a mandatory tie-off/no unhook policy for employees using order picker trucks; 2) ensure that aisle ways are maintained free from obstructions that would interfere with lift truck access to storage shelves; 3) strictly enforce the safety precautions outlined in comprehensive safety programs; and 4) regularly review and update the programs and training. In addition, high lift order picker truck manufacturers should consider equipping trucks with devices that will activate audible or visible alarms if the operator unhooks fall protection while the lift is raised (Massachusetts FACE Report, 99MA058).

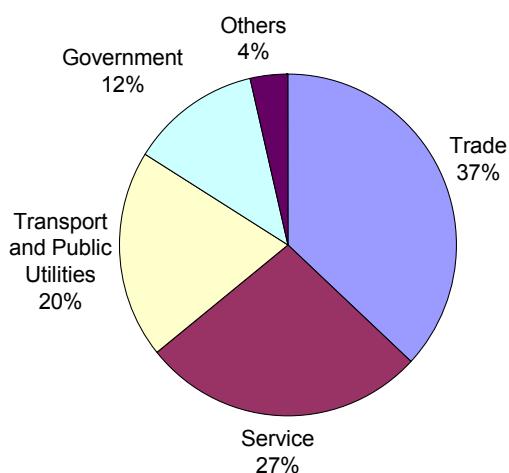
3.2 Work-related Homicide

Homicide was the third leading fatal occupational event in Massachusetts between 1991-1999. During this period, 82 workers (13%) died as a result of homicides at work. The average annual occupational homicide rate was 0.3 per 100,000 workers.

Work-related homicides were concentrated in a small number of industries and occupations.

- As shown in Chart 14, more than one-third (37%) of the victims of work-related homicide in Massachusetts were employed in the Wholesale and Retail Trade industry division. The Service and Transportation and Public Utilities divisions followed, accounting for 27% and 20% of work-related homicides, respectively. These three industry divisions combined accounted for 84% (68 homicides) of all work-related homicides.
- Occupations with high number of homicides were sales supervisors and proprietors (13 homicides), police and detectives (12 homicides), and taxi drivers and chauffeurs (11 homicides). These three occupations, combined, accounted for 44% of all homicides at work.
- Exchange of money and direct customer service are risk factors for workplace homicide. For example, national data indicate that taxi and livery drivers were 60 times more likely than other workers to be victims of work-related homicide.¹⁷

Chart 14. **Workplace Homicide by Industry Division**, Massachusetts, 1991-1999



The risk of workplace homicide was higher for men than women; however, homicide accounted for a higher proportion of work-related fatalities among women than men.

- The average annual occupational homicide rate for male workers (0.5 per 100,000 workers) was five times the female homicide rate of 0.1 per 100,000 workers. This difference was much greater than the difference between the overall homicide rates for men and women in the community (2.8 per 100,000 for males vs 1.2 per 100,000 for females).¹⁸
- Although men were more likely to die as a result of homicide on the job than women, homicides accounted for 27% of all fatal occupational injuries among female workers and only 12% of all occupational fatalities among men.

A 68-year old merchant was shot to death in a late-morning hold-up attempt at his neighborhood grocery store. According to newspaper reports, a gunman ordered several customers to the floor but was stopped by the proprietor after walking around the store counter. The grocer, who was working alone, was shot in the ensuing struggle. He had reportedly been trying to sell the store after several earlier robberies (Massachusetts CFOI report, 1994).

¹⁷ U.S. Department of Labor, Occupational Safety and Health Administration, Risk Factors and Protective Measures for Taxi and Livery Drivers. May 2000.

¹⁸ Massachusetts Department of Public Health, Bureau of Health Statistics, Research and Evaluation, Research & Epidemiology, Massachusetts Deaths, 2000.

A disproportionate number of black, Hispanic, and foreign-born workers were victims of workplace homicide.

- Homicide was the leading fatal event among black and Hispanic workers, accounting for 45% (14 fatalities) and 31% (10 fatalities) of all fatal occupational injuries among black and Hispanic workers, respectively. In contrast, only 11% of the occupational fatalities among white workers were the result of homicide. This finding is consistent with national data.
- Between 1991 and 1999, black and Hispanic workers were victims of 17% and 12% of all workplace homicides respectively, while they constituted only 4% and 3% of the state's labor force. In contrast, white workers, who constituted 93% of the labor force, were victims of 76% of workplace homicides.
- Twenty-five percent (28 fatalities) of the work-related fatalities among foreign-born workers in Massachusetts were due to homicides, whereas homicides accounted for only 10% of the occupational fatalities among workers born in the U.S.
- A high risk of workplace homicide among black, Hispanic and foreign-born workers at the national level was explained in large part by their concentration in occupations with high homicide rates such as taxicab drivers and managers and proprietors of small business establishments.¹⁹
- Self-employed workers, including those working for a family business, accounted for 23% of the homicides at work, whereas they comprised only 7% of all employed workers during 1999.

Patterns of workplace homicide differ from patterns of homicide in general

- Homicide in the workplace is characterized by unique patterns that set it apart from homicide in general. For instance, robbery was the precipitating circumstance in 49% of work-related homicides where motives were known in Massachusetts over the nine-year period. In contrast, a 1995 report by the Massachusetts Department of Public Health (MDPH) identifies robbery or other felony as responsible for less than one-fifth of all homicides in Massachusetts between 1978 and 1993.
- The MDPH report also points out that 45% of homicide victims in general were related to or acquainted with their assailants, a higher percentage than the 26% of workers who were fatally injured by someone they knew (Chart 15).
- Homicide in the workplace is also more likely to result from shooting than homicide in general. In Massachusetts, 68 percent of workers who died as a result of homicide between 1991 and 1999 were fatally injured by shooting, while shootings were responsible for approximately 54 percent of Massachusetts homicides overall in 2000.²⁰ Such differences between workplace and community homicides have been found to exist to an even greater degree at the national level.

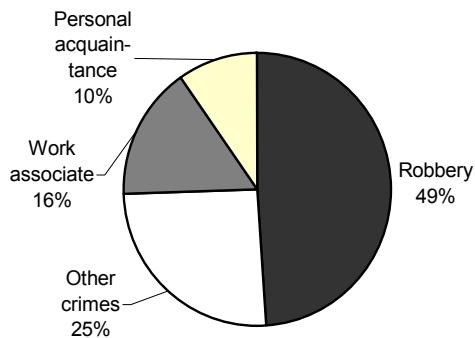
A lawyer was shot and fatally injured by his client's husband. He had gone to the residence of the client. While the lawyer was in her house, the client's husband shot and killed the victim, his wife, and himself (Massachusetts CFOI report, 1995).

An off-duty police officer was killed when a perpetrator who was accused of child molestation stabbed him. The officer was consoling the family of the molested child when the assailant showed up with a knife and mace to attack the child's family. The officer tried to fend off the assailant and was stabbed in the ensuing struggle. He died later from the stab wound he suffered (Massachusetts CFOI report, 1997).

¹⁹ Castillo, D. and Jenkins, L. Industries and Occupations at High Risk for Work-Related Homicide, Journal of Medicine, Volume 36(4), February 1994.

²⁰ MDPH, Bureau of Health Statistics, Research and Evaluation, Research and Epidemiology, Massachusetts Deaths, 2000.

**Chart 15. Workplace Homicide by Circumstance
Massachusetts, 1991-1999 (N = 51)**



Preventing Violence in the Workplace

Workplace violence cannot be considered independently from violence in the community at large. Efforts to prevent violence in the community should contribute to reduction of injuries due to violence at work. At the same time, it is important to recognize that specific efforts can and should be made to address violence in the workplace. As discussed, patterns of workplace homicides are distinct from patterns of homicide in the community in general and point to unique opportunities for violence prevention. While specific approaches will vary depending by the type of workplace, there are steps that most workplaces can take to address risk factors that have been identified. These risk factors include:²¹

- Contact with the public
- Exchange of money
- Delivery of passengers, goods, or services
- Having a mobile workplace (i.e. taxicab, police cruiser)
- Working with unstable persons in health care, social services, or criminal justice settings
- Working alone or in small numbers
- Working late at night or during early morning hours
- Guarding valuable property or possessions
- Working in high-crime areas
- Working in community-based settings

The National Institute for Occupational Safety and Health has recommended that workplace violence prevention programs should include:

1) Management commitment

Management should develop and publicize a written “zero tolerance for violence” policy. A written program should include a policy statement, a system of record keeping, and a program of responsibilities and actions in the event of violence. Implementation of the program should entail mechanisms for reporting threats or violent acts, identification of procedures for dealing with violence, and enforcement of the non-violence policy.

Three immigrant taxi drivers were killed during robberies in separate incidents. One incident occurred during daytime while the other two occurred during evening and early morning hours. The cab of one of the victims did not have a safety partition. Another victim was using his own car as a cab to drive shoppers from a neighborhood supermarket to their residences (Massachusetts CFOI report, 1997).

