

# Injuries to Massachusetts Children and Youth



**Massachusetts Department of Public Health  
Injury Surveillance Program**

**January 2010**





# Injuries to Massachusetts Children and Youth

**Deval L. Patrick, Governor**  
**Timothy P. Murray, Lieutenant Governor**

Executive Office of Health and Human Services  
JudyAnn Bigby, MD, Secretary  
Massachusetts Department of Public Health  
John Auerbach, Commissioner  
Bureau of Health Information, Statistics, Research, and Evaluation  
Jerry O'Keefe, Director  
Injury Surveillance Program  
Victoria Ozonoff, Director

**January 2010**

# Acknowledgements

This report was prepared by Loreta McKeown, Beth Hume, and Maria McKenna of the Injury Surveillance Program (ISP), Bureau of Health Information, Statistics, Research, and Evaluation.

## INJURY SURVEILLANCE PROGRAM STAFF

---

Torie Ozonoff, Director  
Kate Chamberlin, Research Analyst  
Becky Cudmore, Research Assistant  
Sheila Harris, Research Assistant  
Beth Hume, Project Director  
Laurie Jannelli, Research Associate

Lauren Kievits, Project Coordinator  
Maria McKenna, Research Analyst  
Loreta McKeown, Epidemiologist  
Bridget Nestor, Administrative Assistant  
Jeanne Scott, Research Associate

We would like to thank the ISP staff for their input, DPH peer reviewers for their comprehensive review of this publication, and the staff of the Department's Copy Center. A special thank you goes to the staff of the MA Registry of Vital Records and Statistics, and the Division of Health Care Finance and Policy for use of their data sets, without which, such analysis and assessments would not be possible. Finally, we owe an enormous debt of gratitude to all of those at the local level (including nurses, physicians, trauma registrars, and other health care professionals, medical coders, medical examiners, data entry clerks, information technology staff, and so many others) who routinely contribute to the collection, coding, cleaning, and submission of data to these and other data systems.

---

### **To obtain additional copies of this report, contact:**

Massachusetts Department of Public Health  
Bureau of Health Information, Statistics, Research, and Evaluation  
Injury Surveillance Program  
250 Washington Street, 6<sup>th</sup> Floor  
Boston, MA 02108  
617-624-5648

This and other Massachusetts Department of Public Health publications and materials can be accessed on-line at: <http://www.state.ma.us/dph/pubstats.htm>

To obtain more information on injuries to Massachusetts residents, contact Beth Hume at the Injury Surveillance Program (617-624-5648), or on-line at:

<http://www.mass.gov/dph/isp>

For information on how to prevent injuries, contact the Injury Prevention and Control Program (617-624-5460), or on-line at: <http://www.mass.gov/dph/fch/injury>

For other Department of Public Health data, register for MassCHIP, the Department's free internet-accessible data warehouse: <http://masschip.state.ma.us/>

This publication was supported by cooperative agreement #U17/CCU124799 from the Centers for Disease Control and Prevention. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of the Centers for Disease Control and Prevention.

# Table of Contents

<b>Executive Summary</b>	1
--------------------------	---

<b>Data Notes</b>	3
-------------------	---

## **Introduction**

Magnitude of Injury Burden among MA Residents Ages 0-19 Years, 2006 (Figure 15)

## **Section 1: Overview**

Rates of Injury and Non-injury Deaths, MA Residents Ages 0-19, 1997-2006 (Figure 2)	8
Distribution of Injury and Non-injury Deaths, MA Residents Ages 0-19, 2002-2006(Figure 3)	8
Leading Underlying Causes of Death by Age Group, MA Residents Ages 0-19, 2006 (Table 1)	9
Injury Fatalities among MA Residents Ages 0-19, 2006 (Table 2)	10
Injury-related Hospital Stays among MA Residents Ages 0-19, 2006 (Table 3)	11
Injury-related Emergency Department Discharges among MA Residents Ages 0-19, 2006 (Table 4)	12
Number and Rate of Leading Causes of Injuries by Age Group, MA Residents Ages 0-9, 2006 (Table 5)	13
Number and Rate of Leading Causes of Injuries by Age Group, MA Residents Ages 10-19, 2006 (Table 6)	14
Fatalities among by Race/Ethnicity, MA Residents Ages 0-19, 2002-2006 (Figure 4)	15

## **Section 2: Unintentional Injuries**

### **Fall Injuries**

Magnitude of Fall-related Injury among MA Residents Ages 0-19, 2006 (Figure 5)	18
Rates of Nonfatal Fall-related Injury Hospital Stays, MA Residents Ages 0-19, 2002-2006 (Figure 6)	19
Rates of Nonfatal Fall-related Injury Hospital Stays by Age Group and Sex, MA Residents Ages 0-19, 2006 (Figure 7)	20
Rates of Nonfatal Fall-related Injury Emergency Department Discharges by Age Group and Sex, MA Residents Ages 0-19, 2006 (Figure 8)	21
Nonfatal Hospital Case Fall-related Injuries by Fall Type MA Residents Ages 0-19, 2006 (Figure 9)	22
Percent (%) of Nonfatal Hospital Case Fall-related Injuries by Fall Type and Age Group, MA Residents Ages 0-19, 2006 (Table 7)	23
Nature of Injury by Body Region: Fall-related Injury Hospital Stays, MA Residents Ages 0-19, 2006 (Table 8)	24
Nature of Injury by Body Region: Fall-related Injury Emergency Department Discharges, MA Residents Ages 0-19, 2006 (Table 9)	25
Age-adjusted Rates of Fall-related Injury Deaths and Hospital Cases by County, MA Residents Ages 0-19, 2006 (Figure 10)	26

## **Struck by (or Against) an Object**

Magnitude of Struck by/Against Injuries among MA Residents Ages 0-19, 2006 (Figure 11)	27
Rates of Nonfatal Struck by/Against Injury-related Hospital Stays, MA Residents Ages 0-19, 2002-2006 (Figure 12)	28
Rates of Nonfatal Struck by/Against Injury-related Hospital Cases by Age Group and Sex, MA Residents Ages 0-19, 2006 (Figure 13)	29

## **Motor Vehicle Occupant Injuries**

Magnitude of Motor Vehicle Occupant Traffic Injuries among MA Residents Ages 0-19, 2006 (Figure 14)	31
Rates of Nonfatal Motor Vehicle Occupant Injury-related Hospital Stays, MA Residents Ages 0-19, 2002-2006 (Figure 15)	32
Rates of Nonfatal Motor Vehicle Occupant Injury-related Hospital Stays by Age Group and Sex, MA Residents Ages 0-19, 2006 (Figure 16)	33
Rates of Nonfatal Motor Vehicle Occupant Injury-related Emergency Department Discharges by Age Group and Sex, MA Residents Ages 0-19, 2006 (Figure 17)	34
Rates of Nonfatal Motor Vehicle Driver Injury-related Hospital Stays per 100,000 Licensed Drivers, MA Residents Ages 16 and Over, 2006 (Figure 18)	35
Nature of Injury by Body Region: Nonfatal Motor Vehicle Occupant Injury-related Hospital Stays, Ages 0-19, MA Residents Ages 0-19, 2006 (Table 10)	36
Nature of Injury by Body Region: Nonfatal Motor Vehicle Occupant Injury-related Emergency Department Discharges, MA Residents Ages 0-19, 2006 (Table 11)	37
Age-adjusted Rates of Motor Vehicle Traffic Occupant Injury Deaths and Hospital Cases by County, MA Residents Ages 0-19, 2006 (Figure 19)	38

## **Pedal Cyclist/Bicyclist Injuries**

Magnitude of Pedal Cyclist Injuries among MA Residents Ages 0-19, 2006 (Figure 20)	39
Rates of Nonfatal Pedal Cyclist Injury-related Hospital Stays, MA Residents Ages 0-19, 2002-2006 (Figure 21)	40
Rates of Nonfatal Pedal Cyclist Injury-related Hospital Cases by Age Group and Sex, MA Residents Ages 0-19, 2006 (Figure 22)	41

## **Pedestrian Injuries**

Magnitude of Pedestrian Injuries among MA Residents Ages 0-19, 2006 (Figure 23)	42
Rates of Nonfatal Pedestrian Injury-related Hospital Stays, MA Residents Ages 0-19, 2002-2006 (Figure 24)	43
Rates of Nonfatal Pedestrian Injury-related Hospital Cases by Age Group and Sex, MA Residents Ages 0-19, 2006 (Figure 25)	44

## **Cut/Pierce Injuries**

Magnitude of Cut/Pierce Injuries among MA Residents Ages 0-19, 2006 (Figure 26)	45
Rates of Nonfatal Cut/Pierce Injury-related Hospital Stays, MA Residents Ages 0-19, 2002-2006 (Figure 27)	46
Rates of Nonfatal Cut/Pierce Injury-related Hospital Cases by Age Group and Sex, MA Residents Ages 0-19, 2006 (Figure 28)	47

## **Dog Bite Injuries**

Magnitude of Dog Bite Injuries among MA Residents Ages 0-19, 2006 (Figure 29)	48
Rates of Nonfatal Dog Bite Injury-related Hospital Stays, MA Residents Ages 0-19, 2002-2006 (Figure 30)	49
Rates of Nonfatal Dog Bite Injury-related Hospital Cases by Age Group and Sex, MA Residents Ages 0-19, 2006 (Figure 31)	50

### **Fire/Flame Injuries**

Magnitude of Fire/Flame Injuries among MA Residents Ages 0-19, 2006 (Figure 32)	51
Rates of Nonfatal Fire/Flame Injury-related Acute Care Hospital Cases, MA Residents Ages 0-19, 2002-2006 (Figure 33)	52
Rates of Nonfatal Fire/Flame Injury-related Hospital Cases by Age Group and Sex, MA Residents Ages 0-19, 2006 (Figure 34)	53

### **Hot Object/Substance Burn Injuries**

Magnitude of Hot Object/Substance Burn Injuries among MA Residents Ages 0-19, 2006 (Figure 35)	54
Rates of Nonfatal Hot object/Substance Burn Injury-related Hospital Stays, MA Residents Ages 0-19, 2002-2006 (Figure 36)	55
Rates of Nonfatal Hot Object/Substance Burn Injury-related Hospital Cases by Age Group and Sex, MA Residents Ages 0-19, 2006 (Figure 37)	56

### **Poisonings/Drug Overdoses**

Magnitude of Poisonings among MA Residents Ages 0-19, 2006 (Figure 38)	58
Rates of Nonfatal Poisoning Hospital Stays, MA Residents Ages 0-19, 2002-2006 (Figure 39)	59
Rates of Nonfatal Poisoning Hospital Cases by Age Group and Sex, MA Residents Ages 0-19, 2006 (Figure 40)	60

### **Suffocation**

Magnitude of Suffocation Injuries among MA Residents Ages 0-19, 2006 (Figure 41)	62
Rates of Nonfatal Suffocation Injury-related Hospital Stays, MA Residents Ages 0-19, 2002-2006 (Figure 42)	63
Rates of Nonfatal Suffocation Injury-related Hospital Cases, MA Residents Ages 0-19, 2006 (Figure 43)	64

### **Drowning**

Magnitude of Drowning Injuries among MA Residents Ages 0-19, 2006 (Figure 44)	65
Rates of Nonfatal Drowning Injury-related Hospital Stays, MA Residents Ages 0-19, 2002-2006 (Figure 45)	66
Rates of Nonfatal Drowning Injury-related Hospital Cases by Age Group and Sex, MA Residents Ages 0-19, 2006 (Figure 46)	67

## **Section 3: Unintentional Traumatic Brain Injury** 69

Magnitude of Traumatic Brain Injuries among MA Residents Ages 0-19, 2006 (Figure 47)	69
Rates of Nonfatal Traumatic Brain Injury-related Hospital Stays, MA Residents Ages 0-19, 2002-2006 (Figure 48)	70
Rates of Nonfatal Traumatic Brain Injury-related Emergency Department Discharges, MA Residents Ages 0-19, 2002-2006 (Figure 49)	70
Rates of Nonfatal Traumatic Brain Injury-related Hospital Stays by Age Group and Sex, MA Residents Ages 0-19, 2006 (Figure 50)	71
Rates of Nonfatal Traumatic Brain Injury-related Emergency Department Discharges by Age Group and Sex, MA Residents Ages 0-19, 2006 (Figure 51)	72
Traumatic Brain Injury Fatalities by Leading Cause, MA Residents Ages 0-19, 2006 (Figure 52)	73
Traumatic Brain Injury-related Hospital Stays by Leading Cause, MA Residents Ages 0-19, 2006 (Figure 53)	73
Traumatic Brain Injury-related Emergency Department Discharges by Leading Cause, MA Residents Ages 0-19, 2006 (Figure 54)	73

---

**Section 4: Suicide and Self-inflicted Injury** 75

---

Magnitude of Suicide and Self-inflicted Injuries among MA Residents Ages 0-19, 2006 (Figure 55)	75
Rates of Self-inflicted Injury-related Hospital Stays, MA Residents Ages 0-19, 2002-2006 (Figure 56)	76
Rates of Nonfatal Self-inflicted Injury-related Hospital Cases by Age Group and Sex, MA Residents Ages 0-19, 2006 (Figure 57)	77
Nonfatal Self-inflicted Hospital Stays, by Leading Cause, MA Residents Ages 0-19, 2006 (Figure 58)	78
Nonfatal Self-inflicted Emergency Department Discharges, by Leading Cause, MA Residents Ages 0-19, 2006 (Figure 59)	78
Causes of Suicide and Self-inflicted Injury by Age Group	79

---

**Section 5: Homicide and Assault-related Injury** 81

---

Magnitude of Homicide and Assault-related Injuries among MA Residents Ages 0-19, 2006 (Figure 60)	81
Rates of Nonfatal Assault-related Injury Hospital Stays, MA Residents Ages 0-19, 2002-2006 (Figure 61)	82
Rates of Nonfatal Assault-related Injury Hospital Stays by Age Group and Sex, MA Residents Ages 0-19, 2006 (Figure 62)	83
Rates of Nonfatal Assault-related Injury Emergency Department Discharges by Age Group and Sex, MA Residents Ages 0-, 2006 (Figure 63)	84
Nonfatal Assault-related Injury Hospital Stays by Leading Causes, MA Residents Ages 0-19, 2006 (Figure 64)	85
Nonfatal Assault-related Injury Emergency Department Discharges by Leading Causes, MA Residents Ages 0-19, 2006 (Figure 65)	85

---

**Appendix**

---

Total (All intents) Fatal and Nonfatal Injury-related Crude and Age Adjusted Rates by County and EOHHS Region, MA Residents Ages 0-19, 2006	86
--	----

---

**Technical Notes and Methodology**

---

Methods, Limitations, Exclusions, Rates	87
---	----

# Executive Summary

Injuries to children are a serious and *preventable* public health issue. In fact, injuries kill more children and youth ages 1-19 than all other causes combined. The term *injury* includes unintentional injuries, sometimes called “accidents”, as well as, self-inflicted injuries and suicides, and assault-related injuries and homicides. Injuries can be fatal or nonfatal.

In 2006, injuries accounted for 162 fatalities, 6,415 nonfatal hospital stays, and 208,771 emergency department discharges among Massachusetts children ages 0-19 years old. *Injuries to Massachusetts Children* focuses on the magnitude of various injury causes and intents and describes the highest rates and numbers of injury among Massachusetts children ages 0-19.

The following data points are some highlights from the report.

## **Injury Deaths, 2006**

- There were 162 deaths (9.9 per 100,000) of Massachusetts children ages 0-19.
- The leading injury intent was unintentional (69%), followed by homicide (21%), and suicide (8%).
- Motor vehicle traffic crash was the leading cause of injury fatalities accounting for 34% of all injury deaths. This was followed by firearm (15.0%) and suffocation/hanging (13.1%).
- Leading causes vary by age group: the leading cause of death among children <1 was suffocation. Drowning was the leading cause among children ages 1-9, and for youth ages 10-

*“There’s no tragedy in life like the death of a child. Things never get back to the way they were.”*

-Dwight D. Eisenhower

19 the leading cause was motor vehicle traffic crashes.

- The leading cause of death among White non-Hispanic, Asian non-Hispanic, and Hispanic children was motor vehicle traffic crashes. The leading cause of death among Black non-Hispanic children was firearms, driven primarily by the 15-19 year old age group.

## **Nonfatal Injuries, 2006**

### Injury-related Hospital Stays, 2006

- There were 6,413 injury-related hospital stays (an average of 534 every month) among Massachusetts children ages 0-19.
- The leading intent was unintentional (76.3%) followed by self-inflicted (9.1%) and assault-related (7.0%).
- Fall was the leading cause (24.9%) of injury-related hospital stays, followed by motor vehicle traffic crash (14.1%) and poisoning, which includes drug overdoses (13.9%).
- The leading cause of injury-related hospital stays for the younger age groups (<1, 1-4, 5-9, 10-14) was fall. The leading cause among 15 -19 year olds was motor vehicle traffic crash.

## Injury-related Emergency Department Discharges, 2006

- On average, there were 24 injury-related emergency department discharges every hour of every day for children ages 0-19 (N=208,771).
- The vast majority of injury-related emergency department discharges were unintentional (93.6%) followed by assault-related (2.9%) and self-inflicted (1.0%).
- Fall was the leading cause of injury-related emergency department discharges and accounted for 26.1% of injury discharges followed by injuries caused by being struck by or against an object (24.4%).
- The leading cause of injury-related emergency department discharges among children ages 0-9 was fall. The leading cause among 10-19 year olds was injury caused by being struck by or against an object.

## **Other Important Highlights**

- A ten year trend of death rates for children ages 0-19 shows that death from non-injury conditions (e.g., congenital malformations, perinatal conditions, and cancer) decreased significantly<sup>†</sup> between 1997 and 2006, while injury death rates did not.
- Males had higher rates of injury than females. Overall injury death rates were 2.4 times higher, and nonfatal hospital case rates were 1.4 times higher for males than females.
- Females, however, had higher rates than males for nonfatal self-inflicted injuries as well as higher rates of emergency department discharges for nonfatal motor

vehicle traffic-related occupant injuries.

- Thirty-eight percent of unintentional injury deaths to children and youth ages 0-19 were associated with a traumatic brain injury (TBI) compared to 22% for adults ages 20 and older.
- In 2006, total charges of injury-related hospital cases (which include inpatient hospital discharges, observation stays, and emergency department discharges) exceeded \$308 million.

<sup>†</sup> Statistically significant at the  $P \leq .05$  level.

This report presents the magnitude, trends, and risk factors for many childhood injuries. It is intended to serve as a reference book for those working in the field of injury prevention and to provide useful details on specific injury categories. The report is divided into sections according to injury intent (e.g., unintentional, self-inflicted, and assault-related). Data are intended to increase awareness of childhood injuries, inform policy, and assist in focusing resources.

This report does not focus on prevention strategies. The [Injury Prevention and Control Program \(IPCP\)](#), within the Massachusetts Department of Public Health assumes a key leadership role in the prevention of injuries to children in the Commonwealth. The IPCP facilitates the development of injury prevention coalitions and task forces, develops policies and programs, and provides the public materials on a wide range of injuries. The Department's statewide injury prevention plan developed by the IPCP, [Maximizing our Efforts: The Massachusetts State Injury Prevention Plan](#) helps guide prevention efforts.

# Data Notes

## Definitions:

### Residency

Only Massachusetts residents between the ages of 0 and 19 years were included in the report. For deaths, residency was determined by the town of residence recorded on the death certificate. For nonfatal data, residency was determined by zip code; only valid MA zip codes were included for defining these cases.

### Injury Intent/Cause

Definitions of injury intent and cause are provided at the beginning of each section and are from the Centers for Disease Control and Prevention ([www.cdc.gov/ncipc/wisqars](http://www.cdc.gov/ncipc/wisqars)) and/or the Generic ICD-9-CM manual (Hospital Version, 2007).

### Hospital Discharges:

Individuals admitted and subsequently discharged from a Massachusetts acute care hospital.

### Observation Stays:

Individuals discharged from an observation bed of a Massachusetts acute care hospital.

### Hospital Stays:

Combines hospital discharges and observation bed stays into one category to assist in interpreting analysis.

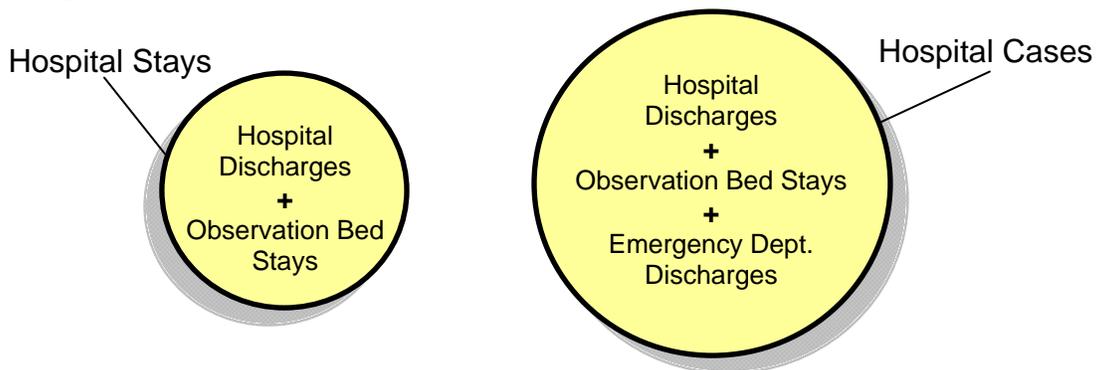
### ED Discharges:

Individuals treated and discharged from the emergency department of a Massachusetts acute care hospital.

### Hospital Cases:

Combines hospital discharges, observation bed stays and emergency department discharges into one category.

Definition diagram of "Hospital Stay" and "Hospital Case" categories which are used throughout this report.



## Injury Parameters:

Injuries are classified using multiple parameters. For example, an injury may be classified by a diagnosis (e.g., a fracture), or by the mechanism or external cause of the injury (e.g., a fall). Injuries are also classified by intent: unintentional ("accidents") or intentional (assaults/homicides or self-inflicted/suicides).

In this report injuries are classified by their external cause and intent according to the International Classification of Diseases (ICD) system. In 1999 a revised version, ICD-10, was implemented for classifying deaths. Certain injury categories may not be comparable between ICD-9 (the previous version) and ICD-10. Comparability ratios between the two systems are relatively high for injury

deaths (1.035 for unintentional injury deaths, .9962 for suicides, and .9983 for homicides).

A modified version of the *Matrix of E-code Groupings for Presenting Injury Mortality and Morbidity Data*, developed by the Centers for Disease Control and Prevention, was used to group injury categories. These groupings can be found in the Technical Notes and Methodology section.

#### **Data Sources:**

Death certificate data from the Massachusetts Registry of Vital Records and Statistics, and statewide inpatient hospital discharge, observation stay, and outpatient emergency department data from the Massachusetts Division of Health Care Finance and Policy (DHCFP) were used for analysis. For the purposes of this report, we combine inpatient hospital discharge data with observation stay data and refer to these cases as “hospital stays”. Patterns are typically similar for these two databases so combining them simplifies presentation and interpretation.

Some analysis combines hospital stays and emergency department discharges. These are referred to in the report as “hospital cases”. Typically this was done when counts were small or patterns of injury were similar among hospital stays and emergency department discharges. If there were notable differences in rates of hospital stays and emergency department discharges (e.g. differences by age groups and sex) then these two datasets were presented or discussed separately.

#### **Additional Notes:**

The most recent year available at the time of analysis, 2006, was used for most of the report. Multiple years of data are presented where needed or useful.

Most trend data presented are for the five-year time-period 2002 to 2006. These years were also combined when presenting race and ethnicity data in order to have sufficient numbers to stabilize rates and make useful comparisons.

The age group 0-19 was used since population data used to calculate rates is typically provided in 5 year age groupings and since the definition of “children” varies. Smaller age groups are presented throughout the report. All rates are per 100,000 Massachusetts’ resident population. Most rates presented are crude – the number of cases/events in a time-period divided by the population of the same time-period. Rates were calculated using the National Center for Health Statistics (NCHS) population estimates for Massachusetts children ages 0-19 (1,633,266 in 2006).<sup>1</sup> Age-adjusted rates are calculated for race and ethnicity analysis only. Adjusted rates help account for the age make-up of different populations (e.g. race/ethnicity).

Some tables contain small numbers which may result in unstable rates and proportions. For deaths, rates and proportions are suppressed for counts less than five. The MA Division of Health Care Finance and Policy requires suppression of counts less than seven when presenting hospital, observation, and emergency department data. Rates are not calculated on these counts.

For additional information refer to the Technical Notes and Methodology section.

---

<sup>1</sup> National Center for Health Statistics. Estimates of the July 1, 2000-July 1, 2006, United States resident population from the Vintage 2006 postcensal series by year, county, age, sex, race, and Hispanic origin, prepared under a collaborative arrangement with the U.S. Census Bureau. Available on the Internet from: <http://www.cdc.gov/nchs/about/major/dvs/popbridge/popbridge.htm>. August 16, 2006.

# Introduction

Fatal and nonfatal injuries to children pose a significant and preventable public health problem. Injuries include homicides and assaults, suicides and self-inflicted injuries, unintentional injuries, and injuries of undetermined intent.

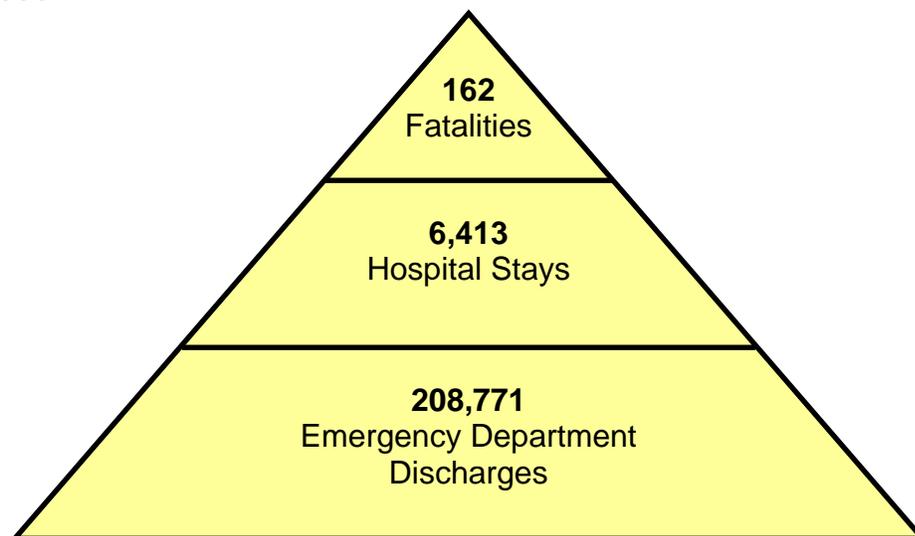
Injuries are responsible for nearly *950,000 deaths* among children ages 17 and under. Unintentional injuries are the *leading cause of death* worldwide for children ages 10-19.<sup>2</sup> In the United States and Massachusetts, unintentional injury is the leading cause of death among children and youth ages 1-19.<sup>3\*</sup>

In Massachusetts 25% of all deaths among children ages 0-19 in 2006 were the result of injuries. Unintentional injury was the second leading cause of death among Massachusetts children ages 0-19. Homicide was the seventh leading cause, and suicide the eighth leading cause of death for this age group. In the U.S. more than 9 million nonfatal injuries to children and youth ages 0-19

are treated in emergency departments every year.<sup>4</sup> In Massachusetts there are over 200,000 emergency department discharges annually in this age group. Nonfatal injuries contribute to disability, missed school days, missed work days for parents, and have huge economic implications. Nationally, in 2000, injuries to children ages 5-14 accounted for \$34.6 billion in costs.<sup>2</sup> In 2006 total charges for fatal and nonfatal hospital cases (includes inpatient hospital discharges, observation stays, and emergency department discharges) among Massachusetts children ages 0-19 exceeded \$308 million. These charges do not include visits to physician's offices, health care centers or rehabilitation charges.

An injury pyramid (Figure 1) assists in understanding the relative burden of injuries. The top of the pyramid demonstrates that injury death, while the most tragic outcome, represents the smallest share of the overall burden of injuries among Massachusetts residents. This can be compared to the bottom of the pyramid

**Figure 1. Magnitude of Injury Burden among MA Residents Ages 0-19 Years, 2006**



\*The leading cause of death among Massachusetts infants less than 1 year old was perinatal conditions.

which shows the number of nonfatal injuries among children discharged from an emergency department as the largest proportion. In 2006 for every Massachusetts child that died of an injury, there were 40 injury-related hospital stays and almost 1,300 visits to an emergency department. It is important to note that injuries that did not result in death or treatment at an acute care hospital were *not included* in this report (e.g., injuries treated within physician's offices, health clinics, school nurse's offices, specialized hospitals, or at home).

### *Injuries are preventable!*

Injuries tend to follow a very predictable sequence of events which allows injury prevention professionals to implement appropriate interventions. Injury prevention uses a combined approach often referred to as the 3E's: Education, Enforcement, and Engineering. This method uses both "active" and "passive" countermeasures. Active countermeasures are those that a person needs to consciously employ such as using a child car seat or booster seat. Passive countermeasures can be engineered and do not require an individual to play an active role in implementing the prevention strategy.<sup>5</sup> This would be the case of airbags. Passive countermeasures are typically more effective since individual personal behavior – forgetting or erroneously utilizing the countermeasure – is removed. However, using both active and passive countermeasures together may be the best strategy.<sup>6</sup>

To learn more about *preventing* injuries, contact the [Injury Prevention and Control Program \(IPCP\)](#), within the Massachusetts Department of Public Health. The IPCP facilitates the development of injury prevention coalitions and task forces, develops

policies and programs, and provides the public materials on a wide range of injuries.

Injury Prevention and Control Program  
MA Department of Public Health  
250 Washington Street, 4<sup>th</sup> Floor  
Boston, MA 02108  
617-624-5544

---

### **Note to Reader:**

This report is comprehensive in nature. It presents the magnitude, trends, and risk factors of childhood injuries by intent (e.g., unintentional, self-inflicted, and assault-related) and for selected injury causes (e.g., falls, motor vehicle crashes, poisonings). It is intended to serve as a base-line document for advocates who may work in one injury area or many. Additional details, such as circumstance are provided for many of the injury categories, but some injury categories do not provide such information. As wide-ranging as the report is, it does not cover everything. Additional analysis can be conducted on any of the injuries presented here and those that are not by contacting the Injury Surveillance Program at 617-624-5648.

---

<sup>2</sup> Peden, M. et al. (2008). *World report on childhood injury prevention*. Geneva: World Health Organization. Retrieved from [http://whqlibdoc.who.int/publications/2008/9789241563574\\_eng.pdf](http://whqlibdoc.who.int/publications/2008/9789241563574_eng.pdf)

<sup>3</sup> Borse, N. N. et al. (2008). *Childhood Injury Report: Patterns of Unintentional Injuries among 0-19 Year Olds in the United States, 2000-2006*. Atlanta, GA: Centers for Disease Control and Prevention. Retrieved from <http://www.cdc.gov/safecild/images/CDC-childhoodinjury.pdf>

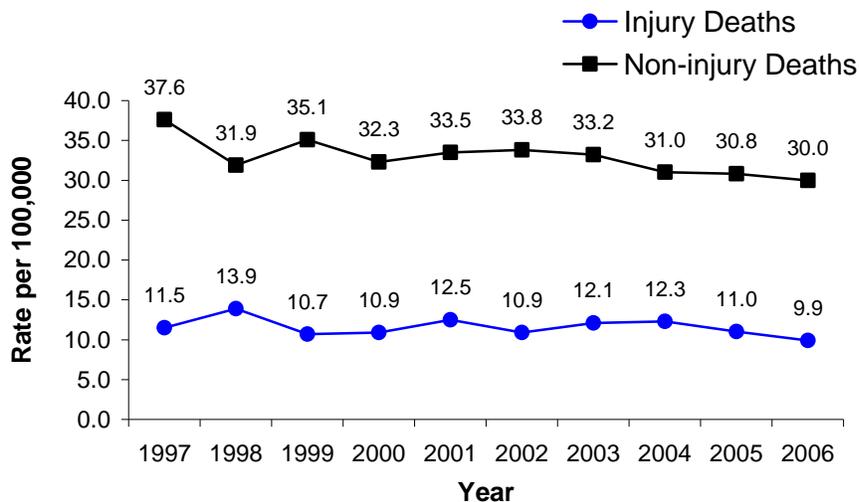
<sup>4</sup> Centers for Disease Control and Prevention. Web-based Injury Statistics Query and Reporting System (WISQARS).

