

Adult Injuries in North Carolina 2007 to 2010

Injury & Violence Prevention Branch
North Carolina Division of Public Health

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Injuries to Adults in North Carolina: 2007-2010

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1. Overview of Adult Injury in North Carolina: 2007-2010

Introduction

Injury is a serious and largely preventable problem that threatens the health and well-being of Americans aged 35 - 64. Unintentional and self-inflicted injury (suicide) were ranked among the top ten leading causes of death in adults from 2007 to 2009, resulting in more than 207,756 deaths combined in the United States (Centers for Disease Control and Prevention (CDC), 2012a). Injury is also a significant cause of morbidity in adults with 1.9 million non-fatal injuries resulting in adults being hospitalized between 2007 and 2009 in the United States. With the exception of assault, the remaining top ten causes of nonfatal injury were unintentional (CDC, 2012b). A recent 2010 report shows that the leading cause of non-fatal injuries among adults ages 35 - 64 resulting in treatment in emergency departments is unintentional falls (CDC, 2012c). Adult injuries reduce workplace productivity, create considerable economic burden, and place substantial stress on the health and well-being of the individuals and their families.

This report provides an overview of the public health burden of injury in adults ages 35 - 64 in the state of North Carolina. To evaluate the scope of the problem of adult injury, analyses were performed of adult injury deaths from 2007 to 2010, hospitalizations from 2007 to 2009, and emergency department visits from 2009 to 2010 with stratification by type of injury, age and gender. All injury death, hospitalization and emergency department visit rates were calculated per 100,000 persons in the North Carolina adult population over the specified time interval. In addition, injury hospitalization charges were calculated to provide an estimate of the economic impact of adult injury in North Carolina. The methodology and data sources analyzed for this report are defined in Appendix A. The reporting format and content are based on prior reports by the UNC Injury Prevention Research Center and the North Carolina Division of Public Health (2010) *Older Adult Injuries in North Carolina: 2004-2007* report and the (2010) *Adolescent and Young Adult Injury Report for North Carolina: 2007 to 2010* report.

This report is intended to provide state and local health officials, policy-makers, researchers, and the public with information to guide prioritization of resources, development of strategies, and evaluation of programs in the prevention of adult injury in North Carolina. It is crucial for adults to prevent injury in order to support and promote long, healthy and productive lives. According to the CDC, drug overdoses have tripled since the early nineties. In 2009, more than 90 percent of unintentional poisonings in the nation were drug-related; the more commonly used drugs, prescription painkillers, reflect the recent epidemic in the United States that is mirrored in North Carolina. Adults aged 45 - 49 had the highest death rates due to overdose and were more likely to visit an emergency department for treatment from an unintentional poisoning in 2009 (CDC, 2012d). Another cause for concern for adults is suicide. Since 1991, trends in adult suicide rates have increased for age groups 35 - 64, with rates for adults ages 45 - 54 at an all-time high in 2009 (CDC, 2012e). These trends highlight the importance of injury as a public health problem for adults as well as injury prevention as a program priority.

This report focuses on the leading causes of injury in adults between the ages of 35 and 64 in North Carolina from 2007 to 2010, including unintentional injuries (poisonings, motor vehicle crashes, falls, and fire/burns), self-inflicted injuries, and assault injuries. Unintentional injuries account for the largest percentage of injury-related fatalities among adults ages 35 - 64, with unintentional poisonings and motor vehicle injuries together responsible for nearly 47 percent of adult injury-related fatalities and \$596 million in hospitalization charges between 2007 and 2010. The leading cause of adult death from 2007 to

2010 was all causes or mechanisms of suicide, or self-inflicted injury, followed by unintentional poisoning and motor vehicle injury.

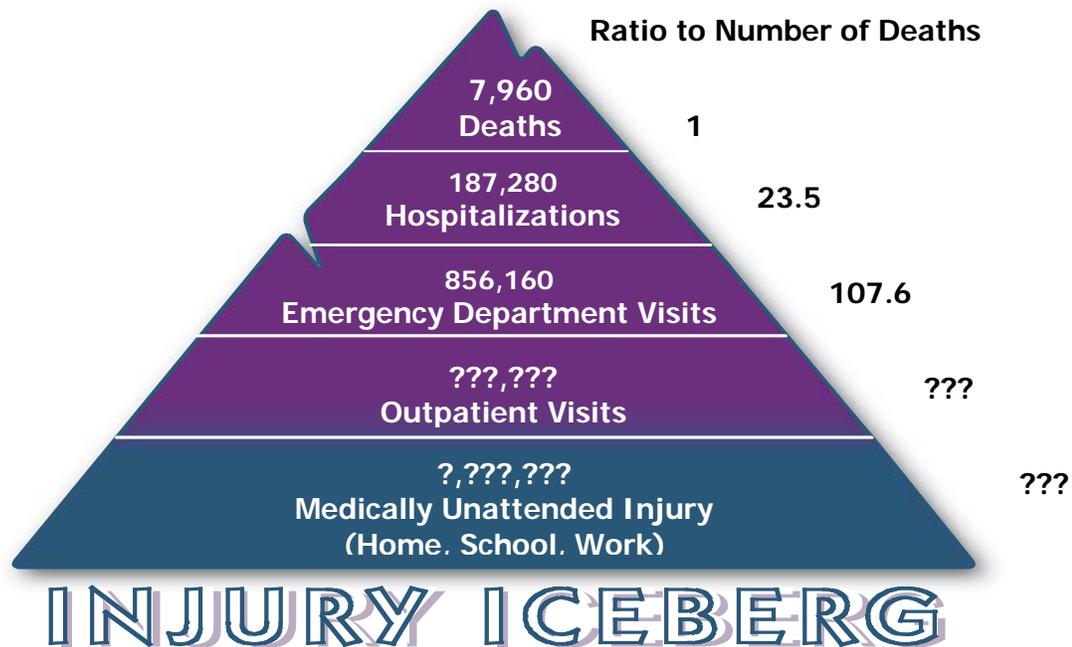
This report attempts to summarize a piece of the adult injury problem in North Carolina. Deaths, hospitalizations, and emergency department visits typically result from the more critical or serious injury cases. However, this report does not reflect the scope of the adult injury problem because some injuries, such as those that are treated at outpatient centers or those that go untreated, are excluded from this report.

Injury is a multi-level issue that is effectively illustrated as an iceberg (Figure 1), with descriptions of the level of severity of injury as well as the extent of medical care required or sought out. Though the portion of this injury iceberg that is often most unsettling and observable is the very tip, or the injury-related fatalities, this only represents a small portion of the injury burden on adults. As evidenced by the iceberg, adult injuries that result in hospitalization or an emergency department visit are much more common than injuries that result in death. For every adult injury-related death, there were approximately 24 hospitalizations and 108 emergency department visits for all types of adult injuries in North Carolina between 2007 and 2009.

The full extent of injury-related morbidity and mortality among adults in North Carolina would not only include deaths, hospitalizations, and emergency department visits for injury but would also capture those adults who visit outpatient centers, such as urgent care centers, for injury-related reasons or who choose not to seek medical attention. The numbers for adult injury across North Carolina from 2007 to 2010 are likely to be underestimated in this report since the numbers for adults visiting outpatient centers and adults who choose not to seek medical attention were not available.

Despite the limitation of available data on less severe injury outcomes, the prevalence of injury presented in this report underscores the importance of efforts to prevent adult injury in the state of North Carolina. Preventing the most severe injury outcomes of death, hospitalization and visits to the emergency department is vital to mitigating the loss of health, independence and productivity of adults ages 35 - 64.

FIGURE 1: Injury Iceberg, North Carolina Adult Injuries, Ages 35-64: 2007-2009. Injury and Violence Prevention Branch, Chronic Disease and Injury Section, Division of Public Health.



The Problem of Adult Injury

Among North Carolina adults ages 35 - 64, injuries resulted in 10,527 deaths (71 per 100,000) from 2007 to 2010, 187,280 hospitalizations (1,694 per 100,000) from 2007 to 2009, and 587,453 emergency department visits (7,763 per 100,000) from 2009 to 2010 in North Carolina. Mortality rates were fairly stable across all age groups with peaks around ages 45 - 49 (80 per 100,000) and 50 - 54 (78 per 100,000) from 2007 to 2010. However, opposing trends in hospitalization rates and emergency department visit rates were seen across age groups. For example, adults ages 60 - 64 had the highest hospitalization rate for 2007 to 2009 (2,696 per 100,000) while they had the lowest emergency department visit rate (6,154 per 100,000) for 2009 to 2010).

Sixty-four percent of adult deaths were caused by unintentional injuries (Figure 2) as were 28 percent of adult hospitalizations (Figure 3) and 69 percent of adult emergency department visits (Figure 4). Unintentional injuries alone resulted in 6,690 adult deaths (50 per 100,000) between 2007 and 2010 in North Carolina. Similarly, unintentional injuries led to 53,320 hospitalizations (482 per 100,000) from 2007 to 2009 and 404,849 emergency department visits (5,350 per 100,000) from 2009 to 2010 for adults.

Figure 2 shows that 25 percent of adult deaths were the result of a self-inflicted injury, or suicide, and 8 percent were from an assault (homicide). The remaining 3 percent have undetermined intent or resulted from some other mechanism. Figure 3 points out that injuries with undetermined intent or mechanism are responsible for a much larger percentage (41%) of hospitalizations among adults ages 35 to 64. Assault injuries account for only 2 percent of hospitalization and self-inflicted injuries only 5 percent. Nearly a quarter of injury-related hospitalizations among adults were missing intent information.

Twenty percent of emergency department visits for adult injuries are also missing intent information (Figure 4). The remaining 11 percent of visits for treatment for adult injuries are comprised of undetermined intent (6%), assault (4%), and self-inflicted injury (1%).