²¹ U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, Violence in the Workplace, 1996.

2) Work-site analysis

Identification and analysis of potential problem areas is a necessary prelude to implementing effective control measures. Part of this process involves studying the history of violence in the community and workplace to better understand the scope and nature of potential violence. A comprehensive physical inspection of the work-site to document areas where controls are in order is also necessary.

3) Environmental controls

Controls will vary with the work setting. Measures may include: enhanced lighting at strategic outside locations and enhanced street visibility; installation of security devices such as alarms, mirrors and video cameras; and design of entrances and exits to deter access by unauthorized persons and eliminate hiding places. In retail and other establishments where money is exchanged, the installation of bulletproof glass can provide workers with physical protection, while using drop safes and posting signs about limited cash availability may also serve as deterrents. In other settings where the public or clients may pose a threat, additional controls may include the provision of separate and locked bathroom facilities for staff, the installation of panic buttons and alarms, and the use of card key access systems.

4) Administrative controls

Staffing patterns are among the foremost violence prevention administrative measures. Increasing the number of staff on site is only one possible control. Particular activities may carry increased risk, such as transporting patients or storing money. Increased staffing policies should be implemented for such activities. Using trained security guards is another way of improving workplace security. Employee training and education on hazard recognition, safe work practices, and conflict resolution is another form of administrative control. Instructing employees in restaurants or bars on how to deal with customers who leave without paying or cause problems and making clear that employees should not physically engage customers are examples of such practices.

Preventing violence against taxi drivers

Taxi and livery drivers face an increased risk of workplace violence both in Massachusetts and nationally. The Occupational Safety and Health Administration recommends the following protective measures to prevent violence-related injury to taxi drivers and speed response time to those who need help. They include:²²

- Automatic vehicle location or global positioning system (GPS) to locate drivers in distress
- Caller ID to help trace location of fares
- First-aid kits in every car for use in emergencies
- In-car surveillance cameras
- Partitions or shields between the driver and passenger
- Protocol with police—owners and police to track high-crime locations
- Radios to communicate in emergencies (e.g., with an “open mike switch”)
- Safety training for drivers
- Silent alarms
- Use of credit/debit cards (“cash-less” fare systems) to discourage robberies

A plain-clothes police officer was shot and killed by an assailant. The officer was responding to a domestic disturbance call from residents and saw one of the men involved in the disturbance leaving the scene. As he followed the assailant, the assailant shot and wounded him several times. He later died of gun shot injuries (Massachusetts CFOI report, 1999).

²² U.S. Department of Labor, Occupational Safety and Health Administration, Risk Factors and Protective Measures for Taxi and Livery Drivers. May 2000.

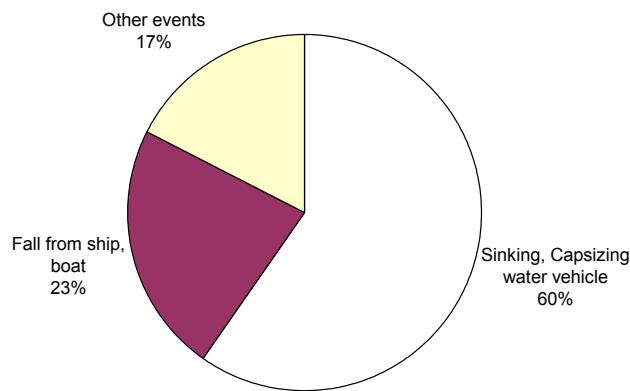
3.3 Commercial Fishing

Fishing claimed the lives of more workers in Massachusetts during 1991-1999 than any other single occupation. During this period, 57 Massachusetts fishers were fatally injured on the job. All victims were men, 24 were self-employed, 43 were white, and 15 were foreign-born. It was not possible to compute a state-specific fatality rate for the fishing industry because adequate data on the number of workers in this industry in Massachusetts were not available. However, commercial fishing has been found to be the most dangerous industry in the country. Nationally, between 1992-1996, an average of 76 fishers were fatally injured on the job each year, and the fatal occupational injury rate was 140 fatalities per 100,000 fishers, more than 28 times the average rate for all industries.²³ During the same period, Massachusetts was second only to Alaska in the number of fishers fatally injured at work.

Most Massachusetts fishers died as a result of sinking or capsizing of water vehicles.

- Sinking or capsizing of water vehicles were the leading events accounting for 60% (34 fatalities) of fishing fatalities (Chart 16). Thirteen workers fell overboard from fishing vessels and 10 died from other injuries such as being struck by a tow-line, inhalation of substance in enclosed, restricted or confined space, being caught in a rotating fishing vessel engine, and falling on boats.

Chart 16. **Fishing Fatalities by Event/Exposure**
Massachusetts, 1991-99
N = 57



- Out of the 34 fatalities due to sinking or capsized fishing vessels, 88% (30 fatalities) were due to ten multiple-fatality incidents with 2 to 6 lives lost at one time. Vessel size information was available for 5 fishing vessels that sunk or capsized, and their size ranged from 40 feet to 112 feet.

Sinking or capsizing of water vehicles claimed more lives of Shellfisher than finfisher.

- Of the total 57 fatalities, 27 victims were shellfishers and 26 were finfishers. Information on specific industry was not available for 4 fatalities. Nationally, more shellfishers (188 fatalities) than finfishers (138 fatalities) died between 1992 and 1997.²⁴

Two fishers were fatally injured when their fishing vessel sank. They were part of a five-man crew on a quahog clam boat. The other three members were rescued by another fishing vessel. The weather condition was rainy with strong wind, high

²³ Drudi, D. Fishing for a Living is Dangerous Work, Fatal Workplace Injuries in 1996: A Collection of Data and Analysis, BLS, June 1998.

²⁴ Drudi, D. Persons Overboard/Sunk Vessels: Fishing Jobs Continue to Take Deadly Toll, BLS, Issues in Labor Statistics, June 1998.

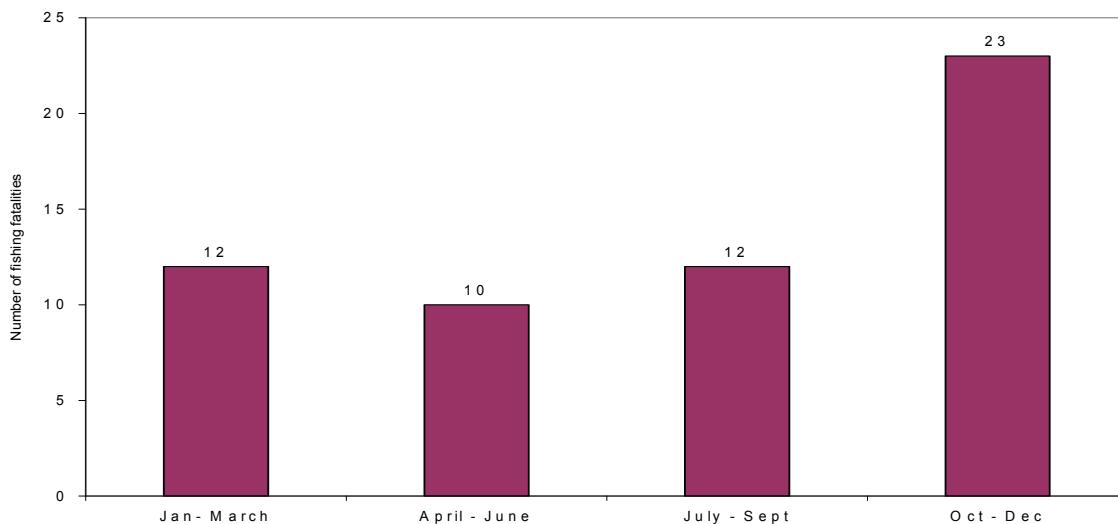
seas, low visibility, and cold water temperature. The bodies of the victims were found washed up on shore two days later (Massachusetts CFOI report, 1999).

- Events involving sinking or capsizing water vehicles claimed more lives of finfishers than shellfishers in Massachusetts. Two-thirds (77%, 20 fatalities) of finfishers who were fatally injured on the job died when their fishing boats sank or capsized, whereas less than half (48%, 13 fatalities) of the fatalities among shellfishers were the result of similar events.
- Fall overboard events were more common among shellfishers than finfishers. One-third (33%, 9 fatalities) of the fatalities among shellfishers and about one-tenth (3 fatalities, 12%) of the fatalities among finfishers were the results of a fall overboard.

Most fishing fatalities occurred during fall and winter seasons.

- In Massachusetts, most fishing fatalities occurred during fall and winter seasons (Chart 17). Six in 10 of all fishing fatalities and two-thirds (68%) of the fatalities due to capsized fishing boats occurred in the months between October and March.

