

# U Unintentional Injury



Injuries are the leading cause of death for people ages one to 44 years of age and are the third leading cause of death for all ages combined. In fact, injuries result in more deaths of children and youth ages one to 19 years than all other causes combined.

The term *injury* includes unintentional injuries, sometimes called “accidents,” self-inflicted injuries, suicides, assault-related injuries and homicides. Injuries can be fatal or nonfatal.

In 2007, there were nearly 3,000 deaths<sup>1</sup>, 60,000 hospitalizations<sup>2</sup>, and more than 700,000 emergency department (ED) visits<sup>3</sup> among Massachusetts residents who suffered injuries.

The financial burden of injuries is enormous. Annually, injuries in the US generate lifetime costs to society of \$406 billion, including \$80 billion in medical care.<sup>4</sup> Lifetime costs reflect the fact that the “cost” of any one injury may span across a lifetime, involving rehabilitation, long term care, and complications. In Massachusetts acute care hospital charges associated with injury were more than \$2.6 billion in 2007, not including outpatient care, Emergency Medical Services, rehabilitation or long term care costs or lost wages.

**On an average day in 2007, eight Massachusetts residents died of injuries, more than 185 were hospitalized, and nearly 2,000 were treated at emergency departments for injuries.**

**Injuries are not chance occurrences, but are predictable, and largely preventable.**

## **Injuries are Predictable and Preventable!**

Injuries are not chance occurrences, but are predictable, and largely preventable. The data presented here highlight the leading causes and consequences of injury, populations at greatest risk, and the circumstances of these injuries. Injury prevention methods are discussed within each subsection and at the end of this chapter.

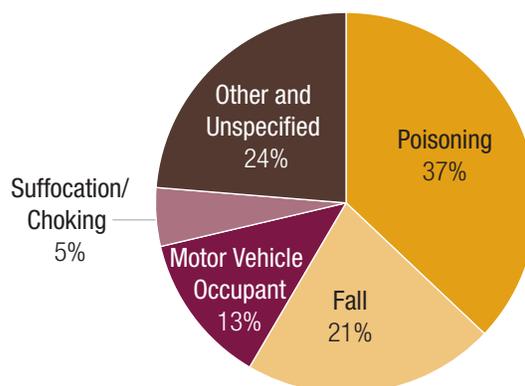
The data presented below refer to unintentional injuries.<sup>5</sup> Assault-related and self-inflicted injuries are covered in Chapters 12 and 13. Only Massachusetts residents are included unless otherwise noted.

## **Unintentional Injury**

In 2007 there were 2,113 unintentional injury deaths, 47,077 hospitalizations and 660,989 ED visits for nonfatal unintentional injuries. Unintentional injuries accounted for seven of ten injury deaths and more than nine of ten injury-related ED visits.

The subsections below provide details on traumatic brain injury, or “head injury,” and injuries resulting from falls, motor vehicle occupant and pedestrian crashes, fires, drownings and poisonings. These are priority areas for prevention at the MA Department of Public Health.

Figure 11.1 **Leading Causes of Unintentional Injury Deaths**



Source: MDPH Death File, 2007.

## **Traumatic Brain Injuries**

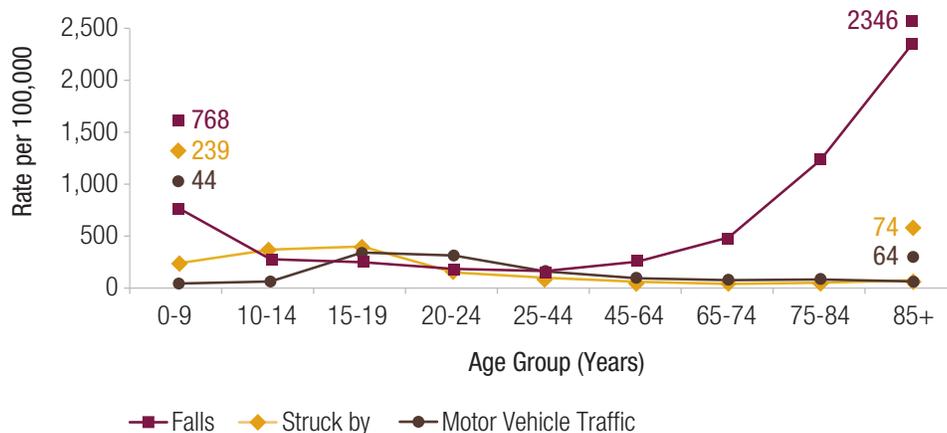
Traumatic brain injuries (TBI) occur after a blow or jolt to the head or a penetrating head injury that disrupts the normal function of the brain. Not all blows or jolts to the head result in a TBI. The severity of a TBI may range from “mild,” – such as a brief loss of consciousness – to “severe” – where there is an extended period of unconsciousness or amnesia after an injury.<sup>6</sup>