<sup>5</sup> Haddon, W. (1980). Advances in the epidemiology of injuries as a basis for public policy. *Public Health Reports*, 95, 411-421.

<sup>6</sup> Flint, L. J. et al. (2008). *Trauma: Contemporary Principles and Therapy*. Philadelphia PA: Lippincott Williams & Wilkins.

# **Section 1: OVERVIEW**

**Figure 2. Rates of Injury and Non-Injury\* Deaths, MA Residents Ages 0-19, 1997-2006**

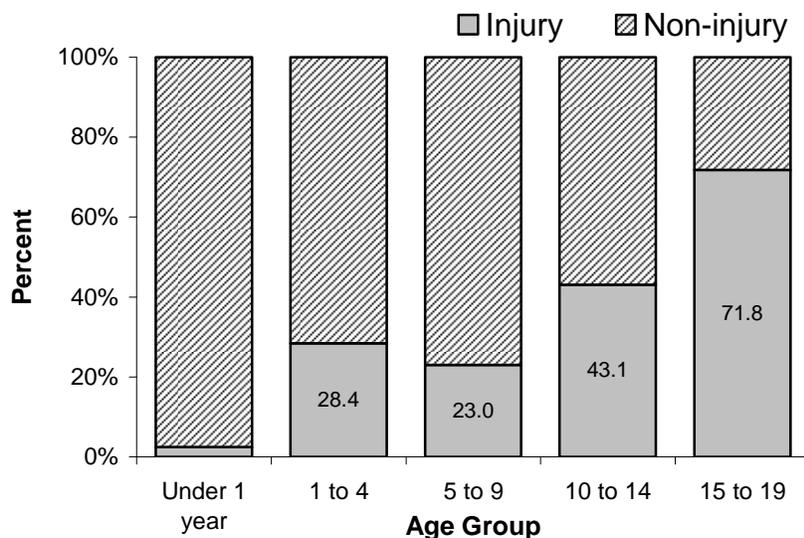


\*Non-injury deaths include perinatal conditions, congenital malformations, cancer, and heart disease.

Figure 2 shows injury and non-injury death rates for children and youth ages 0-19. While non-injury death rates decreased significantly<sup>†</sup> between 1997 and 2006, injury death rates did not.

<sup>†</sup> Statistically significant at the  $P \leq .05$  level.

**Figure 3. Distribution of Injury and Non-Injury Deaths, MA Residents Ages 0-19, 2002-2006**



Among children under the age of 1 year, injury fatalities accounted for about 3% of all deaths (2002-2006).

As age increased so did the proportion of injury fatalities among all deaths. In the 15-19 year age group, injuries made up 72% of all deaths.

Youth ages 15-19 were 2.5 times more likely to die from an injury than other conditions.

**Table 1. Leading Underlying Causes of Death by Age Group, MA Residents  
Ages 0-19, 2006**

Rank*	Age Groups (number of deaths)					
	<1 year	1-4 years	5-9 years	10-14 years	15-19 years	Total (0-19 years)
1	Perinatal Conditions (232)	Unintentional Injuries (11)	Unintentional Injuries (5)	Unintentional Injuries (16)	Unintentional Injuries (70)	Perinatal Conditions (234)
2	Congenital malformations (52)	Cancer (4)	Cancer (4)	Cancer (11)	Homicide (25)	Unintentional Injuries (111)
3	Ill-defined conditions (41)	Congenital Malformations (4)	Congenital Malformations (2)	Heart Disease (2)	Cancer (13)	Congenital malformations (62)
4	Unintentional Injuries (9)	Ill-defined conditions (4)	Meningococcal (1)	Suicide (2)	Suicide (11)	Ill-defined conditions (51)
5	Heart Disease (3)	Influenza & Pneumonia (3)	Septicemia (1)	Homicide (2)	Heart Disease (4)	Cancer (33)
6	Septicemia (2)	Homicide (3)	Viral Encephalitis (1)	Anemias (1)	Ill-defined conditions (4)	Homicide (32)
7	Other infection (2)	Heart Disease (2)	In Situ Neoplasms (1)	Diabetes (1)	Aortic Aneurysm (3)	Suicide (13)
8	Influenza & Pneumonia (2)	Acute Bronchitis (2)	Heart Disease (1)	Nephritis (1)	Congenital malformations (3)	Heart Disease (12)
9	Homicide (2)	Septicemia (1)	Stroke (1)	Congenital Malformations (1)	Septicemia (2)	Influenza & Pneumonia (7)
10	Cancer (1)	Malaria (1)	Influenza & Pneumonia (1)	Ill-defined conditions (1)	Injuries of Undetermined Intent (2)	Septicemia (6)
All Other	All Other (23)	All Other (13)	All Other (12)	All Other (8)	All Other (19)	All Other (88)
<b>TOTAL</b>	<b>369</b>	<b>48</b>	<b>30</b>	<b>46</b>	<b>156</b>	<b>649</b>

\* Ranking is based on number of deaths. The number of deaths is shown in parentheses. Injuries are subdivided into 4 separate categories by intent - unintentional, homicide, suicide and injuries of undetermined intent (deaths where investigation has not determined whether injuries were accidental or purposely inflicted). The ranking may differ from other MDPH publications due to differences in how disease and injury categories are defined and combined/collapsed.

- Table 1 shows the leading causes of death among children and youth ages 0-19 in 2006. Unintentional injuries were ranked in the top ten leading causes of death among children for every age group. Overall, unintentional injury fatalities ranked 2<sup>nd</sup> for ages 0-19.
- Homicide appeared as a top ten leading cause of death for <1, 1-4, 10-14 and 15-19 year olds and ranked as the 7<sup>th</sup> leading cause of death for ages 0-19.
- Suicide was the 5<sup>th</sup> leading cause of death for youth ages 15-19.

**Table 2. Injury Fatalities among MA Residents Ages 0-19, 2006**

INJURY CAUSE	INJURY INTENT					Total Number	Percent of Total
	Unintentional	Suicide	Homicide	Undetermined	Other & Legal <sup>1</sup>		
Cut/pierce	0	1	3	0	0	4	2.5
Drowning/submersion	17	0	0	1	--	18	11.1
Fall	4	0	0	0	--	4	2.5
Fire/burn	1	0	0	0	--	1	0.6
Firearms	0	2	21	0	1	24	14.8
Machinery	0	--	--	--	--	0	0.0
Natural/environmental	3	0	--	0	--	3	1.9
Overexertion	0	--	--	--	--	0	0.0
Poisoning	12	1	0	0	0	13	8.0
Struck by, against	3	--	3	--	0	6	3.7
Suffocation/hanging	9	9	2	1	--	21	13.0
Transport Injuries:	60	0	0	0	--	60	37.0
<i>Motor vehicle traffic-related</i>	54	0	0	0	--	54	33.3
<i>Occupant</i>	6	--	--	--	--	6	3.7
<i>Motorcyclist</i>	1	--	--	--	--	1	0.6
<i>Pedal Cyclist</i>	1	--	--	--	--	1	0.6
<i>Pedestrian</i>	7	--	--	--	--	7	4.3
<i>Other person</i>	0	--	--	--	--	0	0.0
<i>Unspecified person</i>	39	--	--	--	--	39	24.1
<i>Pedal cyclist, other</i>	0	--	--	--	--	0	0.0
<i>Pedestrian, other</i>	1	--	--	--	--	1	0.6
<i>Other transport</i>	5	--	--	--	--	5	3.1
Other specified & classifiable	0	0	1	0	0	1	0.6
Other specified, not classifiable	2	0	1	0	0	3	1.9
Unspecified	0	0	1	1	0	2	1.2
Adverse effects <sup>2</sup>	--	--	--	--	--	2	1.2
Cause and Intent are not provided	--	--	--	--	--	0	0.0
<b>TOTALS<sup>3</sup></b>	<b>111</b>	<b>13</b>	<b>32</b>	<b>3</b>	<b>1</b>	<b>162</b>	<b>100.0</b>

Notes: 1) Legal Intervention includes injuries resulting from police actions and operations of war. 2) Adverse Effects can be related to medical/surgical procedures, or to the use of therapeutic substances (including allergic reactions). 3) Totals do not include subcategory counts. Total percentage may be less or more than 100% due to rounding, but is presented here as 100%.

- In 2006 there were 162 injury fatalities among Massachusetts children and youth ages 0-19 (Table 2). This age group accounted for nearly 6 percent of all injury fatalities in 2006, but 25% of the total population of Massachusetts. The rate of injury deaths among children and youth ages 0-19 was 9.9 per 100,000.
- The leading cause of injury death was motor vehicle traffic-related crashes which accounted for 33.3% of injury fatalities. This was followed by firearm (14.8%) and suffocation/hanging (13.1%).
- The leading intent of injury fatalities was unintentional (69%), followed by homicide (21%) and suicide (8%).

**Table 3. Injury-related Hospital Stays among MA Residents Ages 0-19, 2006**

INJURY CAUSE	INJURY INTENT					Total Number	Percent of Total
	Unintentional	Self-Inflicted	Assault	Undetermined	Other & Legal <sup>1</sup>		
Cut/pierce	117	81	95	<7	0	295	4.6
Drowning/submersion	23	<7	0	0	--	24	0.4
Fall	1,591	<7	0	<7	--	1,597	24.9
Fire/burn	61	<7	<7	<7	--	67	1.0
<i>Fire/flame</i>	24	<7	<7	<7	--	30	0.5
<i>Hot object/substance burn</i>	37	0	0	0	--	37	0.6
Firearms	11	0	123	7	<7	142	2.2
Machinery	10	--	--	--	--	10	0.2
Natural/environmental	221	0	--	0	--	221	3.4
<i>Dog bites</i>	54	0	--	0	--	54	0.8
<i>Other bites &amp; stings</i>	122	0	--	0	--	122	1.9
<i>All other</i>	45	0	--	0	--	45	0.7
Overexertion	127	--	--	--	--	127	2.0
Poisoning	357	472	0	60	0	889	13.9
Struck by, against	477	--	129	--	<7	607	9.5
Suffocation/hanging	62	<7	<7	0	--	68	1.1
Transport Injuries:	1,273	0	<7	0	--	1,274	19.9
<i>Motor vehicle traffic-related</i>	904	0	<7	0	--	905	14.1
<i>Occupant</i>	600	--	--	--	--	600	9.4
<i>Motorcyclist</i>	59	--	--	--	--	59	0.9
<i>Pedal Cyclist</i>	49	--	--	--	--	49	0.8
<i>Pedestrian</i>	174	--	--	--	--	174	2.7
<i>Other person</i>	<7	--	--	--	--	<7	0.0
<i>Unspecified person</i>	19	--	--	--	--	19	0.3
<i>Pedal cyclist, other</i>	189	--	--	--	--	189	2.9
<i>Pedestrian, other</i>	14	--	--	--	--	14	0.2
<i>Other transport</i>	166	--	--	--	--	166	2.6
Other specified & classifiable	276	0	40	0	0	316	4.9
Other specified, not classifiable	109	14	35	<7	<7	165	2.6
Unspecified	180	<7	25	<7	0	214	3.3
Adverse effects <sup>2</sup>	--	--	--	--	--	88	1.4
Cause and Intent are not provided	--	--	--	--	--	309	4.8
<b>TOTALS<sup>3</sup></b>	<b>4,895</b>	<b>582</b>	<b>450</b>	<b>85</b>	<b>&lt;7</b>	<b>6,413</b>	<b>100</b>

Notes: 1) Legal Intervention includes injuries resulting from police actions and operations of war. 2) Adverse Effects can be related to medical/surgical procedures, or to the use of therapeutic substances (including allergic reactions). 3) Totals do not include subcategory counts. Total percentage may be less or more than 100% due to rounding, but is presented here as 100%.

- In 2006 there were 6,413 injury-related hospital stays among children and youth ages 0-19. This age group made up 9.6% of all injury-related hospital stays and the rate was 392.6 per 100,000.
- The leading cause of nonfatal injury-related hospital stays was fall which accounted for 25% of nonfatal injury-related hospital stays for this age group. This was followed by motor vehicle traffic-related crash (14%).
- The leading intent of nonfatal injury-related hospital stays was unintentional (76%).

**Table 4. Injury-related Emergency Department Discharges among MA Residents Ages 0-19, 2006**

INJURY CAUSE	INJURY INTENT					Total Number	Percent of Total
	Unintentional	Self-Inflicted	Assault	Undetermined	Other & Legal <sup>1</sup>		
Cut/pierce	15,299	837	346	47	<7	16,530	7.9
Drowning/submersion	66	0	0	<7	--	67	0.0
Fall	54,419	<7	<7	23	--	54,449	26.1
Fire/burn	2,676	12	9	15	--	2,712	1.3
<i>Fire/flame</i>	353	10	<7	11	--	376	0.2
<i>Hot object/substance burn</i>	2,323	<7	7	<7	--	2,336	1.1
Firearms	42	0	70	9	<7	121	0.1
Machinery	350	--	--	--	--	350	0.2
Natural/environmental	7,591	0	--	<7	--	7,592	3.6
<i>Dog bites</i>	2,152	0	--	0	--	2,152	1.0
<i>Other bites &amp; stings</i>	4,684	0	--	0	--	4,684	2.2
<i>All other</i>	755	0	--	0	--	755	0.4
Overexertion	19,571	--	--	--	--	19,571	9.4
Poisoning	2,288	857	<7	522	<7	3,675	1.8
Struck by, against	47,413	--	3,531	--	84	50,944	24.4
Suffocation/hanging	273	21	7	<7	--	304	0.1
Transport Injuries:	21,120	0	<7	0	--	21,123	10.1
<i>Motor vehicle traffic-related</i>	15,310	0	<7	0	--	15,313	7.3
<i>Occupant</i>	12,935	--	--	--	--	12,935	6.2
<i>Motorcyclist</i>	288	--	--	--	--	288	0.1
<i>Pedal Cyclist</i>	443	--	--	--	--	443	0.2
<i>Pedestrian</i>	972	--	--	--	--	972	0.5
<i>Other person</i>	59	--	--	--	--	59	0.0
<i>Unspecified person</i>	613	--	--	--	--	613	0.3
<i>Pedal cyclist, other</i>	4,159	--	--	--	--	4,159	2.0
<i>Pedestrian, other</i>	143	--	--	--	--	143	0.1
<i>Other transport</i>	1,508	--	--	--	--	1,508	0.7
Other specified & classifiable	11,587	<7	625	25	<7	12,244	5.9
Other specified, not classifiable	2,205	259	784	84	<7	3,333	1.6
Unspecified	10,555	67	594	280	7	11,503	5.5
Adverse effects <sup>2</sup>	--	--	--	--	--	171	0.1
Cause and Intent are not provided	--	--	--	--	--	3,997	1.9
<b>TOTALS<sup>3</sup></b>	<b>195,455</b>	<b>2,063</b>	<b>5,976</b>	<b>1,010</b>	<b>99</b>	<b>208,771</b>	<b>100.0</b>

Notes: 1) Legal Intervention includes injuries resulting from police actions and operations of war. 2) Adverse Effects can be related to medical/surgical procedures, or to the use of therapeutic substances (including allergic reactions). 3) Totals do not include subcategory counts. Total percentage may be less or more than 100% due to rounding, but is presented here as 100%.

- In 2006 there were 208,771 injury-related emergency department discharges among children and youth ages 0-19. Youth ages 0-19 accounted for 29.4% of all injury-related emergency department discharges.
- The leading cause of nonfatal injury-related emergency department discharges among children and youth ages 0-19 was fall which accounted for 26% of discharges. This was followed by struck by/against an object (24.4%).
- The leading intent of nonfatal injury-related emergency department discharges among children and youth ages 0-19 was unintentional (94%).

**Table 5. Number and Rate of Leading Causes of Injuries by Age Group, MA Residents Ages 0-9, 2006**

Age	Deaths			Hospital Stays			ED Discharges		
	Cause	Number	Rate*	Cause	Number	Rate*	Cause	Number	Rate*
< 1 year	Suffocation	6	7.8	Fall	167	216.4	Fall	2,481	3,214.4
	Struck by	2	--	Suffocation	25	32.4	Struck by	516	668.5
	Firearm	1	--	Poisoning/Drug overdose	25	32.4	Fire / burn	191	247.5
	Drowning	1	--	Struck by	17	22.0	Overexertion	163	211.2
	Other/unknown	1	--	Other/unknown	219	283.7	Other/unknown	1,388	1,798.3
	TOTAL	11	14.3	TOTAL	453	586.9	TOTAL	4,739	6,140.0

Age	Deaths			Hospital Stays			ED Discharges		
	Cause	Number	Rate*	Cause	Number	Rate*	Cause	Number	Rate*
1-4 years	Drowning	5	1.6	Fall	348	112.0	Fall	15,963	5,138.1
	MV Traffic	2	--	Poisoning/Drug overdose	151	48.6	Struck by	6,317	2,033.3
	--	--	--	Natural/environ.	69	22.2	Overexertion	2,127	684.6
	--	--	--	Struck by	37	11.9	Cut / pierce	2,084	670.8
	Other/unknown	7	2.3	Other/unknown	287	92.4	Other/unknown	12,824	4,127.7
	TOTAL	14	4.5	TOTAL	892	287.1	TOTAL	39,315	12,654.5

Age	Deaths			Hospital Stays			ED Discharges		
	Cause	Number	Rate*	Cause	Number	Rate*	Cause	Number	Rate*
5-9 years	Drowning	3	--	Fall	401	103.5	Fall	12,411	3,201.9
	Natural/environ.	1	--	MV Traffic	77	19.9	Struck by	8,076	2,083.5
	Other land transport	1	--	Struck by	61	15.7	Cut / pierce	2,842	733.2
	Adverse effects	1	--	Natural/environ.	47	12.1	Overexertion	1,933	498.7
	Other/unknown	0	0	Other/unknown	298	76.9	Other/unknown	11,114	2,867.3
	TOTAL	6	1.5	TOTAL	884	228.1	TOTAL	36,376	9,384.6

Rates are age specific (number of cases per 100,000 persons within each age group). Rates are not calculated on counts less than 5 (for deaths) or 7 (for nonfatal injuries). Rates based on counts less than 20 may be unstable and should be interpreted with caution.

Leading causes of injury death and nonfatal injury vary by age group (Tables 5 and 6).

- Among children less than 1 year suffocation was the leading cause of injury death. Fall was the leading cause of injury-related hospital stays (N=167) and the leading cause of injury-related emergency department discharges (N=2,481).
- Among children ages 1-4 drowning was the leading cause of injury death. Fall was the leading cause of injury-related hospital stays (N=348) followed by poisoning/drug overdose (N=151). Fall was the leading cause of injury-related emergency department discharges (N=15,963) followed by struck by injuries.
- For children ages 5-9 drowning was the leading cause of injury death. Fall was the leading cause of injury-related hospital stays (N=401) followed by motor vehicle traffic-related crash. Fall was again the leading cause of injury-related emergency department discharges (N=12,411) for this age group followed by struck by/against.

**Table 6. Number and Rate of Leading Causes of Injuries by Age Group, MA Residents Ages 10-19, 2006**

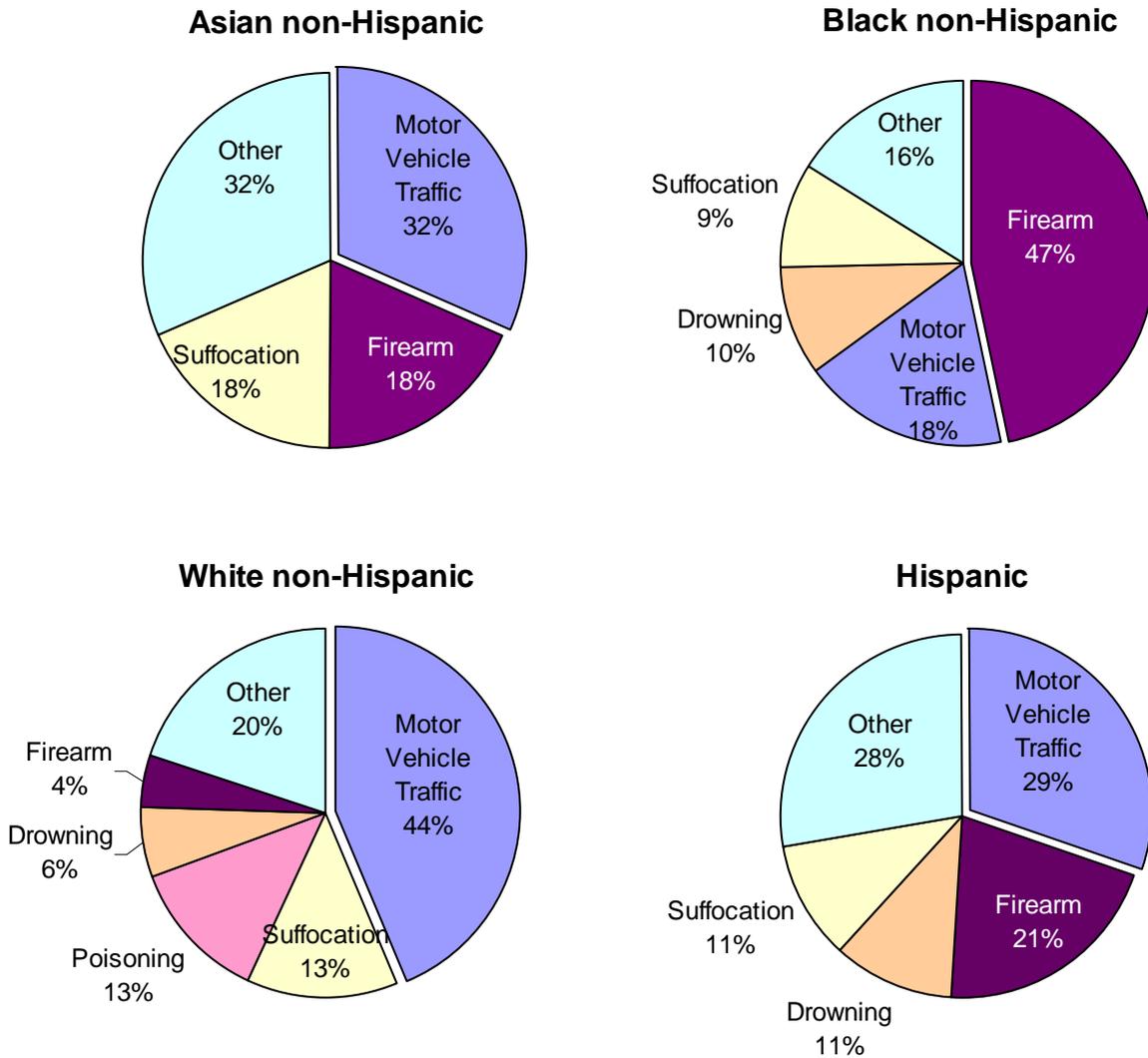
Age	Deaths			Hospital Stays			ED Discharges		
	Cause	Number	Rate*	Cause	Number	Rate*	Cause	Number	Rate*
0-14 years	MV Traffic	9	2.2	Fall	340	82.7	Struck by	16,469	4,007.3
	Suffocation	5	1.2	Struck by	174	42.3	Fall	13,310	3,238.6
	Drowning	4	--	MV Traffic	136	33.1	Overexertion	6,414	1,560.7
	--	--	--	Poisoning/drug overdose	92	22.4	Cut / pierce	3,997	972.6
	Other/unknown	3	--	Other/unknown	479	116.6	Other/unknown	14,288	3,476.6
	TOTAL	21	5.1	TOTAL	1,221	297.1	TOTAL	54,478	13,255.6

Age	Deaths			Hospital Stays			ED Discharges		
	Cause	Number	Rate*	Cause	Number	Rate*	Cause	Number	Rate*
15-19 years	MV Traffic	43	9.6	MV Traffic	656	146.8	Struck by	19,650	4,397.8
	Firearm	22	4.9	Poisoning/drug overdose	594	132.9	MV Traffic	10,664	2,386.7
	Poisoning/drug overdose	12	2.7	Fall	341	76.3	Fall	10,285	2,301.9
	Suffocation	9	2.0	Struck by	318	71.2	Overexertion	8,934	1,999.5
	Other/unknown	24	5.4	Other/unknown	1,054	235.9	Other/unknown	24,330	5,445.3
	TOTAL	110	24.6	TOTAL	2,963	663.1	TOTAL	73,863	16,531.2

Rates are age specific (number of cases per 100,000 persons within each age group). Rates are not calculated on counts less than 5 (for deaths) or 7 (for nonfatal injuries). Rates based on counts less than 20 may be unstable and should be interpreted with caution.

- For youth ages 10-14, motor vehicle traffic-related crash was the leading cause of injury death. Fall was the leading cause of injury-related hospital stays (N=340) followed by struck by/against object (N=174). Struck by/against object was the leading cause of injury-related emergency department discharges (N=16,469) followed by fall (N=13,310).
- Motor vehicle traffic-related crash was also the leading cause of injury deaths among youth ages 15-19 (N=43). This was followed by firearm (N=22). Motor vehicle traffic-related crash was the leading cause of injury-related hospital stays (N=656) followed by poisoning/drug overdose (N=594). Struck by/against object was the leading cause of injury-related emergency department discharges (N=19,650) followed by motor vehicle traffic-related crash (N=10,664).

**Figure 4. Injury Fatalities by Race/Ethnicity, MA Residents Ages 0-19, 2002-2006 (N=918)**



- Leading causes of injury death among children ages 0-19 differed by race and ethnicity (2002-2006). Motor vehicle traffic-related crash was the leading cause of injury fatalities among Asian non-Hispanic, Hispanic and White non-Hispanics. Among Black non-Hispanics, firearm was the leading cause of injury fatality. Among Asian non-Hispanics and Hispanics, firearm was the second leading cause of injury fatality.
- Overall rates of injury death differed by race and ethnicity. Black non-Hispanics ages 0-19 had the highest average annual age-adjusted rates of injury death (22.7 per 100,000). This was followed by Hispanics (12.5 per 100,000). White non-Hispanics had a rate of 9.3 per 100,000. Youth ages 15-19 had the highest injury fatality rates across all race and ethnicity groups.

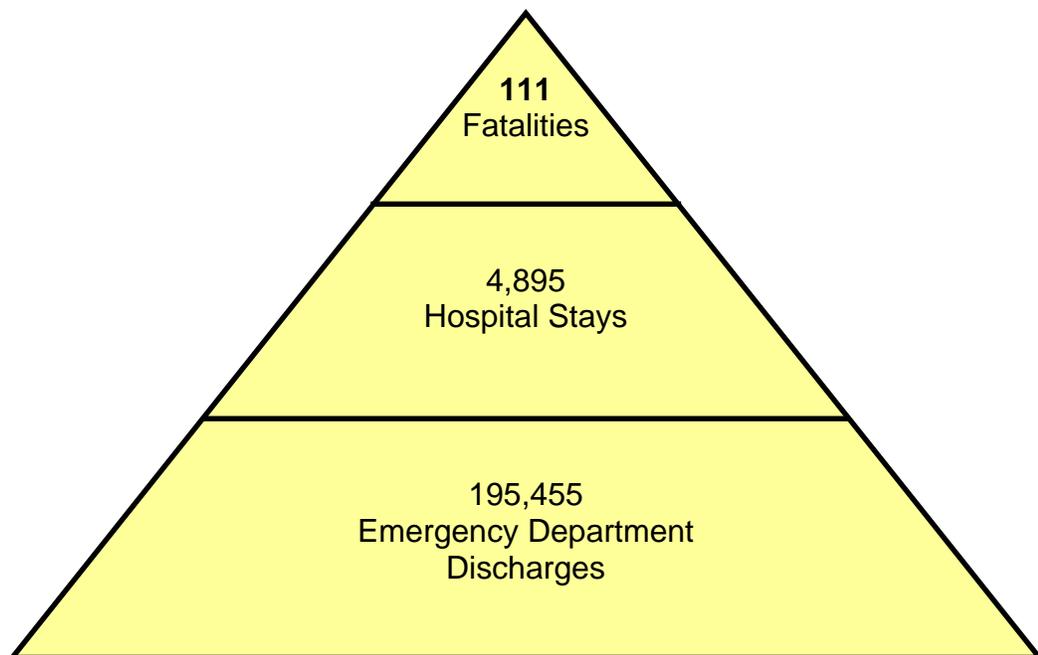


## Section 2: UNINTENTIONAL INJURIES

---

Unintentional injuries are injuries that are not inflicted by deliberate means (i.e., not on purpose). This includes injuries described as unintended or "accidental" regardless of whether the injury was inflicted by oneself or by another person. Unintentional injury results from many causes or mechanisms, such as a poisoning, fall, motor vehicle crash, fire or burn, drowning, and many other causes. Unintentional injuries make up the majority of fatal and nonfatal injuries for children ages 0-19.

### Magnitude of Unintentional Injury among MA Residents Ages 0-19, 2006

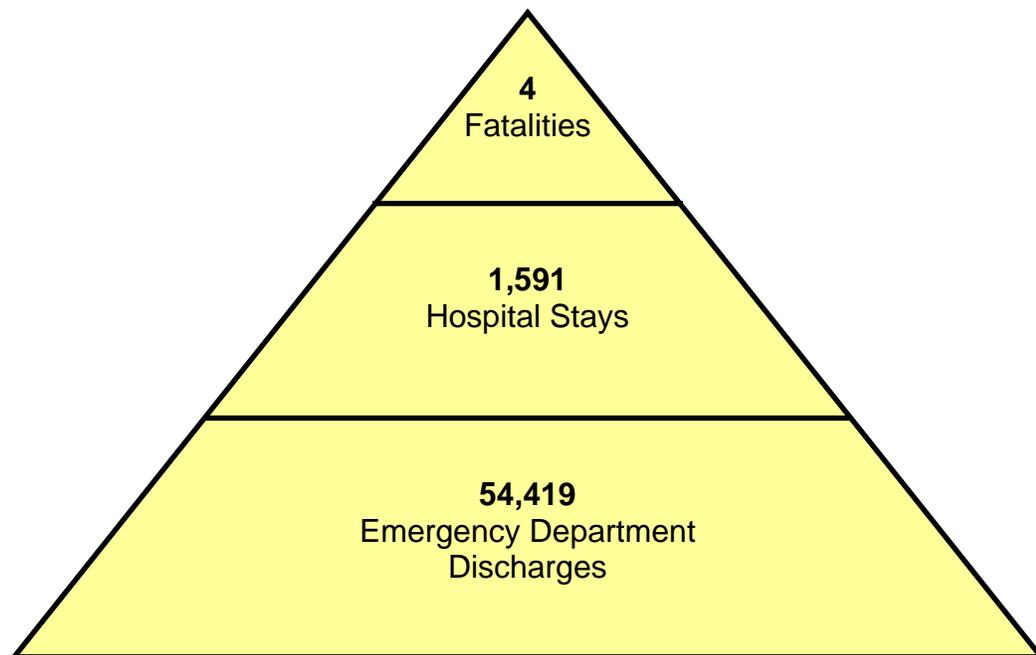


- For every unintentional injury death in 2006 among children and youth ages 0-19, there were 44 hospital stays and 1,761 emergency department discharges.