**Chart 17. Work-related Fishing Fatalities by Time
of the Year, Massachusetts, 1991-1999
(N = 57)**



Preventing work-related fatalities among commercial fishers

- Capsizing or sinking vessels accounted for the majority of fatalities among commercial fishers in Massachusetts. A NIOSH working group on Commercial Fishing in Alaska identified vessel stability and hull integrity, licensing and training of operators and crew, management regimes, and avoidance of most harsh sea and weather conditions as critical issues to be addressed to prevent fatalities due to capsizing and sinking fishing vessels. The working group recommended the following measures²⁵:

Two fishers were fatally injured when their fishing trawler sank. One of them died of hypothermia and drowning and the other could not be found and was presumed dead. According to reports from the Coast Guard, the vessel did not meet several of the voluntary standards set for small commercial fishing vessels. The life raft was found to have been stowed improperly in the wheelhouse. The Emergency Positioning Indicating Radio Beacon (EPIRB), an electronic device meant to float to the

²⁵ NIOSH, Current Intelligence Bulletin 58, Commercial Fishing Fatalities in Alaska: Risk Factors and Prevention Strategies, September 1997.

surface and give off a signal during an emergency, had also been improperly stowed. In addition, the vessel did not carry immersion suits that protect workers from exposure to cold water (Massachusetts CFOI report, 1991).

- **A requirement for periodic stability reassessment and inspection of all vessels**
- **Minimum specifications for watertight components and bulkheads sufficient to keep vessels afloat**
- **Assessing thoroughly the current licensing and training requirements for skippers and crew and correcting deficiencies**
- **Establishing adequate watchkeeping and staffing requirements for all vessels**
- **Examining all existing and proposed management regimes from a health and safety perspective**

A considerable number of fishers also die from falling overboard. Personal Flotation Devices (PFD) can increase the chance of survival. A study by NIOSH indicates that 63% of fishers who fell overboard while wearing PFDs have survived, while only 12% of those who did not wear PFDs survived.²⁶

The availability of PFDs in a readily accessible area to all crewmembers is necessary. The choice and proper use of PFDs during routine work on deck can save the lives of fishers who fall overboard and risk drowning or hypothermia.

NIOSH recommends the following to prevent overboard falling and related fatalities:

- Use safety lines when possible
- Install or extend guardrails where possible
- Keep decks as clean and clear as possible to prevent slipping or tripping
- Ensure that vessels are equipped with at least one Personal Floatation Device (PFD) or immersion suit for each person on board
- Have a rescue system in place for a quick retrieval from the water
- Always wear a PFD while on the deck of a commercial fishing vessel.

A lobsterman died after falling off his boat. He was alone in his boat when he went to check his traps. Hours later, another fisherman found him beneath his boat. He died later from the injuries he suffered (Massachusetts CFOI report, 1996).

Two fishers were fatally injured in two separate incidents when their clothes became entangled in the rotating propulsion shafts of the fishing vessels they were working aboard.

Victim # 1 was attempting to gain access to the bilge pump. He removed the deck cover, which exposed approximately 2 feet of the 2½-inch diameter rotating propulsion shaft and flanged coupling. While reaching underneath the propulsion shaft to clear away debris from the bilge pump the victim's shirt became entangled in the rotating shaft, pulling him into the bilge.

Victim # 2 was owner of a fishing vessel and was assisting his son in solving a problem with the vessel's propulsion system. Prior to checking the transmission and propulsion shaft, the victim had removed the wooden deck cover exposing approximately 1½ feet of the 1½ inch diameter rotating propulsion shaft and flanged coupling. The engine shut down after a clanging sound was heard. The son turned around and found his father entangled in the propulsion shaft.

²⁶ Center for Diseases Control and Prevention, NIOSH, Preventing Drownings of Commercial Fishermen, Alert, April 1994.

In order to prevent similar future incidents, the FACE program recommended that fishers should: 1) disengage the transmission before attempting to work on or near the transmission and propulsion shaft; and 2) guard moving machine parts, such as propulsion shafts, to avoid contact (Massachusetts FACE reports, 99MA068 and 99MA072).

4. Appendices

**Appendix 1. Top Three Fatal Occupational Events/Exposures
by Race and Hispanic Origin, Massachusetts, 1991-1999**

Race of workers			Hispanic Origin	
white (n = 562)	black (n = 31)	Asian/Native Hawaiian/Pacific (n = 24)	Hispanic (n = 32)	Non-Hispanic (n = 578)
Fall to lower level (20%)	Homicide (52%)	Homicide (18%)	Homicide (35%)	Fall to lower level (19%)
Motor vehicle incident (14%)	Motor vehicle incident (16%)	Caught in/or between equipment (18%)	Fall to lower level (12%)	Motor vehicle incident (14%)
Homicide (12%)	Fall to lower level (16%)	Suicide (14%)	Contact with objects (15%)	Homicide (13%)

NOTE: Information about race and Hispanic origin was obtained from death certificates. Race data was not available for 16 workers and information on Hispanic Origin was not available for 23 workers.

SOURCE: Massachusetts Department of Public Health, Occupational Health Surveillance Program, Census of Fatal Occupational Injuries

Appendix 2. Fatal Occupational Injuries by Selected Characteristics
Massachusetts, 1991-1999 and U.S., 1992-1999 Annual Average

Characteristics	Massachusetts 1991-1999		U. S. 1992-99 annual average		Characteristics	Massachusetts 1991- 1999		U.S. 1992-99 annual average	
	N	%	N	%		N	%	N	%
Total	633	100	6,247	100	Highway incidents	84	13	1345	22
Employer					Non-highway accident	19	3	390	6
Private	562	89	5,5	90	Pedestrian	40	6	375	6
	69	11	649	10	Water vehicle accident	51	8	120	2
EMPLOYEE STATUS					Aircraft accident	24	4	298	5
Wage & Salary workers	522	82	4,971	80	Fires and explosion	25	4	198	3
Self-employed*	111	18	1,224	20	Assaults and violent acts	115	18	1,168	19
Gender					Homicide	82	13	923	15
Men	589	93	5,711	91	Suicide	30	5	214	3
Women	44	7	84	9	Industry				
Race					Agriculture, Forestry, and Fishing	94	15	826	13
white	562	89	5,104	82	Commercial fishing	57	9	71	1
black	31	5	647	0	Construction	136	22	1,057	17
Asian/Pacific Islander	24	4	188	3	Special trades contractors	100	16	610	10
Not reported	16	2	308	5	Manufacturing	55	9	739	12
Hispanic Origin					Transportation and Public Utilities	84	13	941	15
Hispanic**	32	5	31	10	Trade	85	13	932	15
Age					Finance/Insurance/ Real Estate	9	1	111	2
Under 20 years	16	3	250	4	Services	97	15	766	12
20 - 24 years	35	3	484	8	Government	69	11	656	11
25 - 34 years	160	25	1,381	22	Occupation				
35 - 44 years	174	28	1,545	25	Managerial and Professional	76	12	687	11
45 - 54 years	111	18	1,251	20	Technical, Sales and Administrative Support	86	14	782	13
55 - 64 years	83	13	824	13	Service	67	11	516	8
65 years and older	49	8	5	8	Farming, Forestry and Fishing	95	15	919	15
Unknown	5	1	-	-	Precision production, Craft and Repair	144	23	1,091	18
Event					Operators, Fabricators and Laborers	161	25	2,069	34
Contact with objects or equipment									
Fall	88	14	1,000	16					
Fall to lower level	133	21	671	11					
	120	19	590	9					
Exposure to harmful Substances or environments									
Contact with electric current	50	8	590	9					
Transportation Incidents									
	25	4	318	5					
	221	35	2,600	42					

SOURCE: Census of Fatal Occupational Injuries (CFOI), Massachusetts Department of Public Health, 1991-1999.

Census of Fatal Occupational Injuries (CFOI), Bureau of Labor Statistics, 1992-1999.

* Includes paid and unpaid family workers and may include owners of incorporated businesses, or members of partnerships.

** Persons identified as Hispanic may be of any race.

NOTE: Totals may include data for subcategories not shown separately. Percentages may not add to totals due to rounding.
Dashes indicate data that are not available or do not meet publication criteria.