In Massachusetts, in 2007, there were 584 unintentional TBI-related deaths, 5,195 hospitalizations and 40,877 ED visits associated with nonfatal TBI. From 2000 to 2007, rates of TBI death rose 57% and rates of hospitalization rose 29%. ED visits associated with nonfatal TBI rose 41% from 2002 (the first year of data) to 2007. The reasons for these increases are not clear.

Residents ages 65 years and older have the highest rates of TBI death and hospitalization, mainly due to falls. Infants less than one year have the highest rates of ED treatment for TBIs, also largely due to falls.

The leading causes of TBI vary by age group, with falls a leading cause among infants, young children and older adults. “Struck by” injuries are the leading cause of TBI among youth 10-19 years old, the majority of these due to sports injuries. Motor vehicle traffic injuries are the leading cause among 20-24 year olds.

Figure 11.2 Traumatic Brain Injury Rates Across the Lifespan by Leading Causes of Injury



Sources: MDPH Death File, 2007; MA Division of Health Care Finance and Policy Inpatient Hospital and Emergency Department Discharge Databases, FY2007. All data summed.

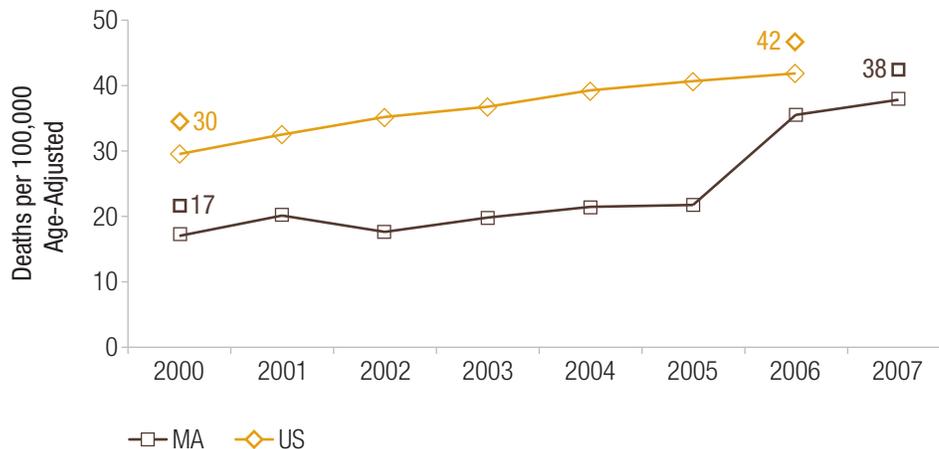
### Falls Among Older Adults (65+ Years)

Fall injuries are a serious and increasing health problem among Massachusetts adults aged 65 years and older. Falls can occur in a variety of situations such as on steps or stairs, getting out of bed or into the bathtub, walking on the sidewalk, while engaged in sports, while working, or around the home.

In 2007, there were 363 deaths, 19,500 hospitalizations, and 37,453 ED visits involving nonfatal falls among adults 65 and older. The age-adjusted fall death rate among older adults in Massachusetts increased 122% from 2000 through 2007. A similar trend occurred nationally (Figure 11.3). Hospitalization rates associated with nonfatal falls in older adults increased 13% from 2000 to 2007.