FIGURE 2: N.C. Adult Injury Deaths by Intent, Age 35-64: 2007-2010 (N=10,527)

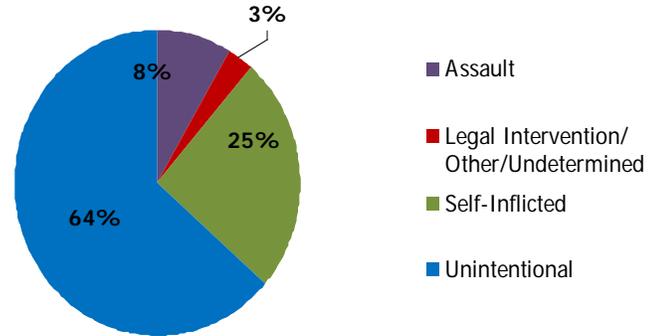


FIGURE 3: N.C. Adult Injury Hospitalizations by Intent, Age 35-64: 2007-2009 (N=187,280)

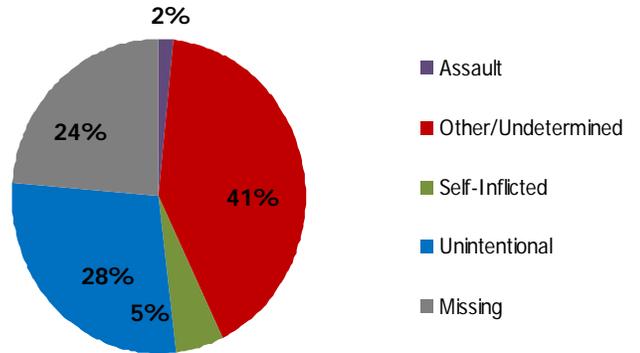
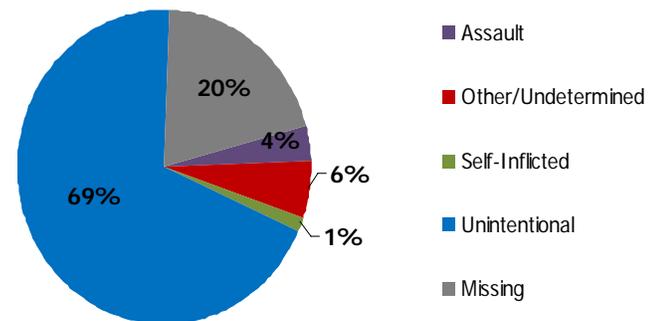


FIGURE 4: N.C. Adult Injury Emergency Department Visits by Intent, Age 35-64: 2009-2010 (N=587,453)



Leading Causes of Adult Injury

Though unintentional injury accounts for the largest percentage of adult deaths, self-inflicted injury (suicide) was the leading cause of death among adults ages 35 - 64 for 2007-2010 and the fourth leading cause of hospitalization from 2007-2009. Suicides accounted for 2,634 deaths (25%) and 9,666 hospitalizations (5%) and were primarily a combination of firearm (55%), poisoning (24%), and suffocation (17%) injuries. Unintentional poisonings and motor vehicle crashes accounted for nearly half of adult injury deaths. Unintentional poisonings resulted in 24 percent of deaths and motor vehicle crashes 23 percent (Table 1). Neither was a major cause of hospitalizations or emergency department visits. Among hospitalizations (24%) and emergency department visits (20%) a large percentage of injury-related intent information is missing or unknown for adults. However, unintentional falls remain a leading cause of hospitalizations (10%) and emergency department visits (19%).

TABLE 1: N. C. Leading Types of Adult Injury Deaths, Age 35 - 64: 2007-2010 (N=10,527)		TABLE 2: N. C. Leading Types of Adult Injury Hospitalizations, Age 35 - 64: 2007-2009 (N=187,280*)		TABLE 3: N. C. Leading Types of Adult Injury Emergency Department Visits, Age 35 - 64: 2009-2010 (N=587,453*)	
Injury Type	Number of Deaths	Injury Type	Number of Hospitalizations	Injury Type	Number of Visits
Self-Inflicted (Suicide)	2,634	Adverse Effects (Other)	74,141	Missing Cause/Intent	119,720
Poisoning (Unintentional)	2,528	Missing Cause/Intent	44,065	Fall (Unintentional)	112,499
Motor Vehicle (Unintentional)	2,396	Fall (Unintentional)	17,029	Motor Vehicle (Unintentional)	67,142
Assault (Intentional)	879	Suicide (Self-Inflicted)	9,666	Unspecified (Unintentional)	47,035
Fall (Unintentional)	453	Motor-Vehicle (Unintentional)	9,283	Overexertion (Unintentional)	45,718
Unspecified (Unintentional)	207	Poisoning (Unintentional)	5,951	Struck (Unintentional)	33,895
Fire/Burn (Unintentional)	197	Unspecified (Unintentional)	5,773	Adverse Effects (Other)	30,433
Suffocation (Unintentional)	172	Otherspec/class (Unintentional)	4,582	Cut/Pierce (Unintentional)	26,569
Drowning (Unintentional)	162	Assault (Intentional)	3,290	Natural/Environ (Unintentional)	22,995
All other causes	899	All other causes	13,500	All other causes	81,447
Total	10,527	Total	187,280	Total	587,453

*5 were unknown/missing gender

*16 were unknown/missing gender

Causes of Adult Unintentional Injury

Unintentional injury deaths accounts for 64 percent of the total number of adult injury deaths, highlighting their significance among this age group. The most significant causes of unintentional injury-related morbidity and mortality include poisonings, motor vehicle crashes, and falls. These specific causes of injury to adults age 35 - 64 in North Carolina had the highest percentage of unintentional-related injury deaths, hospitalizations, and emergency department visits for 2007 to 2010.

In particular, poisoning (38%) and motor vehicle crashes (36%) were the first and second leading causes of unintentional adult injury-related death for 2007-2010. Poisonings were the third leading cause of unintentional injury-related hospitalizations (11%) but result in a smaller percentage of emergency department visits. However, unintentional motor vehicle crashes were the second leading cause of unintentional injury-related hospitalizations (17%) and the second leading cause of emergency department visits (17%).

Tables 2 and 3 show that falls were the leading cause of unintentional injury-related hospitalizations and emergency department visits among adults ages 35 - 64 for unintentional injuries. Unintentional falls caused 32 percent of all hospitalizations from 2007 to 2009 and 28 percent of all emergency department visits from 2009 to 2010 for unintentional injuries. Falls were ranked the third leading cause of unintentional injury-related death in Table 1 (7%) with 453 deaths between 2007 and 2010.

TABLE 4: N.C. Leading Types of Adult Unintentional Injury Deaths, Age 35-64: 2007-2010 (N=6,690)		TABLE 5: N.C. Leading Types of Adult Unintentional Injury Hospitalizations, Age 35-64: 2007-2009 (N=53,320)		TABLE 6: N.C. Leading Types of Adult Unintentional Injury Emergency Department Visits, Age 35-64: 2009-2010 (N=404,849)	
Unintentional Injury Type	Number of Deaths	Unintentional Injury Type	Number of Hospitalizations	Unintentional Injury Type	Number of Visits
Poisoning	2,528	Fall	17,029	Fall	112,499
Motor Vehicle	2,396	Motor Vehicle	9,283	Motor Vehicle	67,142
Fall	453	Poisoning	5,951	Unspecified	47,035
Unspecified	207	Unspecified	5,773	Overexertion	45,718
Fire/Burn	197	Otherspec/class	4,582	Struck	33,895
Suffocation	172	Natural/Environ	2,078	Cut/pierce	26,569
Drowning	162	Transport/other	1,452	Natural/Environ	22,995
Otherspec/class	87	Fire/Burn	1,308	Otherspec/class	15,402
Natural/Environ	77	Struck	1,246	Otherspec/NEC	8,898
Otherlandtransport	76	Otherspec/NEC	1,165	Poisoning	6,741
Pedestrian, other	67	Overexertion	931	Fire/Burn	6,448
All Other Causes	268	All Other Causes	2,522	All Other Causes	11,507
Total	6,690	Total	53,320	Total	404,849

*NEC = not classified elsewhere

Deaths, Hospitalizations, and Emergency Department Visits by Age and Gender

Adult injury mortality rates are displayed by age and gender in Figure 5 for 2007 to 2010. Both male and female rates tend to increase over time and peak at middle age (ages 45 - 54). Rates were relatively stable for both genders, however. Males consistently have higher mortality rates across all age groups than females for injury-related deaths. The age group with the highest death rate for males was 50 - 54 years (113 per 100,000) and for females was 45 - 49 years (51 per 100,000). The age group with the total combined highest mortality rate was adults aged 45 - 49 (80 per 100,000) and accounted for 21 percent of adult deaths. Adults aged 50 - 54 had a similar mortality rate of 78 deaths per 100,000 and accounted for 19 percent of adult deaths.

Figure 6 shows that as age increases, the injury hospitalization rate among adults in North Carolina increases. In every age category, males have higher rates than females. The highest hospitalization rates are seen in the oldest age group of adults aged 60 - 64. The rate for males is 2,888 hospitalizations per 100,000. This age group represents 11 percent of all hospitalizations. Females aged 60 - 64 years have a rate of 2,802 hospitalizations per 100,000 and represent 10 percent of all hospitalizations.

Unlike Figure 6, Figure 7 shows a negative trend in emergency department visits among North Carolina adults for 2009 to 2010. As age increases, the rate of emergency department visits among adults for injuries decreases. Rates for males were higher than females for younger age groups (35 - 49) but lower than females for older age groups (50 - 64).

Among males, the highest rate for visits was 9,344 per 100,000 for ages 35 - 39. Among females for the same age group, the rate was 8,904 per 100,000.

FIGURE 5: N.C. Adult Injury Deaths by Age and Gender, Age 35-64: 2007-2010 (N=10,527)

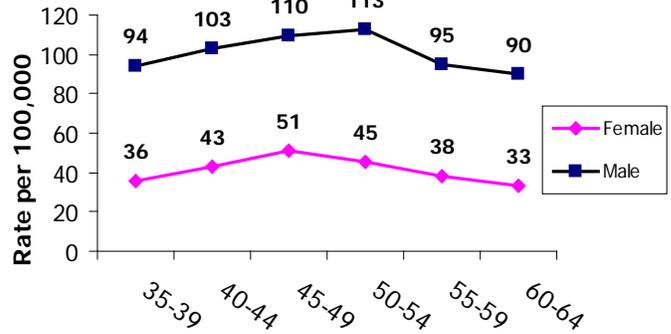


FIGURE 6: N.C. Adult Injury Hospitalizations by Age and Gender, Age 35-64: 2007-2009 (N=187,280)

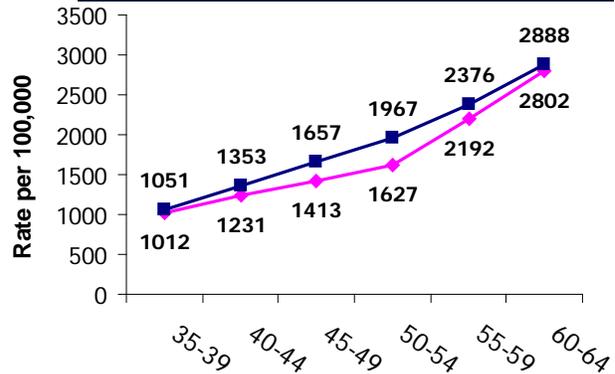


FIGURE 7: N.C. Adult Injury Emergency Department Visits by Age and Gender, Age 35-64: 2009-2010 (N=587,453)