## FALL INJURIES

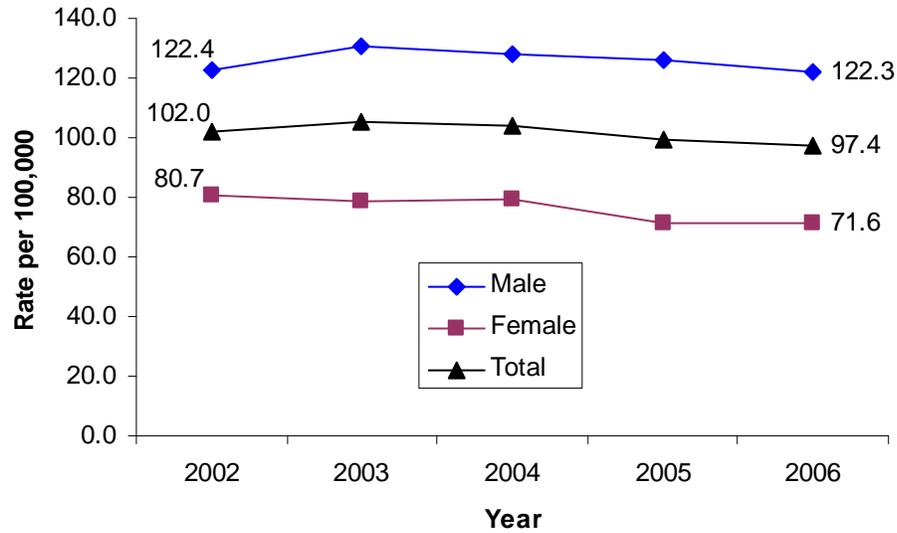
A fall injury occurs when a person descends abruptly due to gravity and strikes a surface below them. Among unintentional injuries, falls are the leading cause of nonfatal injury-related hospital stays and emergency department discharges for children and youth ages 0-19 years (33% and 25% respectively in 2006). Fall injuries can range from falls on or from stairs or steps, to falls from a snowboard. Types of falls differ by age group.

**Figure 5. Magnitude of Fall-related Injury among MA Residents Ages 0-19, 2006**



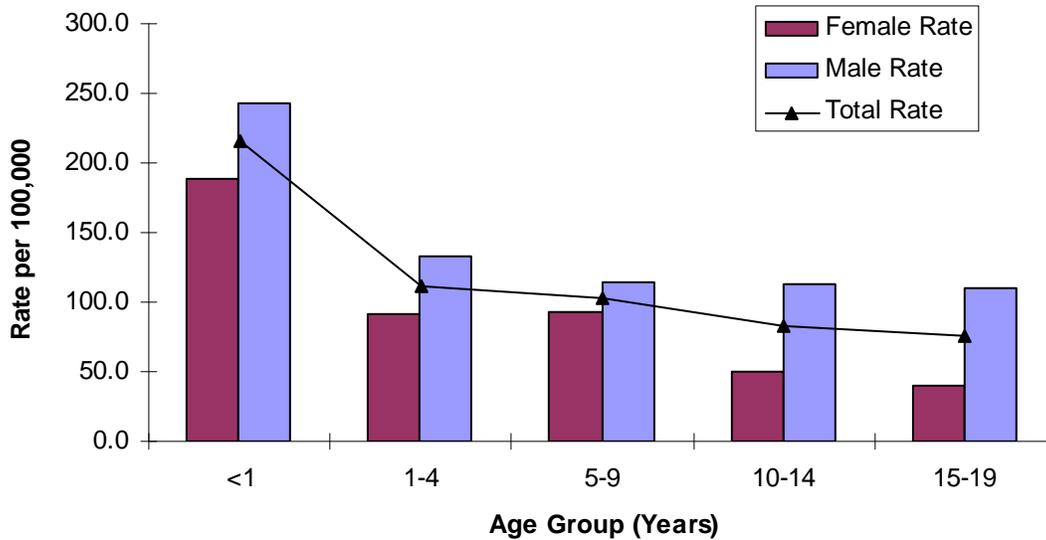
- In 2006, among children and youth ages 0-19 there were 4 fall fatalities, 1,591 hospital stays, and 54,419 emergency department discharges.
- Every day there was an average of 4 nonfatal fall-related hospital stays and 149 emergency department discharges.

**Figure 6. Rates of Nonfatal Fall-related Injury Hospital Stays by Sex, Ages 0-19, MA Residents, 2002-2006 (N=8,427)**



- Overall rates of fall-related hospital stays among Massachusetts children and youth ages 0-19 declined slightly (4.5%) between 2002 and 2006. Rates among females declined 11.3% from 2002 to 2006. Trends however were not statistically significant.
- Males had an average annual rate about 1.6 times higher than females.

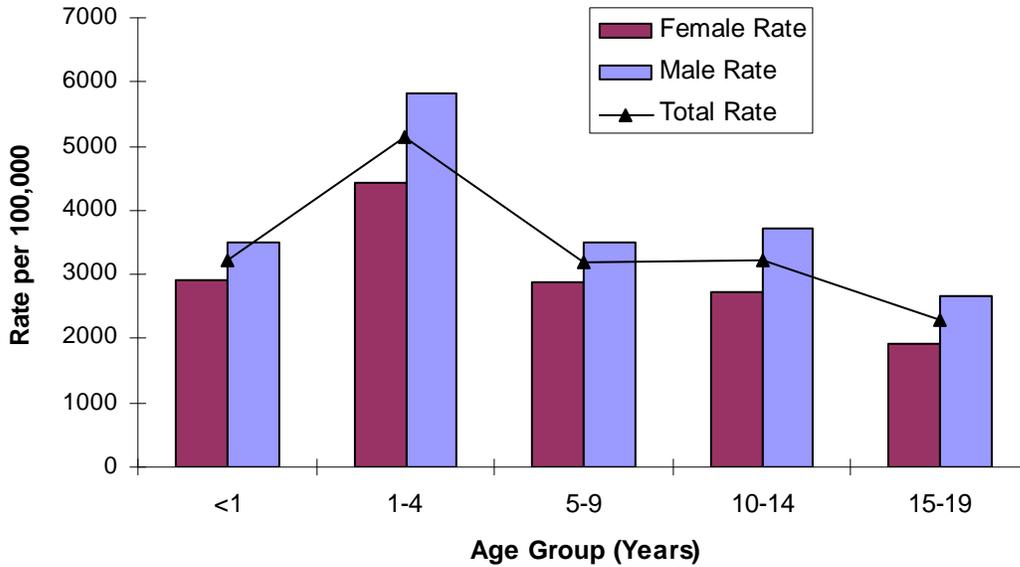
**Figure 7. Rates of Nonfatal Fall-related Injury Hospital Stays by Age Group and Sex, MA Residents Ages 0-19, 2006 (N=1,591)**



Age Group	Female		Male		Total	
	N	Rate	N	Rate	N	Rate
< 1 Year	72	189.1	95	243.0	167	216.4
1-4 Years	138	90.9	210	132.3	348	112.0
5- 9 Years	175	92.2	226	114.2	401	103.5
10-14 Years	101	50.4	238	113.0	339	82.5
15-19 Years	88	39.8	248	110.0	336	75.2
Total	574	71.6	1,017	122.3	1,591	97.4

- Nonfatal fall-related hospital stay rates among 0-19 year olds were highest among children less than 1 year of age. As age increased, overall rates decreased. Youth ages 15-19 had the lowest rates among all age groups (75.2 per 100,000).
- Male rates were higher for all age groups compared to females. Overall, in 2006, male rates were 1.7 times higher than female rates (122.3 per 100,000 compared with 71.6 per 100,000 respectively).

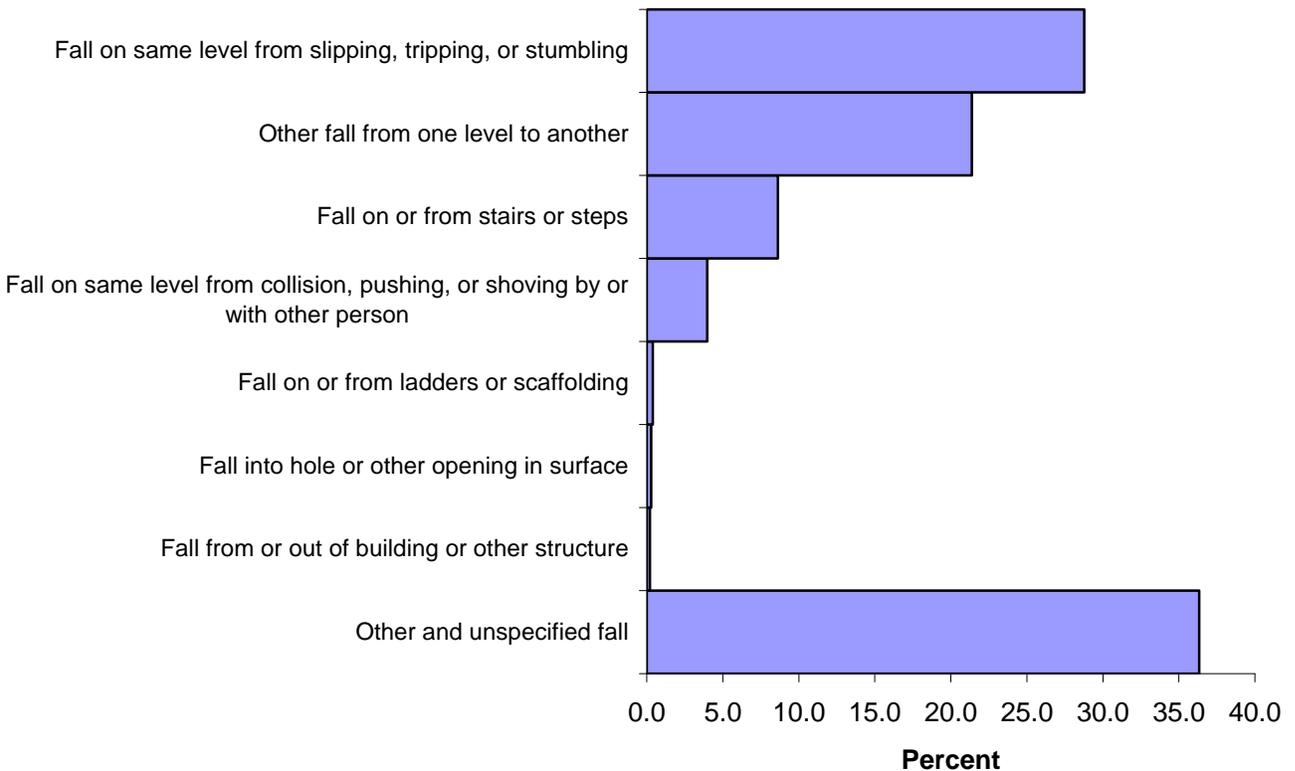
**Figure 8. Rates of Nonfatal Fall-related Injury Emergency Department Discharges by Age Group and Sex, MA Residents Ages 0-19, 2006 (N=54,419)**



Age Group	Female		Male		Total	
	N	Rate	N	Rate	N	Rate
<1 Year	1,112	2,920.1	1,368	3,498.5	2,480	3,213.1
1-4 Years	6,717	4,422.1	9,244	5,821.8	15,962	5,137.8
5-9 Years	5,470	2,882.6	6,936	3,505.7	12,406	3,200.6
10-14 Years	5,483	2,737.3	7,816	3,710.0	13,299	3,235.9
15-19 Years	4,257	1,923.3	6,015	2,667.7	10,272	2,299.0
<b>Total</b>	<b>23,039</b>	<b>2,874.9</b>	<b>31,379</b>	<b>3,772.0</b>	<b>54,419</b>	<b>3,331.9</b>

- Nonfatal fall-related emergency department discharge rates among 0-19 year olds show a slightly different pattern when compared to hospital stays. Ages 1-4 had the highest rates, and children less than 1, 5-9, and 10-14 had very similar rates. Youth ages 15-19 had the lowest rates.
- Male rates were again the highest for all age groups compared to females. In 2006, male rates of fall-related emergency department discharges were 1.3 times higher than female rates (3,772.0 per 100,000 compared with 2,874.9 per 100,000).

**Figure 9. Percent of Nonfatal Fall-related Injury Hospital Cases by Fall Type, MA Residents Ages 0-19, 2006**



Fall Type	N	%
Fall on same levels from slipping, tripping, or stumbling	16,119	28.8
Other fall from one level to another	11,977	21.4
Fall on or from stairs or steps	4,829	8.6
Fall on same level from collision, pushing, or shoving by or with other person	2,223	4.0
Fall on or from ladders or scaffolding	225	0.4
Fall into hole or other opening in surface	163	0.3
Fall from or out of building or other structure*	120	0.2
Other and unspecified fall	20,354	36.3
Total	56,010	100.0

\* This category is not mutually exclusive. It includes many types of falls from buildings and other structures (e.g., balcony, bridge, window, etc.).

- In 2006, the leading specified type of fall was a fall “on the same level from slipping, tripping, or stumbling” (28.8%) followed by “other fall from one level to another” (21.4%). Thirty-six percent of nonfatal fall types were “other” and “unspecified” fall.
- Among other fall injuries from one level to another, 32.5% were “other” which includes fall from embankment, haystack, stationary object, or tree. Twenty-four percent were fall from playground equipment and 22.1% were fall from bed.

**Table 7. Percent of Nonfatal Fall-related Injury Hospital Cases by Fall Type and Age Group, MA Residents Ages 0-19, 2006**

<b>Type of Fall</b>	<b>&lt;1</b>	<b>1 to 4</b>	<b>5 to 9</b>	<b>10 to 14</b>	<b>15 to 19</b>
Fall on same level from slipping, tripping, or stumbling	5.7	18.4	27.8	40.4	36.8
Other fall from one level to another	59.7	28.6	27.1	10.5	7.9
Fall on or from stairs or steps	10.6	10.4	5.4	6.4	12.2
Fall on same level from collision, pushing, or shoving by or with other person	0.0	0.2	1.7	7.8	8.6
Fall on or from ladders or scaffolding	0.0	0.3	0.4	0.2	1.0
Fall into hole or other opening in surface	0.0	0.0	0.2	0.4	0.8
Fall from or out of building or other structure	0.0	0.2	0.2	0.1	0.4
Other and unspecified fall	24.0	41.9	37.2	34.3	32.6
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

The type of nonfatal fall varied by age group.

- “Other fall from one level to another” was the leading type of fall among infants less than 1 year, and children ages 1-4. Within this category, fall from bed was the leading type of fall among children less than 1 year (42.5%) and among 1-4 year olds (26.9%).
- Among 5-9 year olds fall “on the same level from slipping, tripping, or stumbling” was the leading type of fall. This includes fall from non-motorized scooters (7.7%) and roller skates (7.6%). Fall from skateboards and snowboards were leading types of “fall on the same level from slipping, tripping, or stumbling” for 10-14 (21.1%) and 15-19 (25.5%) year olds.
- Among other and unspecified fall, “unspecified” accounted for 50%. An unspecified code used in broad and specific injury categories continues to be a problem that can affect our overall assessment and therefore the prevention of certain injuries.

**Table 8. Nature of Injury by Body Region<sup>1</sup>: Fall-related Injury Hospital Stays, MA Residents Ages 0-19, 2006**

		Nature of Injury							TOTAL
		Fractures	Sprains, strains & dislocations	Internal	Open wound	Contusion/superficial	Other	Unspecified	
Body Region									
Head & Neck	<i>Total Head and Neck</i>	275	0	195	116	110	<7	72	769
	Spine & Back								
	Spinal Cord Injury	<7	0	<7	0	0	0	0	<7
	Vertebral Column Injury	25	12	0	0	0	0	0	37
	<i>Total Spine and Back</i>	27	12	<7	0	0	0	0	42
Torso	Chest/thorax	12	<7	19	0	<7	<7	0	36
	Abdomen	0	0	65	<7	<7	<7	0	76
	Pelvis/urogenital	9	<7	<7	8	<7	0	0	22
	Trunk	0	0	0	<7	7	<7	<7	17
	Back and buttocks	0	0	0	0	<7	0	0	<7
	<i>Total torso</i>	21	<7	86	14	21	<7	<7	155
Extremity	Upper extremity	615	9	0	19	25	15	<7	688
	Lower extremity	283	32	0	16	23	<7	<7	358
	<i>Total extremities</i>	898	41	0	35	48	16	8	1,046
Other & Unspecified	Other and unspecified	0	0	0	0	<7	<7	<7	12
	System wide and late effects	--	--	--	--	--	--	--	18
<b>TOTAL</b>		<b>1,221</b>	<b>56</b>	<b>284</b>	<b>165</b>	<b>184</b>	<b>25</b>	<b>89</b>	<b>2,042</b>

Source: Massachusetts Hospital Discharge Database, Massachusetts Outpatient Observation Stay Database, Division of Health Care Finance and Policy.

<sup>1</sup> Modified version of The Barell Injury Diagnosis Matrix, Classification by Body Region and Nature of the Injury.

The above matrix is a way to examine the nature of the injuries (e.g., fracture, sprain, etc.) and body regions affected (e.g. head, neck, torso, etc.). Table 8 provides total counts by nature and body region for fall-related hospital stays among children ages 0-19. Since a person can sustain one or more injuries to one or more body regions, total counts presented in the matrix will differ from those presented elsewhere.

- Children and youth ages 0-19 had more fall-related hospital stays for injuries of the head and neck (N=769, 38%) and the upper and lower extremities (N=1,046, 51%) than for other body regions.
- Fractures were the most common nature of injury – specifically, fractures of the upper and lower extremities (44%). This was followed by fractures of the head and neck (13%).
- Among internal and open wound injuries, the most common region affected was the head and neck.

**Table 9. Nature of Injury by Body Region<sup>1</sup>: Fall-related Injury Emergency Department Discharges, MA Residents Ages 0-19, 2006**

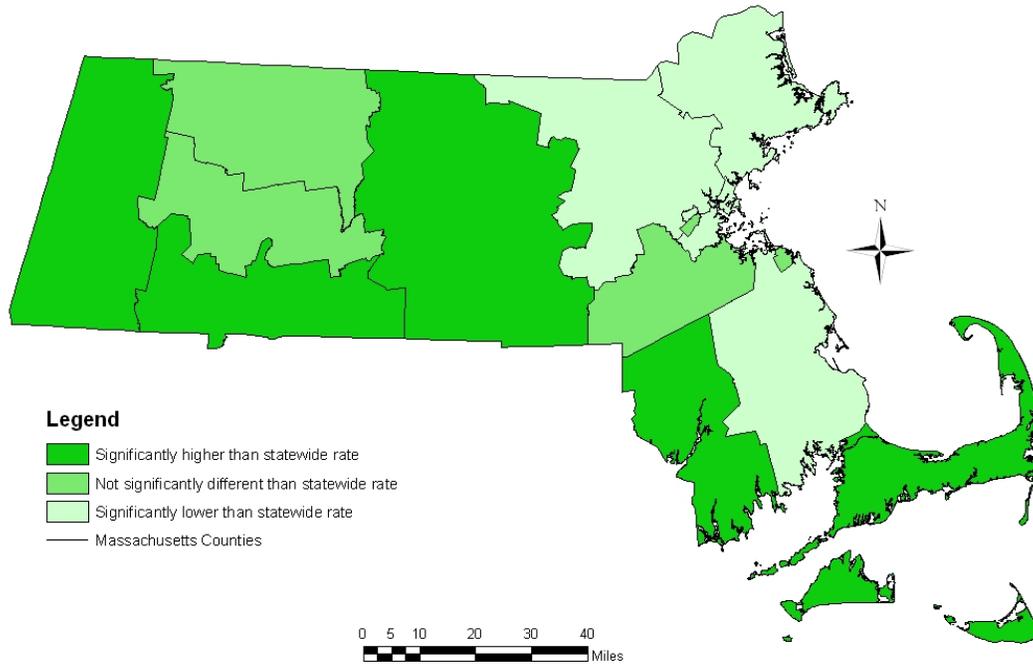
		Nature of Injury							TOTAL
		Fractures	Sprains, strains, & dislocations	Internal	Open wound	Contusion/superficial	Other	Unspecified	
Body Region									
Head & Neck	<i>Total Head and Neck</i>	370	7	1,531	12,900	7,208	7	6,419	28,442
	Spine & Back	Spinal Cord Injury	<7	0	8	0	0	0	10
		Vertebral Column Injury	77	1,149	0	0	0	0	1,226
		<i>Total Spine and Back</i>	79	1,149	8	0	0	0	1,236
Torso		Chest/thorax	35	34	<7	16	495	0	585
		Abdomen	0	0	36	24	144	<7	205
		Pelvis/urogenital	16	39	<7	114	38	0	208
		Trunk	0	0	0	24	237	0	276
		Back and buttocks	0	126	0	27	1,057	0	1,210
		<i>Total torso</i>	51	199	42	205	1,971	<7	2,745
Extremity		Upper extremity	9,681	4,252	0	848	4,174	36	20,335
		Lower extremity	1,953	4,202	0	1,144	3,194	<7	11,267
		<i>Total extremities</i>	11,634	8,454	0	1,992	7,368	39	31,602
Other & Unspecified		Other and unspecified	<7	109	<7	<7	402	7	632
		System wide and late effects	--	--	--	--	--	--	37
<b>TOTAL</b>		<b>12,137</b>	<b>9,918</b>	<b>1,582</b>	<b>15,101</b>	<b>16,949</b>	<b>54</b>	<b>8,916</b>	<b>64,694</b>

Source: Massachusetts Hospital Discharge Database, Massachusetts Outpatient Observation Stay Database, Division of Health Care Finance and Policy.

<sup>1</sup> Modified version of The Barell Injury Diagnosis Matrix, Classification by Body Region and Nature of the Injury.

- Children and youth ages 0-19 had more fall-related emergency department discharges for injuries of the extremities (N=31,602, 49%) especially upper extremities (N=20,335), and the head and neck region (N=28,442, 44%).
- Contusions were the leading nature of injury (26%) followed by open wounds and fractures (23%).
- The leading combinations by nature of injury and body region were open wounds of the head and neck (N=12,900, 20%), fractures of the upper and lower extremities combined (N=11,634, 18%), and sprains, strains, and dislocations of the extremities (N=8,454, 13%).

Figure 10. Age-adjusted Rates of Unintentional Fall-related Injury Deaths and Hospital Cases by County, MA Residents, Ages 0-19 Years, 2006



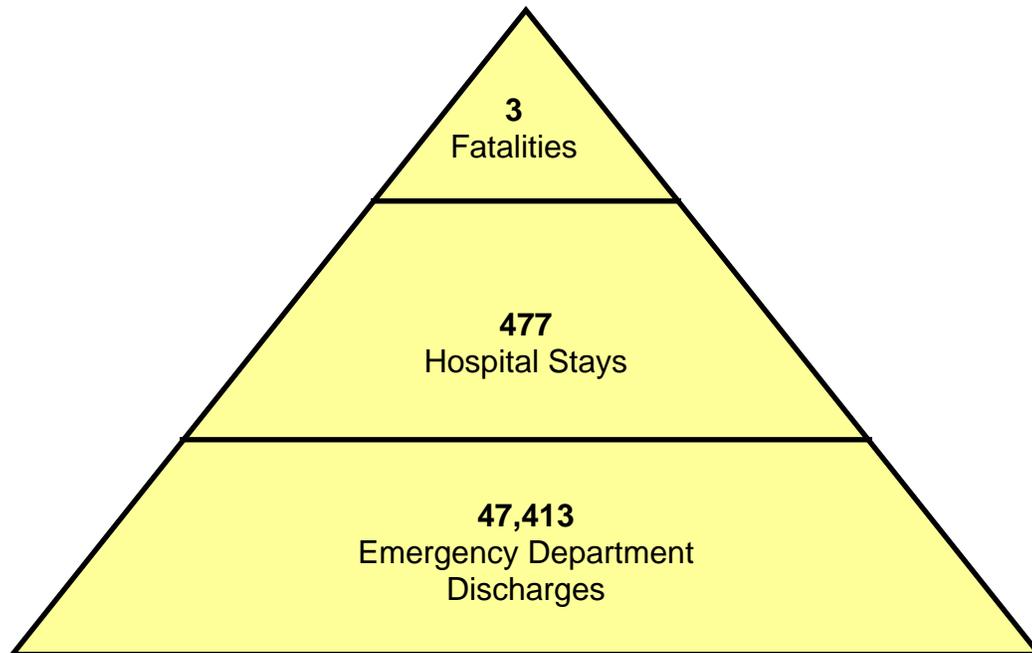
Source: MA Registry of Vital Records and Statistics, MDPH; MA Hospital Discharge Database, MA Outpatient Observation Stay Database, MA Emergency Department Discharge Database, MA DHCFP, Massachusetts Executive Office of Environmental Affairs, MassGIS

County	Number (Fatal and Nonfatal)	Crude Rate/100,000	Age-adjusted Rate/100,000	Lower 95% CI	Upper 95% CI
Barnstable	1,796	3,905.5	3,934.6	3,755.6	4,113.6
Berkshire	1,539	5,038.6	5,036.4	4,788.8	5,284.1
Bristol	5,366	3,801.6	3,812.0	3,712.1	3,912.0
Dukes	178	5,239.9	5,243.4	4,492.2	5,994.5
Essex	6,438	3,177.7	3,143.4	3,067.9	3,219.0
Franklin	569	3,485.9	3,532.1	3,245.1	3,819.2
Hampden	4,375	3,441.6	3,477.1	3,375.9	3,578.3
Hampshire	1,006	2,775.2	3,198.0	2,997.7	3,398.3
Middlesex	11,044	3,048.6	3,030.6	2,975.0	3,086.3
Nantucket	142	6,778.0	6,758.9	5,685.1	7,832.6
Norfolk	5,282	3,174.1	3,157.9	3,074.2	3,241.7
Plymouth	4,155	3,041.2	3,044.9	2,953.7	3,136.0
Suffolk	4,399	2,829.8	2,774.7	2,692.7	2,856.7
Worcester	7,290	3,433.5	3,434.8	3,357.3	3,512.2
<b>Total</b>	<b>53,579</b>	<b>3,269.9</b>	<b>3,263.8</b>	<b>3,236.6</b>	<b>3,290.9</b>

# STRUCK BY / AGAINST INJURIES

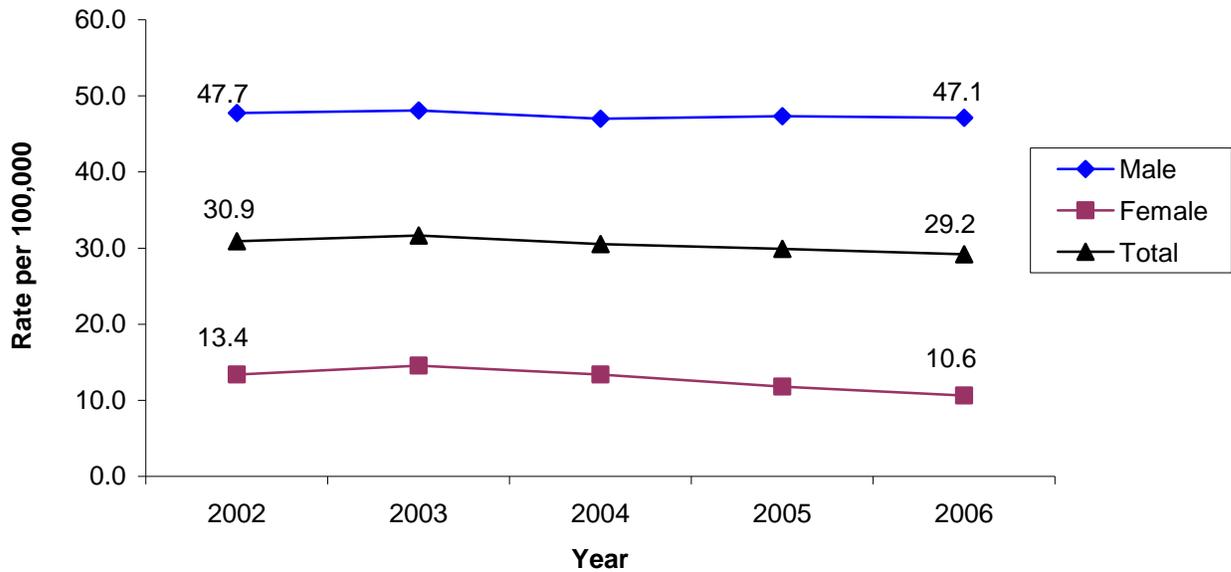
Struck by/against injuries include being struck unintentionally by a falling object including rocks, trees, building or by being struck against or struck by objects or persons including bumping into or against, colliding with, kicking against, stepping on or struck by an object or person. These may occur in sports, in a crowd, or with furniture. In these cases, there is no subsequent fall (see falls) and these exclude being struck by a car or machinery. Struck by/against was the second leading cause of injury-related emergency department discharges among children and youth ages 0-19.

**Figure 11. Magnitude of Struck by / Against Injuries among MA Residents Ages 0-19 Years, 2006**



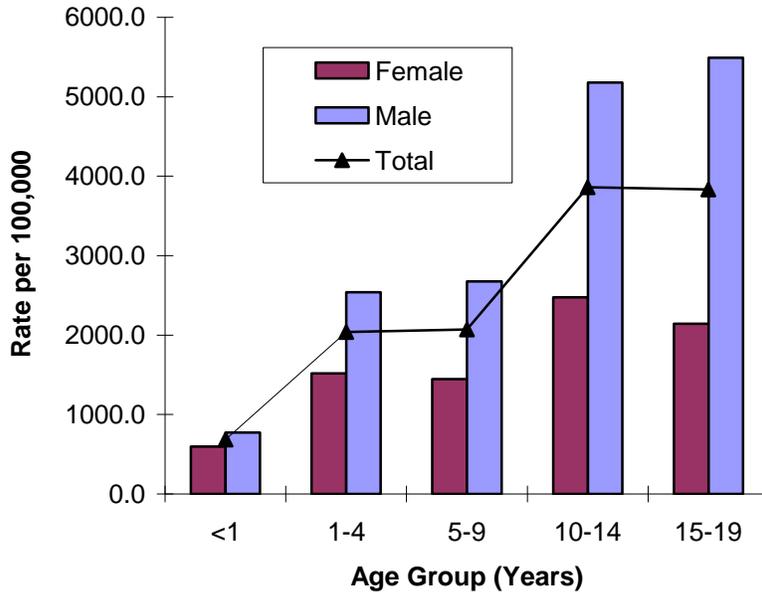
- In 2006, among Massachusetts children and youth ages 0-19 there were 3 fatalities as a result of being struck by and/or against an object, 477 hospital stays, and 47,413 emergency department discharges.

**Figure 12. Rates of Nonfatal Struck by/Against Injury-related Hospital Stays, MA Residents Ages 0-19, 2002-2006 (N=2,524)**



- Overall rates of nonfatal struck by/against hospital stays among children and youth ages 0-19 declined slightly (5.5%) from 2002 to 2006. Rates among females declined 20.7% from 2002 to 2006. Trends however were not statistically significant.
- Males had an average annual rate about 4 times higher than females for nonfatal struck by/against injury-related hospital stays.

**Figure 13. Rates of Struck by/Against Injury-related Hospital Cases by Age Group and Sex, MA Residents Ages 0-19, 2006  
(N=47,890)**



Age Group	Female		Male		Total	
	N	Rate	N	Rate	N	Rate
<1 Year	227	596.1	302	772.3	529	685.4
1-4 Years	2,306	1,518.1	4,034	2,540.6	6,340	2,040.7
5-9 Years	2,744	1,446.0	5,290	2,673.7	8,034	2,072.7
10-14 Years	4,955	2,473.7	10,908	5,177.6	15,863	3,859.8
15-19 Years	4,742	2,142.4	12,382	5,491.6	17,124	3,832.5
<b>Total</b>	<b>14,974</b>	<b>1,868.5</b>	<b>32,916</b>	<b>3,956.8</b>	<b>47,890</b>	<b>2,932.2</b>

- In 2006 among children and youth ages 0-19 males had a higher rate of struck by/against injury-related hospital cases compared to females (3,956.8 per 100,000 and 1,868.5 per 100,000 respectively). This difference in rates was seen in all age groups.
- Male rates of nonfatal struck by/against injury-related hospital cases were highest among youth ages 10-14 (5,177.6 per 100,000) and 15-19 (5,491.6 per 100,000).