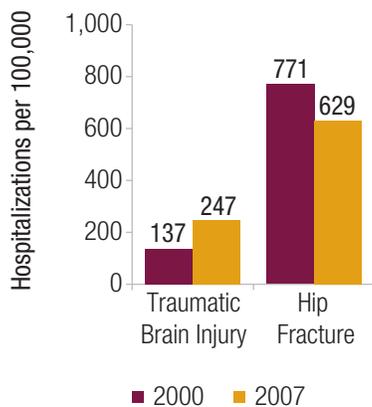
**Hospital charges associated with fall injuries in older adults totaled \$546 million in 2007.**

Figure 11.3 Trends in Fall Death Rates Among Older Adults



Sources: MDPH Death File; CDC Web-based Injury Statistics Query and Reporting System (WISQARS). \*MA 2007 rate statistically different from 2000 rate at  $p \leq 0.05$ .

Figure 11.4 Fall-related Hospitalization Rates Associated with Traumatic Brain Injury and Hip Fracture, 65+



Source: MA Division of Health Care Finance and Policy Inpatient Hospital Discharge Database.

\*2007 rates are statistically different from 2000 rates ( $p \leq 0.05$ ).

Nonfatal fall injuries can result in the loss of independence and a downward spiral in one's health. In 2008<sup>7</sup>, 15.6% of older adults reported at least one fall in the preceding three months. Falls were reported more in those who reported no physical exercise (19.5%), compared with those who engaged in any exercise (13.7%), and falls were reported more among individuals disabled and needing help (28.9%), compared with those who were not (13.8%).

In 2007, where circumstance was known, one of three fatal falls in older adults occurred on stairs or steps; more than one-half (55%) occurred either inside or outside the home, 14% occurred in a nursing home, and 4% occurred at a hospital.

Hospitalization rates associated with fall-related TBIs among those older than age 65 have increased 80% from 2000 to 2007, while those associated with fall-related hip fractures have decreased 18% during the same time period. While the reason for the decrease in hip fractures is not certain, it may be due to advances in the treatment of osteoporosis or increases in body mass indices.<sup>8</sup>

## Fall Prevention

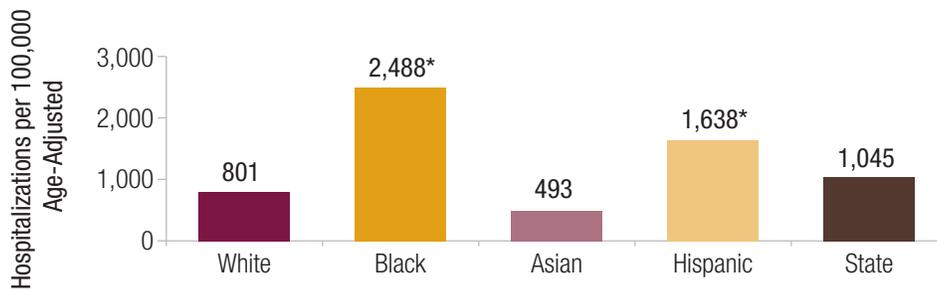
Fall prevention requires a multidisciplinary approach, including environmental modifications (grab bars, hand rails, adequate lighting, contrast markings), medication reviews, balance and strength training, and regular comprehensive vision exams. Collaboration among public health professionals, physicians, nurses, physical therapists, pharmacists, vision professionals, engineers, policy makers, and others optimizes prevention strategies.

## Motor Vehicle Occupant Injuries<sup>9</sup>

The Massachusetts motor vehicle (MV) occupant fatality rate is among the lowest in the nation (age adjusted rate of 4.1 per 100,000 in 2007). The US age adjusted rate was 10.9 per 100,000 in 2006 (the latest year available).

In 2007, there were 272 MV occupant fatalities, 2,932 hospitalizations, and 64,551 ED visits associated with nonfatal MV occupant injuries among Massachusetts residents. While occupant deaths in 2007 did not differ statistically by race and ethnicity, blacks and Hispanics had higher estimated rates of acute care hospital events for nonfatal MV occupant injury compared with whites and Asians.