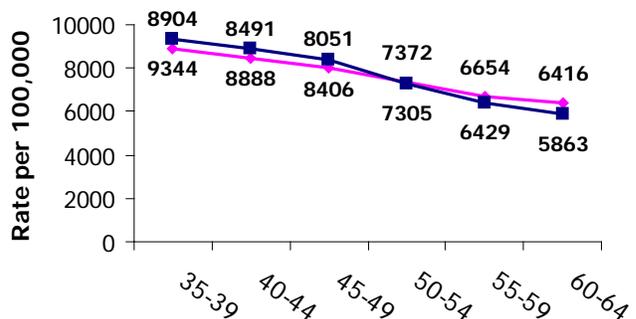
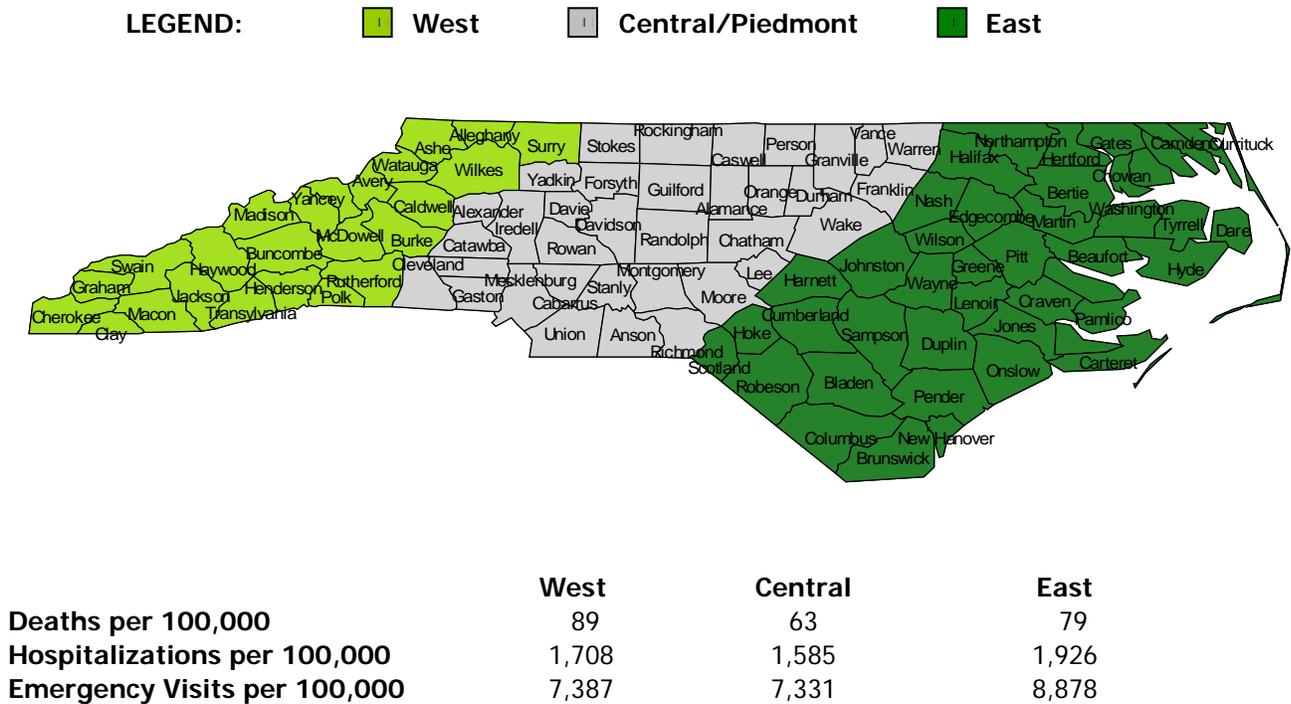


Figure 8 illustrates the adult injury rate for deaths (2007 to 2010), hospitalizations (2007 to 2009) and emergency department visits (2009 to 2010) in the western, central (Piedmont) and eastern regions of North Carolina. The eastern region appears to have the highest crude hospitalization and ED rates as a result of injury for adults, while the central region has the lowest rates for morbidity and mortality.

The adult injury fatality rate was 89 per 100,000 in the western region, 63 per 100,000 in the central region, and 79 per 100,000 in the eastern region of the state. The central region had the lowest hospitalization rate for adult injury (1,585 per 100,000) followed by the western region (1,708 per 100,000) and the eastern region (1,926 per 100,000). The central region also had the lowest rates of ED visits (7,331 per 100,000) among adults followed by the western region (7,387 per 100,000) and the eastern region (8,878 per 100,000).

FIGURE 8: North Carolina Adult Injury Rates by Region, Age 35-64
Deaths (n=10,527): 2007-2010, Hospitalizations (n=187,280): 2007-2009 and
Emergency Department Visits (n=587,453): 2009-2010



Comparison to United States and Comparison over Time

The adult injury death rates in North Carolina and the United States have slightly increased during the 10-year period from 1999 to 2009 (Figure 9). North Carolina has consistently had a higher injury death rate for adults aged 35 - 64 as compared to the United States across this time period. The most recently available adult injury death rate for both state and national level was for the year 2009. The fatality rate was 71 per 100,000 in North Carolina and 65 per 100,000 in the United States. (CDC WISQARS).

Unintentional injuries and self-inflicted injuries were the leading causes of injury-related death among this age group for both the United States and North Carolina between 2007 and 2009 (Figure 10). The United States had similar rates of unintentional poisonings and suicides (17 per 100,000) and had similar rates to North Carolina (17.7 per 100,000 and 17.3 per 100,000). The United States had slightly lower death rates than North Carolina for every injury type except drowning, with the largest discrepancy for unintentional motor vehicle deaths (17.1 per 100,000 for North Carolina versus 12.8 per 100,000 for the United States). The state injury mortality rates are representative of national rates.

FIGURE 9: Adult Injury Death Rates in North Carolina and the United States, Age 35-64: 1999-2009

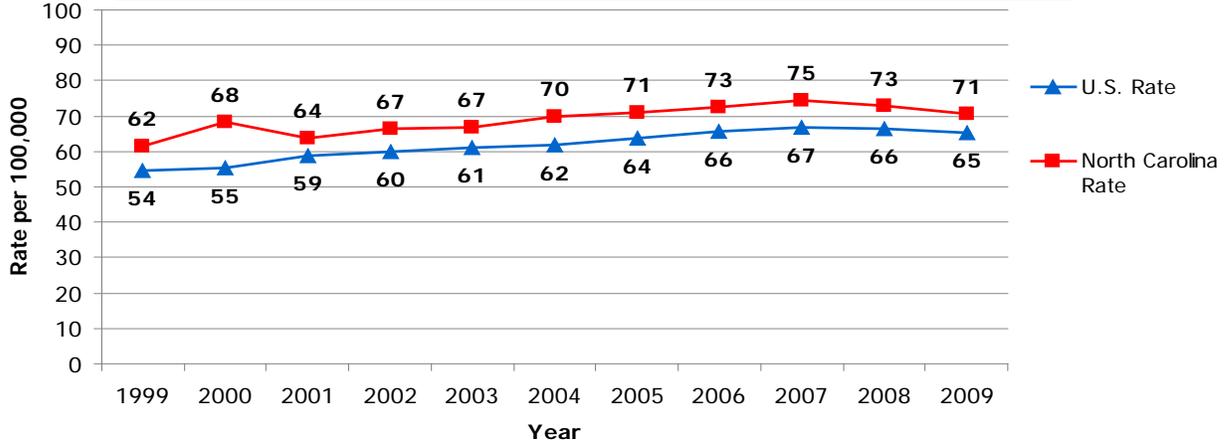
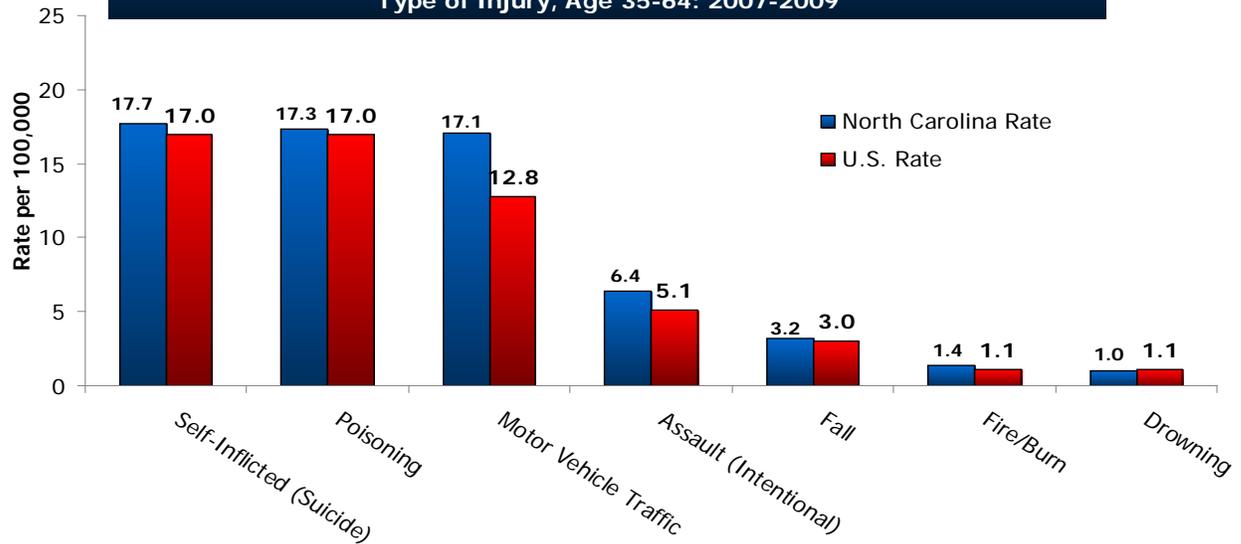


FIGURE 10: Adult Injury Death Rates in North Carolina and the United States by Type of Injury, Age 35-64: 2007-2009



Data Source: CDC WISQARS

*Note: Unintentional unless otherwise specified

Hospitalization Charges for Adult Injuries in 2007-2009

Between 2007 and 2009, hospitalizations from adult injuries generated \$2.4 billion in charges in North Carolina. Referring to Figure 11, about \$1.7 billion in charges were due to unintentional adult injuries which account for the vast majority of all hospitalization charges. Self-inflicted injuries (\$100 million) and assault (\$60 million) account for a very small percentage. Injuries with other mechanisms and intents account for about a half a billion dollars in hospitalization charges (\$500 million). These charges provide an estimate of the financial toll of the medical care requiring hospitalization for adult injuries, but do not account for the indirect costs of loss in productivity and quality of life that contribute to a greater burden on individuals and families.

Total hospitalization charges by injury type for adults in North Carolina, 2007 to 2009, are displayed in Figure 12. Injuries with mechanisms and intents that were not listed or included account for \$541 million in charges, followed by motor vehicle crashes (\$497 million), unintentional falls (\$480 million), and self-inflicted injury (\$133 million). These figures again reflect the magnitude of the burden of suicide, unintentional motor vehicle crashes, and falls on this population in particular.

Figure 13 displays the median estimated charges related to specific types of adult injury based on the estimated charge per injury. Disparities in median charges can be attributed to the differences in each separate injury case such as extent of patient trauma, type of procedure/treatment required, and length of hospital stay. The type of injury for adults aged 35 to 64 with the most expensive median hospitalization charges was unintentional suffocation (\$35,000), followed second by unintentional pedestrian (\$29,000) and other related injuries and thirdly by motor vehicle crashes (\$29,000).