**Appendix 3. Workplace Fall Fatalities by Selected Characteristics,
Massachusetts 1991-1999 and U.S., 1997**

Characteristics	Massachusetts (1991-1999)		U.S. (1997)		Characteristics	Massachusetts (1991-1999)		U.S. (1997)	
	N	%	N	%		N	%	N	%
Total	133	100	715	100	Technical , sales, and administrative support	12	9	28	4
Employee status					Farming, forestry, and fishing	11	8	64	9
Wage and salary workers	112	84	595	83	Precision production, craft and repair	68	51	293	41
Self-employed	21	16	120	17	Mechanic and repairers	5	4	42	6
Gender					Construction trades	62	47	236	33
Men	127	95	695	97	Brickmasons and stonemasons, Apprentices	6	5	12	1
Women	6	5	20	3	Carpenters and apprentices	11	8	43	6
Race					Electricians and apprentices	4	3	14	2
black	5	4	56	8	Painters, construction and maintenance	6	5	21	3
white	125	94	606	85	Roofers	14	11	36	5
Other	3	2	53	7	Structural metal workers	7	5	35	5
Hispanic Origin					Operators, fabricators, and laborers	19	14	207	29
Hispanic	7	5	88	12	Transportation and material moving Occupations	4	3	-	-
Age					Handlers, equipment cleaners, helpers and Laborers	13	10	-	-
Under 15 years	-	-	-	-	Construction laborers	7	5	107	15
15-24 years	6	5	67	9	Laborers, except construction	4	3	-	-
25-34 years	27	20	121	19	Other	-	-	-	-
35-44 years	36	27	157	24	Industry				
45-54 years	24	18	151	23	Agriculture, Forestry, and Fishing	9	7	65	9
55-64 years	16	12	96	15	Construction	72	54	380	53
65 years and older	24	18	66	10	General building contractors	11	8	-	-
Unknown	-	-	5	1	Heavy contractors	3	2	-	-
Event					Special trade contractors	58	44	-	-
Fall to lower level	118	89	652	91	Masonry, stonework, and plastering	7	5	-	-
Fall down stairs or steps	4	3	13	2	Carpentry and floor work	11	8	-	-
Fall from floor, dock, ground	-	-	40	6	Roofing, siding, and sheet metal work	14	11	-	-
Fall from ladder	10	8	116	16	Miscellaneous special trade Contractors	13	10	-	-
Fall from roof	12	9	154	22	Manufacturing	3	4	55	8
Fall through existing roof Opening	-	-	20	3	Transportation and Public Utilities	4	6	37	5
Fall through roof surface	4	3	19	3	Wholesale/Retail trades	7	10	49	7
Fall through skylight	-	-	17	2	Services	11	16	68	10
Fall from roof edge	4	3	56	8	Government			30	4
Fall from scaffold, staging	10	8	87	12	Establishment sizes (no. of employees)				
Fall from building girders or other structural steel	3	2	48	7	1-10	73	59	-	-
Fall from nonmoving vehicle	-	-	53	7	11-19	12	10	-	-
Fall on same level	15	11	44	6	20-49	13	11	-	-
Fall to floor, walkway, or other	4	3	33	55	50-99	4	3	-	-
Occupation					100+	21	17	-	-
Managerial and professional specialty	5	4	64	9					

SOURCE: Massachusetts Department of Public Health, Census of Fatal Occupational Injury (CFOI) Program, 1991-1999, and U.S. Department of Labor, Bureau of Labor Statistics, CFOI, 1997

NOTE: Totals for major categories may include subcategories not shown separately. Percentages may not add to totals due to rounding. Major categories that do not meet publication criteria are not shown. Dashes indicate unpublishable data.

**Appendix 4. Workplace Homicides by Selected Characteristics,
Massachusetts, 1991-1999 and U.S., 1992-1999 Annual Average**

Characteristics	Massachusetts 1991-1999		U.S. 1992-1999 annual average		Characteristics	Massachusetts 1991-1999		U.S. 1992-1999 annual average	
	N	%	N	%		N	%	N	%
	Total	82	100	920	100	Occupation			
Gender					Managerial and professional specialty occupations				
Men	70	85	743	81	Executive, administrative and managerial occupations	17	21	160	17
Women	12	15	147	19	Professional specialty	7	9	127	14
Race					Technical, sales, and administrative Support jobs	10	12	33	4
white	61	74	606	66	Sales occupations	26	32	328	36
black	14	17	170	18	Supervisors and proprietors, sales occupations	20	24	287	31
Other or unknown	7	9	144	16	Cashiers	13	16	146	16
Hispanic Origin					Administrative support	3	4	80	9
Hispanic	10	12	126	14	Occupations, including, clerical	5	6	36	4
Age					Service occupations	19	23	197	21
Under 20 years	1	1	30	3	Protective service occupations	12	15	116	13
20-24 years	7	9	60	8	Operators, Fabricators, Laborers	14	17	110	12
25-34 years	18	22	233	25	Motor vehicle operators	14	17	106	12
35-44 years	25	30	240	26	Truck drivers	2	2	23	3
45-54 years	20	24	181	20	Taxicab drivers and chauffeurs	11	13	70	8
55-64 years	6	7	106	12	Industry				
65 years and older	5	6	56	6	Transportation and public utilities	15	18	98	11
Event					Local and interurban passenger transit	12	15	74	8
Shooting	56	68	705	82	Taxicabs	10	12	70	8
Stabbing	12	15	73	9	Wholesale/Retail trade	29	35	442	48
Hitting, kicking, beating	4	5	47	5	Food stores	9	11	154	17
Other, including, bombing	10	12	31	4	Eating and drinking places	6	7	119	13
Motive					Services	20	24	156	17
Robbery and other crimes	64	78	775	84	Business services	4	5	43	5
Personal acquaintance	11	13	44	5	Manufacturing	-	-	38	4
Work associates	7	9	101	11	Government/Public Administration	15	18	112	12

SOURCE: Massachusetts Department of Public Health, Census of Fatal Occupational Injury (CFOI) Program, 1991-1999, and U.S. Department of Labor Bureau of Labor Statistics, CFOI, 1997.

NOTE: Totals for major categories may include subcategories not shown separately. Percentages may not add to totals due to rounding. Major categories that do not meet publication criteria are not shown. Dashes indicate no data reported or data that do not meet publication criteria.

Appendix 5. **Work-related Fishing Fatalities by Selected Characteristics,
Massachusetts, 1991 – 1999**

Characteristics	Massachusetts 1991-1999		Characteristics	Massachusetts, 1991-1999	
	N	%		N	%
Total	57	100	Occupation		
Employee status			Fishers, hunters and trappers	57	100
Wage and salary workers	33	58	Captains and other officers,		
			Fishing vessels	12	21
Self-employed	24	42	Fishers	45	79
Gender					
Men	57	100	Industry		
Race			Fishing, hunting and trapping	57	100
white	43	75	Finfish	26	49
Not classified	14	25	Shellfish	27	43
Foreign-born	15	26	Unknown	4	7
Portugal	5	9	Event		
Ireland	4	7	Oxygen deficiency, n.e.c.	3	5
Cape Verde	3	5	Drowning	3	5
Poland	1	2	Water vehicle accident	47	82
Honduras	1	2	Fall from ship, boat	12	21
England	1	2	Sinking, capsized water vehicle	26	46
Age			Water vehicle accident, n.e.c.	9	16
20-24 years	1	2	Contact with objects	4	7
25-34 years	20	35	Other events	3	5
35-44 years	20	35	Establishment Size		
45-54 years	5	9	1 to 10	35	61
55-64 years	6	11	11 to 19	2	4
Unknown	5	9	Not reported	20	35

n.e.c.- not elsewhere classified

SOURCE: Massachusetts Department of Public Health, Occupational Health Surveillance Program, Census of Fatal Occupational Injuries (CFOI).

NOTE: Totals for major categories may include subcategories not shown separately. Percentages may not add to totals due to rounding. Major categories that do not meet publication criteria are not shown. Dashes indicate no data reported or data that does not meet publication criteria.

**Appendix 6. Fatal Occupational Injuries of Government Workers
by Selected Characteristics, Massachusetts, 1991-1999 and U.S., 1995**

Characteristics	Massachusetts 1991-1999		U.S. 1995		Characteristics	Massachusetts 1991-1999		U.S. 1995	
	N	%	N	%		N	%	N	%
Total fatalities	69	100	772	100	Type of Government				
Gender					Federal	6	9	299	39
Men	64	93	657	85	State	16	23	124	16
Women	5	7	115	15	Local	47	68	338	44
Race					Foreign	-	-	7	1
white	63	91	620	80	other	-	-	4	1
black	6	9	110	14	Occupation	69	100	772	100
Hispanic Origin					Managerial and professional specialty occupations	11	16	124	16
Hispanic	4	6	40	5	Executive, administrative and Managerial occupations	4	6	64	8
Employee status					Professional specialty	7	10	60	8
Active duty armed forces (resident)	2	3	143	19	Technical, sales, and administrative support jobs	5	7	91	12
Wage and salary	66	96	602	78	Service occupations	32	46	241	31
Volunteers	1	1	27	3	Protective service occupations	31	45	221	29
Age					Police and detectives, including, supervisors	18	26	168	22
16-19 years	1	1	20	3	Firefighting and fire prevention	10	15	35	5
20-24 years	2	3	73	9	Precision, production, craft and repair occupations	10	15	62	8
25-34 years	12	17	204	26	Electricians	4	6		
35-44 years	25	36	188	24	Operators, fabricators, and laborers	8	12	92	12
45-54 years	19	28	150	19	Laborers, except, construction	5	7	-	-
55-64 years	9	13	104	13					
65 years and older	1	1	29	4	Industry				
Event					Transportation and public Utilities	12	17	65	8
Highway incidents	14	20	194	25	Local and interurban passenger transit	4	6	10	1
Homicide	14	20	211	27	U.S. Postal service	-	-	16	2
Struck by vehicle	9	13	67	9	Electric, gas and sanitary Services	6	9	30	4
Exposure to harmful substances or objects	7	10	51	7	Construction	3	4	43	6
Fires	8	12	32	4	Heavy Construction, except Building	3	4	41	5
Suicides	6	9	37	5	Services	7	10	72	9
Other events	11	16	-	-	Government/Public Administration	46	67	576	75

SOURCE: Massachusetts Department of Public Health, Census of Fatal Occupational Injuries, 1991-1999.