Figure 11.5 Acute Care Hospital Utilization Rates for Nonfatal Motor Vehicle Traffic Occupant Injury

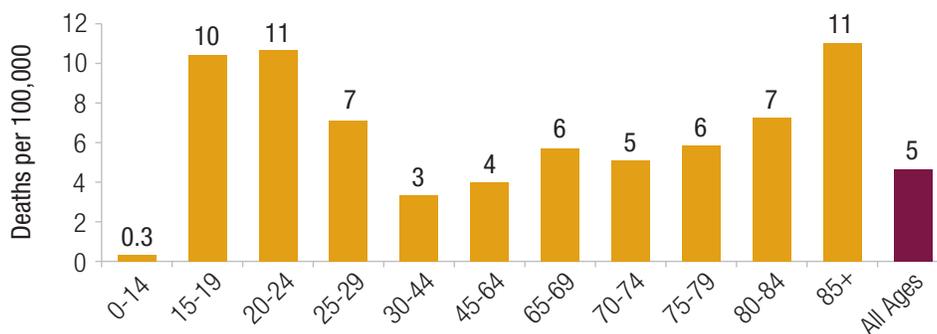


Sources: MA Division of Health Care Finance and Policy Inpatient Hospital and Emergency Department Discharge Databases (summed), FY2007.

\*Rates for Blacks and Hispanics are statistically higher than Whites and Asians ( $p \leq 0.05$ ).

Three year average annual MV occupant fatality rates are highest among males and differ substantially by age group. Of the MV occupant fatalities in 2007 where seat belt use was known, 66% were not wearing seat belts.<sup>10</sup> Massachusetts has historically ranked lower than the national average in seat belt use. In a 2009 observational survey, seat belt use was 74% in the Commonwealth.<sup>11</sup> The overall national seat belt use in 2009 was 84%.<sup>12</sup>

Figure 11.6 Average Annual Motor Vehicle Traffic Occupant Fatality Rates by Age Group



Source: MDPH Death File, 2005-2007.

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## Motor Vehicle Occupant Injury Prevention

MV occupant injury prevention strategies include safe road and vehicle design, the enforcement of laws requiring seat belts and child safety seats, laws pertaining to junior operators, alcohol and speed limits, and sobriety checkpoints.

**Massachusetts residents ages 65 years and older have the highest rate of pedestrian deaths, with a 3 year average annual rate (2005-2007) three times the rate of those under 65 years.**

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## Pedestrian Injuries

There were 81 pedestrian deaths, 675 hospitalizations and 3,590 ED visits associated with nonfatal pedestrian injury in 2007. Pedestrian injuries include injuries to individuals hit by motor vehicles (predominantly) or other transport vehicles. They do not include trips and falls on sidewalks or roads or injuries not involving a transport crash. Decreasing pedestrian injuries requires a multidisciplinary approach from traffic engineers, planners, smart growth advocates, police, policy makers, public health, and others. Strategies include safe street and sidewalk design, enforcement of speed limits, snow and ice removal, and “Safe Routes to School”, a school-based walking program that includes pedestrian safety training.

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## Fire Injuries

Over the past two decades, there has been success in reducing the rate of fire deaths. Age-adjusted fire death rates in MA decreased 60% from 1990 through 2007 and 40% in the US from 1990-2006 (Figure 11.7).

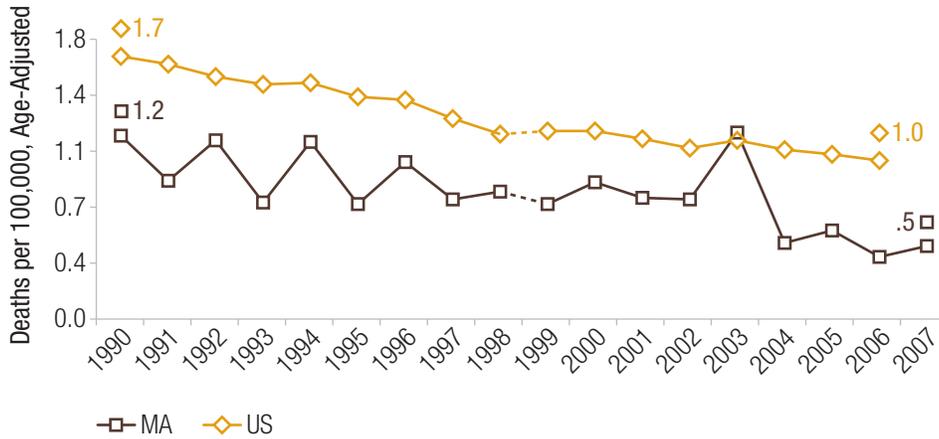
In 2007, according to the Massachusetts Fire Incident Reporting System, there were 49 unintentional fire deaths<sup>13</sup> (including civilians and firefighters). Additionally, there were 185 hospitalizations and 1,711 ED visits for nonfatal fire injuries among MA residents in 2007.