FIGURE 11: Total Hospitalization Charges for Adult Injuries in North Carolina, Age 35- 64: 2007-2009

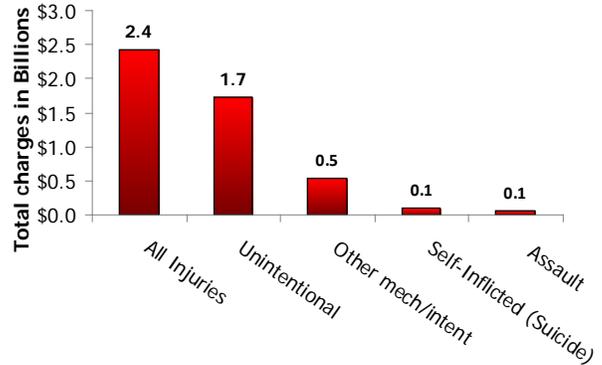


FIGURE 12: Total Hospitalization Charges for Adult Injuries in North Carolina by Type of Injury, Age 35-64: 2007-2009

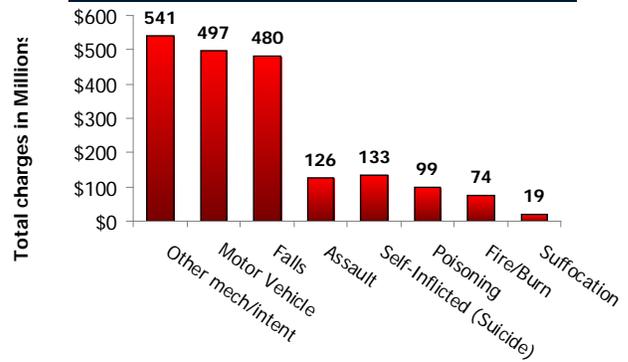
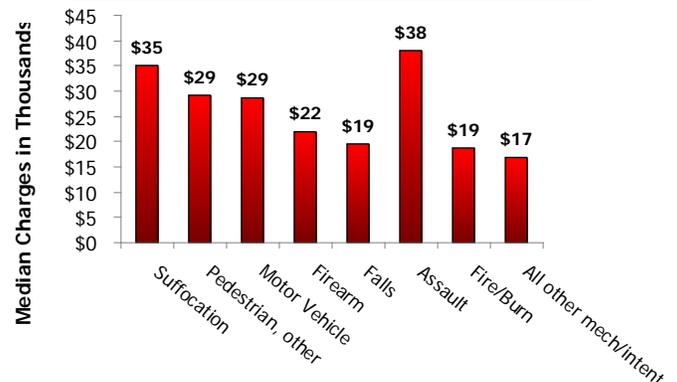


FIGURE 13: Median Hospitalization Charges for Adult Injuries in North Carolina by Type of Injury, Age 35-64: 2007-2009



*Causes = unintentional unless specified

2. Types of Adult Injury

2.1 Unintentional

Poisoning (Unintentional)

For adults in North Carolina, unintentional poisonings were the second overall leading cause of injury-related death and the leading cause of death among all unintentional injury between 2007 and 2010. Unintentional poisonings were the sixth overall leading cause of adult hospitalizations.

Between 2007 and 2010, 2,528 adults (17 per 100,000) in North Carolina died as a result of an unintentional poisoning. From 2007 to 2009, unintentional poisonings resulted in 5,591 adult hospitalizations (54 per 100,000). From 2009 to 2010, 6,741 adults (89 per 100,000) visited an emergency department for an unintentional poisoning-related injury. Table 7 shows that the total hospitalization charges due to unintentional poisonings from 2007 to 2009 are fairly high at \$99.1 million.

The mortality rate for unintentional poisoning was higher for males (21 per 100,000) than females (13 per 100,000) but the reverse was true for emergency department visits (Figure 16). Hospitalization rates were similar (Figure 15). Deaths due to unintentional poisonings were more common for adults ages 45 - 49 (23 per 100,000); adults in this age group were nearly 5 times more likely to die of an unintentional overdose than adults ages 60 - 64 (5 per 100,000). Hospitalization rates increased with age and peaked at ages 50 - 54 (62 per 100,000) but were fairly stable across groups (Figure 15). Similarly, rates for emergency department visits were stable (Figure 16) with a peak of 96 per 100,000 for ages 45 - 49.

FIGURE 14: N.C. Adults Unintentional Poisoning-Related Injury Deaths by Age and Gender, Age 35-64: 2007-2010 (N=2,528)

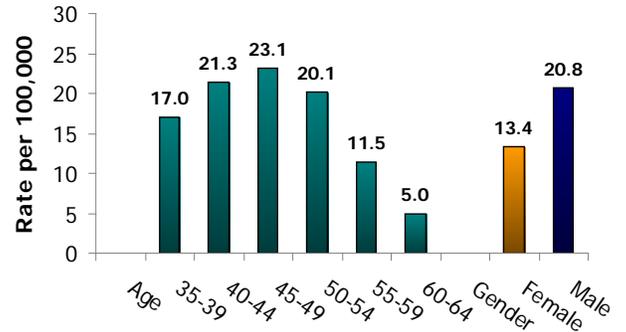


FIGURE 15: N.C. Adults Unintentional Poisoning-Related Injury Hospitalizations by Age and Gender, Age 35-64: 2007-2009 (N=5,951)

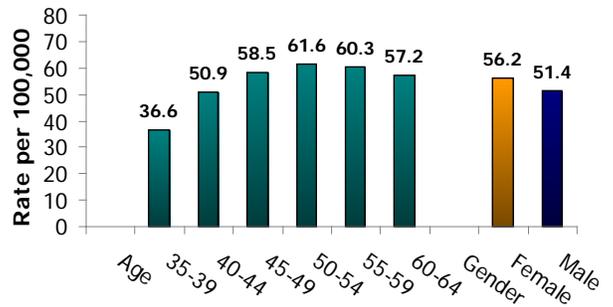


FIGURE 16: N.C. Adults Unintentional Poisoning-Related Injury Emergency Department Visits by Age and Gender, Age 35-64: 2009-2010 (N=6,741)

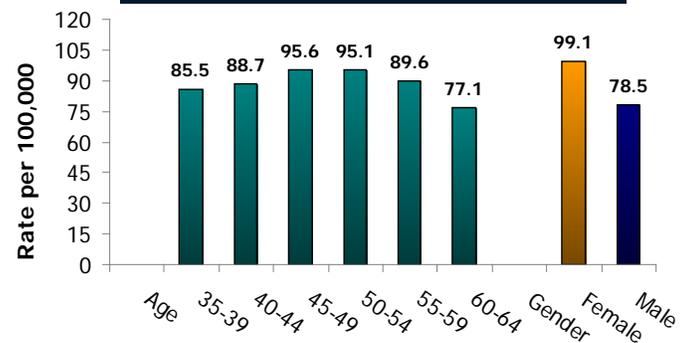


TABLE 7: Estimated Hospitalization Charges Resulting Adult Unintentional Poisoning-Related Injuries in North Carolina, Age 35-64: 2007-2009

Total Charges	\$99,128,266
Median Charges	\$10,738
Average Charges	\$16,660

Motor Vehicle Injury (Unintentional)

Unintentional motor vehicle injury was the third overall leading cause of injury deaths (16 per 100,000) and the second leading cause of death among unintentional injuries. In addition, it was the fifth overall cause of hospitalizations and third overall cause of emergency department visits for adults in North Carolina for the specified years.

Motor vehicle-related injuries in adults led to 2,396 deaths (16 per 100,000) from 2007 to 2010, 9,283 hospitalizations (84 per 100,000) from 2007 to 2009, and 67,142 emergency department visits (887 per 100,000) from 2009 to 2010. The total hospitalization charges attributed to motor vehicle injury were \$496 million among adults in North Carolina from 2007 to 2009 (Table 8). Motor vehicle injuries were ranked third highest in median charges at \$28,564 with average charges of \$53,540.

The mortality rates (Figure 17) for motor vehicle injuries were fairly equal across age groups but were three times higher for males (24 per 100,000) than for females (8 per 100,000). The hospitalization rates for motor vehicle injuries (Figure 18) remained fairly stable across age groups as well but were overall slightly higher for the younger age groups (35 - 49). The oldest age group, ages 60 - 64, had the lowest hospitalization rate of 71 per 100,000. The rate for males (110 per 100,000) was nearly twice that of females (59 per 100,000).

The rates for emergency department visits (Figure 19) among North Carolina adults tended to decrease with age, though the lowest rate of visits was for ages 50 - 54 (420 per 100,000) followed by ages 60 - 64 (542 per 100,000). Females had only a slightly higher rate of emergency department visits than males from 2009 to 2010.

TABLE 8: Estimated Hospitalization Charges Resulting from Adult Unintentional Motor-Vehicle Injuries in North Carolina, Age 35-64: 2007-2009	
Total Charges	\$496,852,311
Median Charges	\$28,564
Average Charges	\$53,540

FIGURE 17: N.C. Adults Unintentional Motor Vehicle-Related Injury Deaths by Age and Gender, Age 35-64: 2007-2010 (N=2,396)

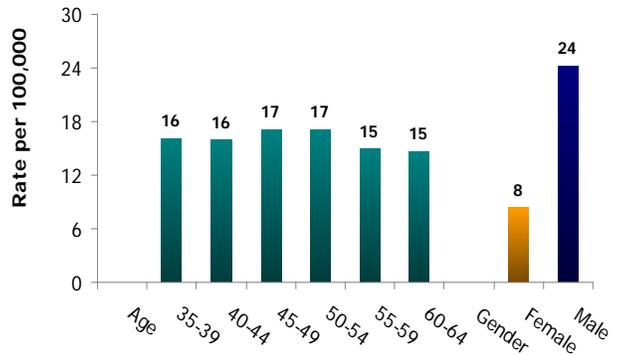


FIGURE 18: N.C. Adults Unintentional Motor Vehicle-Related Injury Hospitalizations by Age and Gender, Age 35-64: 2007-2009 (N=9,283*)

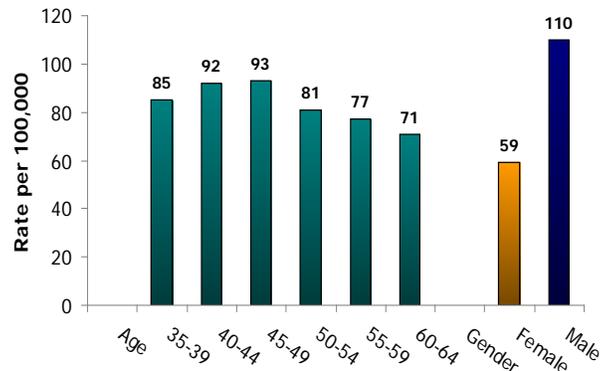
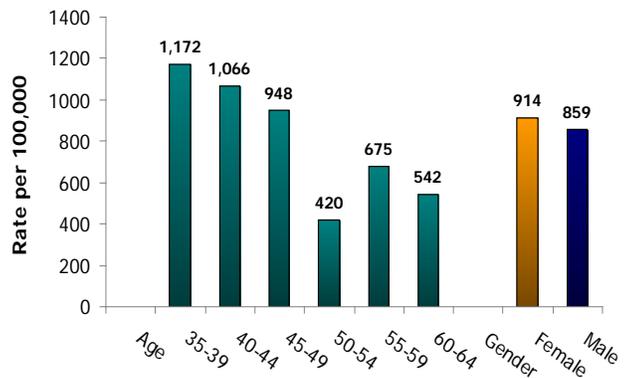


FIGURE 19: N.C. Adults Unintentional Motor Vehicle-Related Injury Emergency Department Visits by Age and Gender, Age 35-64: 2009-2010 (N=67,142*)



Falls (Unintentional)

Unintentional falls are an important problem in terms of adult injury, especially as age increases. Not only are falls the fifth leading cause of adult death for ages 35 - 64, but the second and third leading causes of emergency department visits and hospitalizations among these age groups during the specified years, respectively. Among unintentional injuries, falls are the leading cause of hospitalizations and emergency department visits.