The types of struck by/against injury causes varied by age.

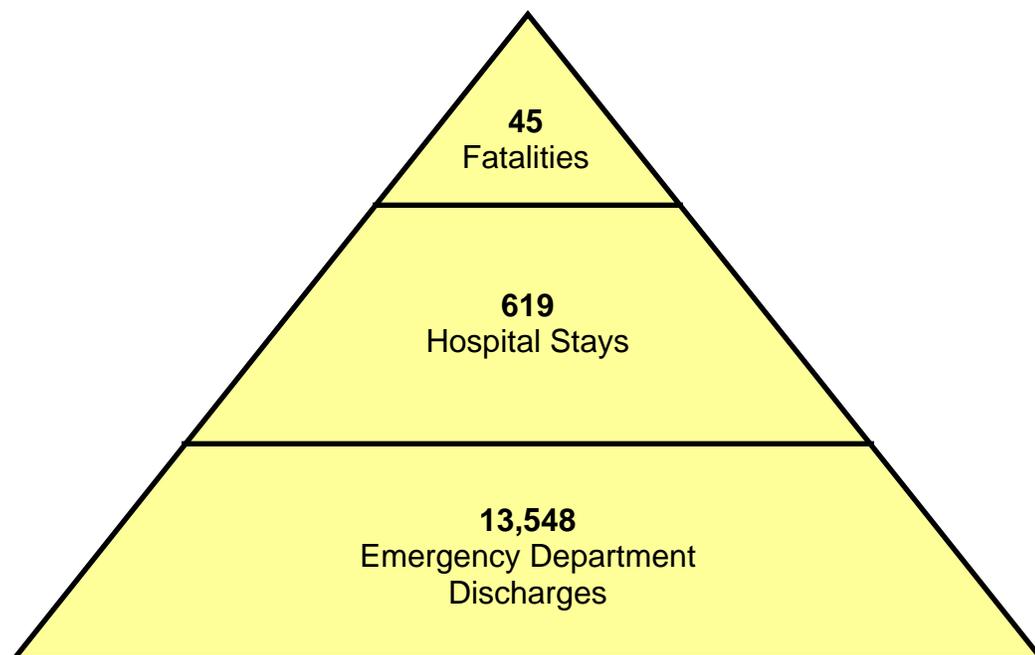
- Among children less than 1 year of age, struck by a falling object was the leading type of struck by/against injury-related hospital cases.
- Among children ages 1-4, striking against/or struck by furniture without subsequent fall and other stationary object without subsequent fall (e.g. bathtub, fence, lamp-post) were the leading types of struck by/against injuries.
- For children ages 5-19, striking against or struck by objects or persons in sports without subsequent fall (e.g., kicked or stepped on during game, hit with thrown ball, struck by hockey stick or puck) was the leading type of struck by/against injuries.

# MOTOR VEHICLE OCCUPANT INJURIES

Motor vehicle occupant injuries include any injury occurring to a driver, passenger, or unspecified person of a car, pickup truck, SUV, truck, van, bus, and other heavy transport vehicle. All injuries described in this section include motor vehicle crashes that occurred on a public roadway.

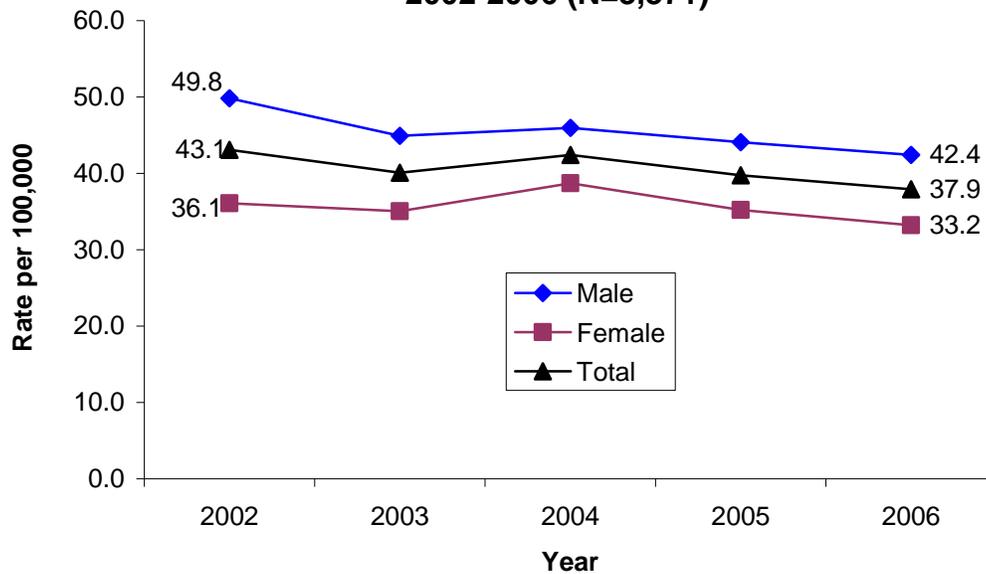
Motor vehicle occupant injuries are an important public health concern for all age groups and are of particular importance for children and youth. Motor vehicle traffic injuries are the leading cause of injury fatality among children and youth ages 0-19. In 2006, occupant-related deaths accounted for 83% of all motor vehicle traffic-related fatalities in this age group.

**Figure 14. Magnitude of Motor Vehicle Occupant Injuries among MA Residents Ages 0-19, 2006**



- In 2006, among Massachusetts children and youth ages 0-19 there were 45 motor vehicle occupant fatalities, 619 hospital stays, and 13,548 emergency department discharges. Each day in Massachusetts there are approximately 2 nonfatal unintentional motor vehicle occupant hospital stays and 37 emergency department discharges.

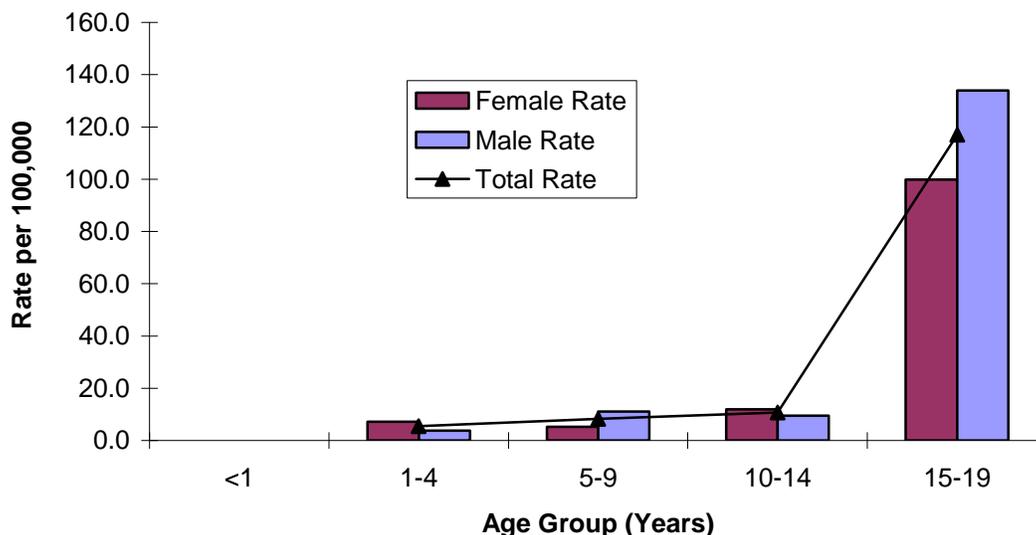
**Figure 15. Rates of Nonfatal Motor Vehicle Occupant Injury-related Hospital Stays, MA Residents Ages 0-19, 2002-2006 (N=3,371)**



- Overall rates of nonfatal motor vehicle occupant injury-related hospital stays among children and youth ages 0-19 decreased 12.1% from 2002 to 2006. Rates among males declined 14.8% from 2002 to 2006.<sup>†</sup>
- Males had an average annual rate about 1.3 times higher than females for motor vehicle occupant hospital stays.
- The pattern was reversed for emergency department discharges where females had an average annual rate 1.3 times higher than males (data not depicted).

<sup>†</sup> Statistically significant at the  $P \leq .05$  level. The noted change is unlikely to be due to chance alone.

**Figure 16. Rates of Nonfatal Motor Vehicle Occupant Injury-related Hospital Stays by Age Group and Sex, MA Residents Ages 0-19, 2006 (N=619)**

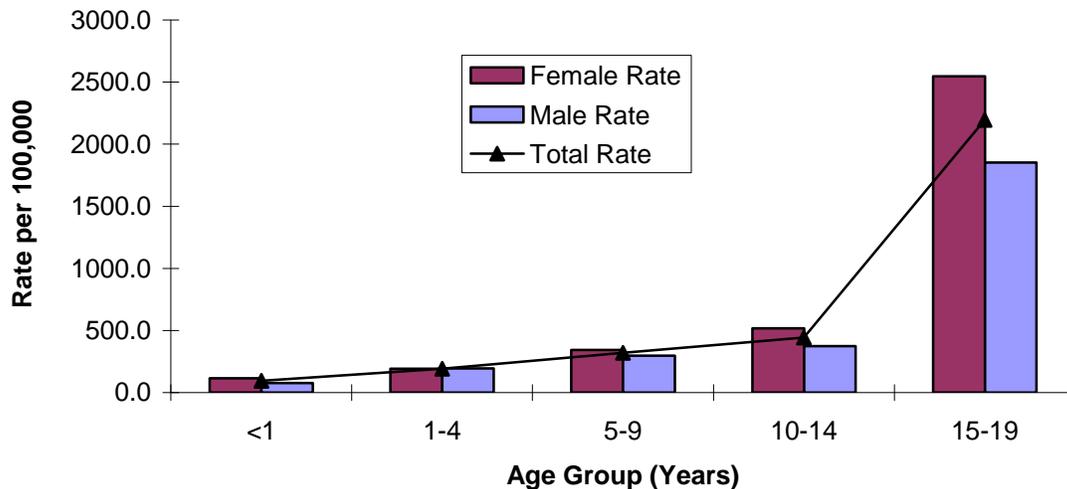


Age Group	Female		Male		Total	
	N	Rate	N	Rate	N	Rate
< 1 Year	0	0.0	<7	--	<7	--
1-4 Years	11	7.2	<7	--	17	5.5
5-9 Years	10	5.3	22	11.1	32	8.3
10-14 Years	24	12.0	20	9.5	44	10.7
15-19 Years	221	99.8	302	133.9	523	117.1
Total	266	33.2	353	42.4	619	37.9

\* Rates not are calculated on counts of less than 5. Rates calculated on counts of less than 20 may be unstable and should be interpreted with caution.

- Nonfatal motor vehicle occupant hospital stay rates among children and youth ages 0-19 years were highest among youth ages 15-19 (117.1 per 100,000).
- Overall the male rate of motor vehicle occupant hospital stays was 1.3 times higher than the total female rate (42.2 per 100,000 compared to 33.2 per 100,000).

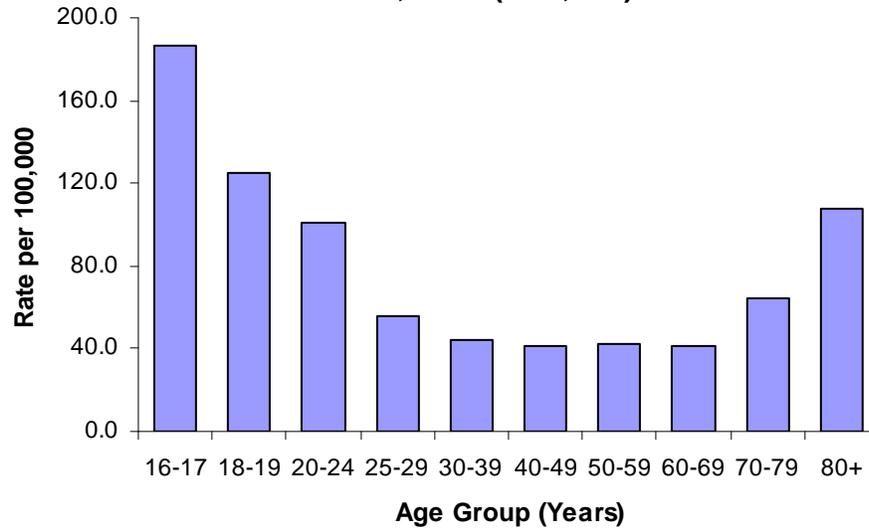
**Figure 17. Rates of Nonfatal Motor Vehicle Occupant Injury-related Emergency Department Discharges by Age Group and Sex, MA Residents Ages 0-19, 2006 (N=13,548)**



Age Group	Female		Male		Total	
	N	Rate	N	Rate	N	Rate
<1 Year	44	115.5	30	76.7	74	95.9
1-4 Years	291	191.6	308	194.0	599	192.8
5-9 Years	653	344.1	588	297.2	1,241	320.2
10-14 Years	1,036	517.2	787	373.6	1,823	443.6
15-19 Years	5,636	2,546.3	4,175	1,851.7	9,811	2,195.8
Total	7,660	955.8	5,888	707.8	13,548	829.5

- Similar to hospital stays, the rate of nonfatal motor vehicle occupant emergency department discharges among 0-19 year olds were highest among youth ages 15-19 (2,195.8 per 100,000). Children less than 1 year of age had the lowest rates (95.9 per 100,000)
- In contrast to motor vehicle occupant hospital stay rates, total female motor vehicle occupant emergency department rates were 1.4 times higher than total male rates. (955.8 per 100,000 compared to 707.8 per 100,000 respectively). Female rates were higher than male rates for all age groups except those ages 1-4.

**Figure 18. Rates of Motor Vehicle Traffic Driver Injury-related Hospital Stays per 100,000 Licensed Drivers, MA Residents Ages 16 and Over, 2006 (N=2,524)**



Age Group	N	Rate/100,000 licensed drivers*
16-17	118	186.9
18-19	166	125.0
20-24	370	101.2
25-29	218	56.2
30-39	362	44.2
40-49	375	41.1
50-59	318	41.8
60-69	197	41.5
70-79	197	64.3
80+	203	107.9
Total	2,524	57.2

\* Rate calculated using licensed driver data from Massachusetts Registry of Motor Vehicles

- In 2006, young drivers ages 16 and 17 had the highest rate of motor vehicle injury-related hospital stays (186.9 per 100,000). Drivers ages 18 and 19 had the second highest rate (125.0 per 100,000).
- Rates of hospital stays decreased as age increased until about age 40-49 where rates remained relatively stable. Rates began to increase again in persons ages 70 and over.

**Table 10. Nature of Injury by Body Region<sup>1</sup>: Motor Vehicle Occupant Hospital Stays, MA Residents Ages 0-19, 2006**

		Nature of Injury							TOTAL
		Fractures	Sprains, strains & dislocations	Internal	Open wound	Contusion/superficial	Other	Unspecified	
Body Region									
Head & Neck	<i>Total Head and Neck</i>	183	0	184	248	84	7	40	746
Spine & Back	Spinal Cord Injury	<7	0	<7	0	0	0	0	6
	Vertebral Column Injury	112	39	0	0	0	0	0	151
	<i>Total Spine and Back</i>	115	39	<7	0	0	0	0	157
Torso	Chest/thorax	67	<7	128	<7	17	<7	0	217
	Abdomen	0	0	119	<7	20	<7	0	142
	Pelvis/urogenital	55	<7	<7	<7	0	0	0	58
	Trunk	0	0	0	0	23	<7	17	42
	Back and buttocks	0	0	0	0	<7	0	0	3
	<i>Total torso</i>	122	<7	248	<7	63	<7	17	462
	Extremity	Upper extremity	99	<7	0	40	52	8	<7
Lower extremity		131	25	0	22	51	<7	<7	235
<i>Total extremities</i>		230	31	0	62	103	12	<7	442
Other & Unspecified	Other and unspecified	0	0	<7	0	24	<7	<7	35
	System wide and late effects	--	--	--	--	--	--	--	22
<b>TOTAL</b>		<b>650</b>	<b>55</b>	<b>437</b>	<b>313</b>	<b>274</b>	<b>29</b>	<b>66</b>	<b>1,864</b>

Source: Massachusetts Hospital Discharge Database, Massachusetts Outpatient Observation Stay Database, Division of Health Care Finance and Policy.

<sup>1</sup> Modified version of The Barell Injury Diagnosis Matrix, Classification by Body Region and Nature of the Injury.

The above matrix is a way to examine the nature of the injuries (e.g., fracture, sprain, etc.) and body regions affected (e.g. head, neck, torso, etc.). Table 10 provides total counts by nature and body region for unintentional motor vehicle occupant injury-related hospital stays among children ages 0-19. Since a person can sustain one or more injuries to one or more body regions total counts presented in the matrix will differ from those presented elsewhere.

- The head and neck was the body region with the highest number of injuries (N=746, 40%) for unintentional motor vehicle occupant injury hospital stays among children ages 0-19.
- Fractures (35%) and internal injuries (23%) were the leading types of injuries sustained.
- The leading combinations by nature of injury and body region were internal injuries to the torso (including the chest and abdomen), open wounds of the head and neck, and fractures to the extremities.

**Table 11. Nature of Injury by Body Region<sup>1</sup>: Motor Vehicle Occupant Emergency Department Discharges, MA Residents Ages 0-19, 2006**

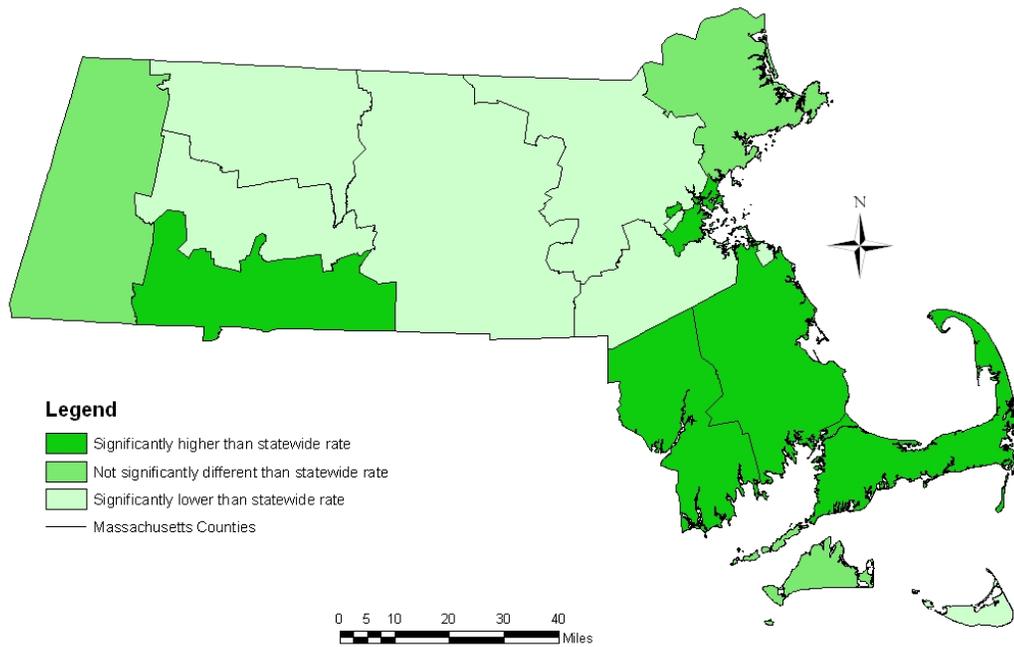
		Nature of Injury							TOTAL
		Fractures	Sprains, strains, & dislocations	Internal	Open wound	Contusion/superficial	Other	Unspecified	
Body Region									
Head & Neck	<i>Total Head and Neck</i>	122	<7	464	725	2,577	18	1,404	5,315
Spine & Back	Spinal Cord Injury	<7	0	<7	0	0	0	0	<7
	Vertebral Column Injury	39	6,394	0	0	0	0	0	6,433
	<i>Total Spine and Back</i>	40	6,394	<7	0	0	0	0	6,435
Torso	Chest/thorax	15	39	19	<7	692	<7	0	769
	Abdomen	0	0	32	<7	201	0	0	236
	Pelvis/urogenital	12	210	<7	<7	<7	0	0	227
	Trunk	0	0	0	0	157	<7	203	361
	Back and buttocks	0	803	0	<7	196	0	0	1,000
	<i>Total torso</i>	27	1,052	52	8	1,247	<7	203	2,593
Extremity	Upper extremity	247	768	0	214	1,592	56	144	3,021
	Lower extremity	75	360	0	89	1,689	<7	90	2,309
	<i>Total extremities</i>	322	1,128	0	303	3,281	62	234	5,330
Other & Unspecified	Other and unspecified	0	454	<7	<7	558	9	243	1,268
	System wide and late effects	--	--	--	--	--	--	--	23
<b>TOTAL</b>		<b>511</b>	<b>9,033</b>	<b>519</b>	<b>1,038</b>	<b>7,663</b>	<b>93</b>	<b>2,084</b>	<b>20,964</b>

Source: Massachusetts Hospital Discharge Database, Massachusetts Outpatient Observation Stay Database, Division of Health Care Finance and Policy.

<sup>1</sup> Modified version of The Barell Injury Diagnosis Matrix, Classification by Body Region and Nature of the Injury.

- The spine and back (N=6,433, 31%), extremities (N=5,330, 25.4%), and head and neck (N=5,315, 25.4%), were the body regions with the most injuries for unintentional motor vehicle occupant injury emergency department discharges among children ages 0 to 19.
- Sprains, strains and dislocations (43%) were the leading nature of injuries followed by contusion (37%).
- The leading combinations by nature of injury and body region were sprains, strains and dislocations of the spine and back (N=6,394, 30%), and contusions of the extremities (N=3,281, 16%) and to the head and neck (N=2,577, 12%) region.

Figure 19. Age-adjusted Rates of Motor Vehicle Traffic Occupant Injury Deaths and Hospital Cases by County, MA Residents, Ages 0-19 Years, 2006



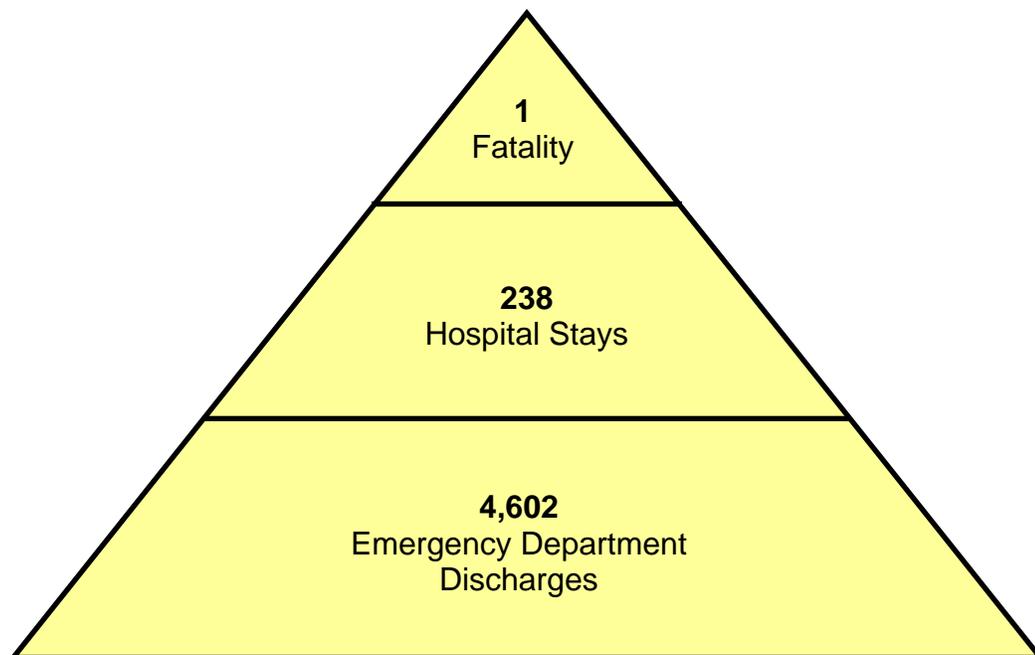
Source: MA Registry of Vital Records and Statistics, MDPH; MA Hospital Discharge Database, MA Outpatient Observation Stay Database, MA Emergency Department Discharge Database, MA DHCFP; Massachusetts Executive Office of Environmental Affairs, MassGIS

County	Number (Fatal and Nonfatal)	Crude Rate/100,000	Age-adjusted Rate/100,000	Lower 95% CI	Upper 95% CI
Barnstable	576	1,252.6	1,156.8	1,063.7	1,249.9
Berkshire	324	1,060.8	933.2	831.7	1,034.7
Bristol	1,631	1,155.5	1,136.4	1,082.1	1,190.8
Dukes	23	677.1	635.4	377.4	893.4
Essex	1,633	806.0	824.0	784.5	863.6
Franklin	113	692.3	614.7	501.9	727.5
Hampden	1,735	1,364.8	1,306.9	1,246.0	1,367.8
Hampshire	233	642.8	461.7	399.0	524.5
Middlesex	2,180	601.6	600.1	575.1	625.1
Nantucket	8	381.9	422.2	129.7	714.7
Norfolk	985	592.0	606.4	568.9	644.0
Plymouth	1,448	1,059.8	1,059.1	1,005.3	1,112.9
Suffolk	1,504	967.7	942.9	895.2	990.6
Worcester	1,534	722.5	709.7	674.5	745.0
Total	13,927	850.0	828.4	814.7	842.0

# PEDAL CYCLE / BICYCLIST INJURIES

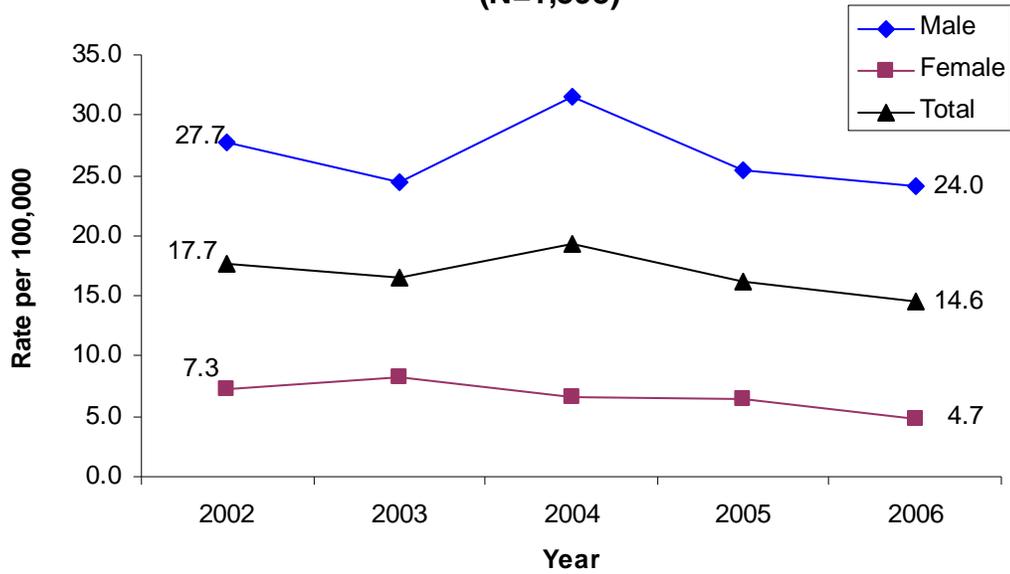
Pedal cycles are defined as any road transport vehicle operated solely by pedals such as bicycles, tricycles, and unicycles. Pedal cyclist injuries included here are those that occurred on a public roadway (traffic related) such as a collision with a motor vehicle or elsewhere (non-traffic related) such as a driveway.

**Figure 20. Magnitude of Pedal Cyclist Injuries among MA Residents Ages 0-19 Years, 2006**



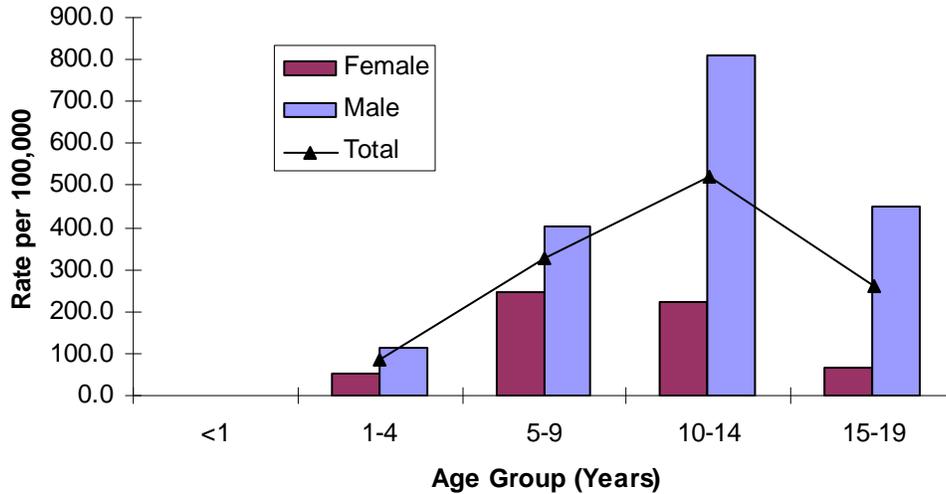
- In 2006, among Massachusetts children and youth ages 0-19 there was 1 pedal cyclist fatality, 238 hospital stays, and 4,602 emergency department discharges. For this analysis pedal cyclist injuries include traffic and non-traffic related pedal cyclist injuries.

**Figure 21. Rates of Nonfatal Pedal Cyclist Hospital Stays,  
MA Residents Ages 0-19, 2002-2006  
(N=1,398)**



- From 2002 to 2006 rates of pedal cyclist injuries requiring a hospital stay among children and youth ages 0-19 decreased 17.6%. For females, this decrease was higher than males (35% compared to 13.1%, respectively). None of these trends however were statistically significant.
- Males had an average annual rate 4 times higher for nonfatal pedal cyclist hospital stays than females.