There are geographical differences in the rate of fire injuries in Massachusetts. From 2003 to 2007, average annual fire death rates in the Southeastern region were higher than the overall state rate (1.2 vs. 0.7 per 100,000), while rates in the Metrowest region were lower (0.4 per 100,000) than the state rate.

Prevention efforts that combine education, engineering and law enforcement are critical in reducing the burden of fire injuries in the state. Legislative funding has supported the Student Awareness of Fire Education (S.A.F.E.) Program, which has enabled fire fighter educators to teach fire prevention and safety at schools and in other community settings. The Commonwealth also has strong laws promoting fire prevention, including those that require smoke alarms.

Working smoke alarms have been shown to greatly reduce fire injury by providing an early warning and time for escape. Smoke alarm installation programs are an effective method for increasing the number of working

Figure 11.7 Fire/Flame Death Rates



Sources: MDPH Death File; CDC Web-based Injury Statistics Query and Reporting System (WISQARS).  
 \* Statistically different from 1990 rate at  $p \leq 0.05$ .

smoke alarms, particularly for populations at high risk. In Massachusetts, smoke alarms either failed to operate or were not present in 38% of the 2007 residential fire deaths.<sup>14</sup>

### Drowning/Near Drowning

Unintentional drowning and near drowning can occur at any age and in all types of water settings. In 2007, there were 51 drowning deaths and 195 acute care hospital events for nonfatal submersion injuries. Drowning was the leading cause of injury death in one to four year olds, accounting for nearly 40% of these deaths from 2005-2007. During this 3-year period, 16% of all drowning in MA occurred in swimming pools, 7% in bathtubs, and 56% in natural water. Another 21% occurred in an unspecified or “other” water source.

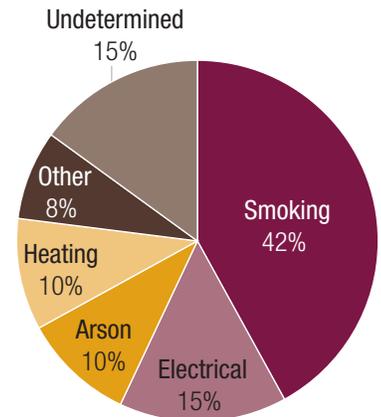
Major risk factors for drowning include lack of barriers such as pool fencing, and lack of constant supervision while infants and toddlers are in the bath or near any water.

Lack of personal floatation device use in recreational boating is also a major risk factor in drowning. In 2006, the US Coast Guard received reports of 4,967 boating incidents; 3,474 boaters were reported injured, and 710 died. Among those who drowned in boating incidents, nine out of ten were not wearing life jackets.<sup>15</sup>

### Poisoning

Poisoning, which includes drug overdose, is the leading cause of injury death in Massachusetts and the second leading cause of injury hospitalization. In 2007, poisoning resulted in 846 deaths, 2,576 hospitalizations

Figure 11.8 Leading Causes of Residential Fire Deaths



Source: MA Office of the State Fire Marshal Fire Incident Reporting System 2007.