In terms of economic burden, falls also have a significant impact. For adult injuries in North Carolina from 2007 to 2009, hospitalization charges totaled more than \$479.9 million. Median charges were ranked fifth overall at \$19,467 (Table 9).

Figure 20 illustrates a positive trend in unintentional fall death rates among adults aged 35 - 64 from 2007 to 2010. As age increase, the mortality rate from falls increases. Adults ages 60 - 64 (6.3 per 100,000) have a death rate seven times that of adults 35 - 39 years old (0.9 per 100,000). Males (4.4 per 100,000) are nearly 2.5 times more likely to die from an unintentional fall than females (1.8 per 100,000).

Hospitalizations for adults ages 35 - 64 follow the same positive trend (Figure 21). Adults ages 60 - 64 (325 per 100,000) are five times as likely to die from a fall as adults ages 35 to 39 (64 per 100,000). The rate for males and females, however, is equal (154 per 100,000).

Emergency department visits follow a similar trend for the most part (Figure 22); as age increases, the death rate increases until ages 55 - 59. Here, the rate of emergency department visits drops from 1,521 per 100,000 for ages 50 - 54 to 1,494 per 100,000 for ages 55 - 59, then increases again for ages 60 - 64 (1,613 per 100,000). Similar to other unintentional injuries, females have a higher rate of visits than males (1,726 per 100,000 versus 1,233 per 100,000).

TABLE 9: Estimated Hospitalization Charges Resulting from Adult Unintentional Fall Injuries in North Carolina, Age 35-64: 2007-2009	
Total Charges	\$479,940,003
Median Charges	\$19,467
Average Charges	\$28,190

FIGURE 20: N.C. Adults Unintentional Fall-Related Injury Deaths by Age and Gender, Age 35-64: 2007-2010 (N=453)

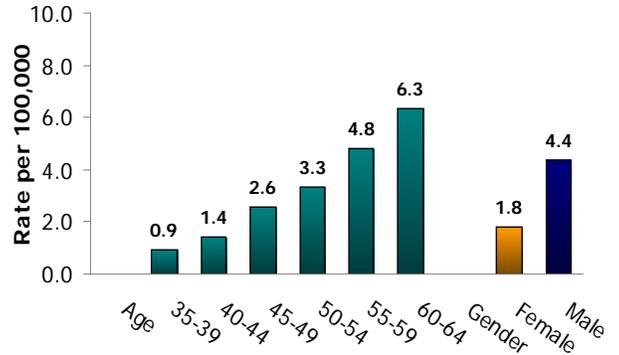


FIGURE 21: N.C. Adults Unintentional Fall-Related Injury Hospitalizations by Age and Gender, Age 35-64: 2007-2009 (N=17,029)

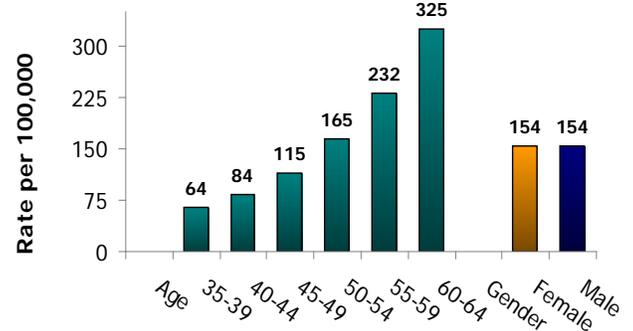
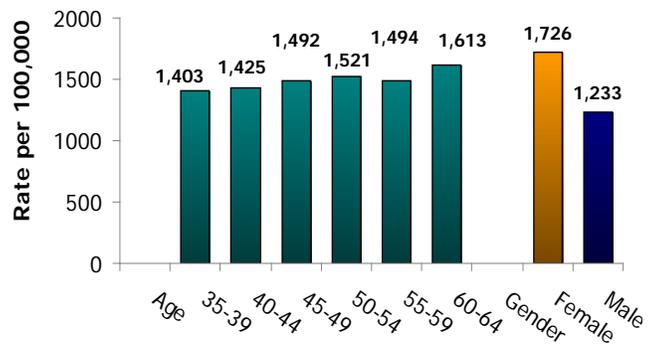


FIGURE 22: N.C. Adults Unintentional Fall-Related Injury Emergency Department Visits by Age and Gender, Age 35-64: 2009-2010 (N=112,499*)



Unspecified (Unintentional)

It is unknown why cause was unspecified for a large percentage of unintentional injuries in adults. Adults may have other health conditions that mask the true cause or make identification difficult. These unspecified causes remain a leading producer of unintentional injury, however, and are particularly relevant in that they may be obscuring the true extent of injuries with identifiable, specific cause.

Injury deaths from unspecified causes resulted in 207 deaths (1.4 per 100,000) from 2007 to 2010, 5,773 hospitalizations (52 per 100,000) from 2007 to 2009, and 47,035 emergency department visits (621 per 100,000) from 2009 to 2010 for North Carolina adults.

The mortality rates for unspecified unintentional injuries were greatest for oldest age groups. The rate among adults aged 60 - 64 (2.5 per 100,000) was five times greater than adults 40 - 44 (0.5 per 100,000) and about three times greater than adults 35 - 39 (0.8 per 100,000). The rate for males was twice that of females (Figure 23).

Figure 24 shows that hospitalization rates among adults aged 35 - 64 for unspecified unintentional injuries from 2007 to 2009 follow a gradual positive trend. As age increases, the rate of hospitalization increases. The rates for adults aged 60 - 64 (84 per 100,000) was 3.5 times that of adults 35 - 39 (28 per 100,000). Males (60 per 100,000) were slightly more likely to be hospitalized from an unspecified unintentional injury than females (45 per 100,000).

Emergency department visit rates for unspecified unintentional injuries follow a negative trend (Figure 25). As age increases, the rate of visiting an emergency department for treatment of an unspecified injury decreases. Females were slightly more likely to visit an emergency department for treatment than males.

FIGURE 23: N.C. Adults Unintentional Unspecified Injury-Related Deaths by Age and Gender, Age 35-64: 2007-2010 (N=207)

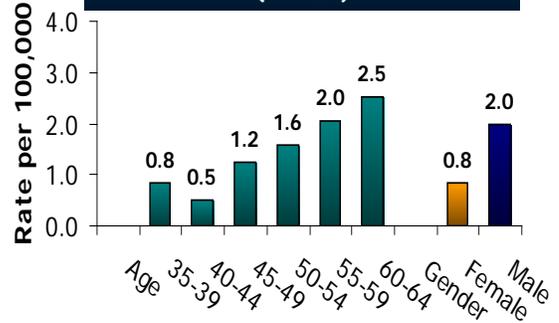


FIGURE 24: N.C. Adults Unintentional Unspecified Injury-Related Hospitalization Rates by Age and Gender, Age 35-64: 2007-2009 (N=5,773*)

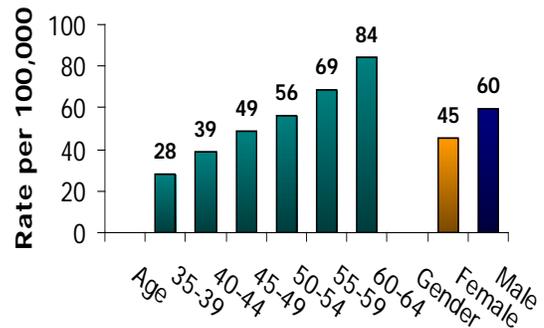


FIGURE 25: N.C. Adults Unintentional Unspecified Injury Related Emergency Department Visits by Age and Gender, Age 35-64: 2009-2010: (N=47,035*)

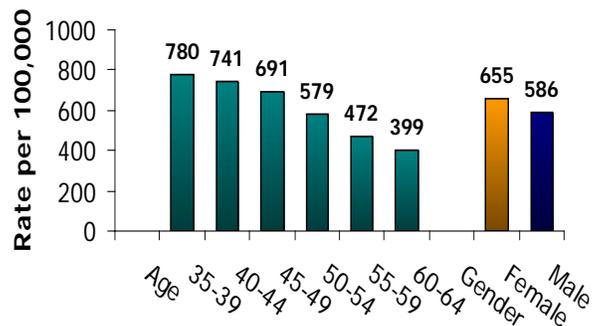


TABLE 10: Estimated Hospitalization Charges Resulting from Adult Unspecified Unintentional Injuries in North Carolina, Age 35-64: 2007-2009

Total Charges	\$163,948,915
Median Charges	\$17,232
Average Charges	\$28,404

Fire/Burn (Unintentional)

In North Carolina, 197 adults aged 35 - 64 (1.3 per 100,000) died between 2007 and 2010 and 1,308 (12 per 100,000) were hospitalized between 2007 and 2009 as a result of unintentional fire or burn injuries. Furthermore, 6,448 adults (85 per 100,000) visited an emergency department because of unintentional fire or burn injuries from 2009 to 2010.

Unintentional fire/burn injuries remains among the top contributors for total estimated hospitalization charges in adults at \$74 million between 2007 and 2009 in North Carolina (Table 11). Estimated median charges were \$18,819 and average charges were \$56,914.

Figure 26 shows a positive trend among mortality rates for unintentional fire/burn injuries. The rate of adult death due to fire/burn injury is 3.4 times higher for adults ages 60 - 64 (2.7 per 100,000) than for adults ages 35 - 39 (0.8 per 100,000). The rates increase fairly steadily across age groups but increase more sharply between the ages of 55 - 59 and 60 - 64. Males (1.7 per 100,000) had a slightly higher death rate than females (1.0 per 100,000).