**Figure 22. Rates of Nonfatal Pedal Cyclist Injury-related Hospital Cases by Age Group and Sex, MA Residents Ages 0-19, 2006 (N=4,840)**



Age Group	Female		Male		Total	
	N	Rate	N	Rate	N	Rate
<1 Year	0	0.0	<7	--	<7	--
1-4 Years	81	53.3	179	112.7	260	83.7
5-9 Years	464	244.5	801	404.9	1,265	326.4
10-14 Years	442	220.7	1,706	809.8	2,148	522.7
15-19 Years	149	67.3	1,017	451.1	1,166	261.0
<b>Total</b>	<b>1,136</b>	<b>141.8</b>	<b>3,704</b>	<b>445.3</b>	<b>4,840</b>	<b>296.3</b>

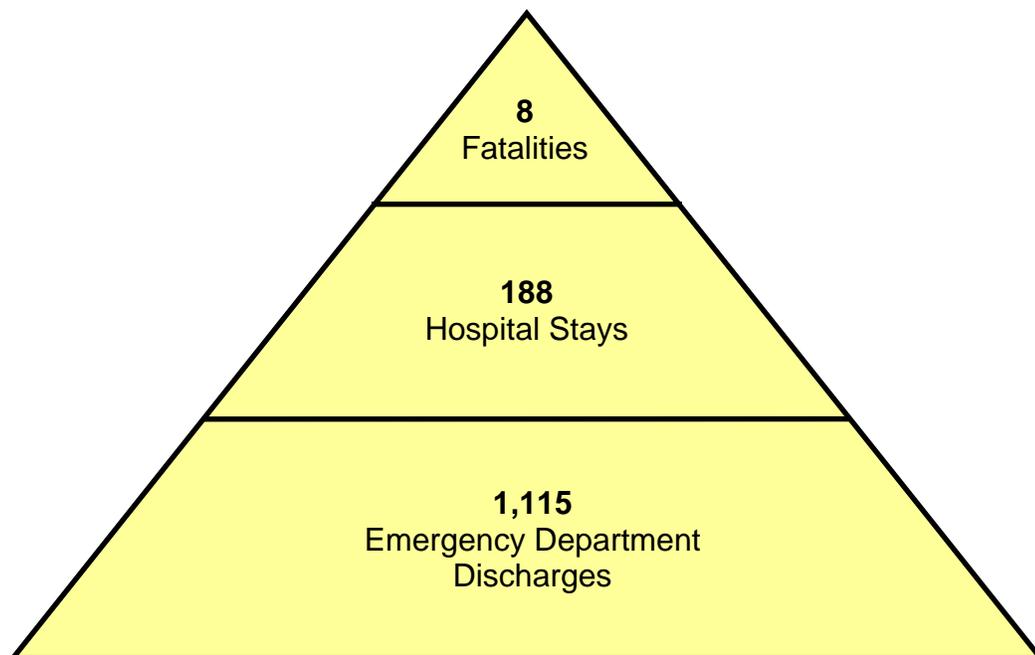
\* Rates not calculated on counts of less than 5. Rates calculated on counts of less than 20 may be unstable and should be interpreted with caution.

- In 2006, nonfatal pedal cyclist injury hospital case rates were highest among 10-14 year olds followed by 5-9 year olds (522.7 per 100,000 and 326.4 per 100,000 respectively).
- Males had higher nonfatal pedal cyclist injury hospital case rates than females in all age groups.

# PEDESTRIAN INJURIES

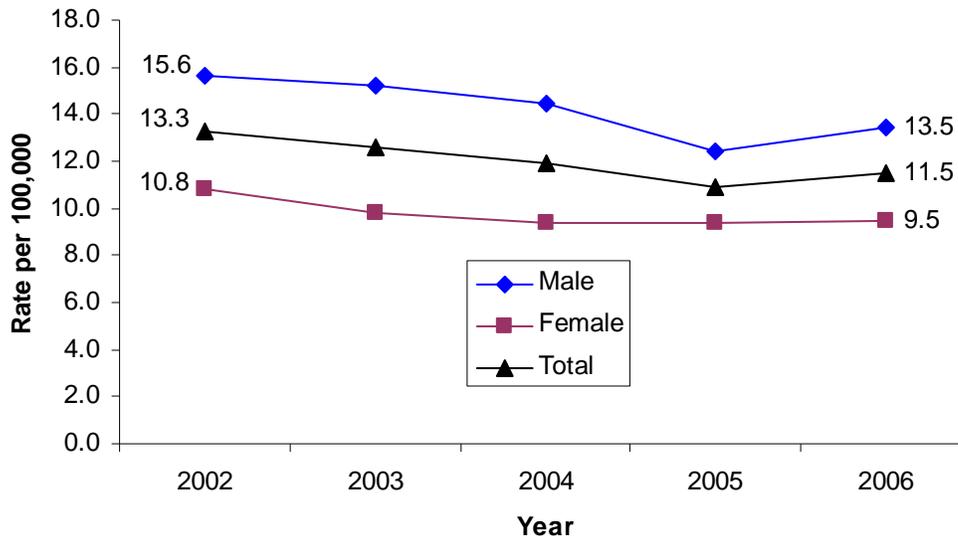
Pedestrian injuries are those injuries where the injured person was involved in a collision with a motor vehicle and was not at the time, riding in or on a motor vehicle, train, animal or any other motor vehicle. These injuries occurred during a traffic incident (those occurring on a public roadway/highway) and those that occurred elsewhere (e.g. parking lot, private road/driveway, etc.)

**Figure 23. Magnitude of Pedestrian Injuries among MA Residents Ages 0-19 Years, 2006**



- In 2006, among Massachusetts children and youth ages 0-19 there were 8 pedestrian fatalities, 188 hospital stays, and 1,115 emergency department discharges. For this analysis pedestrian injuries include traffic and non-traffic related pedestrian injuries.

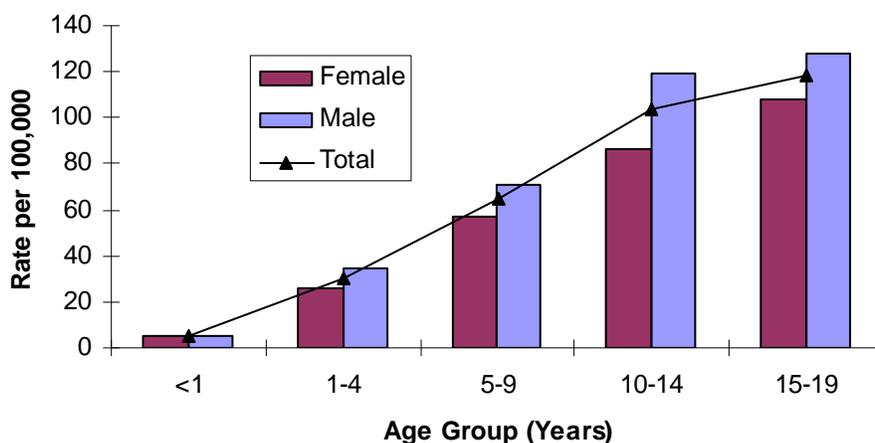
**Figure 24. Rates of Nonfatal Pedestrian Hospital Stays, MA Residents Ages 0-19, 2002-2006 (N=999)**



- From 2002 to 2006 among children and youth ages 0-19, rates of pedestrian related hospital stays decreased overall (13.3%), among males (13.9%)<sup>†</sup> and females (12.3%). Only the decrease noted among males was statistically significant.
- Males had an average annual rate about 1.5 times higher than females for nonfatal pedestrian related hospital stays.

<sup>†</sup> Statistically significant at the  $P \leq .05$  level. The noted change is unlikely to be due to chance alone.

**Figure 25. Rates of Nonfatal Pedestrian Injury-related Hospital Cases by Age Group and Sex, MA Residents Ages 0-19, 2006 (N=1,303)**



Age Group	Female		Male		Total	
	N	Rate	N	Rate	N	Rate
<1 Year	<7	--	<7	--	<7	--
1-4 Years	40	26.3	55	34.6	95	30.6
5 -9 Years	109	57.4	141	71.3	250	64.5
10-14 Years	173	86.4	252	119.6	425	103.4
15-19 Years	240	108.4	289	128.2	529	118.4
<b>Total</b>	<b>564</b>	<b>70.4</b>	<b>739</b>	<b>88.8</b>	<b>1,303</b>	<b>79.8</b>

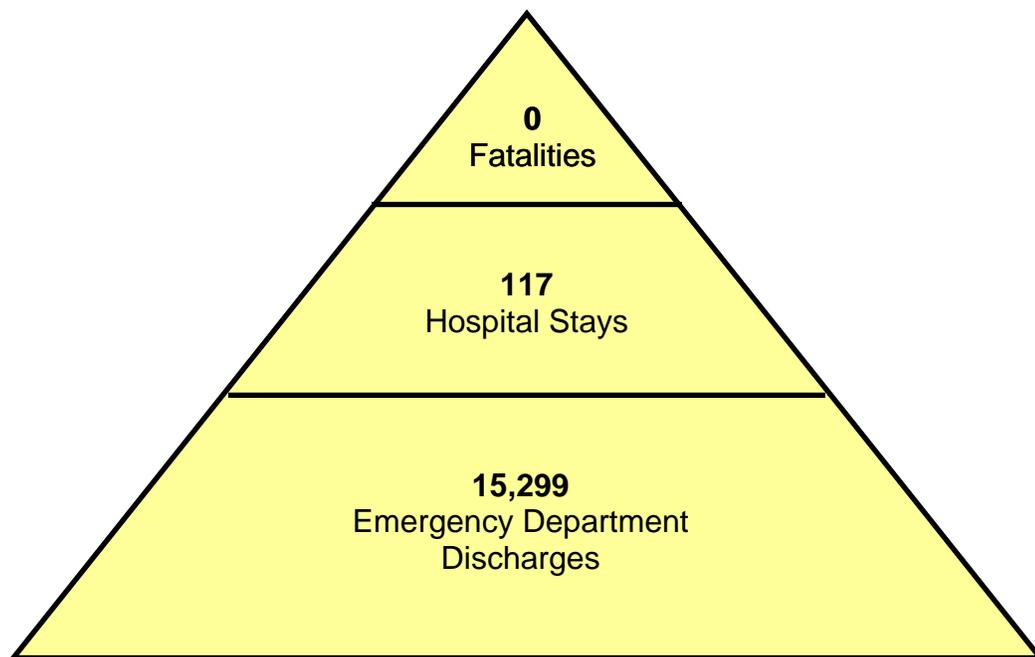
\* Rates not are calculated on counts of less than 5. Rates calculated on counts of less than 20 may be unstable and should be interpreted with caution.

- In 2006, rates of nonfatal pedestrian hospital cases (which include motor vehicle traffic and non-traffic injuries) were highest among 15-19 year olds followed by 10-14 year olds (118.4 per 100,000 and 103.4 per 100,000 respectively). The risk of these injuries increased as age increased.
- Males had higher rates than females in all age groups. Overall, male rates were 88.8 per 100,000 compared with female rates of 70.4 per 100,000.
- For hospital stays alone (data not depicted) children ages 10-14 had the highest rates of pedestrian related injuries (16.8 per 100,000) followed by 15-19 year olds (14.5 per 100,000).

## CUT / PIERCE INJURIES

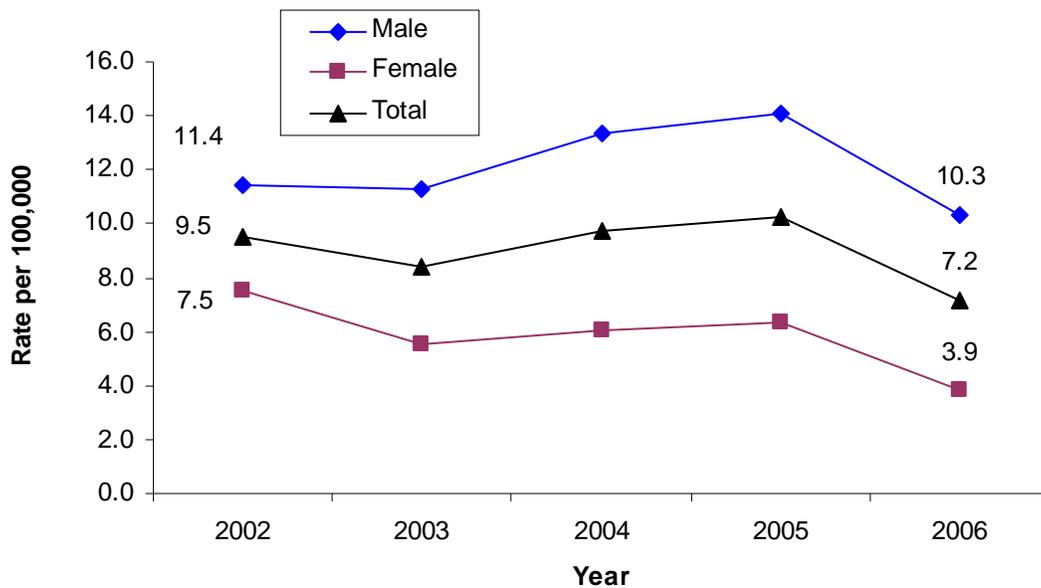
Cut/pierce injuries result from an incision, slash, perforation, or puncture by a pointed or sharp instrument, weapon, or object. Unintentional cut/pierce injuries are the fifth leading cause of unintentional injury-related emergency department discharges among MA children ages 0-19.

**Figure 26. Magnitude of Cut/Pierce Injuries among MA Residents Ages 0-19 Years, 2006**



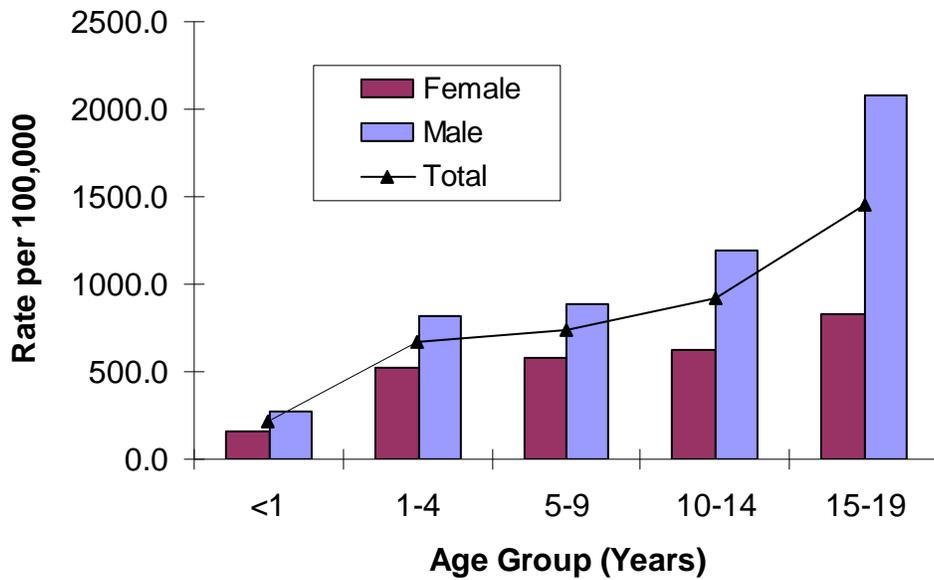
- In 2006, among Massachusetts children and youth ages 0-19 there were no cut/pierce deaths, 117 cut/pierce injury-related hospital stays, and 15,299 emergency department discharges.

**Figure 27. Rates of Nonfatal Cut/Pierce Injury-related Hospital Stays, MA Residents Ages 0-19, 2002-2006 (N=749)**



- Total rates of nonfatal cut/pierce injury-related hospital stays decreased 24.8% from 2002 to 2006. Rates among males decreased 9.6% and among females 48.7%. None of these trends however were statistically significant.
- Males had an average annual rate about 2 times higher than females for nonfatal cut/pierce injury related hospital stays.

**Figure 28. Rates of Nonfatal Cut/Pierce Injury-related Hospital Cases by Age Group and Sex, MA Residents Ages 0-19, 2006 (N=15,416)**

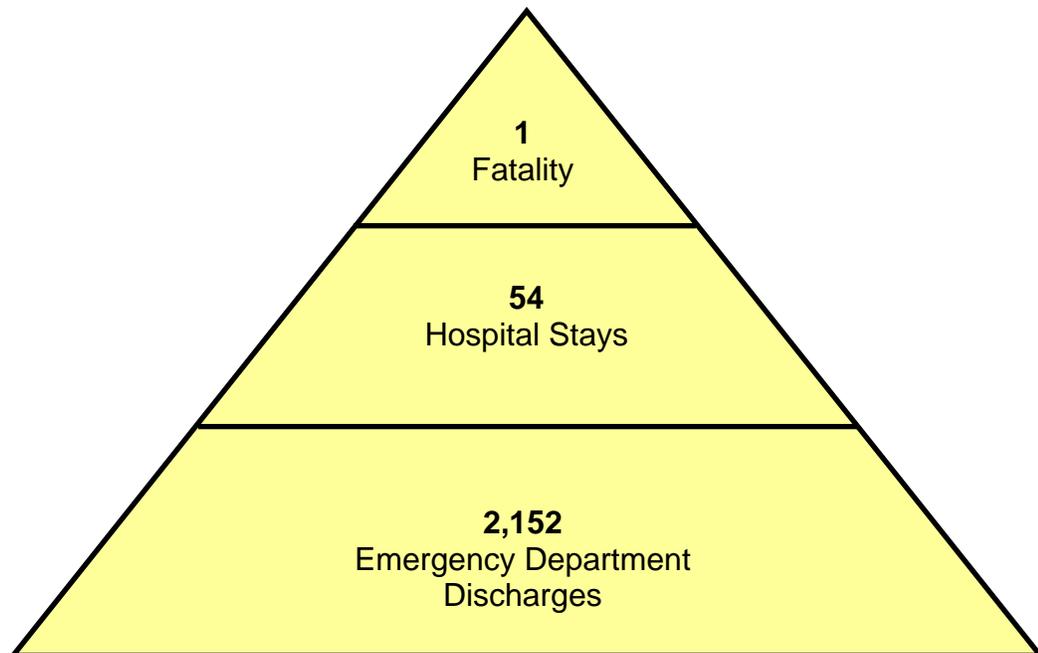


Age Group	Female		Male		Total	
	N	Rate	N	Rate	N	Rate
<1 Year	62	162.8	106	271.1	168	217.7
1-4 Years	790	520.1	1308	823.8	2098	675.3
5-9 Years	1095	577.0	1762	890.6	2857	737.1
10-14 Years	1250	624.0	2524	1198.1	3774	918.3
15-19 Years	1828	825.9	4691	2080.5	6519	1459.0
Total	5025	627.0	10391	1249.1	15416	943.9

- Rates of nonfatal cut/pierce hospital cases were highest among youth 15-19 years old. Risk for these injuries increased as age increased.
- Males had higher rates of nonfatal cut/pierce injuries than females for all age groups.

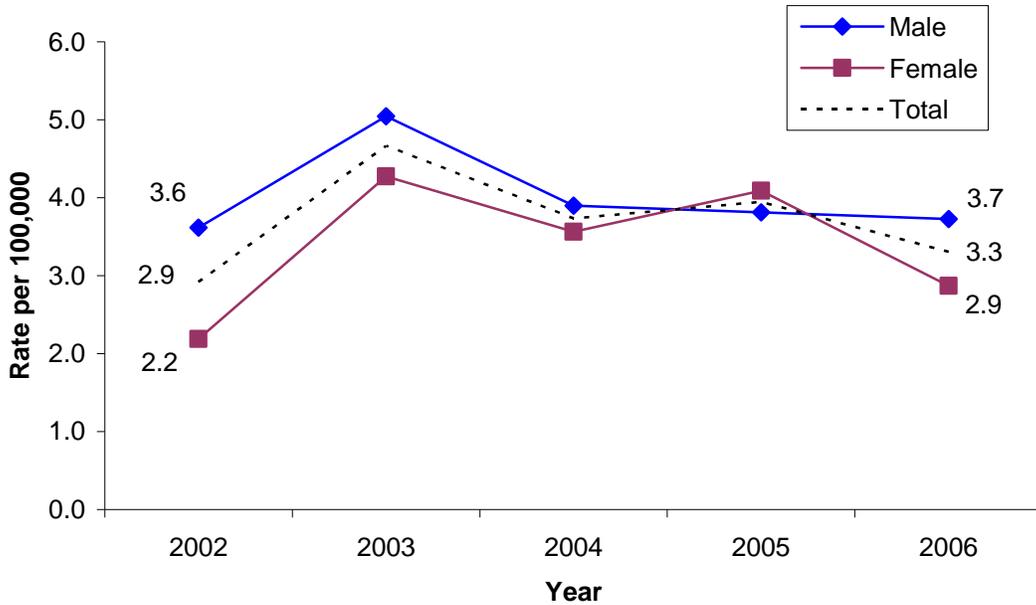
# DOG BITE INJURIES

**Figure 29. Magnitude of Dog Bite Injuries among MA Residents  
Ages 0-19 Years, 2006**



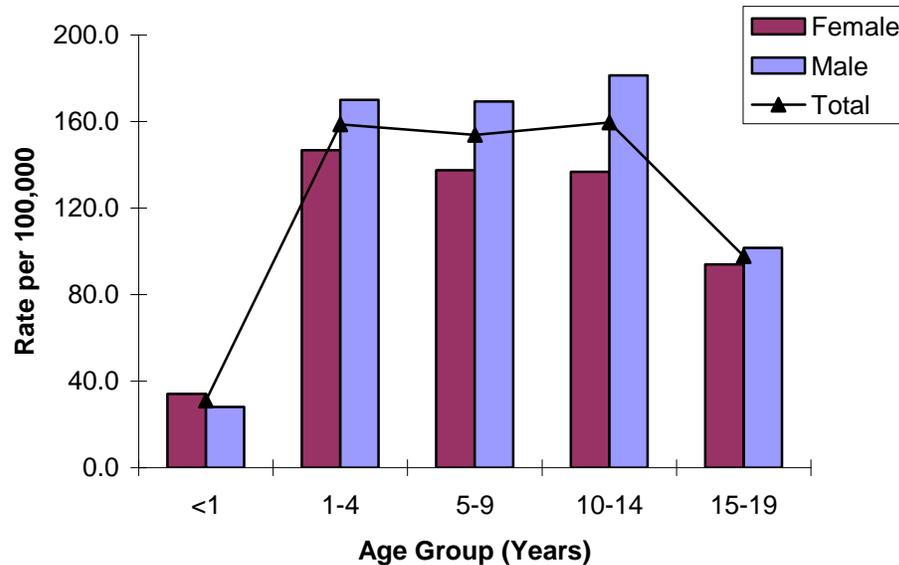
- In 2006, among Massachusetts children and youth ages 0-19 there was 1 dog bite fatality, 54 dog bite related hospital stays, and 2,152 emergency department discharges.

**Figure 30. Rates of Nonfatal Dog Bite Injury-related Hospital Stays, MA Residents Ages 0-19, 2002-2006 (N=311)**



- Rates of nonfatal dog bite injury-related hospital stays among children ages 0-19 increased 13.3% from 2002 to 2006, though the trend was not statistically significant.
- Males had an average annual rate 1.2 times higher than females for dog bite injury-related hospital stays.

**Figure 31. Rates of Nonfatal Dog Bite Injury-related Hospital Cases by Age Group and Sex, MA Residents Ages 0-19, 2006 (N=2,206)**



Age Group	Female		Male		Total	
	N	Rate	N	Rate	N	Rate
<1 Year	13	34.1	11	28.1	24	31.1
1-4 Years	223	146.8	270	170.0	493	158.7
5-9 Years	261	137.5	335	169.3	596	153.8
10-14 Years	274	136.8	382	181.3	656	159.6
15-19 Years	208	94.0	229	101.6	437	97.8
Total	979	122.2	1,227	147.5	2,206	135.1

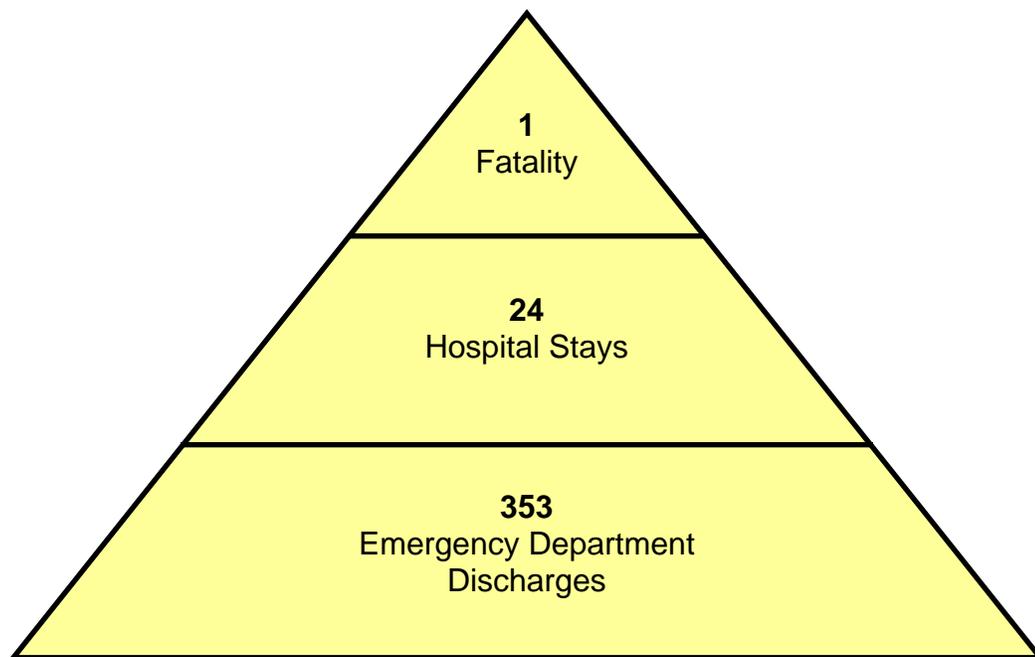
\* Rates not are calculated on counts of less than 5. Rates calculated on counts of less than 20 may be unstable and should be interpreted with caution.

- In 2006, rates of nonfatal dog bite-related hospital cases were highest among children ages 1-14.
- Overall, males had higher rates of dog bite hospital cases compared to females (147.5 per 100,000 and 122.2 per 100,000 respectively).
- Males between the ages of 10 and 14 had the highest number and rate of nonfatal dog bite hospital cases.
- The body region that had the most injuries varied by age group. For children ages 0-14 the head, face, and neck was the region with the most injuries. For children ages 15-19, the upper extremity was the region with the most injuries.
- Among hospital stay injuries only, children ages 1-4 had the highest rates (N=19, 6.1 per 100,000) of dog bite related injuries (data not depicted).

# FIRE AND FLAME INJURIES

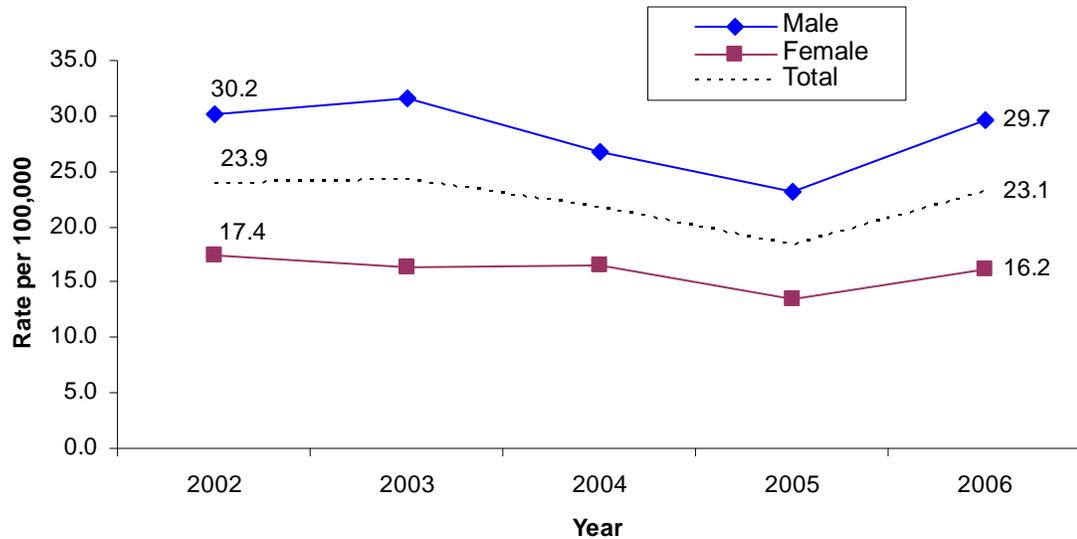
Unintentional fire/flame injuries are those caused by fire or flame in private dwellings (including apartments and houses), in other and unspecified buildings or structures, fires not in a building or structure (such as a forest, vehicle in transit), ignition of clothing, ignition of highly inflammable material, controlled fire in a private dwelling (fireplace), burning of bedclothes, and other burns (candle, cigarette, matches).

**Figure 32. Magnitude of Fire/Flame Injuries among MA Residents Ages 0-19 Years, 2006**



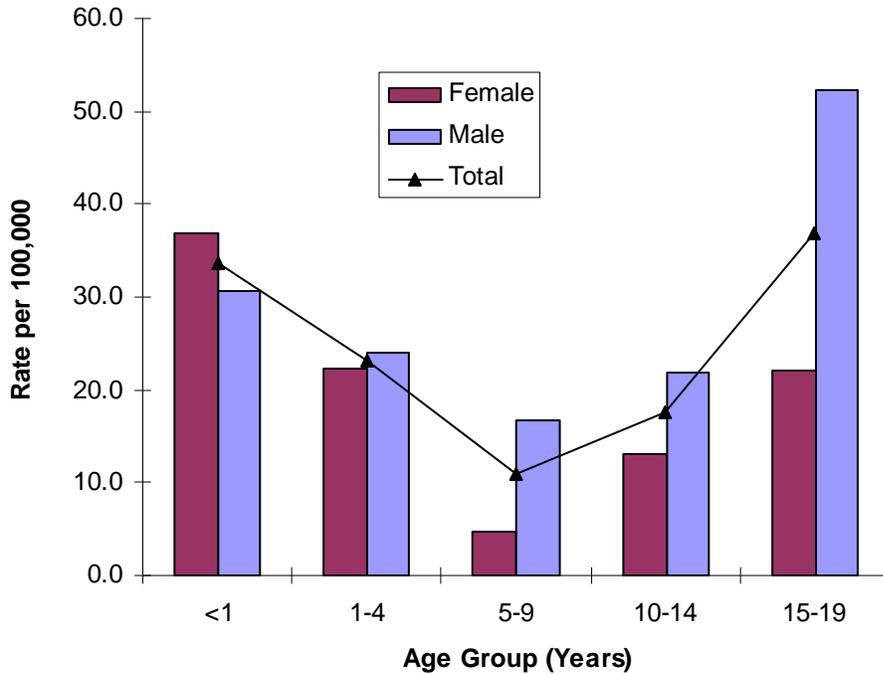
- In 2006, among Massachusetts children and youth ages 0 to 19 there was 1 fire/flame fatality, 24 hospital stays, and 353 emergency department discharges.

**Figure 33. Rates of Nonfatal Fire/Flame Injury-related Hospital Cases, MA Residents Ages 0-19, 2002-2006 (N=1,845)**



- Hospital stays and emergency department discharges were combined for this analysis due to the small number of hospital stays.
- From 2002 to 2006 overall rates of nonfatal fire/flame hospital cases among children and youth ages 0-19 decreased 3.6%. Males showed a slight decrease of 1.8% while female rates decreased 6.7%. None of these trends however were statistically significant.
- Males had an average annual rate 1.8 times higher than females for nonfatal fire/flame hospital cases.

**Figure 34. Nonfatal Fire/Flame Injury-related Hospital Cases by Age Group and Sex, MA Residents Ages 0-19, 2006 (N=377)**



Age Group	Female		Male		Total	
	N	Rate	N	Rate	N	Rate
<1 Year	14	36.8	12	30.7	26	33.7
1-4 Years	34	22.4	38	23.9	72	23.2
5-9 Years	9	4.7	33	16.7	42	10.8
10-14 Years	26	13.0	46	21.8	72	17.5
15-19 Years	49	22.1	118	52.3	165	36.9
Total	130	16.2	247	29.7	377	23.1

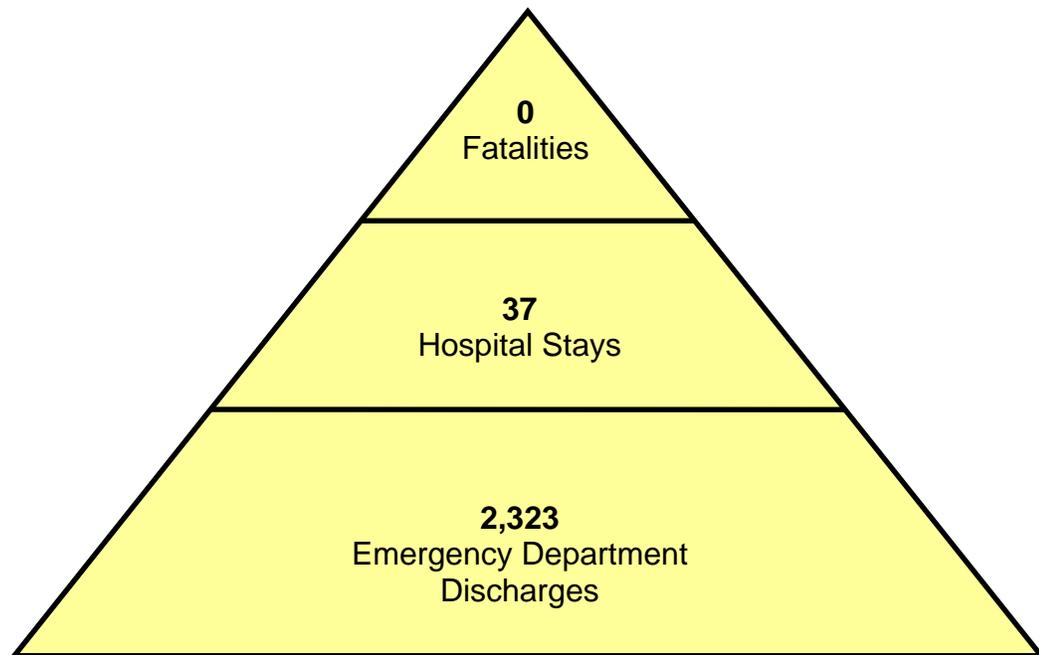
\* Rates not are calculated on counts of less than 5. Rates calculated on counts of less than 20 may be unstable and should be interpreted with caution.