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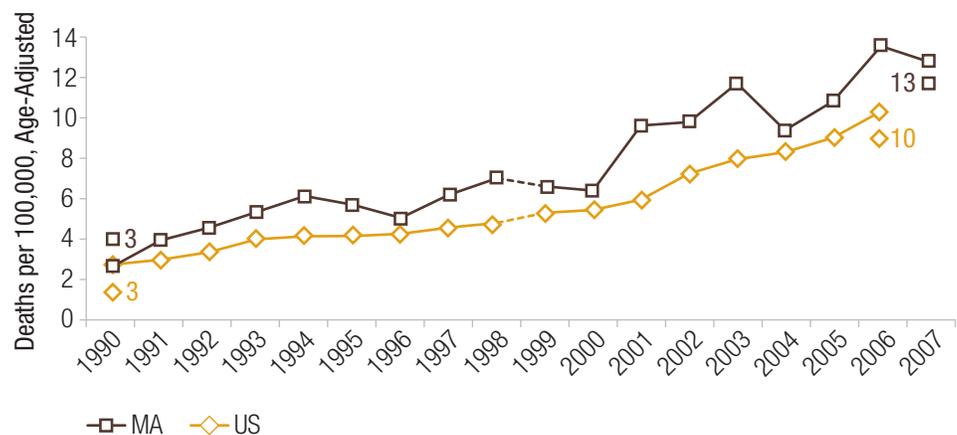
and 7,223 ED visits. Poisoning refers to the damaging effects of ingestion, inhalation or other exposure to pharmaceuticals, illicit drugs, chemicals and pesticides, heavy metals, gases, and common household substances.<sup>16</sup>

From 1990 through 2007, age-adjusted poisoning death rates increased 382% in MA. From 1990 through 2006 (the latest year for which national data are available) the US deaths from poisoning increased 277% (Figure 11.9).

In Massachusetts, much of this increase has been driven by opioids, such as heroin, oxycodone (OxyContin®), fentanyl, and methadone (see Chapter 10 for more information on substance abuse data).

In 2007, 73% of these deaths were associated with an opioid; 32% were associated with cocaine (these two groups are not mutually exclusive). Poisoning mortality rates are highest among males of all ages, and among persons ages 25-54 years.

Figure 11.9 Poisoning Death Rates



Sources: MDPH Death File; CDC Web-based Injury Statistics Query and Reporting System (WISQARS). \*The rate in 2009 is statistically different from the 1990 rate at  $p \leq 0.05$ .

Nonfatal poisoning events are also on the rise. From 1994 through 2007, hospitalization rates increased 64%, and from 2002 (the first year for which data are available) through 2007, ED visit rates associated with poisoning increased 6%. Hospitalization rates associated with poisoning are highest among individuals 75 years and older while ED visit rates were highest among children under 5 years of age.

The Regional Center for Poison Control and Prevention is a key partner in helping Massachusetts residents and health care providers manage and treat poisoning exposures. In 2007, specialists at the Poison Center responded to more than 51,000 calls from MA residents and health care providers. Exposures to children five years and under represent 44% of these calls.

The Poison Center is a cost-efficient model for providing critical life-saving care. In 2007, more than 76% of all calls received by the Poison Center were managed over the telephone by a poison specialist and did not require referral to a health care facility. This approach saves the health care system millions of dollars.

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## Strategies for Injury Prevention

The most successful injury prevention programs combine four basic strategies. These are known as the “4 E’s” of injury prevention:

- **Engineering/environmental interventions.** Changes in the design of products and in the physical environment can reduce injury. Examples include improvements in the design of sidewalks, roads, cars, trains, playground surfaces, toys, children’s clothing, child-resistant medication packaging, the existence of safety features such as smoke and carbon monoxide detectors, lighting, and handrails/grab bars.
- **Education/behavior change and interventions aimed at the individual.** Efforts to modify behavioral and medical risk factors for injury such as seat belt use, driver education, planning and practicing a home escape plan, and improvements in vision, bone density, and balance and strength can reduce injury.
- **Enactment and enforcement of policies.** Passage and enforcement of laws and regulations can reduce injury. Laws which aim to reduce injury in Massachusetts include seat belt and child passenger safety requirements, motorcycle and bike helmet requirements, pool fencing, and smoke and carbon monoxide detector requirements.
- **Emergency medical response and trauma management.** While not primary injury prevention methods, the presence of well coordinated Emergency Medical Systems (EMS), access to poison control centers, and the existence of trauma management protocols after injury has occurred can prevent fatalities and reduce the severity of injuries.