Between 2007 and 2009, hospitalization rates for unintentional fire/burn injuries among adults were fairly similar across age groups (Figure 27). The age group with the highest rate, ages 60 to 64 (13.1 per 100,000) had only a slightly higher rate than the age group with the lowest rate, 35 - 39 years (10.4 per 100,000). Males had twice the rate (16.0 per 100,000) that females had (7.9 per 100,000).

Figure 28 shows that with the exception of adults ages 35 - 39, the remaining age groups follow a negative trend for rates of emergency department visits for fire/burn injuries. Adults ages 35 - 39 had a rate (73 per 100,000) similar to that of adults in their 50's (between 77 and 64 per 100,000). Males had a slightly higher visit rate than females.

FIGURE 26: N.C. Adults Unintentional Fire/Burn-Related Injury Deaths by Age and Gender, Age 35-64: 2007-2010 (N=197)

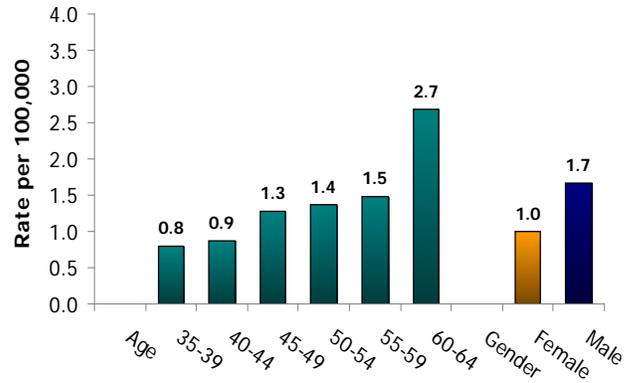


FIGURE 27: N.C. Adults Unintentional Fire/Burn-Related Injury Hospitalizations by Age and Gender, Age 35-64: 2007-2009 (N=1308)

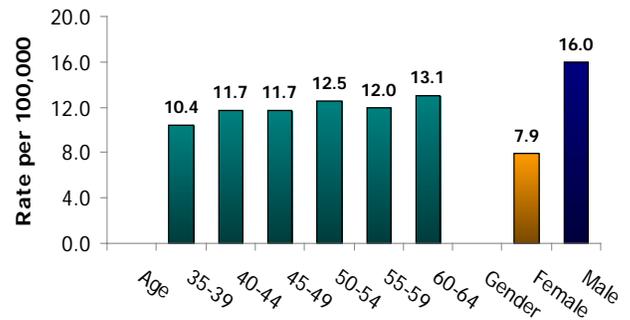


FIGURE 28: N.C. Adults Unintentional Fire/Burn-Related Injury Emergency Department Visits by Age and Gender, Age 35-64: 2009-2010 (N=6,448)

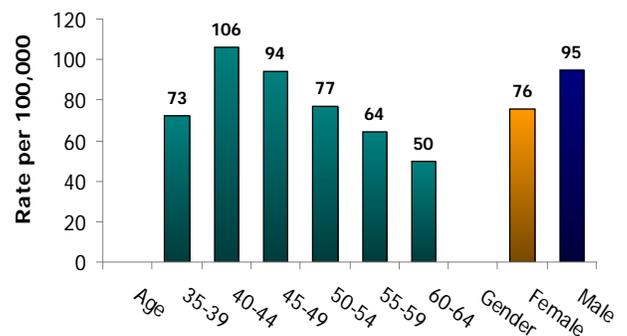


TABLE 10: Estimated Hospitalization Charges Resulting from Adult Fire/Burn Unintentional Injuries in North Carolina, Age 35-64: 2007-2009

Total Charges	\$74,329,634
Median Charges	\$18,819
Average Charges	\$56,914

2.2 Self-Inflicted Injuries

Self-inflicted injuries follow different patterns than other adult injuries, yet have a slightly higher total mortality rate (18 per 100,000) than all other causes of death. While the total hospitalization charges shown in Table 12 for 2007 to 2009 are ranked fourth overall at \$132 million, the median and average charges are much lower than for other injuries (\$8,078 and \$13,734).

Figure 29 shows that the mortality rates for self-inflicted injuries among adults across all age-groups are fairly stable. The lowest rates of suicide are for the youngest (16 per 100,000) and oldest (14 per 100,000) age groups.

Hospitalization rates for self-inflicted injuries for 2007 to 2009 follow a negative trend. As age increases, hospitalization rates decrease. Ages 35 - 39 and 40 - 44 have rates of 116 per 100,000, nearly 3.3 times that of adults ages 60 - 64 (35 per 100,000).

Emergency department visits for self-inflicted injuries (Figure 31) also follow a negative trend. Self-inflicted hospitalization and emergency department visit rates have opposite trends of unintentional falls.

The gender patterns for self-inflicted injury show that male self-inflicted injuries were three times as likely to result in death (27 per 100,000) than female injuries (9 per 100,000). Females tend to have higher hospitalization rates (100 per 100,000) and emergency department visit rates (119 per 100,000) than males (75 per 100,000 and 93 per 100,000, respectively). This may be explained by the mechanism of injury; males may be more likely to attempt suicide using highly lethal methods such as firearm, the most common method of self-inflicted injury (55%) whereas females may attempt suicide by less lethal means such as poisoning (24%), suffocation (17%), cutting (1%), or drowning (0.6%).

TABLE 11: Estimated Hospitalization Charges Resulting from Adult Self-Inflicted Injuries in North Carolina, Age 35-64: 2007-2009

Total Charges	\$132,683,198
Median Charges	\$8,078
Average Charges	\$13,734

Figure 29: N.C. Adults Self-Inflicted-Related Injury Deaths by Age and Gender, Ages 35-64: 2007-2010 (N=2,634)

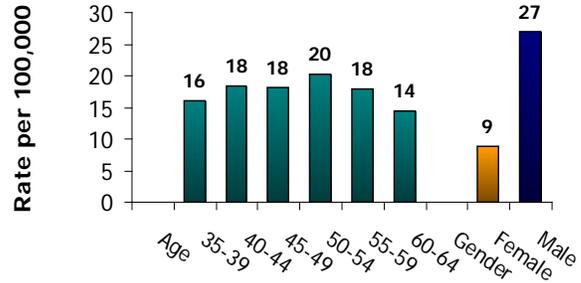


FIGURE 30: N.C. Adults Self-Inflicted-Related Injury Hospitalizations by Age and Gender, Age 35-64: 2007-2009 (N=9,666)

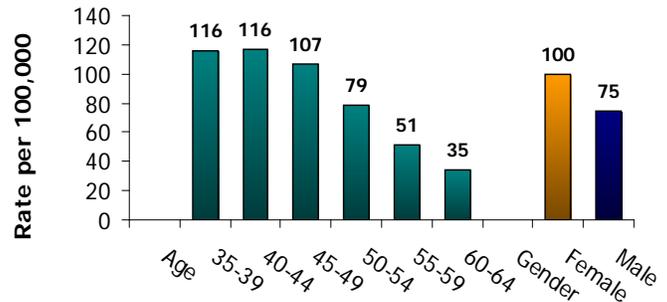
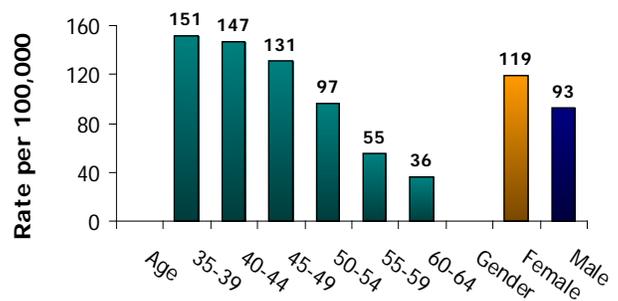


FIGURE 31: N.C. Adults Self-Inflicted-Related Injury Emergency Department Visits by Age and Gender, Age 35-64: 2009-2010 (N=8,058)



Self-inflicted injury, all mechanisms combined, was the overall leading cause of adult deaths in North Carolina for 2007 to 2010 for ages 35 - 64, indicating its significance as an injury-related issue to this age-population in particular. These injuries account for 25 percent of injury deaths when compared to unintentional, assault, and other mechanisms/intent-related deaths (Figure 2). Of all self-inflicted injuries, firearms are responsible for more than half of the fatalities (55%), followed by poisoning (24%) and suffocation (17%). Table 14 and 15 point out the importance of poisoning among self-inflicted injuries as it is the overwhelming leading cause of hospitalizations (85%) and emergency department visits (77%) for self-inflicted injuries among these age groups. However, where firearm accounts for 1,442 deaths (Table 13) from 2007 to 2010, only 100 adults visited the emergency department for wounds from a firearm between 2009 and 2010 (Table 15). Cut/pierce is the second leading cause of hospitalizations (9%) and emergency department visits (17%) and is the fourth leading cause of suicide deaths (1%), though it accounts for a small percentage in comparison to firearm, poisonings, and suffocations.

In summary, for adults aged 35 - 64 in North Carolina, there were a total of 2,634 suicides (Table 13) from 2007 to 2010 (18 per 100,000). For 2007 to 2009, there were 9,666 hospitalizations related to self-inflicted injury (Table 14). For 2009 to 2010, there were 8,058 visits to the emergency department for injuries that were self-inflicted. Suicide mortality rates were highest for ages 50 - 54 (20 per 100,000) and lowest for the youngest and oldest age groups (Figure 29). Males were 3 times as likely to die from their injuries as females (Figure 29) but females had slightly higher hospitalization and emergency department visit rates than males (Figure 30 and 31). Of all intentional causes that include suicide and assault, self-inflicted firearm and poisoning account for almost 60 percent of deaths and poisonings for 64 percent of all hospitalizations.

TABLE 13: N.C. Types of Adult Self-Inflicted Injury Deaths, Age 35-64: 2007-2010 (N=2,634)		TABLE 14: N.C. Types of Adult Self-Inflicted Injury Hospitalizations, Age 35-64: 2007-2009 (N=9,666)		TABLE 15: N.C. Types of Adult Self-Inflicted Injury Emergency Department (ED) Visits, Age 35-64: 2009-2010 (N=8,058)	
Type of Self-Inflicted Injury	Number of Deaths	Type of Self-Inflicted Injury	Number of Hospitalizations	Type of Self-Inflicted Injury	Number of ED Visits
Firearm	1,442	Poisoning	8,259	Poisoning	6,220
Poisoning	628	Cut/pierce	833	Cut/pierce	1,354
Suffocation	441	Otherspec/NEC	187	Otherspec/NEC	173
Cut/pierce	27	Firearm	150	Firearm	100
Otherspec/NEC	25	Unspecified	66	Unspecified	76
Unspecified	18	Otherspec/class	48	Suffocation	56
Fall	17	Fall	38	Otherspec/class	28
All other causes	36	All other causes	85	All other causes	51
Total	2,634	Total	9,666	Total	8,058

2.3 Assault

Assault was the fourth overall leading cause of adult injury-related death (6 per 100,000) in North Carolina from 2007 to 2010 and accounted for eight percent of injury-related deaths (Figure 2). Figures 32 through 34 demonstrate its heavy impact on younger age groups and males in particular.