U.S. Department of Labor, Bureau of Labor Statistics, Fatal Workplace Injuries in 1995: A collection of Data and Analysis.

NOTE: Number of Government Workers include workers employed by Local, State and Federal Governments in Massachusetts regardless of industry.

Appendix 7. Fatal Occupational Injuries of Older Workers (65 and over) and Younger Workers (< 65 years) by Selected Characteristics, Massachusetts, 1991-1999

Worker Characteristics	Age Groups			
	65 years and older		< 65 years	
	N	%	N	%
Total fatalities	49	100	579	100
Gender				
Men	45	92	539	93
Women	4	8	40	7
Race				
white	48	98	514	89
black	-	-	31	5
Others	-	-	23	4
Employment				
Wage and salary	36	73	479	83
Self-employed	13	27	96	17
Event				
Contact with Object	4	8	84	15
Falls	24	49	109	19
Exposure to Harmful substances and Environments	-	-	50	9
Transportation related incidents	15	31	201	35
Highway incidents	8	16	76	13
Assaults and Violent Acts	5	10	110	19
Homicide	5	10	77	13
Industry				
Agriculture, Forestry and Fishing	3	6	86	15
Construction	10	20	126	22
Manufacturing	4	8	51	9
Transport and Public Utilities	4	8	80	14
Trade	8	16	77	13
Finance, Insurance and Real Estate	-	-	7	1
Services	16	33	83	14
Government	-	-	69	12
Occupation				
Managerial and Professional Occupations	6	12	70	9
Technical, Sales, and Administrative Support Occupations	13	27	73	13
Service Occupations	4	8	63	11
Farming, Forestry and Fishing Occupations	4	8	86	15
Precision Production, Craft and Repair Occupations	13	27	131	23
Operators, Fabricators and Laborers	9	18	152	26

SOURCE: Massachusetts Department of Public Health, Occupational Health Surveillance Program, Census of Fatal Occupational Injuries, and Bureau of Labor Statistics, Census of Fatal Occupational Injuries.

NOTE: Totals for major categories may include subcategories not shown separately. Percentages may not add to totals due to rounding. Major categories that do not meet publication criteria are not shown. Dashes indicate no data reported or data that does not meet publication criteria. Five fatalities were excluded due to lack of age information.

Appendix 8. Detailed Standard Industrial Classification (SIC) Industry Groupings

SIC Industry Division	Major Industry Group	Included Industries
AGRICULTURE, FORESTRY AND FISHING (00 - 09)	AGRICULTURAL PRODUCTION-CROPS (01)	Cash grains; Non-cash Field Crops; Vegetable and Melons; Fruits and Tree Nuts; Horticultural Specialties; General Farms, Primarily Crop
	AGRICULTURAL PRODUCTION LIVESTOCK (02)	Livestock, Except Dairy and Poultry; Dairy Farms; Poultry and Eggs; Animal Specialties; General Farms, Primarily Animal
	AGRICULTURAL SERVICES (07)	Soil Preparation Services; Crop Services; Veterinary Services; Animal Services (except veterinary); Farm Labor and Management Services; Landscape and Horticultural Services
	FORESTRY (08)	Timber Tracts; Forest Products; Forestry Services
	FISHING, HUNTING, AND TRAPPING (09)	Commercial Fishing; Fish Hatcheries and Preserves; Hunting, Trapping, Game Propagation
	GENERAL BUILDING CONTRACTORS (15)	Residential Building Construction; Operative Builders; Non-residential Building Construction
	HEAVY CONSTRUCTION, EXCEPT BUILDING (16)	Highway and Street Construction; Heavy Construction (except highway)
	SPECIAL TRADE CONTRACTORS (17)	Plumbing, Heating and Air-conditioning; Painting and Paper Hanging; Electrical Work; Masonry, Stonework, and Plastering; Carpentry and Floor work; Roofing, Siding, and Sheet Metal work
MANUFACTURING (20 - 39)	FOOD AND KINDRED PRODUCTS (20)	Meat Products; Dairy Products; Preserved Fruits and Vegetables; Grain Mill Products; Bakery Products; Sugar and Confectionery Products; Fats and Oils; Beverages; Miscellaneous Food and Kindred Products
	TOBACCO PRODUCTS (21)	Cigarettes; Cigars; Chewing and Smoking Tobacco; Tobacco Stemming and Redrying
	TEXTILE MILL PRODUCTS (22)	Broadwoven Fabric Mills, Cotton; Broadwoven Fabric Mills, Manmade; Broadwoven Fabric Mills, Wool; Narrow Fabric Mills; Knitting Mills; Textile Finishing, Except Wool; Yarn and Thread Mills; Miscellaneous Textile Goods
	APPAREL AND OTHER TEXTILE PRODUCTS (23)	Men's and Boys' Suits and Coats; Men's and Boys' Furnishings; Women's and Misses' Outerwear; Women's and Children's Undergarments; Hats, Caps, and Millinery; Girls' and Children's Outerwear; Fur Goods; Miscellaneous Apparel and Accessories; Miscellaneous Fabricated Textile Products
	LUMBER AND WOOD PRODUCTS (24)	Logging; Sawmills and Planing Mills; Millwork, Plywood and Structural Members; Wood Containers; Wood Buildings and Mobile Homes; Miscellaneous Wood Products
	FURNITURE AND FIXTURES (25)	House Hold Furniture; Office Furniture; Public Building and Related Furniture; Partitions and Fixtures; Miscellaneous Furniture and Fixtures
	PAPER AND ALLIED PRODUCTS (26)	Pulp Mills; Paper Mills; Paperboard Mills; Paperboard Containers and Boxes; Miscellaneous Converted Paper Products
	PRINTING AND PUBLISHING (27)	Newspapers; Periodicals; Books; Miscellaneous Publishing
CHEMICALS AND ALLIED PRODUCTS (28)	CHEMICALS AND ALLIED PRODUCTS (28)	Industrial Inorganic Chemicals; Plastics Materials and Synthetics; Drugs; Soap, Cleaners, and Toilet Goods; Paints and Allied Products; Industrial Organic Chemicals; Agricultural Chemicals; Miscellaneous Chemical Products

Appendix 8. **Detailed Standard Industrial Classification (SIC) Industry Grouping --- Continued**

SIC Industry Division	Major Industry Group	Included Industries
MANUFACTURING Continued	PETROLEUM AND COAL PRODUCTS (29)	Petroleum Refining; Asphalt Paving and Roofing Materials; Miscellaneous Petroleum and Coal products
	RUBBER AND MISC.PLASTICS PRODUCTS (30)	Tires and Inner Tubes; Rubber and Plastic Footwear; Hose and Belting and Gaskets and Packing; Fabricated Rubber Products
	LEATHER AND LEATHER PRODUCTS (31)	Leather Tanning and Finishing; Footwear Cut Stock; Footwear, Except Rubber; Luggage; Handbags and Personal Leather Goods; Leather Goods, n.e.c.
	STONE, CLAY, AND GLASS PRODUCTS (32)	Flat Glass; Glass and Glassware, Pressed or Blown; Products of Purchased Glass; Structural Clay Products; Pottery and Related products; Concrete, Gypsum, and Plaster products; Cut Stone and Stone Products; Miscellaneous Nonmetallic Mineral Products
	PRIMARY METAL INDUSTRIES (33)	Blast Furnace and Basic Steel Products; Iron and Steel Foundries; Primary Nonferrous Metals; Secondary Nonferrous Metals; Nonferrous Rolling and Drawing; Nonferrous Foundries (Castings); Miscellaneous Primary Metal products
	INSTRUMENTS AND RELATED PRODUCTS (38)	Search and Navigation Equipment; Measuring and Controlling Devices; Medical Instruments and Supplies; Ophthalmic Goods; Photographic Equipment and Supplies; Watches, Clocks, Watchcases and Parts
	MISCELLANEOUS MANUFACTURING INDUSTRIES (39)	Jewelry, Silverware, and Plated Ware; Musical Instruments; Toys and Sporting Goods; Pens, Pencils, Office, and Art Supplies; Costume Jewelry and Notions; Miscellaneous Manufactures.
TRANSPORTATION AND PUBLIC UTILITIES (40-49)	RAILROAD TRANSPORTATION (40)	Railroads
	LOCAL AND INTERURBAN PASSENGER TRANSIT (41)	Local and Suburban Transportation; Taxicabs; Inter-city and Rural Bus Transportation; Bus Charter Service; School Buses; Bus Terminal and Service Facilities
	TRUCKING AND WAREHOUSING (42)	Trucking and Courier Services, except Air; Public Warehousing and Storage; Trucking Terminal Facilities
	U.S. POSTAL SERVICE (43)	U.S. Postal Service
	WATER TRANSPORTATION (44)	Deep Sea Foreign Transportation of Freight; Deep Sea Domestic Transportation of Freight; Freight Transportation on the Great Lakes; Water Transportation of Freight ,n.e.c.; Water Transportation of Passengers; Water Transportation Services
	TRANSPORTATION BY AIR (45)	Air Transportation, Scheduled; Air Transportation, Nonscheduled; Airports, Flying Fields, and Services
	PIPELINES, EXCEPT NATURAL GAS (46)	Pipelines, Except Natural Gas
	TRANSPORTATION SERVICES (47)	Passenger Transportation Arrangement; Freight Transportation Arrangement; Rental of Railroad Cars; Miscellaneous Transportation Services
	COMMUNICATIONS (48)	Telephone Communications; Telegraph and Other Communications; Radio and Television Broadcasting; Cable and Other Pay TV Services
	ELECTRIC, GAS, AND SANITARY SERVICES (49)	Electric Services; Gas Production and Distribution; Combination Utility Services; Water Supply; Sanitary Services; Steam and Air-conditioning Supply; Irrigation Systems