- In 2006, rates of nonfatal fire/flame injuries were highest among youth ages 15-19 (36.9/100,000) followed by children less than 1 year old (33.7/100,000).
- Male rates of nonfatal fire/flame injuries were higher than female rates for all age groups except children less than 1 year of age.
- Most fire/flame injuries were due to “other smoke and fumes from conflagration including carbon monoxide, fumes, or smoke not otherwise specified” (19.1%) followed by “controlled fire not in building or structure” which includes burns from gunfire or trash fire (13.0%).

# HOT OBJECT/ SUBSTANCE BURN INJURIES

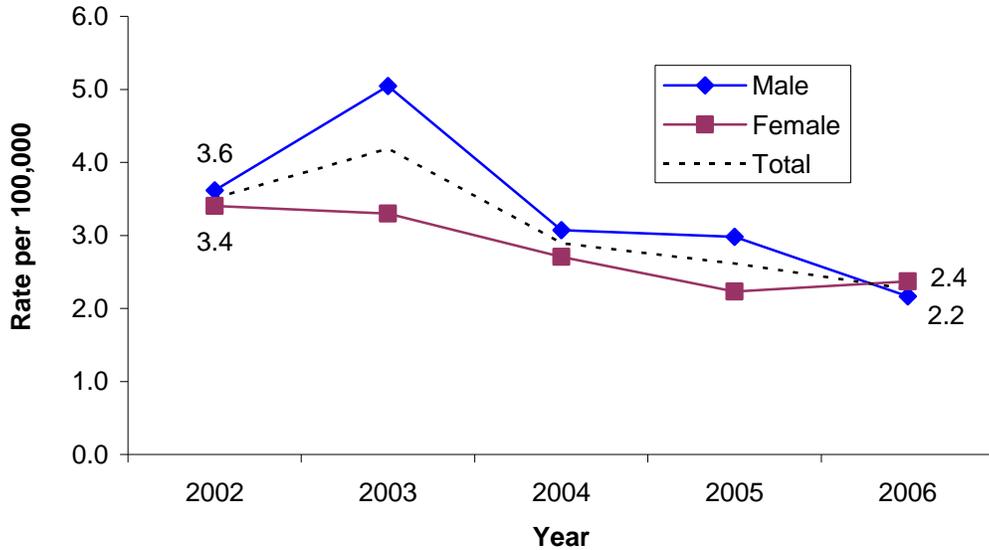
Unintentional hot object/substance burn injuries are those injuries caused by hot substances or objects, caustic or corrosive material, and steam. Examples include burning by boiling tap water, steam, acid, lye, or being burned by an electric heating appliance, light bulb, or steam pipe.

**Figure 35. Magnitude of Hot Object/Substance Burn Injuries among MA Residents Ages 0-19 Years, 2006**



- In 2006 among Massachusetts children and youth ages 0-19 there were no hot object/substance burn fatalities, 37 nonfatal hospital stays, and 2,323 emergency department discharges.

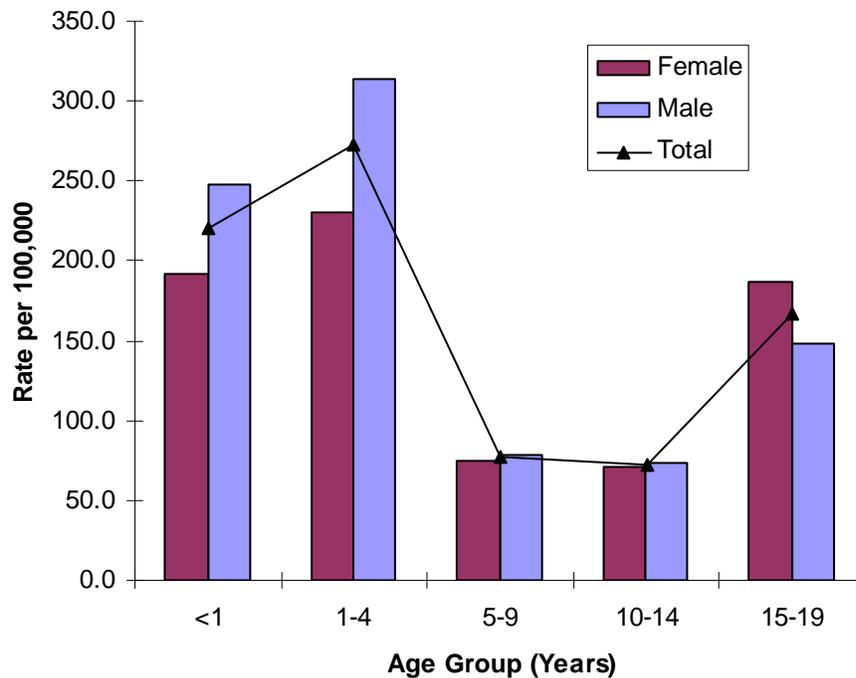
**Figure 36. Rates of Nonfatal Hot Object/Substance Burn Injury-related Hospital Stays, MA Residents Ages 0-19, 2002-2006 (N=257)**



- From 2002 to 2006 hospital stay injury rates of hot object/substance burn injuries among Massachusetts children and youth ages 0-19 decreased approximately 35.5% overall. Male rates decreased 40.2% while female rates decreased 30.3%<sup>†</sup>. Only the decrease noted among females was statistically significant.
- Males had an average annual rate 1.2 times higher than females for nonfatal hot object/substance burn injury hospital stays.

<sup>†</sup> Statistically significant at the  $P \leq .05$  level. The noted change is unlikely to be due to chance alone.

**Figure 37. Rates of Nonfatal Hot Object/Substance Burn Injury-related Hospital Cases by Age Group and Sex, MA Residents Ages 0-19, 2006 (N=2,360)**



Age Group	Female		Male		Total	
	N	Rate	N	Rate	N	Rate
<1 Year	73	191.7	97	248.1	170	220.3
1-4 Years	350	230.4	499	314.3	849	273.3
5-9 Years	142	74.8	155	78.3	297	76.6
10-14 Years	142	70.9	155	73.6	297	72.3
15-19 Years	413	186.6	334	148.1	747	167.2
Total	1,120	139.8	1,240	149.1	2,360	144.5

- In 2006, the rate of nonfatal hot object/substance burn injury-related hospital cases was highest among youth ages 1-4 (273.3/100,000), followed by children <1 year old (220.3/100,000).
- The lowest rates were among children ages 5-9 and 10-14 (76.6/100,000 and 72.3/100,000 respectively)
- Overall, males had slightly higher rates of hot object/substance burn hospital cases compared to females (149.1/100,000 and 139.8/100,000 respectively).

- Specific types of hot object/substance burn injury hospital cases by age group include the following:
  - Among children less than 1 year of age, the leading type of hot object/substance burn was “other” (45.9%) which includes burn by electric heating appliances, light bulbs, steam pipes and hot objects not specified.
  - “Other” was also the leading type of hot object/substance burn among children in age groups 1-4 (53%), 5-9 (45%), and 10-14 (43%). The second leading type in these three age groups was injuries from hot liquids and vapors including steam.
  - Among youth ages 15-19 years scalds by hot liquids and vapors including steam were the leading type of hot object/substance burn accounting for 39.0% of such injuries.
    - Worker’s compensation was the leading payer (42%) and commercial insurance (33%) was the second leading payer of scalds by hot liquids and vapors including steam. Percents are based on the number of cases rather than charges.

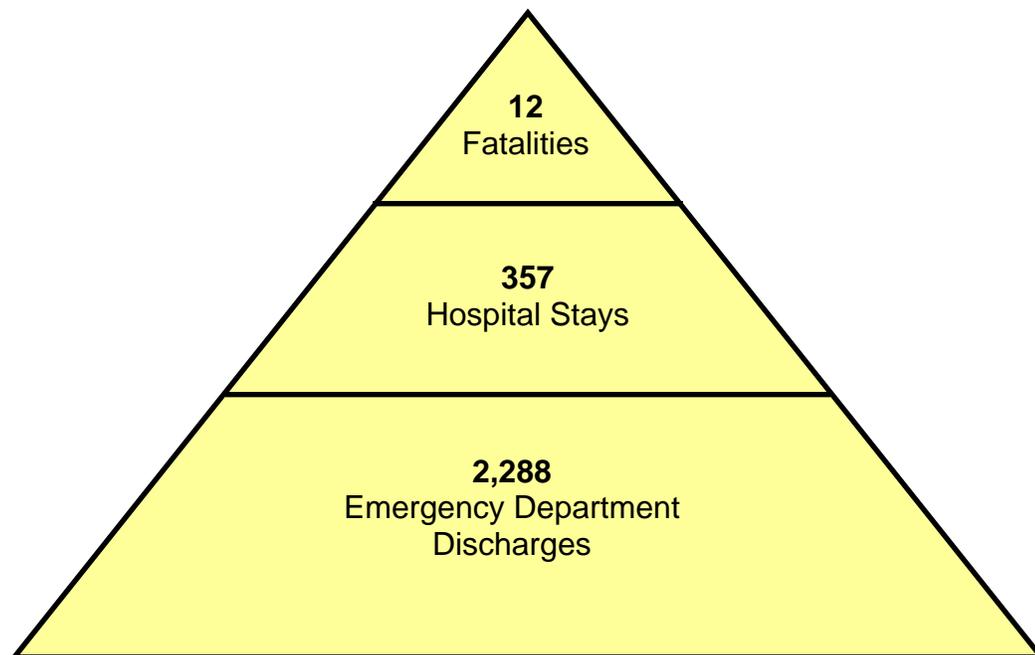
Many of the hot object/substance injuries among youth ages 15-19 appear to be work-related. The Massachusetts Department of Public Health’s Occupational Health Surveillance Program (OHSP) collects and analyzes work-related injuries of all ages, provides education, and assists in targeting intervention strategies. The OHSP’s [Teens at Work: Injury Surveillance and Prevention Project](#) specifically monitors work-related injuries to workers under the age of 18.

# POISONINGS/ DRUG OVERDOSES

Unintentional poisonings/drug overdoses include the accidental overdose of a drug, the wrong drug given or taken in error, and drugs taken inadvertently so that there is a harmful effect. This includes illegal drugs such as heroin as well as legal drugs (e.g., fentanyl, morphine, and oxycodone) that may be obtained and used illicitly.

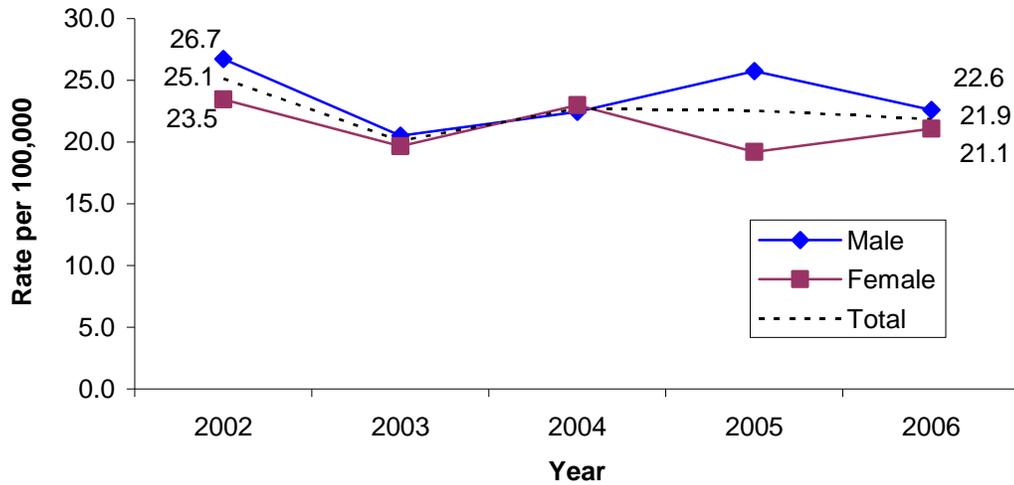
Unintentional poisonings also include poisonings by other solid or liquid substances, gases, and vapors including cleansing agents, agricultural chemicals, and poisonous food/plants, among others. Poisonings can occur through ingestion, inhalation, injection, or absorption of a substance through the skin. Refer to the Technical Notes and Methodology section for a table of drug agents.

**Figure 38. Magnitude of Poisonings/Drug Overdoses among MA Residents Ages 0-19 Years, 2006**



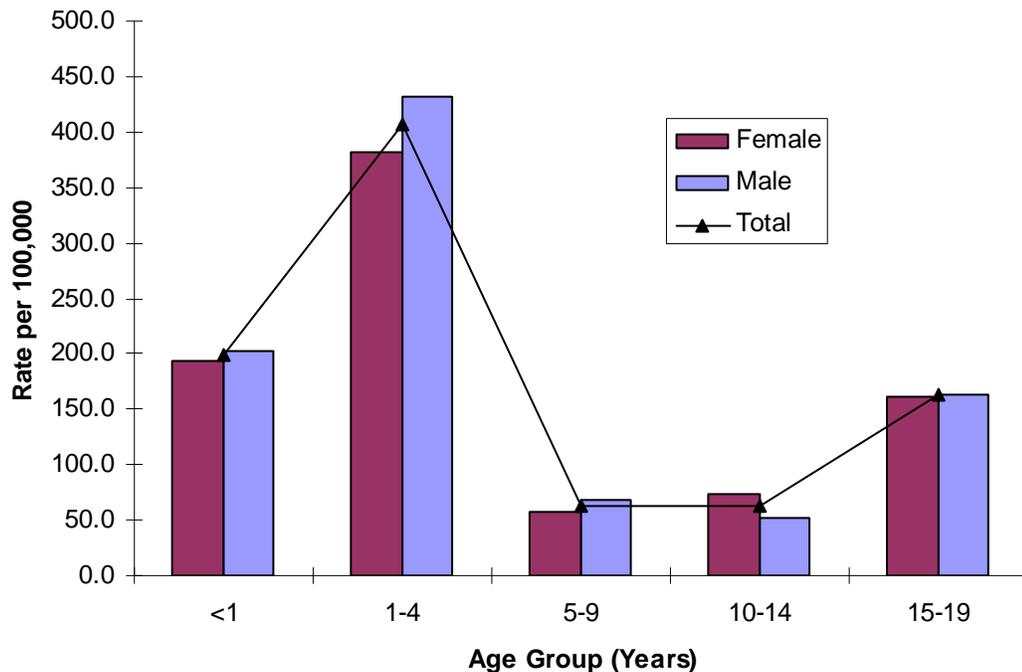
- In 2006, among Massachusetts children and youth ages 0-19 there were 12 poisoning/drug overdose fatalities, 357 hospital stays, and 2,288 emergency department discharges.

**Figure 39. Rates of Nonfatal Poisoning/Drug Overdose Hospital Stays, MA Residents Ages 0-19, 2002-2006 (N=1,863)**



- From 2002 to 2006 poisoning/drug overdose hospital stay rates among Massachusetts children and youth ages 0-19 decreased by 13%. Male rates decreased by 15.4% while female rates decreased by 10.1%. None of these trends however were statistically significant.
- Male and female rates of poisoning/drug overdose hospital stays were similar each year, with the largest difference in rates between males and females occurring in 2005.

**Figure 40. Rates of Nonfatal Poisoning/Drug Overdose Hospital Cases by Age Group and Sex, MA Residents Ages 0-19, 2006 (N=2,645)**



Age Group	Female		Male		Total	
	N	Rate	N	Rate	N	Rate
<1 Year	74	194.3	79	202.0	153	198.2
1-4 Years	579	381.2	687	432.7	1,266	407.5
5-9 Years	108	56.9	136	68.7	244	62.9
10-14 Years	147	73.4	110	52.2	257	62.5
15-19 Years	358	161.7	367	162.8	725	162.3
Total	1,266	158.0	1,379	165.8	2,645	161.9

- In 2006, rates of poisonings/drug overdoses were highest among children ages 1-4 years (407.5 per 100,000).
- Male rates were slightly higher than female rates for children age 9 and younger. Female rates were slightly higher than male rates for youth ages 10-14 (73.4 per 100,000 and 52.2 per 100,000 respectively). Rates were similar for males and females ages 15-19.
- One exception to this pattern is that for poisoning hospital stays among infants less than 1 (not depicted), female rates were higher than male rates (34.1 per 100,000 and 23.0 per 100,000 respectively).

- The type of drug involved in poisonings/drug overdoses also varied by age group.
  - Among children less than 1 year old, 16% (N=24) were accidental poisoning from utility gas and carbon monoxide, and 19% (N=29) were other drugs primarily affecting the skin and mucous membrane, the eye, ear, nose, and throat, and dental drugs.
  - Among 1-4 year olds, 31% were accidental poisoning by other drugs (N=390). Seventeen percent (N=211) were poisoning by analgesics, antipyretics, and antirheumatics. 55% (N=115) of these were poisoning by acetaminophen.\*
  - Among 5-9 year olds, 25% (N=62) were poisoning by other drugs, and 14% (N=35) were poisoning from utility gas and carbon monoxide.
  - Among 10-14 year olds, 17% (N=44) were poisoning from utility gas and carbon monoxide, and 14% (N=37) were accidental poisoning by other drugs.
  - Among 15-19 year olds, 21% (N=154) were poisoning by analgesics, antipyretics, and antirheumatics. Of these 39% (N=60) were poisoning by acetaminophen.\*

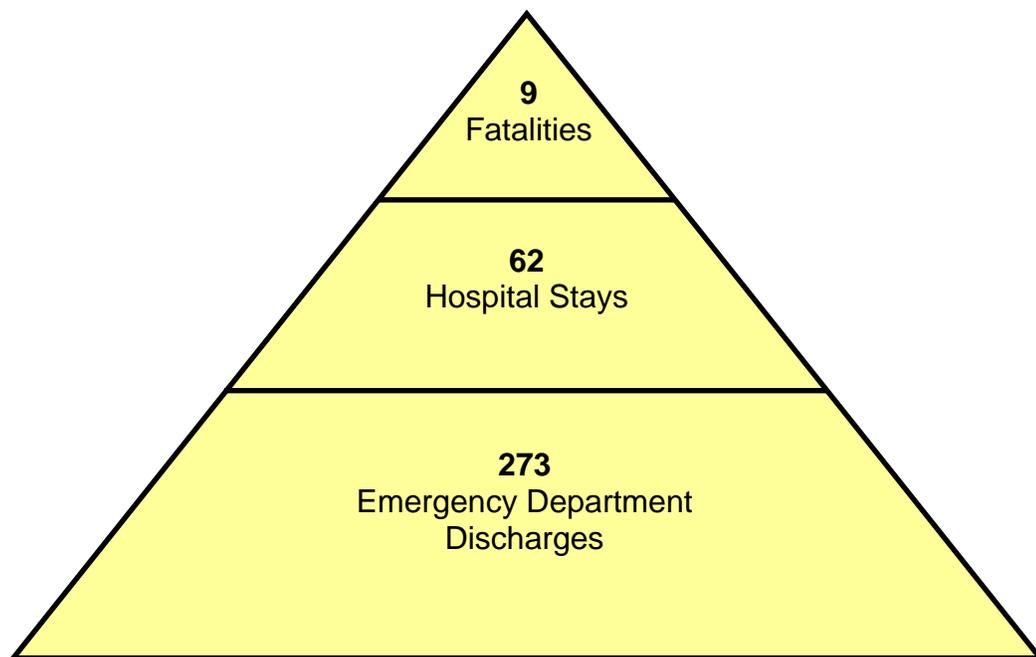
---

\* Please note that we use external cause code E850.4 (Aromatic Analgesics, Not Else Classified) as a proxy for acetaminophen. Other drugs listed in this category (acetanilide and phenacetin) are infrequently used.

# SUFFOCATION

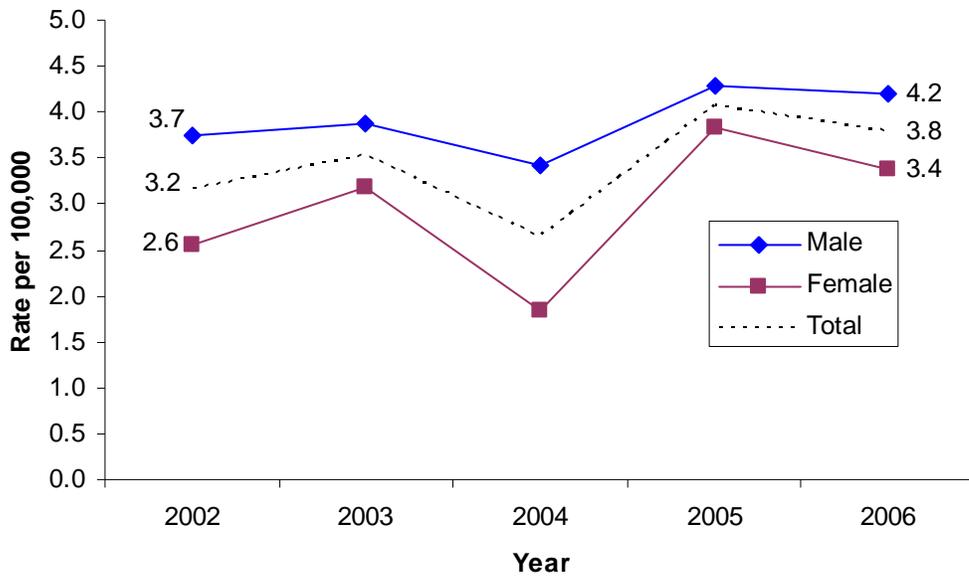
Suffocation can include the inhalation and ingestion of food, other objects, or mechanical suffocation (e.g. bed or cradle, plastic bag, cave in) where the airway is obstructed. Unintentional suffocation is the third leading cause of unintentional injury death among MA children and youth ages 0-19.

**Figure 41. Magnitude of Suffocation Injuries among MA Residents  
Ages 0-19 Years, 2006**



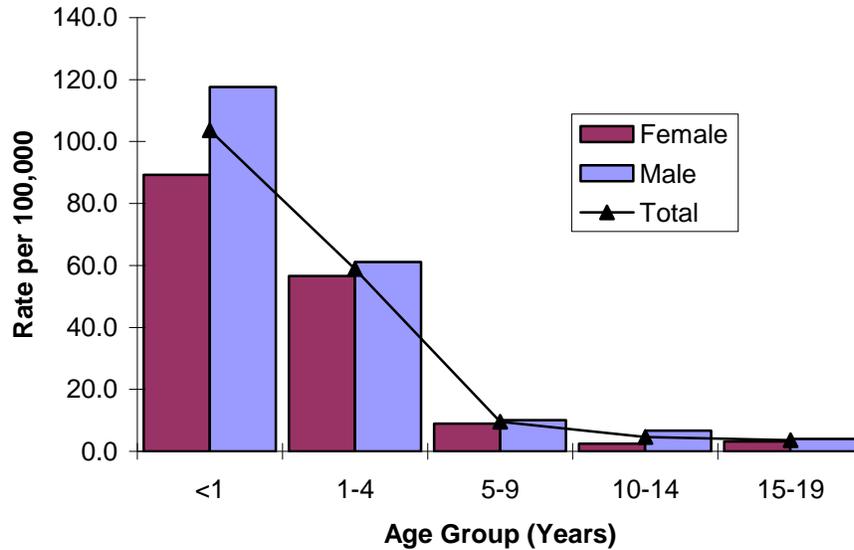
- In 2006, among children and youth ages 0-19 there were 9 suffocation fatalities, 62 hospital stays, and 273 emergency department discharges.

**Figure 42. Rates of Nonfatal Suffocation Injury-related Hospital Stays, MA Residents Ages 0-19, 2002-2006 (N=285)**



- From 2002 to 2006 the rates of nonfatal suffocation hospital stays increased overall by 20.3%. Among males, rates increased approximately 12.7% and female rates increased 32.0%. These trends however were not statistically significant.
- Males had an average annual rate 1.3 times higher than females for nonfatal suffocation hospital stays.

**Figure 43. Rates of Nonfatal Suffocation Injury-related Hospital Cases, MA Residents Ages 0-19, 2006 (N=335)**



Age Group	Female		Male		Total	
	N	Rate	N	Rate	N	Rate
<1 Year	34	89.3	46	117.6	80	103.6
1-4 Years	86	56.6	97	61.1	183	58.9
5-9 Years	17	9.0	20	10.1	37	9.5
10-14 Years	5	2.5	14	6.6	19	4.6
15-19 Years	7	3.2	9	4.0	16	3.6
Total	149	18.6	186	22.4	335	20.5

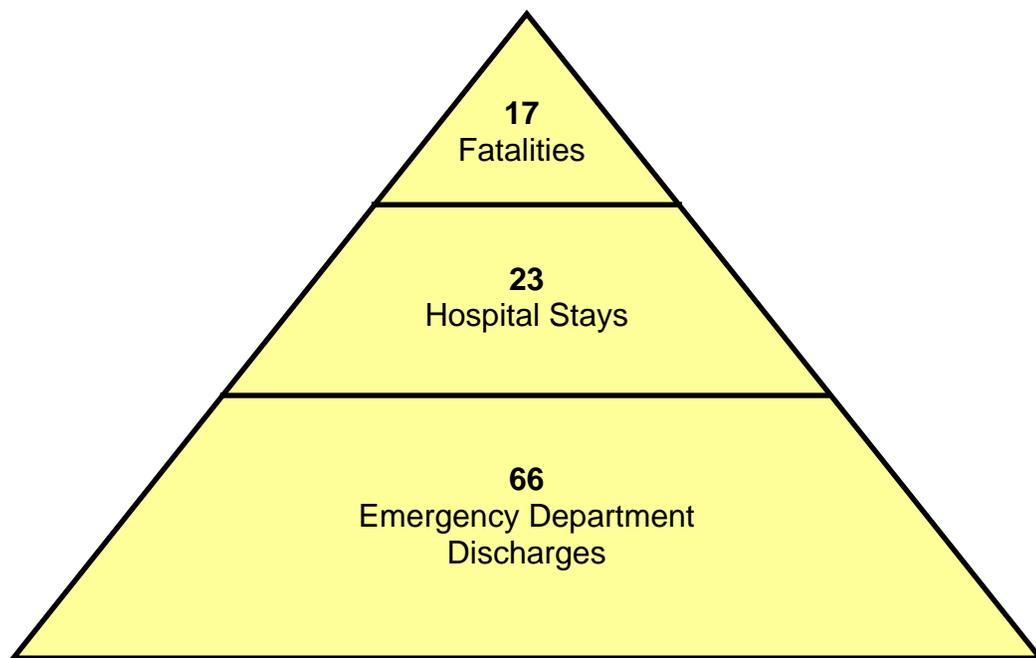
\* Rates not calculated on counts of less than 5. Rates calculated on counts of less than 20 may be unstable and should be interpreted with caution.

- In 2006, nonfatal suffocation hospital case rates were highest among children less than 1 year (103.6 per 100,000), followed by children ages 1-4. Risk for suffocation decreased as age increased.
- Males had slightly higher rates of nonfatal suffocation.
- Causes of suffocation varied slightly by age group. Among children less than 1 year, 56% of nonfatal suffocation injuries were from inhalation and ingestion of other objects such as a bean or marble in nose and 43% were from inhalation and ingestion of food.
- Among 1-4 year olds, 18% of nonfatal suffocation injuries were due to inhalation and ingestion of food and 80% were due to inhalation and ingestion of other objects.
- The highest proportion of suffocation injury-related hospital stays were among children <1 (40%) compared to emergency department discharges where 60% were among children ages 1-4.

# DROWNING/ NEAR-DROWNING INJURIES

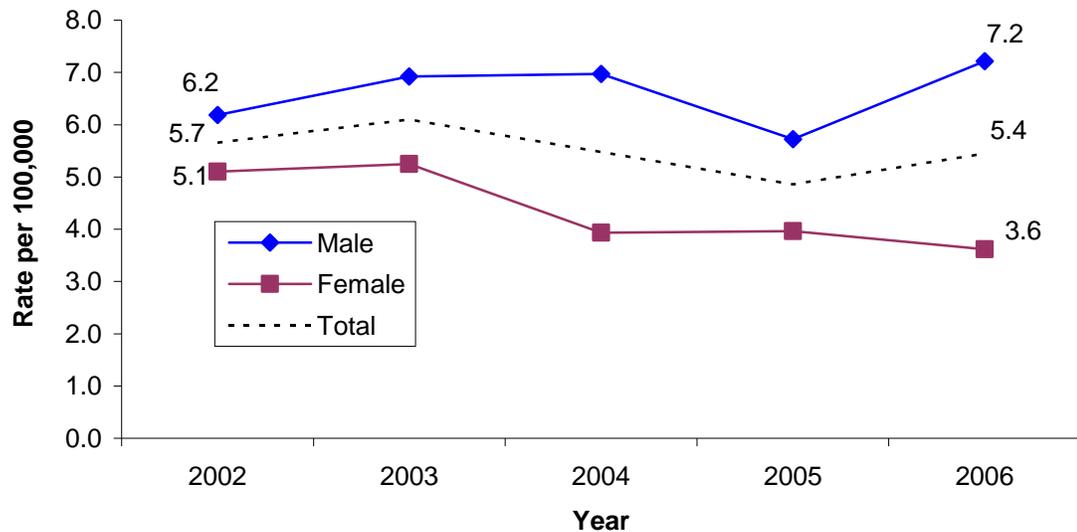
Drowning/near-drowning is defined as suffocation (asphyxia) resulting from submersion in water or another liquid. Drowning deaths among children ages 0-19 accounted for 37.8% of the total drowning fatalities of all ages in Massachusetts in 2006. The case fatality rate of drowning was the highest among all injury causes for children ages 0-19 at 16%. That is, the proportion of fatal injuries as a percent of the overall number of injuries (fatal and nonfatal combined) was highest for this cause.

**Figure 44. Magnitude of Drowning and Near-Drowning Injuries among MA Residents Ages 0-19 Years, 2006**



- In 2006, among Massachusetts children and youth ages 0 to 19 there were 17 drowning deaths, 23 near-drowning injury-related hospital stays, and 66 emergency department discharges.