Assault-related hospitalization charges are considerably high; total charges for 2007 to 2009 are more than \$111 million and are ranked fifth in overall adult injury-related hospitalization charges. Median charges are \$19,024 and the average charges are \$33,819.

Figure 32 shows that adults ages 35 - 49 have similar death rates from assault (7 to 8 per 100,000). Figure 33 shows a similar age trend for hospitalizations from assaults for 2007 to 2009 in North Carolina. Adults ages 40 - 44 have the highest rate of assault-related hospitalizations (41 per 100,000) and are 3.7 times more likely to be hospitalized from an assault injury than adults ages 60 - 64 (11 per 100,000). Figure 34 shows a negative trend for emergency department visits for assault injuries for adults from 2009 to 2010. Adults ages 35 - 39 (447 per 100,000) have a visit rate 6.5 times that of adults ages 60 - 64 (69 per 100,000).

Males are three times as likely to die from an assault-related injury (9 per 100,000) than females (3 per 100,000). Unlike other types of injuries, males are also more likely to be hospitalized and visit an emergency department than females. Figure 33 shows that the hospitalization rate for assaults for males (48 per 100,000) is four times that of females (12 per 100,000). Males visit emergency departments for assault-related injuries at a rate of 342 per 100,000, whereas the rate for female visits is 213 per 100,000 (Figure 34).

FIGURE 32: N.C. Adults Intentional Assault-Related Injury Deaths by Age and Gender, Age 35-64: 2007-2010 (N=879)

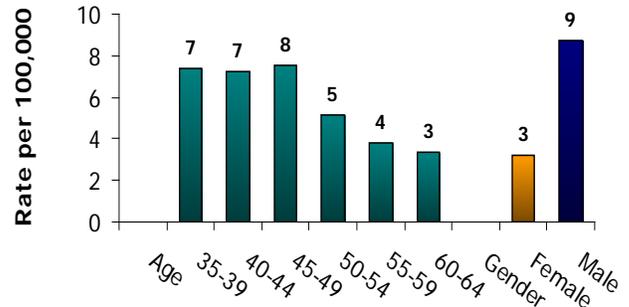


FIGURE 33: N.C. Adults Intentional Assault-Related Injury Hospitalizations by Age and Gender, Age 35-64: 2007-2009 (N=3290)

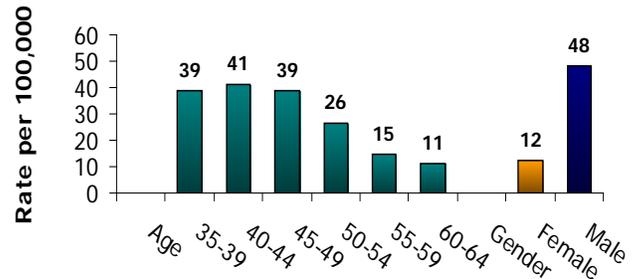


FIGURE 34: N.C. Adults Intentional Assault-Related Injury Emergency Department Visits by Age and Gender, Age 35-64: 2009-2010 (N=20,859*)

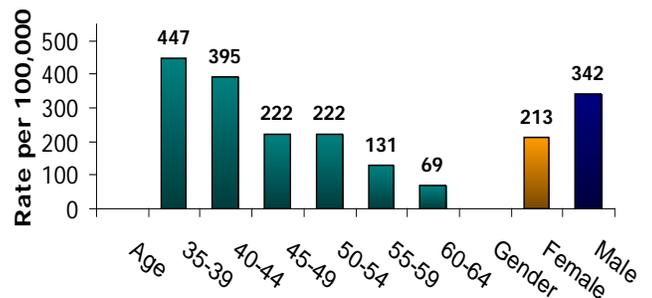


TABLE 16: Estimated Hospitalization Charges Resulting from Adult Intentional Assault Injuries in North Carolina, Age 35-64: 2007-2009

Total Charges	\$111,230,809
Median Charges	\$19,024
Average Charges	\$33,819

Table 17 lists the top causes of assault injury deaths from 2007 to 2010 for adults ages 35 - 64 in North Carolina. There were a total of 879 deaths from assault-related injuries (6 per 100,000); the table indicates the relative importance of firearms in comparison to other mechanisms of assault. Firearm accounts for 62 percent of assaults versus cut/pierce (15%) and unspecified causes (14%). However, a much smaller percentage of adults are hospitalized (13%) or visit an emergency department (2%) for assault-related firearm injuries. Cut/pierce remains a leading cause of assault death (15%), hospitalizations (17%) and emergency department visits (8%). The overall leading cause of assault hospitalizations from 2007 to 2009 shown in Table 18 was being struck by another person (35%). Similarly, the leading cause of adults ages 35 - 64 visiting an emergency department from 2009 to 2010 in Table 19 was being struck by another individual, accounting for half of the visits for assault injuries (50%).

Of all intentional injuries, including suicide and assault, firearm assault accounts for 15.5 percent of deaths for adults, still a significant amount when compared to self-inflicted firearm (41%) and self-inflicted poisoning (18%). Among hospitalizations for all intentional injuries, being struck by an individual (8%) was the 2nd leading cause behind self-inflicted poisonings (64%). For all intentional injuries resulting in emergency department visits, being struck by another individual was the most common cause for visit among adults ages 35 - 64 from 2009 to 2010 (36%). In summary, assault remains a problem for adults and is a contributor to morbidity and mortality, particularly in males and adults under age 50.

TABLE 17: N.C. Types of Adult Assault Injury Deaths, Age 35-64: 2007-2010 (N=879)		TABLE 18: N.C. Types of Adult Assault Injury Hospitalizations, Age 35-64: 2007-2009 (N=3,290)		TABLE 19: N.C. Types of Adult Assault Injury Emergency Department Visits, Age 35-64: 2009-2010 (N=20,859)	
Type of Assault Injury	Number of Deaths	Type of Assault Injury	Number of Hospitalizations	Type of Assault Injury	Number of ED Visits
Firearm	544	Struck	1,151	Struck	10,408
Cut/pierce	132	Cut/pierce	566	Unspecified	3,622
Unspecified	120	Otherspec/NEC	446	Otherspec/NEC	3,106
Otherspec/NEC	38	Unspecified	445	Cut/pierce	1,642
Suffocation	33	Firearm	424	Otherspec/class	1,475
Fire/Burn	6	Otherspec/class	195	Firearm	421
Struck	2	Fire/Burn	29	MVT	58
All other causes	4	All other causes	34	All other causes	127
Total	879	Total	3,290	Total	20,859

3. Conclusions and Recommendations

Injury is a significant source of morbidity and mortality for North Carolinians ages 35 - 64. Adult injuries can be prevented, however, and the purpose of this report is to highlight the most significant causes of adult injury and point prevention efforts in the right direction. Prevention of injuries in adults is an important issue since resulting disability or death can lead to major losses in workplace productivity, mental stress and economic burden on family members. As adults get older, issues like onset of chronic disease or chronic pain may put them at risk for injury. Similarly, adults may suffer from anxiety or pressure concerning their jobs, financial woes, chronic diseases, or family issues that also raise the risk of injury.

Deaths, hospitalizations and emergency department visits give a snapshot of the more severe injury cases among adults in North Carolina but fail to capture the entire picture. The overwhelming majority of adult deaths and visits to emergency departments result from unintentional injuries. The majority of hospitalizations among adults results from other injuries with unspecified intent or mechanism, supporting the idea that coding injuries properly helps to understand what causes a large proportion of injury-related morbidity.

The estimated financial toll of adult injuries in North Carolina from 2007 to 2009 is \$2.5 billion in total hospitalization charges. In order to decrease total spending, prevention efforts should specifically be targeted at unintentional motor vehicle related-injuries, unintentional falls and injuries with other mechanisms or causes, such as adverse effects from medications. Hospitals should be encouraged to continue working on properly coding and identifying the cause of injury as best they can. These efforts could also help further eliminate unnecessary spending if there is less confusion surrounding the injury-related incident.

The risk of morbidity and mortality for adults ages 35 - 64 in North Carolina varies by injury type, but in general unintentional injury and self-inflicted injury remain as the leading causes of death, hospitalization, and emergency room visits. In particular, unintentional poisonings, unintentional motor vehicle injuries, and self-inflicted injuries result in the majority of adult deaths in North Carolina. Similarly, unintentional falls and unintentional motor vehicle injuries result in a large proportion of hospitalizations and visits to emergency rooms, yet the majority of individuals seeking treatment have an injury whose cause or mechanism of intent is unknown.

When combining all specific mechanisms, suicide has the highest mortality rate among adults (18 per 100,000) in North Carolina. Males are much more likely to die from suicide attempts than females, but females are more likely to visit hospitals or emergency rooms for treatment from self-inflicted injuries. Mortality rates are stable across age groups. Public health efforts focused on preventing suicidal behaviors through education, outreach, and awareness should be given priority. An example would be to educate employees in a company on signs and symptoms of depression, anxiety, and suicidal behavior in an attempt to promote connectedness among individuals. Also, programs and policies to address vulnerable groups, build support systems, and remove barriers for those persons seeking help or attention are also key strategies to prevent suicide (CDC, 2008a)

Unintentional poisonings were the second leading cause of death for adults aged 35 - 64 from 2007 to 2010 and are a serious threat to the health of adults. Middle aged adults and males are at particularly high risk for morbidity and mortality related to unintentional poisonings. Efforts to educate individuals about proper storage, consumption, and disposal of prescription drugs are essential. Physicians and pharmacists should be encouraged to closely work with their patients in discussing drug regimens, filling prescriptions, and pain management. Promoting the use of and conducting trainings for state Prescription Drug Monitoring Systems by healthcare practitioners is also encouraged. Finally, programs should focus some resources on raising awareness of and response to overdose symptoms (CDC, 2012f)

Unintentional motor vehicle injuries continue to be an enormous burden on adults in terms of mortality, morbidity, and hospitalization charges. They are the second leading cause of unintentional injury deaths and are ranked second in total hospitalization charges resulting from injury for the specified years. There are a number of CDC Community Guideline strategies that communities can follow and implement, including enforcement of seat belt laws and mandating their use, publicizing sobriety checkpoint programs, and maintaining minimum drinking age (CDC, 2012g). Communities can focus resources on making streets and sidewalks safer for bikers and pedestrians. Public health leaders should continue to focus on the issue of texting/emailing and driving. At the local level, the CDC suggests that employers require seat belt use in company cars and maintain a zero-tolerance policy for texting.

The other major injury risks for adults ages 35 - 64 include unintentional falls, unintentional fire and burn injuries, and assaults. Unintentional falls warrant time and effort for prevention since they account for a large proportion of hospitalizations and emergency department visits. Falls may be age-related and can be targeted with exercise programs and diet modification (Older Adult Injuries in North Carolina, 2010). However, they also may be related to occupation. Employers, work regulators, and safety professionals are encouraged to continue promoting workplace safety among employees (CDC, 2012h).