Appendix 8. **Detailed Standard Industrial Classification (SIC) Industry Grouping ---Continued**

SIC Industry Division	Major Industry Group	Included Industries
WHOLESALE TRADE (50 - 51)	WHOLESALE TRADE-DURABLE GOODS (50)	Motor Vehicles, Parts, and Supplies; Furniture and Home Furnishings; Lumber and Construction Materials; Professional and Commercial Equipment; Metals and Minerals, Except Petroleum; Electrical Goods; Hardware, Plumbing ,and Heating Equipment; Machinery, Equipment, and Supplies; Miscellaneous Durable Goods
	WHOLESALE TRADE-NONDURABLE GOODS (51)	Paper and Paper Products; Drugs, Proprietaries, and Sundries; Apparel, Piece Goods, and Notions; Groceries and Related Products; Farm-Product Raw materials; Chemicals and Allied Products; Petroleum and Petroleum Products; Beer, Wine, and Distilled Beverages; Miscellaneous Non-durable Goods
RETAIL TRADE (52 - 59)	BUILDING MATERIALS AND GARDEN SUPPLIES (52)	Lumber and Other Building Materials; Paint, Glass, and Wallpaper Stores; Hardware Stores; Retail Nurseries and Garden Stores; Mobile Home Dealers;
	GENERAL MERCHANDISE STORES (53)	Department Stores; Variety Stores; Miscellaneous General Merchandise Stores
	FOOD STORES (54)	Grocery Stores; Meat and Fish Markets; Fruit and Vegetable Markets; Candy, Nut, and Confectionery Stores; Dairy Products Stores; Retail Bakeries; Miscellaneous Food Stores
	AUTOMOTIVE DEALERS and SERVICE STATIONS (55)	New and Used Car Dealers; Used Car Dealers; Auto and Home Supply Stores; Gasoline Service Stations; Boat Dealers; Recreational Vehicle Dealers; Motorcycle Dealers; Automotive Dealers, n.e.c.
	APPAREL AND ACCESSORY STORES (56)	Men's and Boys' Clothing Stores; Women's Clothing Stores; Women's Accessory and Specialty Stores; Children's and Infants' Wear Stores; Family Clothing Stores; Shoe Stores; Miscellaneous Apparel and Accessory Stores
	FURNITURE AND HOMEFURNISHING STORES (57)	Furniture and Home Furnishings Stores; Household Appliance Stores; Radio, Television, and Computer Stores
FINANCE, INSURANCE AND REAL ESTATE (60 - 69)	EATING AND DRINKING PLACES (58)	Eating and Drinking Places
	MISCELLANEOUS RETAIL (59)	Drug Stores and Proprietary stores; Used Merchandise Stores; Liquor Stores; Miscellaneous Shopping Goods Stores; Non-store Retailers; Fuel Dealers; Retail Stores, n.e.c.
	DEPOSITORY INSTITUTIONS (60)	Central Reserve Depositories; Commercial Banks; Savings Institutions; Credit Unions; Foreign Bank and Branches & Agencies; Functions Closely Related to Banking;
	NONDEPOSITORY INSTITUTIONS (61)	Federal and Fed-Sponsored Credit; Personal Credit Institutions; Business Credit Institutions; Mortgage Bankers and Brokers
	SECURITY AND COMMODITY BROKERS (62)	Security Brokers and Dealers; Commodity Contracts Brokers, Dealers; Security and Commodity Exchanges; Security and Commodity Services
	INSURANCE CARRIERS (63)	Life Insurance; Medical Service and Health Insurance; Fire, Marine, and Casualty Insurance; Surety Insurance; Title Insurance; Pension, Health, and welfare Funds; Insurance Carriers, n.e.c.

Appendix 8. **Detailed Standard Industrial Classification (SIC) Industry Grouping --- Continued**

SIC Industry Division	Major Industry Group	Included Industries
FINANCE, INSURANCE AND REAL ESTATE	INSURANCE AGENTS, BROKERS, and SERVICE (64)	Insurance Agents, Brokers, and Service
	REAL ESTATE (65)	Real Estate Operators and Lessors; Real Estate Agents and Managers; Subdividers and Developers
SERVICES (70 - 89)	HOTELS AND OTHER LODGING PLACES (70)	Hotels and Motels; Rooming and Boarding Houses; Camps and Recreational Vehicle Parks; Membership-Basis Organization Hotels
	PERSONAL SERVICES (72)	Laundry, Cleaning, and Garment Services; Photographic Studios, Portrait; Beauty Shops; Barber Shops; Shoe Repair and Shoeshine Parlors; Funeral Service and Crematories; Miscellaneous Personal Services
	BUSINESS SERVICES (73)	Advertising; Credit Reporting and Collection; Mailing, Reproduction, Stenographic; Services to Buildings (including disinfecting and pest control and building maintenance); Miscellaneous Equipment Rental and Leasing; Personnel Supply Services; Computer and Data Processing Services; Miscellaneous Business Services (including Detective and Armored Car Services).
	AUTO REPAIR, SERVICES, AND PARKING (75)	Automotive Rentals, No Drivers; Automobile Parking; Automotive Repair Shops; Automotive Services, Except Repair
	MISCELLANEOUS REPAIR SERVICES (77)	Electrical Repair Shops; Watch, Clock, and Jewelry Repair; Reupholstry and Furniture Repair; Miscellaneous Repair Shops
	MOTION PICTURES (78)	Motion Picture Production and Services; Motion Picture Distribution and Services; Motion Picture Theatres; Video Tape Rental;
	AMUSEMENT AND RECREATION SERVICES (79)	Dance Studios, Schools, and Halls; Producers, Orchestras, Entertainers; Bowling Centers; Commercial Sports; Miscellaneous Amusement, Recreation Services
	HEALTH SERVICES (80)	Offices and Clinics of Medical Doctors; Offices and Clinics of Dentists; Offices and Clinics of Physicians; Offices of Other Health Practitioners; Nursing and Personal Care Facilities; Hospitals; Medical and Dental Laboratories; Home Health Care Services; Health and Allied Services, n.e.c.
	LEGAL SERVICES (81)	Legal Services
	EDUCATIONAL SERVICES (82)	Elementary and Secondary Schools; Colleges and Universities; Libraries; Vocational Schools; Schools and Educational Services, n.e.c.
	SOCIAL SERVICES (83)	Individual and Family Services; Job Training and Related Services; Child Day Care Services; Residential Care; Social Services, n.e.c.
	MUSEUMS, BOTANICAL, ZOLOGICAL GARDENS (84)	Museums and Art Galleries; Botanical and Zoological Gardens
	MEMBERSHIP ORGANIZATIONS (86)	Business Associations; Professional Organizations; Labor Organizations; Civic and Social Associations; Political Organizations; Religious Organizations; Membership Organizations, n.e.c.