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## Summary

Injury prevention requires collaboration among many stakeholders including public health and highway safety professionals, town and regional planners, engineers and manufacturers, health care providers, policy makers, educators, law enforcement and fire safety personnel, emergency medical services, the media, the health care industry, private citizens, and many others.



**Cindy Rodgers, MPH**

Former Director, Injury Prevention and Control Program, MDPH

**A**lthough Massachusetts injury fatality rates, on the whole, are lower than much of the nation, the deaths of nearly 3,000 residents along with three quarters of a million hospital admissions and emergency department visits each year should be wholly unacceptable, since most of these can be easily prevented. The magnitude of the problem is so large and injuries are so common that our society has come to accept them as inevitable. Due to the mounting toll in human lives and financial cost, there is an urgent need to change the perception of the public and policy makers from “injuries as accidents” to “injuries are predictable and preventable,” and to develop the political will needed to provide the resources and infrastructure to implement effective injury prevention interventions.

The MDPH Injury Prevention and Control Program (IPCP) was established 30 years ago and today is one of the oldest and most comprehensive injury prevention programs in a state health department. Despite the program's longevity and successes, there remain serious gaps which restrain the program from reaching its goal of reducing injury and death in the Commonwealth. Primary among these are:

- **State funding.** Since its inception, the IPCP has relied solely on ever diminishing, highly competitive federal grants to support staff and programming efforts. In its 30 years there has not been one state dollar provided to the program to prevent unintentional injury – the leading cause of death for Massachusetts residents ages 1 – 44! Stable state funding is needed to support core injury prevention and surveillance staff and to enhance injury prevention interventions in local communities.
- **Implementation of interventions for priority injuries.** In 2004 and 2007 the MDPH released the Massachusetts State Injury Prevention Plan: Maximizing Our Efforts and Traumatic Brain Injury: A Case for Prevention, respectively. These reports identify gaps and action steps for many of the injuries detailed in this chapter. Implementation of these recommendations and action steps should be vigorously acted upon to reduce the burden of injury in Massachusetts. Foremost among these are: passage of a primary

enforcement seat belt law; broadening the “Keys to Independence” campaign to eliminate fall hazards in the homes of older adults; support of legislation to ban the sale and use of all-terrain vehicles by children under the age of 14; and support the adoption of requirements for automatic fire sprinklers in new one- and two-family homes.

- **Massachusetts PINN (Prevent Injuries Now! Network).** Preventing injury is a shared responsibility across many professions. Reducing the injury burden in Massachusetts requires the collaborative work of urban planners, social workers, epidemiologists, engineers, clinicians, fire safety personnel, product manufacturers, law enforcement, policy makers, researchers, communication professionals and many others. Mass PINN was formed in 2006 to provide such a multidisciplinary group with an opportunity to share information and data, forge partnerships, and advocate for sensible public health and safety initiatives at both the state and federal levels. This organization needs modest financial support and buy in from the highest levels of state government in order to continue its valuable efforts.



# FIGURE NOTES

**Figure 11.2:** “Motor Vehicle Traffic” includes occupants, motorcyclists, pedestrians, bicyclists and others injured in traffic. “Struck by” includes injuries caused by strikes to the body by an object or person such as in sports, against furniture or a falling object. Population data are from National Center for Health Statistics. Postcensal estimates of the resident population of the United States for July 1, 2000 – July 1, 2007, by year, county, age, bridged race, Hispanic origin, and sex (Vintage 2007). Prepared under a collaborative arrangement with the US Census Bureau; released August 7, 2008. Available from: <http://www.cdc.gov/nchs/about/major/dvs/popbridge/popbridge.htm> as of September 5, 2008.

**Figure 11.3:** US data for 2007 not yet available. The sharp increase in Massachusetts rates from 2005 to 2006 may be due to increased identification of these types of deaths at the Massachusetts Medical Examiner’s Office. Includes deaths among residents ages 65 years and older.