Additionally, assault is the fourth leading cause of death (all mechanisms combined) for adults in North Carolina from 2007 to 2010. However, it is primarily a risk for adult males ages 35 - 49, with the risk of death and morbidity decreasing as age increases. Males are at a much higher risk for death, hospitalization, and visiting an emergency department for an assault-related injury. This indicates that prevention may need to be strategically targeted at a narrower group of adults.

The adult injury rate has only slightly increased from 1999 to 2009 and has generally remained higher than the national overall rate. However, the rate for North Carolina is a fairly good estimate of the national rate for all types of injury and statewide prevention programs could be similar or mirror those of national initiatives. Prevention efforts should largely be focused on suicide, unintentional poisonings, and unintentional motor vehicle injuries for adults. Hospitals and emergency departments should be encouraged to adopt improved coding practices or techniques in order to reduce the number of unknown or unspecified causes of injury so that the full burden of adult injury (and prevention, in turn) can be understood.

4. Appendix

Appendix A: Data Sources and Technical Notes

Comparison of United States and North Carolina Injury Rates 1999-2010

The Web-based Injury Statistics Query and Reporting System (WISQARS) from the Centers for Disease Control and Prevention, National Center for Injury Prevention and Control provided the comparative United States and North Carolina fatal injury rates for the years 1999 to 2009 and by injury type for 2007 to 2009. Crude rates were reported unless otherwise noted. The WISQARS injury mortality reports were retrieved July 20, 2012 from: http://webappa.cdc.gov/sasweb/ncipc/mortrate10_sy.html.

North Carolina Population Estimates 2007-2010

The North Carolina State Center for Health Statistics (SCHS) provided North Carolina population data for the years 2007 to 2010. SCHS obtained the population data from the CDC National Center for Health Statistics bridged population file (2010 version).

North Carolina Death Data 2007-2010

The North Carolina State Center for Health Statistics provided death certificate data for every death in North Carolina. Only state residents with a North Carolina county address and an age of 35 -64 years were analyzed for this report. Primary cause of death was assigned with the International Classification, 10th Revision; Clinical Modification (ICD-10) codes. Injuries were then classified into manner and mechanism using CDC's standard injury matrix framework.

North Carolina Hospital Discharge Data 2007-2009

The North Carolina State Center for Health Statistics provided data for every North Carolina hospital discharge of North Carolina residents aged 35-64. A hospital discharge occurs after a patient leaves a hospital following admission. These data do not represent number of patients, but number of discharges (multiple discharges per patient are possible). Cause of injury was assigned with International Classification, 9th Revision; Clinical Modification (ICD-9-CM) External Causes of Injury codes (E Codes). Injuries were then classified into manner and mechanism using CDC's standard injury matrix framework.

North Carolina Emergency Department Data 2009-2010

The North Carolina Disease Event Tracking and Epidemiologic Collection Tool (NC DETECT) provided emergency department data for North Carolina residents aged 65 or older. NC DETECT is a state system that receives data on at least a daily basis from hospital emergency departments (EDs) statewide to provide early event detection and timely public health surveillance to public health officials and hospital users. In 2009, an estimated 99.5% of all ED records from 24/7 acute care hospital-affiliated EDs in North Carolina were sent to NC DETECT. Near real-time data were extracted from 111 of 114 eligible hospital administrative and clinical electronic databases. In 2010, NC DETECT captured ED records from 113 of 114 (99%) 24/7 acute care hospital-affiliated EDs in NC and captured an estimated 99.5% of all eligible ED visits. Therefore, data for these years are not representative of all EDs in the state, although the majority of EDs were reporting. The ED data, death data, and the hospital discharge data are not mutually exclusive. Cause of injury was assigned by hospital coders using International Classification, 9th Revision; Clinical Modification (ICD-9-CM) External Causes of Injury codes (E Codes). Injuries were then classified into manner and mechanism using the CDC's standard injury matrix framework.

Assault

Assault injuries were categorized as assault intent by any mechanism (e.g., firearm, struck, etc.). Cause of death codes: X85-Y09. Hospital and emergency department E-codes: E960.0-E969.9, E979, E999.1.

Self-Inflicted

Self-inflicted injuries were categorized as self-inflicted intent by any mechanism (e.g., firearm, poisoning, etc.). Cause of death code: X60-X84. Hospital and emergency department E-codes: E950-E959.

Unintentional Fall

Unintentional falls included falls with an unintentional intent and the following mechanisms: on same level involving ice and snow; on same level from slipping, tripping and stumbling; involving ice-skates, skis, roller-skates or skateboards; on same level due to collision with, or pushing by, another person; while being carried or supported by other persons; involving wheelchair, bed, chair or other furniture; involving playground equipment; on and from stairs and steps; on and from ladder; on and from scaffolding; from, out of, or through a building or structure; from tree; from cliff; diving or jumping into water causing injury other than drowning or submersion; from one level to another; other on same level; and unspecified. Cause of death codes: W00-W19. Hospital and emergency department E-codes: E880.0-E886.9, E888.

Unintentional Fire or Burn

Unintentional fire or burn injuries included injuries categorized with an unintentional intent and resulting from exposure to a fire and contact with heat or hot substances. Cause of death codes: X00-X19. Hospital and emergency department E-codes: E890.0-E899, E924.0-.9.

Unintentional Motor Vehicle, Traffic (MVT)

Unintentional Motor Vehicle, Traffic (MVT) injuries were categorized as an occupant, pedestrian and/or motorcyclist injured in a motor vehicle traffic crash with an unintentional intent. This definition included injuries from incidents that involved automobiles, trucks, vans, motorcycles, and motorized cycles traveling on public roadways. This classification did not include motor vehicle non-traffic, other land transport and other transport. Cause of death codes: V30-V79 (.4-.9), V83-V86 (.0-.3), V20-V28 (.3-.9), V29 (.4-.9), V12-V14 (.3-.9), V19 (.4-.6), V02-V04 (.1, .9), V09.2, V80 (.3-.5), V81.1, V82.1, V87 (.0-.8), V89.2. Hospital and emergency department E-codes: E810-E819 (.0-.9).

Unintentional Poisonings

Unintentional poisoning included injuries with an unintentional intent resulting from ingestion of harmful drugs, medicines, gases, household products, solvents, chemicals, acids, and poisonous foods or plants. Cause of death codes: X40-X49. Hospital and emergency department E-codes: E850.0-E869.9.

Unintentional Unspecified

Unintentional unspecified injuries were categorized as unintentional intent and unspecified mechanism. Cause of death codes: X59. Hospital and emergency department E-codes: E887, E928.9, E929.9.

Methods

In order to explore the extent of the current older adult injury problem in North Carolina, two methodological approaches were undertaken: (a) a quantitative analysis of mortality, hospital discharge data and emergency department visits to determine injury rates; and (b) a description of hospital charges for injuries.

Injury Rate Calculations

Crude rates were reported unless otherwise specified. Mortality and hospitalization rates were calculated based on the North Carolina Death and Hospitalization files for 2007 to 2010 and 2007-2009, respectively. Emergency department visit rates were calculated based on NC DETECT for 2009 to 2010. The processes for calculating the rates for North Carolina older adult injuries were similar. First, duplicate records or records with a primary diagnosis other than injury were excluded. Next, E-codes using CDC's injury matrix standard definitions were collapsed to create injury groups that were suitable for describing the external causes of injuries. Denominators for rate calculations were based upon age group population estimates over the specified time period (2007-2010 for deaths, 2007-2009 for hospitalizations; 2009-2010 for emergency department visits) from the North Carolina State Center for Health Statistics and were expressed "per 100,000 persons" unless otherwise noted.

Hospital Charges Calculations

Hospital charge estimates were computed by summing the charges across all cases within each injury group (e.g., overall, unintentional falls, motor vehicle traffic, etc.). It is important to note that hospital charges reflect only a part of the cost of injuries. Physician charges, emergency vehicle services, out-patient drug charges, medical equipment and time lost from work were not included in this report. All charges were reported in that year's dollars and were not adjusted for inflation. Hospital charges also reflect contracts that hospitals have with insurance companies.

Other E-Codes Used in Analysis

Additional injury coding was used to categorize differing types of unintentional injuries. These codes were based on the CDC Injury Matrix Framework: Deaths/Mortality:
www.cdc.gov/nchs/data/ice/icd10_transcode.pdf

Hospitalization Discharge and Emergency Department Visits, Nonfatal:

www.cdc.gov/ncipc/osp/matrix2.htm

Appendix B: Injury Prevention Resources

CDC Centers of Excellence

UNC Injury Prevention Research Center (IPRC)
University of North Carolina
Bank of America Building, Suite 500
137 East Franklin Street, CB#7505
Chapel Hill, NC 27599-7505
Phone: (919) 966-2251
www.iprc.unc.edu
Director: Stephen Marshall, PhD

Injury and Violence Prevention Branch

Chronic Disease and Injury Section, North Carolina Division of Public Health
North Carolina Department of Health and Human Services
1915 Mail Service Center
Raleigh, NC 27699-1915
Phone: (919) 707-5425
Email: beinjuryfreenc@ncmail.net
www.injuryfreenc.ncdhhs.gov
Branch Head: Alan Dellapenna
Chronic Disease and Injury Section Chief: Ruth Petersen

National Center for Injury Prevention and Control (NCIPC)

(Centers for Disease Control and Prevention)
Mailstop F63
4770 Buford Highway NE
Atlanta, GA 30341-3717
Phone: 800-CDC-INFO (800-232-4636)
TTY: (888) 232-6348
24 Hours/Every Day
Email: cdcinfo@cdc.gov
www.cdc.gov/injury
Director: Daniel M. Sosin, MD, MPH, FACP

North Carolina Division of Mental Health, Developmental Disabilities and Substance Abuse Services

North Carolina Department of Health and Human Services
3009 Mail Service Center
Raleigh, NC 27699-2101
Phone: (919) 733-3197
www.ncdhhs.gov/mhddsas/

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- Centers for Disease Control and Prevention (CDC), National Center for Injury Prevention and Control (2012f) Prevent Unintentional Poisonings. <http://www.cdc.gov/Features/PoisonPrevention/>
- Centers for Disease Control and Prevention (CDC), The Guide to Community Preventive Services (2012g) Motor Vehicle-Related Injury-Prevention. <http://www.thecommunityguide.org/mvoi/index.html>Centers for Disease Control and Prevention (CDC), National Center for Injury Prevention and Control (2012h) Fall Injuries: Prevention in the Workplace. <http://www.cdc.gov/niosh/topics/falls/>
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**State of North Carolina
Patrick McCrory, Governor**

**Department of Health and Human Services
Aldona Wos, M.D., Secretary**

**Division of Public Health
Robin Cummings, M.D., State Health Director**

Injury and Violence Prevention Branch

www.injuryfreenc.ncdhhs.gov

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