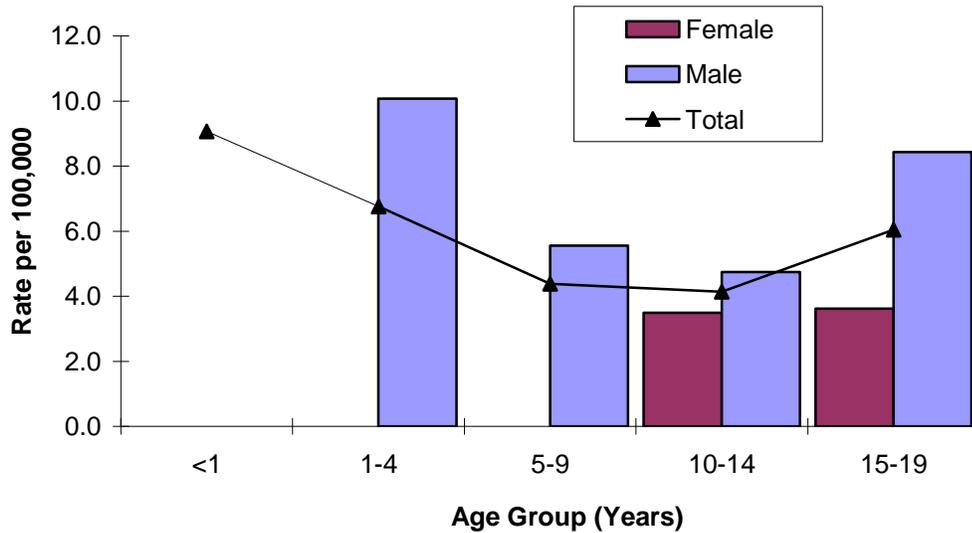
**Figure 45. Rates of Near-Drowning Injury-related Hospital Cases, MA Residents Ages 0-19, 2002-2006**



- Due to the small numbers of near-drowning injuries, hospital stays and emergency department discharges were combined to look at these injuries over time.
- The overall rate of near-drowning injury-related hospital cases decreased 3.7% from 2002 to 2006.
- While the male rate of near-drowning increased 16.6%, the female rate decreased 29.1%<sup>†</sup>. The decrease noted among females was statistically significant.
- The average annual male rate of near-drowning was approximately 1.5 times higher than females.

<sup>†</sup> Statistically significant at the  $P \leq .05$  level. The noted change is unlikely to be due to chance alone.

**Figure 46. Rates of Near-Drowning  
Injury-related Hospital Cases by Age Group and Sex,  
MA Residents Ages 0-19, 2006 (N=89)**



Age Group	Female		Male		Total	
	N	Rate	N	Rate	N	Rate
<1 Year	<7	--	<7	--	7	9.1
1-4 Years	<7	--	16	10.1	21	6.8
5-9 Years	<7	--	11	5.6	17	4.4
10-14 Years	7	3.5	10	4.7	17	4.1
15-19 Years	8	3.6	19	8.4	27	6.0
Total	29	3.6	60	7.2	89	5.4

\* Rates not are calculated on counts of less than 5. Rates calculated on counts of less than 20 may be unstable and should be interpreted with caution.

- Near-drowning hospital case rates were highest among children less than 1 year old and 1 to 4 years old.
- Males had higher rates of near-drowning injuries than females. Males ages 1-4 and 15-19 had the highest rates overall.

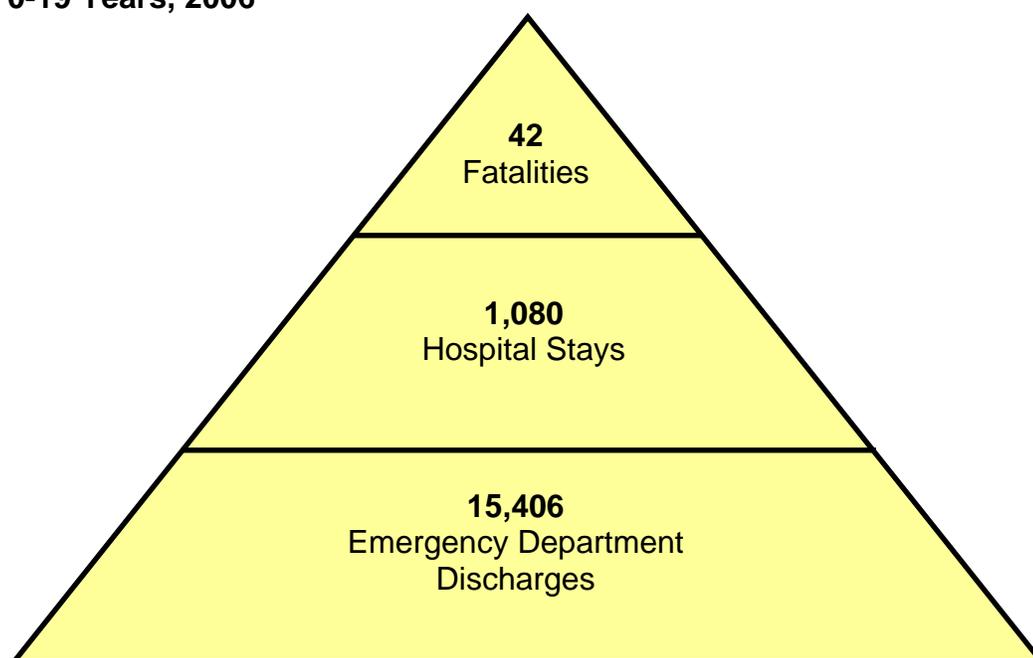


## Section 3: UNINTENTIONAL TRAUMATIC BRAIN INJURY

Traumatic brain injury (TBI) cuts across all injury intents and causes. It can be unintentional, self-inflicted or assault-related and can result from any number of injury causes such as falls, motor vehicle crashes, stuck by/against, and firearms.

TBI's are caused from a blunt or penetrating trauma to the head or from acceleration-deceleration forces. These injuries can negatively impact psychosocial development, which may extend throughout a lifetime contributing to increased high school dropout rates, risk for substance abuse, psychiatric hospitalizations including suicide attempts, and criminal activity.<sup>7</sup>

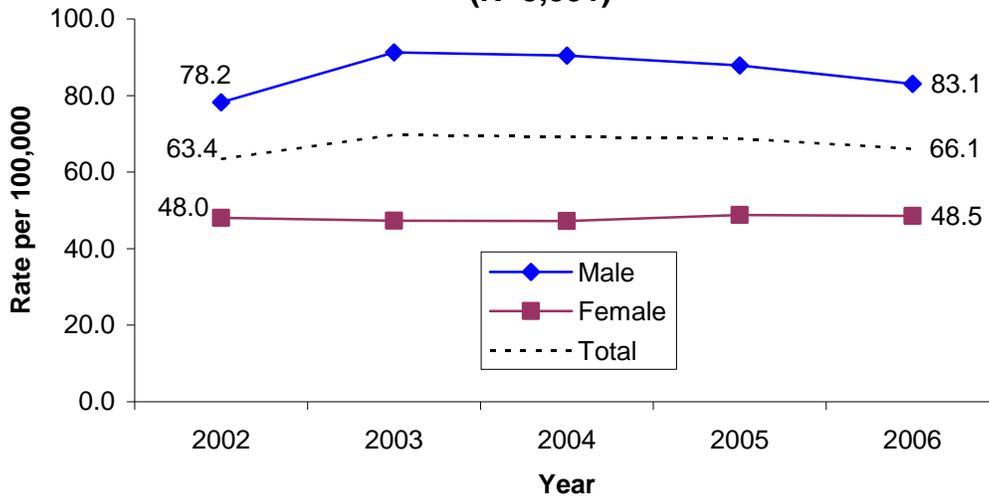
**Figure 47. Magnitude of Traumatic Brain Injury among Residents Ages 0-19 Years, 2006**



- In 2006, among children and youth ages 0-19 there were 42 unintentional TBI fatalities, 1,080 hospital stays, and 15,406 emergency department discharges.
- Thirty-eight percent of unintentional injury deaths to children and youth ages 0-19 were associated with a TBI compared to 22% for adults ages 20 and older.
- Among children and youth ages 0-19, 22% of hospital stays and eight percent of emergency department discharges were associated with a TBI.

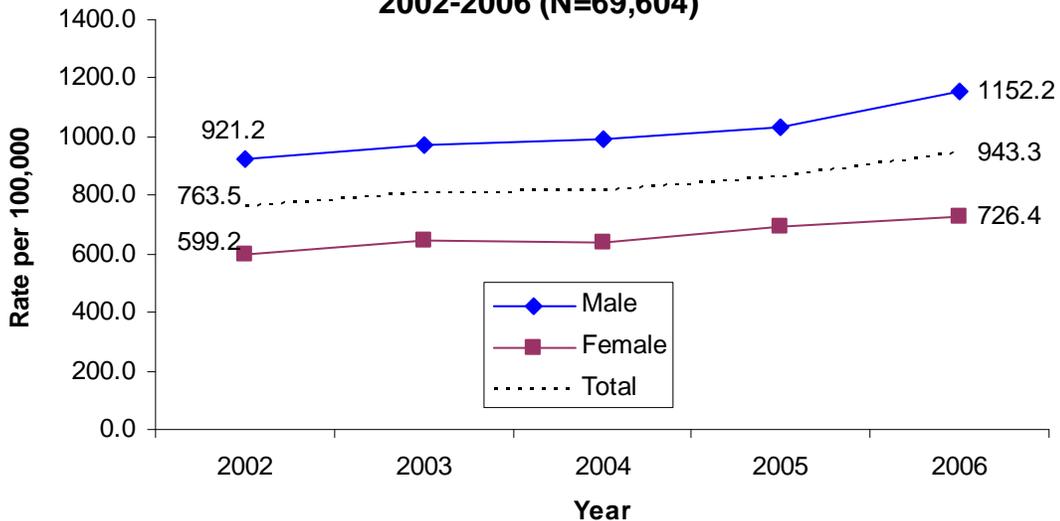
<sup>7</sup> LeVecchia F. Final Report of the Massachusetts Traumatic Brain Injury Transition Project; June 1996.

**Figure 48. Rates of Nonfatal TBI Hospital Stays, MA Residents Ages 0-19, 2002-2006 (N=5,591)**



- From 2002 to 2006, among children and youth ages 0-19 rates of nonfatal TBI related hospital stays increased 4.3%. Male rates increased 6.2% and female rates increased 1.1%. These trends were not statistically significant.

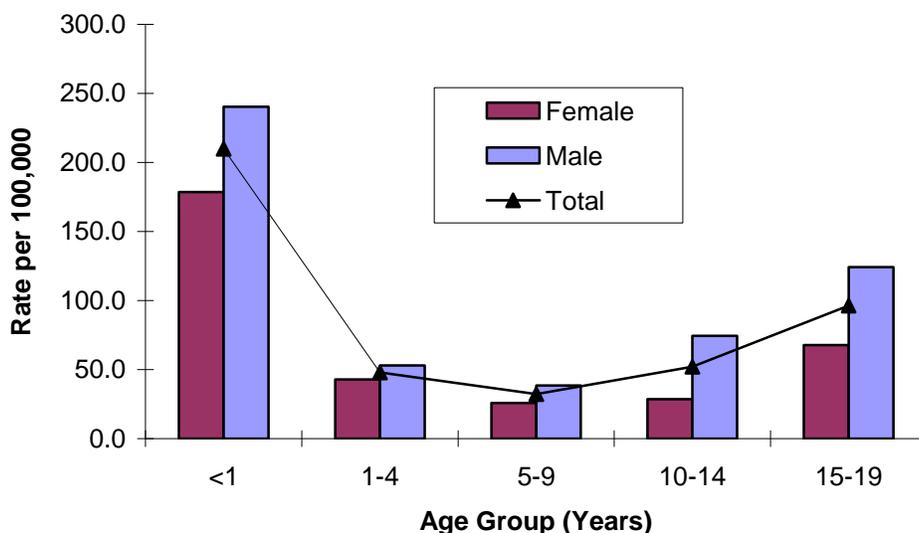
**Figure 49. Rates of Nonfatal TBI Emergency Department Discharges, MA Residents Ages 0-19, 2002-2006 (N=69,604)**



- TBI related emergency department discharge rates showed a greater increase than hospital stays from 2002 to 2006. Total rates increased 23.6<sup>†</sup>%. Male rates increased 25.1%<sup>†</sup> while female rates increased 21.2%<sup>†</sup>. Trends were statistically significant for the overall total as well as for males and females.

<sup>†</sup> Statistically significant at the  $P \leq .05$  level. The noted change is *unlikely* to be due to chance alone.

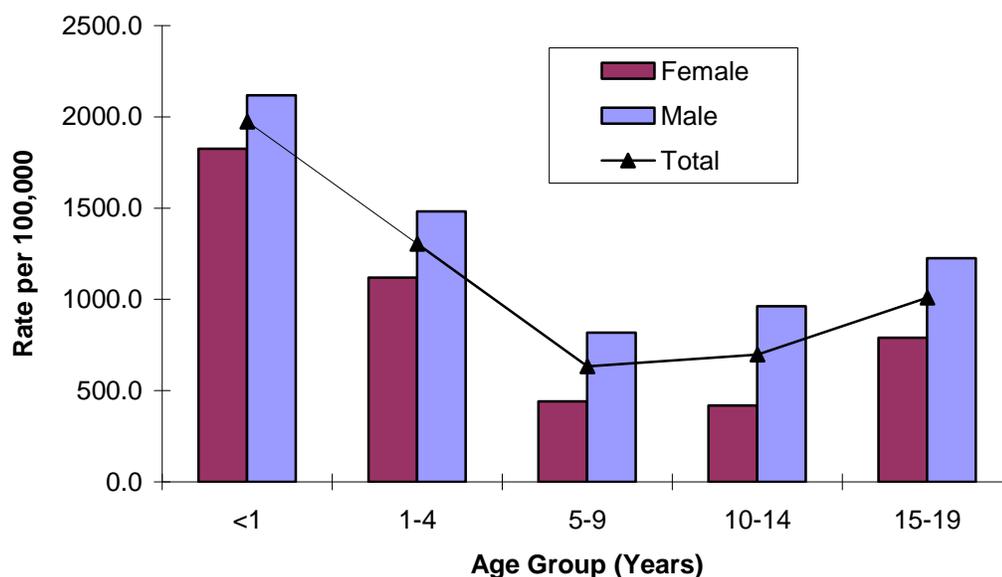
**Figure 50. Rates of Nonfatal Traumatic Brain Injury-related Hospital Stays by Age Group and Sex, MA Residents Ages 0-19, 2006 (N=1,080)**



Age Group	Female		Male		Total	
	N	Rate	N	Rate	N	Rate
<1 Year	68	178.6	94	240.4	162	209.9
1-4 Years	65	42.8	84	52.9	149	48.0
5-9 Years	49	25.8	76	38.4	125	32.2
10-14 Years	57	28.5	157	74.5	214	52.1
15-19 Years	150	67.8	280	124.2	430	96.2
Total	389	48.5	691	83.1	1,080	66.1

- In 2006, the highest rates of TBI related hospital stays were in infants less than 1 year of age (209.9 per 100,000). This was followed by youth ages 15-19 (96.2 per 100,000).
- Male rates were higher than female rates in all age groups. Overall the male rate of TBI related hospital stays was 1.7 times higher than female rates.

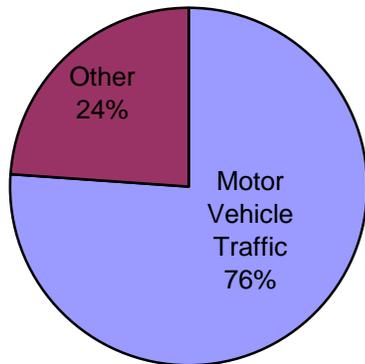
**Figure 51. Rates of Nonfatal Traumatic Brain Injury-related Emergency Department Discharges by Age Group and Sex, MA Residents Ages 0-19, 2006 (N=15,406)**



Age Group	Female		Male		Total	
	N	Rate	N	Rate	N	Rate
<1 Year	695	1,825.1	828	2,117.5	1,523	1,973.2
1-4 Years	1,700	1,119.2	2,352	1,481.3	4,052	1,304.2
5 -9 Years	838	441.6	1,617	817.3	2,455	633.4
10-14 Years	839	418.9	2,026	961.7	2,865	697.1
15-19 Years	1,749	790.2	2,762	1,225.0	4,511	1,009.6
<b>Total</b>	<b>5,821</b>	<b>726.4</b>	<b>9,585</b>	<b>1,152.2</b>	<b>15,406</b>	<b>943.3</b>

- In 2006, the highest rates of TBI related emergency department discharges were in infants less than 1 year of age (1973.2 per 100,000). This was followed by children ages 1-4 (1304.2 per 100,000).
- Male rates were higher than female rates in all age groups. Overall the male rate of TBI related emergency department discharges was 1.6 times higher than female rates in 2006.

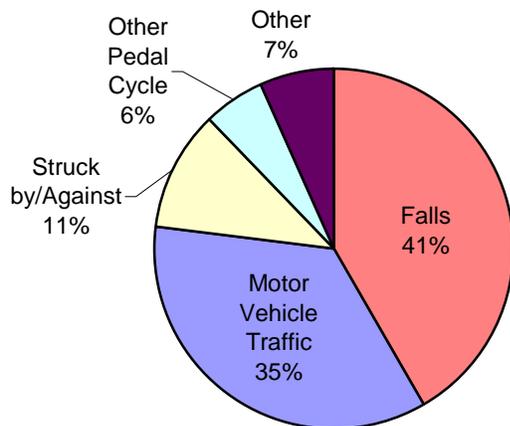
**Figure 52. TBI Fatalities by Leading Cause, MA Residents Ages 0 to 19, 2006 (N=42)**



There are differences between fatal and nonfatal causes of traumatic brain injury (TBI) in children.

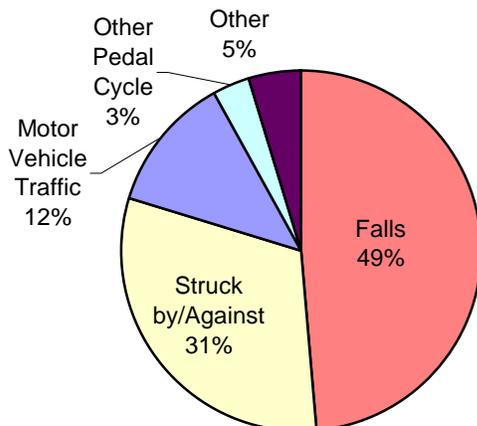
- In 2006, the leading cause of traumatic brain injury death among children and youth ages 0-19 was motor vehicle traffic crash. These accounted for 76% (N=32) of all TBI fatalities among youth ages 0-19.

**Figure 53. TBI Hospital Stays by Leading Cause, MA Residents Ages 0 to 19, 2006 (N=1,080)**



- The leading cause of TBI related hospital stay discharges was fall, followed by motor vehicle traffic crash.

**Figure 54. TBI Emergency Dept. Discharges by Leading Cause, MA Residents Ages 0 to 19, 2006 (N=15,406)**



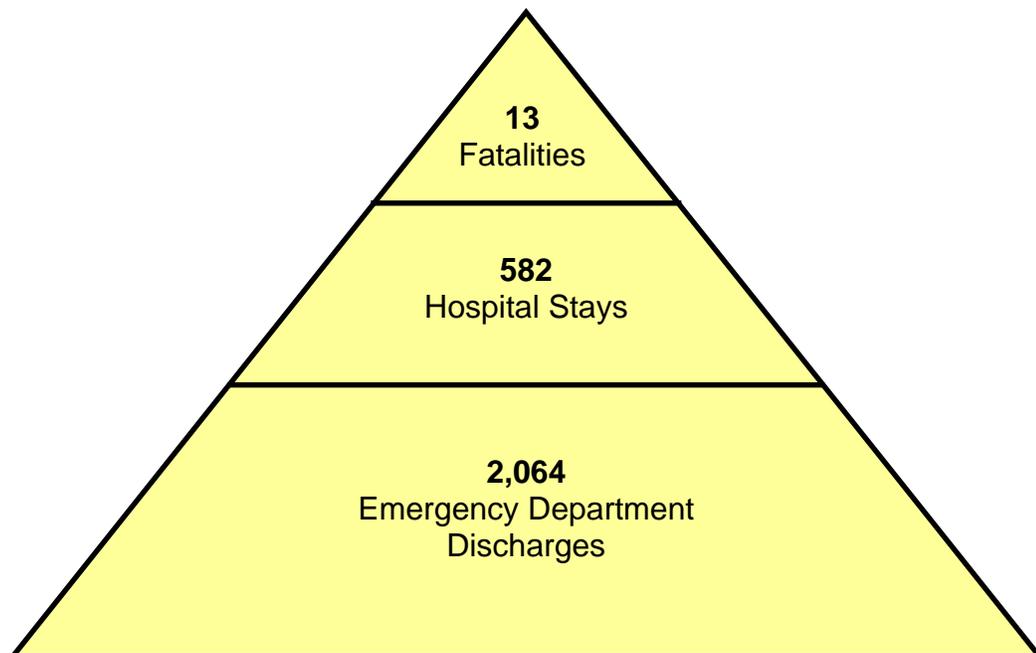
- Similar to hospital stays, fall was the leading cause of traumatic brain injury emergency department discharges. The second leading cause was struck by/against object.



## Section 4: SUICIDE AND SELF-INFLICTED INJURY

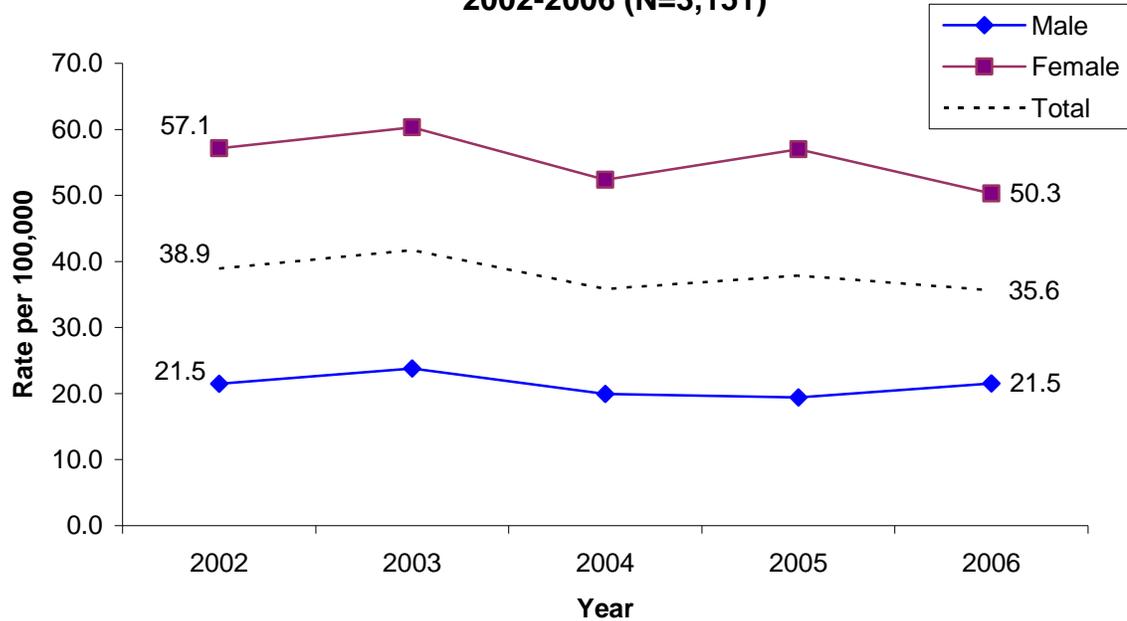
Suicide and self-inflicted injury refers to the purposeful violent act inflicted on oneself to intentionally take one's own life or cause self-harm. It can include suicide attempts and self-injurious behaviors such as cutting or burning where the intent to inflict harm may have been present, but it was not the intent to take one's life. In the following analysis, for nonfatal self-inflicted injuries, there is no way to distinguish suicide attempts and self-injurious behaviors, therefore the term "self-inflicted" injury will be used throughout the section.

**Figure 55. Magnitude of Suicide and Self-inflicted Injury among MA Residents Ages 0-19 Years, 2006**



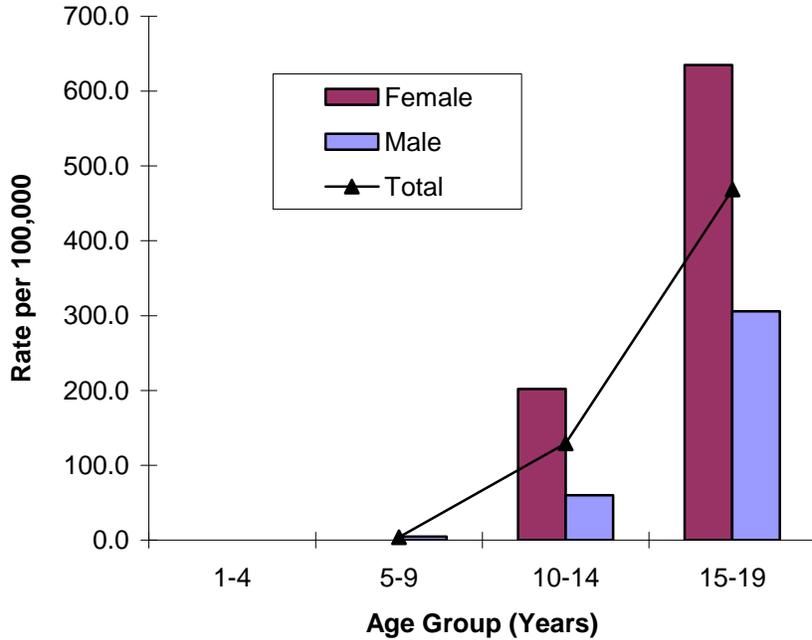
- In 2006, among Massachusetts children and youth ages 0-19 there were 13 suicides, 582 self-inflicted injury related hospital stays, 2,064 self-inflicted injury-related emergency department discharges.

**Figure 56. Rates of Nonfatal Self-inflicted Injury Hospital Stays, MA Residents Ages 0-19, 2002-2006 (N=3,151)**



- Between 2002 and 2006 self-inflicted injury hospital stay rates among children and youth ages 0-19 remained relatively stable among males. Rates decreased 12.0% for females and decreased 8.5% overall. None of the trends were statistically significant.
- Between 2002 and 2006, the average annual rate among females was approximately 2.5 times higher than that of males.

**Figure 57. Rates of Self-Inflicted Injury-related Hospital Cases by Age Group and Sex, MA Residents Ages 0-19, 2006 (N=2,646)**

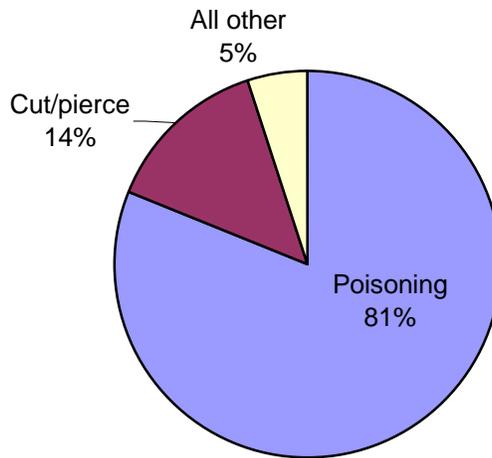


Age Group	Female		Male		Total	
	N	Rate	N	Rate	N	Rate
<1 Year	0	0.0	0	0.0	0	0.0
1-4 Years	<7	--	<7	--	<7	--
5 -9 Years	<7	--	9	4.5	15	3.9
10-14 Years	405	202.2	126	59.8	531	129.2
15-19 Years	1,405	634.8	689	305.6	2,094	468.7
Total	1,818	226.9	828	99.5	2,646	162.0

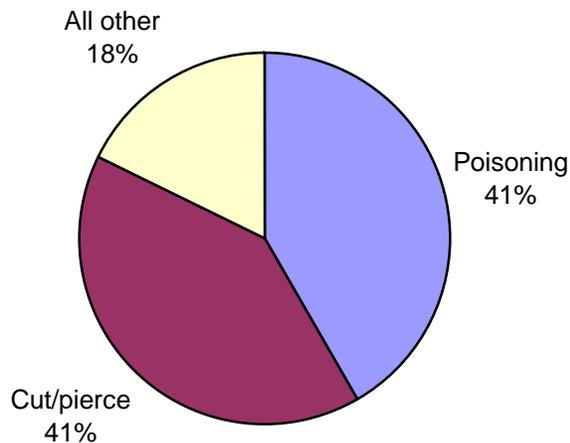
\* Rates not are calculated on counts of less than 5. Rates calculated on counts of less than 20 may be unstable and should be interpreted with caution.

- In 2006, rates of nonfatal self-inflicted injury-related acute care hospital cases were highest among youth ages 15-19 (468.7 per 100,000).
- Overall, in 2006 the female rate (226.9 per 100,000) exceeded the male rate (99.5 per 100,000).

**Figure 58. Nonfatal Self-Inflicted Injury-related Hospital Stays, by Leading Cause, Ages 0-19, MA Residents, 2006 (N=582)**



**Figure 59. Nonfatal Self-Inflicted Injury-related Emergency Department Discharges, Ages 0-19, MA Residents, 2006 (N=2,064)**



- For nonfatal self-inflicted hospital stays, poisoning was the leading cause followed by cut/pierce. For nonfatal self-inflicted emergency department discharges poisoning and cut/pierce were equally the leading causes.
- In 2006, suffocation/hanging was the leading cause of suicide (69.2%) among children and youth ages 0-19 (data not depicted).

## Causes of Suicide and Self-inflicted Injury by Age Group

- Among ages 15-19, poisoning was the leading cause of nonfatal self-inflicted hospital stays and emergency department discharges, followed by cut/pierce.
- Youth ages 15-19 had the highest proportion of poisonings for both self-inflicted hospital stays and emergency department discharges.
  - Analgesics, antipyretics, and anti-rheumatics were the leading substance involved in self-inflicted poisoning hospital cases (42%; N=460) for this age group.
- Among youth ages 10-14, poisoning was the leading cause of self-inflicted hospital stays, followed by cut/pierce. Among emergency department discharges, cut/pierce was the leading cause followed by poisoning.
- Youth ages 10-14 had the second highest proportion of poisonings for both self-inflicted hospital stays and emergency department discharges.
  - Analgesics, antipyretics, and anti-rheumatics were the leading substance involved in self-inflicted poisoning hospital cases (39.3%; N=90) for this age group.
- Children ages 0-9 had very few nonfatal self-inflicted injury cases. Numbers were suppressed for confidentiality purposes.



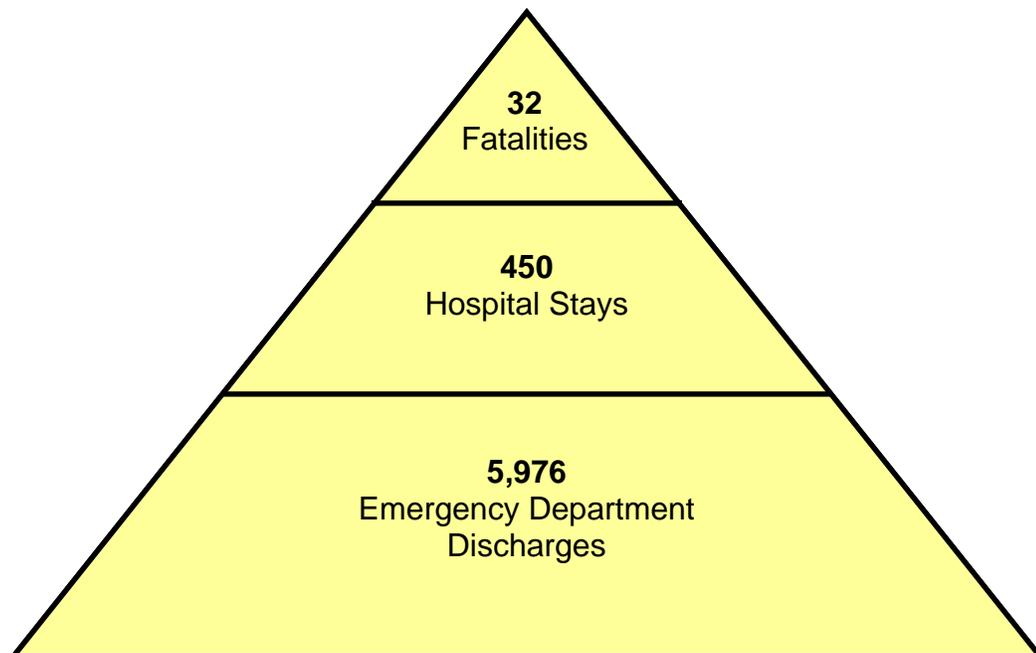
## Section 5: HOMICIDE AND ASSAULT-RELATED INJURY

---

Assault is defined as any injury from an act of violence where physical force by one or more persons is used with the intent of causing harm, injury, or death to another person.