**Figure 11.5:** Estimates based on discharges occurring 4/1/07 – 9/30/07.

**Figure 11.7:** Population data were from National Center for Health Statistics. Post-censal estimates of the resident population of the United States for July 1, 2000 – July 1, 2007, by year, county, age, bridged race, Hispanic origin, and sex (Vintage 2007). Prepared under a collaborative arrangement with the US Census Bureau; released August 7, 2008. Available from: <http://www.cdc.gov/nchs/about/major/dvs/popbridge/popbridge.htm> as of September 5, 2008. The spike in MA rates in 2003 was due to the 33 deaths that occurred in the RI Station Night Club fire. The broken line represents a change in the coding of death data that occurred across the US beginning in 1999. US data for 2007 are not yet available.

**Figure 11.9:** US data for 2007 are not yet available. The broken line represents the change in the coding of death data that occurred across the US beginning in 1999. Population data were from National Center for Health Statistics. Postcensal estimates of the resident population of the United States for July 1, 2000 – July 1, 2007, by year, county, age, bridged race, Hispanic origin, and sex (Vintage 2007). Prepared under a collaborative arrangement with the US Census Bureau; released August 7, 2008. Available from: <http://www.cdc.gov/nchs/about/major/dvs/popbridge/popbridge.htm> as of September 5, 2008.

# ENDNOTES

- 1 Unless otherwise indicated, the death data presented in this chapter are from the Registry of Vital Records and Statistics, MDPH. All annual data presented represent a calendar year.
- 2 Unless otherwise indicated, the hospitalization data presented in this chapter are from the MA Inpatient Hospital Discharge Database, MA Division of Health Care Finance and Policy. All annual data presented represent a fiscal year (October 1 – September 30).
- 3 Unless otherwise indicated, the emergency department discharge data presented in this chapter are from the Massachusetts Emergency Department Discharge Database, MA Division of Health Care Finance and Policy. All annual data presented represent a fiscal year (October 1 – September 30).
- 4 Finkelstein EA, Corso PS, Miller TR, Associates. *Incidence and Economic Burden of Injuries in the United States*. New York: Oxford University Press; 2006.
- 5 The subsections of this chapter speak to unintentional injuries. With the exception of poisoning deaths all of the data reported in these subsections reflects unintentional injuries only. Poison deaths in Massachusetts prior to 2005 were often classified as “undetermined intent” when there was no evidence of a suicide or homicide. Beginning in 2005, these deaths were classified as unintentional. In order to examine trends over time, the poison death data presented in this chapter include both unintentional deaths and deaths of undetermined intent.
- 6 Centers for Disease Control and Prevention. What is traumatic brain injury? Available at <http://www.cdc.gov/ncipc/tbi/TBI.htm>. Accessed August 11, 2009.
- 7 MDPH, Massachusetts Behavioral Risk Surveillance System, 2008.
- 8 Leslie WD, O'Donnell S, Jean S, et al. Trends in hip fracture rates in Canada. *JAMA*. 2009; 302(8):883-9.
- 9 Injuries sustained as a “motor vehicle traffic - occupant” includes drivers and passengers injured in a motor vehicle and excludes motorcyclists, pedestrians, train passengers and bicyclists; “unspecified person” injured in motor vehicle traffic are included in the occupant counts provided.
- 10 National Highway Traffic Safety Administration. Fatality Analysis Reporting System. Available at <http://www-fars.nhtsa.dot.gov/Trends/TrendsRestrains.aspx>. Accessed August 12, 2009.
- 11 The Commonwealth of Massachusetts. Executive Office of Public Safety and Security. Press Release (August 11, 2009).
- 12 National Highway Transportation Safety Administration. Seat belt use in 2009 – Overall Results. Traffic Safety Facts. September 2009.
- 13 The number of fire-related deaths reported by the Massachusetts Fire Incident Reporting System differs from that reported by the Massachusetts Registry of Vital Records and Statistics due to differences in case definition.
- 14 Massachusetts Fire Incident Reporting System, Massachusetts Office of the State Fire Marshal.
- 15 Centers for Disease Control and Prevention. Water-related injuries: Fact Sheet. Available at <http://www.cdc.gov/HomeandRecreationalSafety/Water-Safety/waterinjuries-factsheet.htm>. Accessed August 11, 2009
- 16 Centers for Disease Control and Prevention. Unintentional and undetermined poisoning deaths – 11 states, 1990-2001. *MMWR* 2004; 53: 233-238.