Appendix 8. **Detailed Standard Industrial Classification (SIC) Industry Grouping ---Continued**

SIC Industry Division	Major Industry Group	Included Industries
SERVICES - Continued	ENGINEERING AND MANAGEMENT SERVICES (87)	Engineering and Architectural Services; Accounting, Auditing, and Bookkeeping; Research and Testing Services; Management and Public Relations
	PRIVATE HOUSEHOLDS (88)	Private Households
	SERVICES, n.e.c. (89)	Services, n.e.c.
PUBLIC ADMINISTRATION (91 - 97)	EXECUTIVE, LEGISLATIVE, AND GENERAL (91)	Executive Offices; Legislative Bodies; Executive and Legislative Combined; General Government, n.e.c.
	JUSTICE, PUBLIC ORDER, AND SAFETY (92)	Courts; Public Order and Safety
	FINANCE, TAXATION, AND MONETARY POLICY (93)	Finance, Taxation, and Monetary Policy
	ADMINISTRATION OF HUMAN RESOURCES (94)	Administration of Educational Programs; Administration of Public Health Programs; Administration of Social and Manpower Programs; Administration of Veterans' Affairs
	ENVIRONMENTAL QUALITY AND HOUSING (95)	Environmental Quality; Housing and Urban Development
	ADMINISTRATION OF ECONOMIC PROGRAMS (96)	Administration of General Economic Programs; Regulation, Administration of Transportation; Regulation, Administration of Utilities; Regulation of Agricultural Marketing; Regulation Miscellaneous Commercial Sectors; Space and Research and Technology
	NATIONAL SECURITY AND INTERNATIONAL AFFAIRS (97)	National Security; International Affairs

n.e.c.— not elsewhere classified

SOURCE: Standard Industrial Classification Manual, Office of Management and Budget, 1987.

Appendix 9. **Detailed Bureau of Census Occupation Groupings**

OCCUPATION CATEGORY	MAJOR OCCUPATION GROUPS	OCCUPATION SUB-GROUPS INCLUDED
MANAGERIAL AND PROFESSIONAL SPECIALTY OCCUPATIONS (003-199)	EXECUTIVE, ADMINISTRATIVE, AND MANAGERIAL OCCUPATIONS (003 – 037) PROFESSIONAL SPECIALTY OCCUPATIONS (043 – 199)	Executive, Administrative, and Managerial Occupations; Management Related Occupations Engineers, Architects, and Surveyors; Mathematical and Computer Scientists; Natural Scientists; Health Diagnosing Occupations; Health Assessment and Treating Occupations; Teachers, Post-Secondary; Teachers, Except Post-Secondary; Social Scientists and Urban Planners; Librarians, Archivists, and Curators; Social, Recreation, and Religious Workers; Lawyers and Judges; Writers, Artists, Entertainers, and Athletes
TECHNICAL, SALES, AND ADMINISTRATIVE SUPPORT OCCUPATIONS (203-389)	TECHNICIANS AND RELATED SUPPORT OCCUPATIONS (203 – 235) SALES OCCUPATIONS (243 – 285) ADMINISTRATIVE SUPPORT OCCUPATIONS, INCLUDING CLERICAL (303 – 389)	Health Technologists and Technicians; Technologists and Technicians, Except Health; Science Technicians; Technicians, Except Health, Engineering, and Science Supervisors and Proprietors, Sales Occupations; Sales Representatives, Finance and Business Services; Sales Representatives, Commodities Except Retail; Sales Workers, Retail and Personal Services; Sales Related Occupations Supervisors, Administrative Support; Computer Equipment Operators; Secretaries, Stenographers, and Typists; Information Clerks; Records Processing Occupations, Except Financial; Financial Records Processing Occupations; Duplicating, Mail and Other Office Machine Operators; Communications Equipment Operators; Mail and Message Distributing Occupations; Material Recording, Scheduling, and Distributing Clerks; Adjusters and Investigators; Miscellaneous Administrative Support Occupations
SERVICE OCCUPATIONS (403-469)	PRIVATE HOUSEHOLD OCCUPATIONS (403 – 407) PROTECTIVE SERVICE OCCUPATIONS (413 – 427) SERVICE OCCUPATIONS, EXCEPT PROTECTIVE AND HOUSEHOLD (433 – 469)	Launderers and Ironers; Cooks, Private Household; Housekeepers and Butlers; Child Care Workers, Private Household; Private Household Cleaners and Servants Supervisors, Protecting Service Occupations; Firefighting and Fire Prevention Occupations; Police and Detectives; Guards Food Preparation and Service Occupations; Health Service Occupations; Cleaning and Building Service Occupations, except Household; Personal Service Occupations
FARMING, FORESTRY, AND FISHING OCCUPATIONS (473-499)	FARMING, FORESTRY, AND FISHING OCCUPATIONS (473 – 499)	Farm Operators and Managers; Other Agricultural and Related Occupations; Forestry and Logging Occupations; Fishers, Hunters, and Trappers
PRECISION PRODUCTION, CRAFT, AND REPAIR OCCUPATIONS (503-699)	MECHANICS AN REPAIRERS (503 – 549) CONSTRUCTION TRADES (553 – 599) EXTRACTIVE OCCUPATIONS (613 – 617)	Vehicle and Mobile Equipment Mechanics and Repairers; Electrical and Electronic Equipment Repairers; Miscellaneous Mechanics and Repairers Supervisors, Construction Occupations; Construction Trades, Except Supervisors Supervisors, Extractive Occupations; Drillers, Oil Well; Explosives Workers; Mining Machine Operators; Mining Occupations, n.e.c.

Appendix 9. Detailed *Bureau of Census* Occupation Groupings --- Continued

OCCUPATION CATEGORY	MAJOR OCCUPATION GROUPS	OCCUPATIONS SUB-GROUPS INCLUDED
PRECISION PRODUCTION, AND CRAFT REPAIR OCCUPATIONS-continued	PRECISION PRODUCTION OCCUPATIONS (628 – 699)	Precision Metal working Occupations; Precision Woodworking Occupations; Precision Textile, Apparel, and Furnishings Machine Workers; Precision Workers, Assorted Materials; Precision Food Production Occupations; Precision Inspectors, Testers, and Related Workers; Plant and System Operators
OPERATORS, FABRICATORS, AND LABORERS (703-889)	MACHINE OPERATORS, ASSEMBLERS, AND INSPECTORS (703 – 799)	Machine Operators and Tenders, Except Precision; Fabricators, Assemblers, and Hand Working Occupations; Production Inspectors, Testers, Samplers, and Weighers
	TRANSPORTATION AND MATERIAL MOVING OCCUPATIONS (803 – 859)	Motor Vehicle Operators; Transportation Occupations, Except Motor Vehicles; Material Moving Equipment Operators
	HANDLERS, EQUIPMENT CLEANERS, HELPERS, AND LABORERS (864 – 889)	Supervisors, Handlers, Equipment Cleaner, and Laborers, n.e.c.; Helpers, Mechanics and Repairers; Helpers, Construction and Extractive Occupations; Freight, Stock, and Material Handlers

SOURCE: Occupational Injuries and Illnesses, Occupational Coding Manual, U.S. Department Labor, Bureau of Labor Statistics, May 2000.

Appendix 10. Occupational Injuries and Illnesses Classification Manual (Section 2.4)

0. Contact with Objects and Equipment

- ◆ Contact with objects and equipment, unspecified
- ◆ Struck against object
 - Struck against object, unspecified
 - Stepped on object
 - Struck against stationary object
 - Struck against moving object
 - Struck against object, n.e.c.
- ◆ Struck by object
 - Struck by object, unspecified
 - struck by falling object
 - struck by flying object
 - Struck by flying object, unspecified
 - Struck by dislodged flying object, particle
 - Struck by discharged object or substance
 - struck by flying object, n.e.c.
- ◆ Struck by swinging or slipping object
 - Struck by swinging or slipping object, unspecified
 - Struck by or slammed in swinging door or gate
 - Struck by slipping handheld object
 - Struck by swinging or slipping object, n.e.c.
- ◆ Caught in or compressed by equipment or objects
 - Caught in or compressed by equipment or objects, unspecified
 - Caught in running equipment or machinery
 - Compressed or pinched by rolling, sliding, or shifting objects
 - Caught in or compressed by equipment or objects, n.e.c.
- ◆ Caught in or crushed in collapsing materials
 - Caught in or crushed in collapsing materials, unspecified
 - Excavation or trenching cave-in
 - Other cave-in
 - Caught in or crushed in collapsing structure
 - Caught in or crushed in collapsing materials, n.e.c.
- ◆ Rubbed or abraded by friction or pressure
 - Rubbed or abraded by friction or pressure, unspecified
 - Rubbed or abraded by kneeling on surface
 - Rubbed or abraded by objects being handled
 - Rubbed or abraded by foreign matter in eye
 - Rubbed or abraded by friction or pressure, n.e.c.
- ◆ Rubbed, abraded, or jarred by vibration

- Rubbed, abraded, or jarred by vibration, unspecified
- Rubbed, abraded, or jarred by vehicle or mobile equipment vibration
- Rubbed, abraded, or jarred by other machine or equipment vibration
- Rubbed, abraded, or jarred by vibration, n.e.c.
- ◆ Contact with objects and equipment, n.e.c.