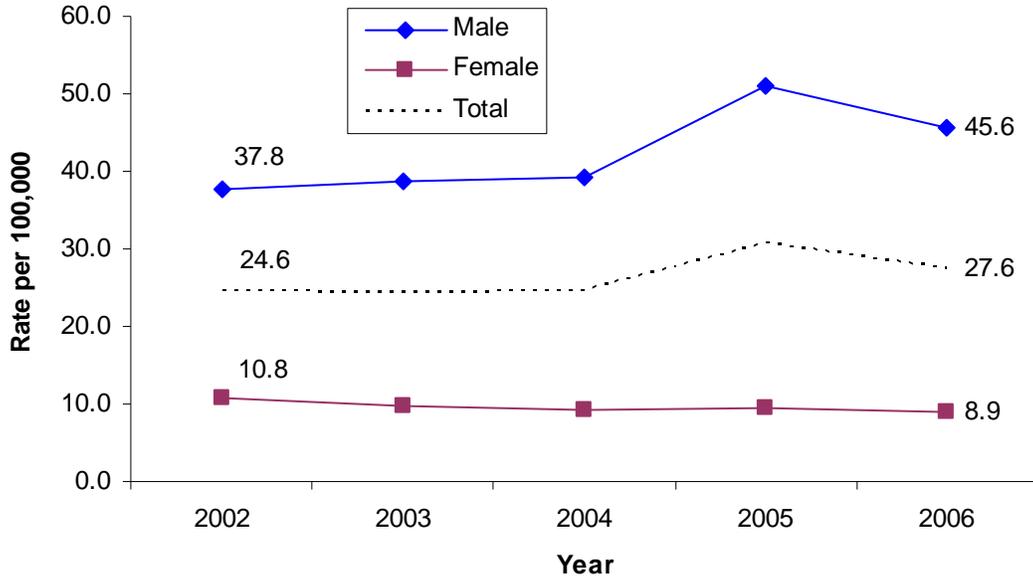
In 2006, 20% of injury deaths among children and youth ages 0-19 were homicides. Nonfatal assault-related injuries made up 7% of all injury-related hospital stays and 3% of all injury-related emergency department discharges, for this age group.

**Figure 60. Magnitude of Homicide and Assault-related Injury among MA Residents Ages 0-19 Years, 2006**



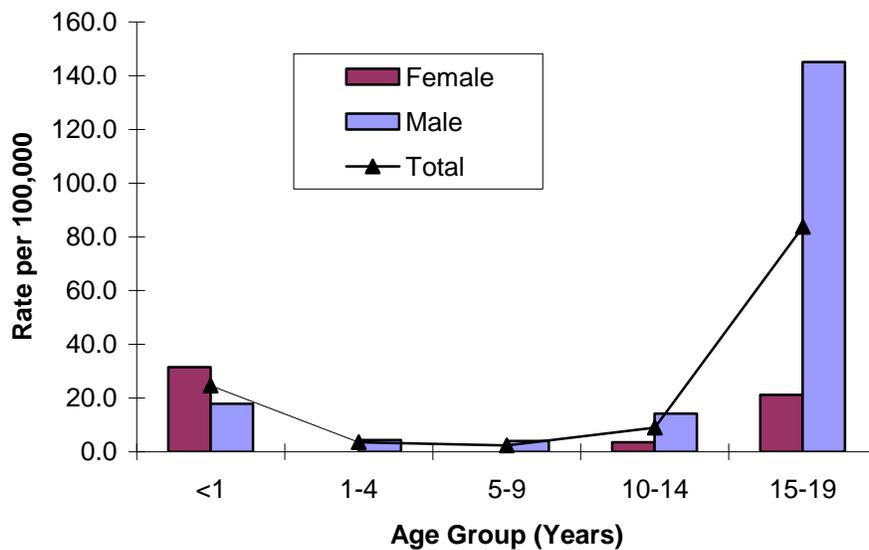
- In 2006, among Massachusetts children and youth ages 0 to 19 there were 32 homicides, 450 assault-related injury hospital stays, and 5,976 assault-related injury emergency department discharges.

**Figure 61. Rates of Nonfatal Assault-related Injury Hospital Stays, MA Residents Ages 0-19, 2002-2006 (N=2,185)**



- From 2002 to 2006, rates of nonfatal assault-related hospital stays among Massachusetts children and youth ages 0-19 increased 12.1%. Male rates increased 20.5% while female rates decreased 18.1%.
- During this 5-year time frame male rates of nonfatal assault-related hospital stays were 4.4 times higher than female rates.
- For emergency department discharges (data not depicted) the difference between male and female rates was considerably less. Male rates were 2 times higher than female rates.

**Figure 62. Nonfatal Assault-related Hospital Stays by Age Group and Sex, MA Residents Ages 0-19, 2006 (N=450)**

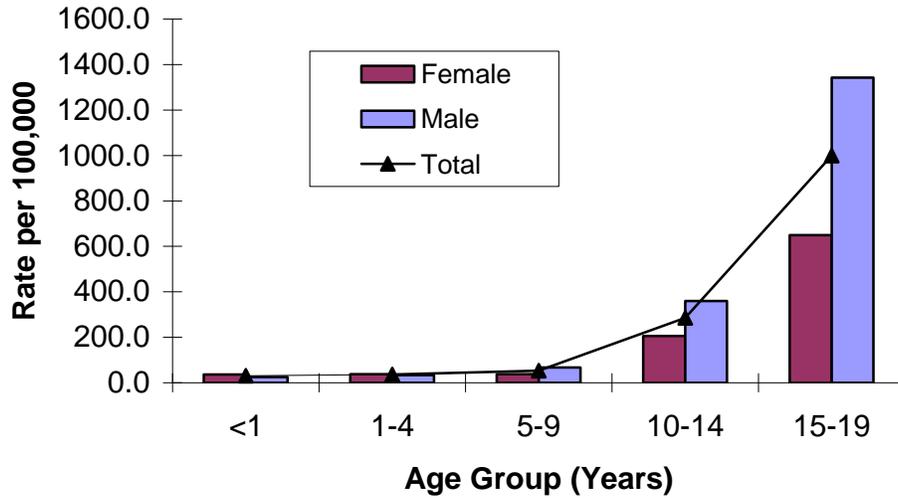


Age Group	Female		Male		Total	
	N	Rate	N	Rate	N	Rate
<1 Year	12	31.5	7	17.9	19	24.6
1-4 Years	<7	--	7	4.4	11	3.5
5-9 Years	<7	--	8	4.0	9	2.3
10-14 Years	7	3.5	30	14.2	37	9.0
15-19 Years	47	21.2	327	145.0	374	83.7
Total	71	8.9	379	45.6	450	27.6

\* Rates not are calculated on counts of less than 5. Rates calculated on counts of less than 20 may be unstable and should be interpreted with caution.

- In 2006, among children and youth ages 0-19, 15-19 year olds had the highest rates (83.7 per 100,000). This was followed by children less than one year of age (24.6 per 100,000).
- Overall in 2006, males had markedly higher rates of assault-related hospital stays compared to females (45.6 per 100,000 and 8.9 per 100,000, respectively). This was not the case for infants <1 where *female* rates were higher than male rates.
- Males 15-19 years old had the highest assault-related hospital stay rates (145 per 100,000).

**Figure 63. Rates of Nonfatal Assault-related Injury Emergency Department Discharges by Age Group and Sex, MA Residents Ages 0-19, 2006 (N=5,976)**

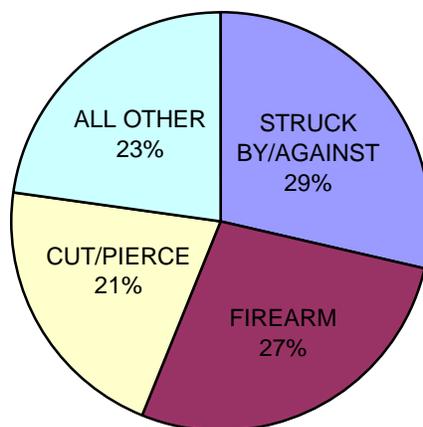


Age Group	Female		Male		Total	
	N	Rate	N	Rate	N	Rate
<1 Year	14	36.8	10	25.6	24	31.1
1-4 Years	58	38.2	54	34.0	112	36.0
5 -9 Years	71	37.4	133	67.2	204	52.6
10-14 Years	413	206.2	759	360.3	1,172	285.2
15-19 Years	1,437	649.2	3,027	1,342.5	4,464	999.1
<b>Total</b>	<b>1,993</b>	<b>248.7</b>	<b>3,983</b>	<b>478.8</b>	<b>5,976</b>	<b>365.9</b>

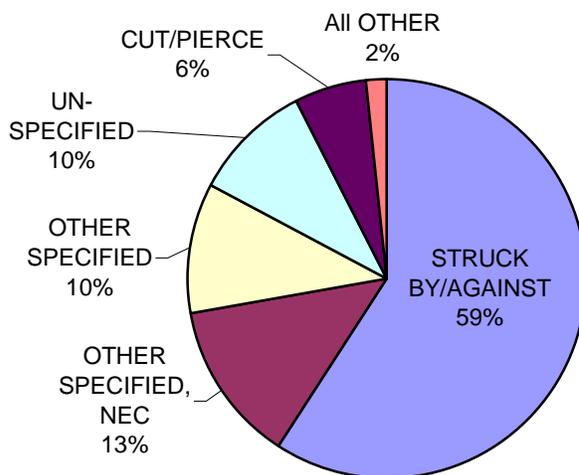
\* Rates not are calculated on counts of less than 5. Rates calculated on counts of less than 20 may be unstable and should be interpreted with caution.

- In 2006, among children and youth ages 0-19 rates of nonfatal assault-related emergency department discharges were highest among youth ages 15-19 (999.1 per 100,000). This was followed by children ages 10-14 (285.2 per 100,000).
- Overall in 2006, males had higher rates of emergency department discharges compared to females (478.8 per 100,000 and 248.7 per 100,000, respectively). This was not the case for infants less than 1 where female rates were higher than male rates.

**Figure 64. Assault-related Hospital Stays, by Leading Cause, MA Residents Ages 0-19, 2006 (N=450)**



**Figure 65. Assault-related Emergency Department Discharges by Leading Cause, MA Residents Ages 0-19, 2006 (N=5,976)**



- In 2006, the leading cause (65.6%) of homicide among youth ages 0-19 was firearms (data not depicted).
- The leading causes of nonfatal assault related hospital stays among children and youth ages 0-19 was struck by/against (29%). Firearms (27%) were the second leading cause of assault-related hospital stays followed by cut/pierce (21%).

## Appendix

**Total (all intents) Fatal and Nonfatal Injury-related Crude and Age-Adjusted Rates by County and EOHHS Region, MA Residents Ages 0-19, 2006**

<b>County</b>	<b>Fatal</b>	<b>Nonfatal</b>	<b>Total</b>	<b>Crude Rate</b>	<b>Age-Adjusted Rate</b>	<b>Lower 95% CI</b>	<b>Upper 95% CI</b>
Barnstable	6	7,647	7,653	16,642.0	16,211.2	15,880.3	16,542.0
Berkshire	3	6,382	6,385	20,904.3	20,225.9	19,779.0	20,672.8
Bristol	15	22,471	22,486	15,930.6	15,832.3	15,643.7	16,020.9
Dukes	0	759	759	22,343.2	22,049.5	20,668.2	23,430.8
Essex	13	26,477	26,490	13,075.2	13,103.0	12,956.6	13,249.5
Franklin	1	2,585	2,586	15,842.7	15,376.8	14,829.6	15,924.0
Hampden	15	17,672	17,687	13,913.5	13,743.2	13,555.4	13,930.9
Hampshire	3	3,845	3,848	10,615.2	10,780.9	10,441.6	11,120.2
Middlesex	29	41,634	41,663	11,500.5	11,487.1	11,383.5	11,590.6
Nantucket	0	573	573	27,350.8	27,996.3	26,082.3	29,910.2
Norfolk	15	20,030	20,045	12,045.5	12,075.7	11,919.5	12,231.8
Plymouth	16	17,811	17,827	13,048.2	13,011.5	12,834.6	13,188.5
Suffolk	22	18,795	18,817	12,105.6	12,016.3	11,853.5	12,179.1
Worcester	24	28,503	28,527	13,435.9	13,351.9	13,208.1	13,495.7

<b>EOHHS Region</b>	<b>Fatal</b>	<b>Nonfatal</b>	<b>Total</b>	<b>Crude Rate</b>	<b>Age-Adjusted Rate</b>	<b>Lower 95% CI</b>	<b>Upper 95% CI</b>
Region 1 (Western)	21	30,988	31,009	14,600.4	14,262.0	14,113.9	14,410.1
Region 2 (Central)	26	30,689	30,715	13,269.3	13,197.7	13,060.7	13,334.7
Region 3 (Northeast)	29	43,684	43,713	12,807.0	12,844.6	12,732.7	12,956.4
Region 4 (Metro West)	28	41,045	41,073	11,293.6	11,283.3	11,180.7	11,385.9
Region 5 (Southeast)	35	49,038	49,073	15,162.1	15,040.2	14,918.4	15,162.0
Region 6 (Boston)	23	19,740	19,763	11,904.7	11,806.5	11,650.4	11,962.7

# Technical Notes and Methodology

## Data Sources and Inclusion Criteria:

### Injury Deaths:

Source: Registry of Vital Records and Statistics, Mass. Dept. of Public Health.

An injury death is defined as any death with an ICD-10 code of V01-Y36, Y40-Y89, U01-U03 in the underlying cause field. This includes Adverse Effects of Medical Care and Drugs.

Massachusetts residents who died in or out-of-state are included in these analyses; out-of-state residents who died in Massachusetts are *not* included.

### Injury-Related Hospitalizations:

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

An injury-related hospital discharge case is defined as:

any case having an ICD9-CM Nature of Injury Code of: 800-908, 9090-9092, 9094, 9099, 910-994, 99550-99559, 99580-99585, assigned to any of the ICD9 diagnosis fields.

Injury-related hospital discharge cases transferred to another acute care hospital or subsequently dying in the hospital are excluded from these analyses.

Massachusetts residency is based on patient's ZIP code. Only cases having a valid Massachusetts ZIP code are included in these analyses.

### Injury-Related Observation Stays:

Source: MA Outpatient Observation Bed Database, MA Division of Health Care Finance and Policy.

This database contains cases admitted to a hospital bed for observation. They are *not* included in the hospital discharge database.

An injury-related "observation" case is defined as:

any case having an ICD9-CM Nature of Injury Code of: 800-908, 9090-9092, 9094, 9099, 910-994, 99550-99559, 99580-99585, assigned to any of the ICD9 diagnosis fields.

Massachusetts residency is based on patient's ZIP code. Only cases having a valid Massachusetts ZIP code are included in these analyses.

Injury-related observation cases subsequently dying in the hospital are excluded from these analyses.

A general definition of Outpatient Observation services is defined for reporting purposes in the Case Mix Regulation 114.1 CMR 17.02 as:

*"Observation services are those furnished on a hospital's premises which are reasonable and necessary to further evaluate a patient's condition and provide treatment to determine the need for possible admission to the hospital. These services include the use of a bed and periodic monitoring by a hospital's physician, nursing and other staff."*

### Injury-Related Emergency Department Discharges:

Source: Massachusetts Emergency Department Discharge Database, MA Division of Health Care Finance and Policy.

This database contains individuals discharged from any acute care emergency department in Massachusetts. These cases are *not* included in the hospital discharge or observation bed stay databases.

An emergency department injury-related case is defined as:

any case having an ICD9-CM Nature of Injury Code of: 800-908, 9090-9092, 9094, 9099, 910-994, 99550-99559, 99580-99585, assigned to any of the ICD9 diagnosis fields.

Massachusetts residency is based on patient's zip code. Only cases having a valid Massachusetts ZIP code are included in these analyses.

Injury-related emergency department cases subsequently dying in the hospital are excluded from these analyses.

Population Source:

National Center for Health Statistics. Estimates of the July 1, 2000-July 1, 2006, United States resident population from the Vintage 2006 postcensal series by year, county, age, sex, race, and Hispanic origin, prepared under a collaborative arrangement with the U.S. Census Bureau. Available on the Internet from:

<http://www.cdc.gov/nchs/about/major/dvs/popbridge/popbridge.htm>. August 16, 2006.

### **Residency:**

Analyses for injury *deaths* include Massachusetts residents who died in or out-of-state. All other analyses include Massachusetts residents admitted and released from a Massachusetts acute care hospital or treated and discharged from an emergency department. Massachusetts residents treated at hospitals out of state are not included. Non-Massachusetts residents were excluded from *all* analyses presented in this report.

### **External Cause (E-Code) Rates:**

Among hospital discharge data, 96% of cases for which there was an injury assigned to one of the diagnostic fields had an external cause code provided. Among observation bed stay data the percentage was 84.6% and among emergency department data, the percentage was 98.6%. Overall, external cause codes were assigned to 98.3% of all injury-related cases.

### **Data Limitations and Exclusions:**

Limitations of Small Numbers: Cells in some tables contain small numbers. Rates and proportions based on fewer than five observations are suppressed, and trends based upon small numbers (<20) should be interpreted cautiously as rates can fluctuate greatly from year to year with even a small increase or decrease in the number of cases.

Exclusions: Due to data quality issues, the external cause of injury codes (E-Codes) for two hospitals, were excluded from all ED analysis. Total injury counts presented in this report include primary diagnostic codes for these hospitals, but associated diagnostic codes have been excluded.

**Rates:**

All rates reported are per 100,000 individuals.

**Crude Death Rate**

The crude death rate represents the “true” number of occurrences of a health event in a specified time and population per unit time. It is calculated as follows.

Formula:

$$\text{Crude Rate} = \frac{\text{\# of resident injury deaths (or injuries) in a year}}{\text{resident population for that year}} \times 100,000$$

**Age-Adjusted Rate**

A summary rate designed to minimize the distortions created by differences in age distribution when comparing rates for populations with different age compositions. Age-adjusted rates are useful when comparing death rates from different populations or in the same population over time. For example, if one wished to compare the 1998 death rates between Barnstable County (Cape Cod) and Hampshire County, the age-adjusted formula would account for the fact that 24% of the Barnstable County residents were 65 years of age or older, whereas only 11% of the Hampshire County residents were in this age group.

Age-adjusted rates are calculated by weighting the age-specific rates for a given year by the age distribution of a standard population. The weighted age-specific rates are then added to produce the adjusted rate for all ages combined.

**Age-Specific Rate**

A rate for a specified age group is calculated by dividing the actual number of cases in a given year for a specific age group by the population in that age group for that year. The numerator (number of cases) and the denominator (population) refer to the same age group.

Formula:

$$\text{Age-specific Rate (for ages 25-34)} = \frac{\text{\# of injury deaths (or injuries) among residents (ages 25-34) in a given year}}{\text{population of residents (ages 25-34) in that year}} \times 100,000$$



## Recommended Framework of E-code Groupings for Presenting Injury Morbidity Data\*

Mechanism/Cause	Manner/Intent				
	Unintentional	Self-inflicted	Assault	Undetermined	Other
Cut/pierce	E920.0-.9	E956	E966	E986	E974
Drowning/submersion	E830.0-.9, E832.0-.9 E910.0-.9	E954	E964	E984	
Fall	E880.0-E886.9, E888	E957.0-.9	E968.1	E987.0-.9	
Fire/burn: Fire/flame	E890.0-E899	E958.1	E968.0, E979.3	E988.1	
Fire/burn: Hot object/substance	E924.0-.9	E958.2,.7	E961, E968.3	E988.2,.7	
Firearm	E922.0-.3,.8, .9	E955.0-.4	E965.0-4, E979.4	E985.0-.4	E970
Machinery	E919 (.0-.9)				
Motor vehicle traffic	E810-E819 (.0-.9)	E958.5	E968.5	E988.5	
Occupant	E810-E819 (.0,.1)				
Motorcyclist	E810-E819 (.2,.3)				
Pedal cyclist	E810-E819 (.6)				
Pedestrian	E810-E819 (.7)				
Unspecified	E810-E819 (.9)				
Pedal cyclist, other	E800-E807 (.3) E820-E825 (.6), E826.1,.9 E827-E829(.1)				
Pedestrian, other	E800-807(.2) E820-E825(.7) E826-E829(.0)				
Transport, other	E800-E807 (.0,.1,.8,.9) E820-E825 (.0-.5,.8,.9) E826.2-8 E827-E829 (.2-.9), E831.0-.9, E833.0-E845.9	E958.6		E988.6	
Natural/environmental	E900.0-E909, E928.0-.2	E958.3		E988.3	
Dog bites	E906.0				
Overexertion	E927				
Poisoning	E850.0-E869.9	E950.0-E952.9	E962.0-.9	E980.0-E982.9	E972
Struck by, against	E916-E917.9		E960.0; E968.2		E973, E975
Suffocation	E911-E913.9	E953.0-.9	E963	E983.0-.9	
Other specified and classifiable	E846-E848, E914-E915, E918, E921(0-.9), E922(.4, .5), E923(0-.9), E925.0-E926.9, E928(.3- .5), E929(0-.5)	E955(.5,.6,.7,.9), E958(.0,.4)	E960.1, E965(.5- .9), E967(.0-.9), E968(.4,.6, .7), E979(0-.2), E979(.5-.9)	E985(.5,.6,.7), E988(.0,.4)	E971, E978, E990- E994, E996, E997(0-.2)
Other specified, not elsewhere classifiable	E928.8, E929.8	E958.8, E959	E968.8, E969	E988.8, E989	E977, E995, E997.8, E998, E999
Unspecified	E887, E928.9, E929.9	E958.9	E968.9	E988.9	E976, E997.9
Adverse effects: Medical care					E870-E879
Adverse effects: Drugs					E930.0-E949.9
All injury by Intent	E800-E869, E880-E929	E950-E959	E960-E969, E979	E980-E989	E970-E978, E990-E999
All external causes	E800-E999				

\*Modified version of the CDC Recommended E-Code Groupings for Presenting Injury Morbidity, National center for Injury Prevention and Control, Centers for Disease Control and Prevention.

## Recommended Framework of E-Code Groupings for Presenting Injury Mortality Data\*

Mechanism/Cause	Manner/Intent				
	Unintentional	Self-inflicted	Assault	Undetermined	Other
Cut/pierce	W25-W29, W45	X78	X99	Y28	Y35.4
Drowning/submersion	W65-W74	X71	X92	X21	
Fall	W00-W19	X80	Y01	Y30	
Fire/burn: Fire/flare	X00-X09	X76	X97, U01.3	Y26	
Fire/burn: Hot object/substance	X10-X19	X77	X98	Y27	Y36.3
Firearm	W32-W34	X72-X74	X93-X95, U01.4	Y22-Y24	Y35.0
Machinery	W24, W30-W31				
Motor vehicle traffic:					
Occupant	V30-V79 (.4-.9), V83-V86 (.0-.3)				
Motorcyclist	V20-V28 (.3-.9), V29 (.4-.9)				
Pedal cyclist	V12-V14 (.3-.9), V19 (.4-.6)				
Pedestrian	V02-V04 (.1, .9), V09.2				
Other	V80 (.3-.5), V81.1, V82.1				
Unspecified	V87 (.0-.8), V89.2				
Pedal cyclist, other	V10-V11, V12-V14 (.0-.2), V15-V18, V19 (.0-.3, .8, .9)				
Pedestrian, other	V01, V02-V04 (.0), V05, V06, V09 (.0, .1, .3, .9)				
Land Transport, other	V20-V28 (.0-.2), V29 (.0-.3), V30-V79 (.0-.3), V80 (.0-.2, .6-.9), V81-V82 (.0, .2-.9), V83-V86 (.4-.9), V87.9, V88 (.0-.9), V89 (.0, .1, .3, .9)	X82	Y03	Y32	
Transport, other	V90-V99		U01.1		Y36.1
Natural/environmental	W42-W43, W53-W64, W92-W99, X20-X39, X51-X57				
Overexertion	X50				
Poisoning	X40-X49	X60-X69	X85-X90, U01(.6, .7)	Y10-Y19	Y35.2
Struck by, against	W20-W22, W50-W52	X79	Y00, Y04	Y29	Y35.3
Suffocation	W75-W84	X70	X91	Y20	
Other specified and classifiable	W23, W35-W41, W44, W49, W85-W91, Y85	X75, X81, U03.0	X96, Y02, Y05-Y07, U01 (.0, .2, .5)	Y25-Y31	Y35 (.1, .5), Y36 (.0, .2, .4-.8)
Other specified, not elsewhere classifiable	X58, Y86	X83, Y87.0	Y08, Y87.1, U01.8, U02	Y33, Y87.2	Y35.6, Y89 (.0, .1)
Unspecified	X59	X84, U03.9	Y09, U01.9	Y34, Y89.9	Y35.7, Y36.9
Adverse effects: Medical care					Y40-Y59, Y88.0
Adverse effects: Drugs					Y60-Y84, Y88 (.1-.3)
All injury by Intent	V01-X59, Y85-Y86	X60-X84, Y87.0, U03	X85-Y09, Y87.1, U01, U02	Y10-Y34, Y87.2, Y89.9	Y35-Y36, Y89.0, Y89.1
All external causes	V01-Y36, Y85-Y87, Y89, U01-U03				

\*CDC Recommended E-Code Groupings for Presenting Injury Mortality, National Center for Injury Prevention and Control, Centers for Disease Control and Prevention.

## Interpretation of Selected E Codes

The following list provides sample scenarios to assist with the interpretation of selected ICD9 External Cause of Injury codes. This is *not* a comprehensive listing.

<i>Injury Cause</i>	<b>Intent</b>	<b>ICD-9 E Codes</b>	<b>Sample</b>
Fall	Assault-Related	E968.1	Pushed down a flight of stairs.
	Self-Inflicted	E957.0-E957.9	Jumped off building with intent to harm self
	Unintentional	E880.0-E886.9 E888	Fell from bed. Tripped down stairs. Slipped on ice. Fell during football game.
Fire/Burn	Assault-Related	E961, E968.0, E968.3	Purposely burned by boiling water thrown by another person.
	Self-Inflicted	E958.1, E958.2, 958.7	Purposely burned oneself with cigarette.
	Unintentional	E890.0-E899 E924.0-E924.9	Spilled hot coffee. Burned on stove. Burned in bath water that was too hot.
Motor Vehicle Traffic -Motorcycle	Unintentional	E810-E819(.2, .3)	Rider injured in crash with truck. Motorcycle slid on gravel.
Motor Vehicle Traffic -Occupant	Self-Inflicted	E958.5	Driver purposely ran into telephone pole.
Motor Vehicle Traffic -Occupant	Unintentional	E810-E819(.0, .1)	Car rear-ended at stop sign. Head on collision with another car. .0 indicates driver, .1 indicates passenger
Motor Vehicle Traffic -Unspecified	Unintentional	E810-E819(.8, .9)	Injury to someone involved in motor vehicle crash but unknown if occupant, or other, etc.
Overexertion	Unintentional	E927	Pulled muscle during sports. Twisted ankle walking down stairs. Injured back lifting heavy boxes.
Pedal Cycle: motor vehicle & non-motor vehicle- related	Unintentional	E810-E819(.6) E800-E807(.3) E820-E825(.6) E826.1 E826.9 E827-E829(.1)	Hit by a car while riding bike in the street. Fell off bike on mountain trail. Ran into a pedestrian on the sidewalk. Ran into a dog with tricycle.
Pedestrian: motor vehicle & non-motor vehicle- related	Unintentional	E810-E819(.7) E800-E807(.2) E820-E825(.7) E826-E829(.0)	Hit by car while walking across street. Collision with bicycle courier. Run over by three-wheeler.
Poisoning	Assault-Related	E962.0-E962.9	Was served drink intentionally laced with pesticide.
	Self-Inflicted	E950.0-E952.9	Purposely breathed exhaust fumes from car. Intentional overdose of sleeping pills.
	Unintentional	E850.0-E869.9	Child drank cleanser from bottle under sink. Unknowingly ate poisonous mushroom.
Nature/Environment: (e.g., animal bites, insect stings, exposure to cold/heat, earthquake, etc.)	Unintentional	E905.0-E905.6 E905.9 E906.0-.5 E906.9	Bitten by any animal, including dog, cat, rat, or snake. Bitten or stung by an insect, including bee, wasp, spider, scorpion.
Struck by/against	Unintentional	E916-918	Struck by falling box. Crushed fingers in car door. Collided with another player during football game.
Suffocation/hanging	Assault-Related	E963	Person strangled.
	Self-Inflicted	E953.0-E953.9	Hanged self.
	Unintentional	E911-E913.9	Choked on piece of meat.

## Selected Class of Agents (drug/medication) for Poisoning/Overdose Cases

Class of Agent	Examples
Antibiotics	Penicillins, Chloramphenicol Group, Tetracycline Group, Cephalosporin Group, Antimycobacterial
Analgesics, Antipyretics, and Antirheumatics	Heroin, Methadone, Other Opiates and related Narcotics, Salicylates, Aromatic Analgesics-not elsewhere classified, Pyrazole Derivatives, Antirheumatics (antiphlogistics), Other Non-Narcotic Analgesics, Other and Unspecified Analgesics and Antipyretics
Sedatives and Hypnotics	Barbiturates, Chloral Hydrate Group, Paraldehyde, Bromine Compounds, Methaqualone Compounds, Glutethimide Group, Mixed Sedatives, Other and Unspecified Sedatives and Hypnotics
Other Central Nervous System Depressants and Anesthetics	Central Nervous System Muscle-Tone Depressants, Halothane, Other Gaseous Anesthetics, Intravenous Anesthetics, Other and Unspecified General Anesthetics, Peripheral Nerve- and Plexus-Blocking Anesthetics, Spinal Anesthetics, Other and Unspecified Local Anesthetics
Psychotropic Agents	Antidepressants, Phenothiazine-based Tranquilizers, Butyrophenone-based Tranquilizers, Other Antipsychotics, Neuroleptics, and Major Tranquilizers, Benzodiazepine-based Tranquilizers, Other Tranquilizers, Psychodysleptics (Hallucinogens), Psychostimulants, Other and Unspecified Psychotropic Agents
Central Nervous System Stimulants	Analeptics, Opiate Antagonists, Other Specified and Unspecified Central Nervous System Stimulants
Drugs Primarily Affecting the Autonomic Nervous System	Parasympathomimetics (Cholinergics), Parasympatholytics (Anticholinergics and Antimuscarinics) and Spasmolytics, Sympathommetics (Adrenergics), Sympatholytics (Antiadrenergics), Unspecified Drug Primarily Affecting the Autonomic Nervous System
Agents primarily affecting the cardiovascular system	Cardiac Rhythm Regulators, Cardiotonic Glycosides, Antilipemic and Antiarteriosclerotic Drugs, Ganglion-blocking agents, Coronary Vasodilators, Other Antihypertensive Agents
Hormones and Synthetic Substitutes	Adrenal Cortical Steroids, Androgens and Anabolic Congeners, Ovarian Hormones and Synthetic Substitutes, Insulins and Antidiabetic Agents, Anterior Pituitary Hormones, Posterior Pituitary Hormones, Parathyroid and Parathyroid Derivatives, Thyroid and Thyroid Derivatives, Antithyroid Agents, Other and Unspecified Hormones and Synthetic Substitutes