1. Falls

- ◆ Fall, unspecified
- ◆ Fall to lower level
 - Fall to lower level, unspecified
 - Fall down stairs or steps
 - Fall from roof, dock, or ground level
 - Fall from floor, dock, or ground level, unspecified
 - Fall through existing floor opening
 - Fall through floor surface
 - Fall from loading dock
 - Fall from ground level to lower level
 - Fall from floor, dock, or ground level, n.e.c.
 - Fall from ladder
 - Fall from piled or stacked material
 - Fall from roof
 - Fall from roof, unspecified
 - Fall through existing roof opening
 - Fall through roof surface
 - Fall through skylight
 - Fall from roof edge
 - Fall from roof, n.e.c.
 - Fall from scaffold, staging
 - Fall from building girders or other structural steel
 - Fall from nonmoving vehicle
 - Fall to lower level, n.e.c.
- ◆ Jump to lower level
 - Jump to lower level, unspecified
 - Jump from scaffold, platform, loading dock
 - Jump from structure, structure element, n.e.c.
 - Jump from nonmoving vehicle
 - Jump to lower level, n.e.c.
- ◆ Fall on same level
 - Fall on same level, unspecified
 - Fall to floor, walkway, or other surface
 - Fall onto or against objects
 - Fall on same level, n.e.c.
- ◆ Fall, n.e.c.

Appendix 10. Occupational Injuries and Illnesses Classification Manual-Continued

2. Bodily Reaction and Exertion

- ◆ Bodily reaction and exertion, unspecified
- ◆ Bodily reaction
 - Bodily reaction, unspecified
 - Bending, climbing, crawling, reaching, twisting
 - Sudden reaction when surprised, frightened, startled
 - Running—without other incident
 - Sitting
 - Slip, trip, loss of balance—without fall
 - Standing
 - Walking—without other incident
 - Bodily reaction, n.e.c.
- ◆ Overexertion
 - Overexertion, unspecified
 - Overexertion in lifting
 - Overexertion in pulling or pushing objects
 - Overexertion in holding, carrying, turning, or welding objects
 - Overexertion in throwing objects
 - Overexertion, n.e.c.
- ◆ Repetitive motion
 - Repetitive motion, unspecified
 - Typing or key entry
 - Repetitive use of tools
 - Repetitive placing, grasping, or moving objects, except tools
 - Repetitive motion, n.e.c.
 - Bodily conditions, n.e.c.
- ◆ Bodily reaction and exertion, n.e.c.

3. Exposure to Harmful Substances or Environments

- ◆ Exposure to harmful substances or environments, unspecified
- ◆ Contact with electric current
 - Contact with electric current, unspecified
 - Contact with electric current of machine tool, appliance, or light fixture
 - Contact with wiring, transformers, or other electrical components
 - Contact with overhead power lines
 - Contact with underground, buried power lines
 - Struck by lightning
 - contact with electric current, n.e.c.
- ◆ Contact with temperature extremes
 - Contact with temperature extremes, unspecified

- Exposure to environmental heat
- Exposure to environmental cold
- Contact with hot objects or substances
- Contact with cold objects or substances
- ◆ Exposure to air pressure changes
 - Exposure to air pressure change, unspecified
 - Pressure changes underwater
 - Pressure changes in airplane, other aircraft
 - Exposure to air pressure change, n.e.c.
- ◆ Exposure to caustic, noxious, or allergenic substances
 - Inhalation of substance
 - Inhalation of substance, unspecified
 - Inhalation in enclosed, restricted, or confined space
 - Inhalation in open or non-confined space
 - Contact with skin or other exposed tissue
 - Injections, stings, venomous bites
 - Injections, stings, venomous bites, unspecified
 - Needle sticks
 - Bee, wasp, hornet sting
 - Other stings or venomous bites
 - Injections, stings, venomous bites, n.e.c.
 - Ingestion of substance
 - Exposure to caustic, noxious, or allergenic substances, n.e.c.
- ◆ Exposure to noise
 - Exposure to noise, unspecified
 - Exposure to noise overtime
 - Exposure to noise in single incident
- ◆ Exposure to radiation
 - Exposure to radiation, n.e.c.
 - Exposure to traumatic or stressful event, n.e.c.
 - Oxygen deficiency, n.e.c.
 - Drowning, submersion
 - Choking on object or substance
 - Depletion of oxygen from cave-in or collapsed materials
 - Depletion of oxygen in other enclosed, restricted, or confined space
 - Other oxygen deficiency, n.e.c.
 - Exposure to harmful substances or environments, n.e.c.

Appendix 10. Occupational Injuries and Illnesses Classification Manual---

Continued

4. Transportation Accidents

- ◆ Transportation accident, unspecified
- ◆ Highway accident
 - Highway accident, unspecified
 - Collision between vehicles, mobile equipment
 - Collision between vehicles, mobile equipment, unspecified
 - Re-entrant collision
 - Moving in same direction
 - Moving in opposite directions, oncoming
 - Moving in intersection
 - Moving in intersection
 - Moving and standing vehicle, mobile equipment—in roadway
 - Moving and standing vehicle, mobile equipment—side of road
 - Collision between vehicles, mobile equipment, n.e.c.
 - Vehicle struck stationary object or equipment in roadway
 - Vehicle struck stationary object, equipment on side of road
 - Non-collision accident
 - Non-collision, accident, unspecified
 - Jack-knifed or overturned—no collision
 - Ran off highway—no collision
 - Struck by shifting load
 - Sudden start or stop, n.e.c.
 - Non-collision accident, n.e.c.
 - Highway accident, n.e.c.
- ◆ Non-highway accident, except rail, air, water
 - Non-highway accident, unspecified
 - Collision between vehicles or mobile equipment
 - Vehicle, mobile equipment struck stationary object
 - Non-collision accident
 - Non-collision accident, unspecified
 - Fall from moving vehicle, mobile equipment
 - Fell from and struck by vehicle, mobile equipment
- Overturned
- Loss of control
- Struck by shifting load
- Sudden start or stop, n.e.c.
- Non-collision accident, n.e.c.
- Non-highway accident, n.e.c.
- ◆ Pedestrian, non-passenger struck by vehicle, mobile equipment
 - Pedestrian struck by vehicle, mobile equipment, unspecified
 - Pedestrian struck by vehicle, mobile equipment in roadway
 - Pedestrian by vehicle, mobile equipment on side of road
 - Pedestrian struck by vehicle, mobile equipment in parking lot or non-roadway area
- ◆ Railway accident
 - Railway accident, unspecified
 - Collision between railway vehicles
 - Collision between railway vehicle and other vehicle
 - Collision between railway and other object
 - Fell from and struck by railway vehicle
 - Derailment
 - Explosions, fire, n.e.c.
 - Fall in, on, or from railway vehicle in motion, n.e.c.
 - Railway accident, n.e.c.
- ◆ Water vehicle accident
 - Water vehicle accident, unspecified
 - Collision
 - Explosion, fire, n.e.c.
 - Fall from ship, boat, n.e.c.
 - Fall on ship, boat
 - Sinking, capsized water vehicle
 - Water vehicle accident, n.e.c.
- ◆ Aircraft accident
 - Aircraft accident, unspecified
 - During takeoff or landing
 - Aircraft accident, n.e.c.
- ◆ Transportation accident, n.e.c.

Appendix 10. Occupational Injuries and Illnesses Classification Manual ----Continued

5. Fires and Explosions

- ◆ Fire or explosions, unspecified
- ◆ Fire—unintended or uncontrolled
 - Fire, unspecified
 - Fire in residence, building, or other structure
 - Forest, brush, or other outdoor fire
 - Ignition of clothing from controlled heat source
 - Fire, n.e.c.
- ◆ Explosion
 - Explosion, unspecified
 - Explosion of battery
 - Explosion of pressure vessel or piping
 - Explosion, n.e.c.

6. Assaults and Violent Acts

- ◆ Assaults and violent acts, unspecified
- ◆ Assaults and violent acts by person(s)
 - Assaults and violent acts by person(s), unspecified
 - Biting
 - Hitting, kicking, beating

- Shooting
- Squeezing, pinching, scratching, twisting
- Stabbing
- Rape
- Threats or verbal assaults
- Assaults and violent acts by person(s), n.e.c.
- ◆ Self-inflicted injury
 - Self-inflicted injury, unspecified
 - Suicide, attempted-suicide
 - Self-inflicted injury or fatality---intent unknown
- ◆ Assaults by animals
 - Assaults by animals, unspecified
 - Non-venomous bites
 - Assaults by animals, n.e.c.

9. Other Events or Exposures

9999. Non-Classifiable

Source: Occupational Injuries and Illnesses Classification Manual, Bureau of Labor Statistics, U.S. Department of Labor, 1992.