

Older Adult Injuries in North Carolina 2004 to 2007

Injury Epidemiology and Surveillance Unit
Injury & Violence Prevention Branch
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**Injuries to Older Adults in North Carolina:
2004-2007**

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1. Overview of Older Adult Injury in North Carolina: 2004-2007

Introduction

Injury is a serious and largely preventable problem that threatens the health, independence and well-being of all citizens but particularly those aged 65 or older. Unintentional injury is among the top ten leading causes of death in older adults, resulting in more than 35,000 deaths each year from 2004 to 2006 in the United States (Centers for Disease Control and Prevention (CDC), 2009a). Injury is also a significant cause of morbidity in older adults with 2.9 million non-fatal injuries treated in hospital emergency departments each year between 2004 and 2006 in the U.S. (CDC, 2009b). Older adult injuries impose a substantial health and economic burden on individuals, families and communities.

This report provides an overview of the public health burden of injury in adults aged 65 or older in the state of North Carolina. To evaluate the scope of the older adult injury problem in North Carolina, an analysis was performed of older adult injury deaths and hospitalizations from 2004 to 2007 and emergency department visits from 2006 to 2007 with stratification by type of injury, age and gender. Injury death, hospitalization and emergency department visit rates were calculated per 100,000 persons in the North Carolina older adult population over the specified time. In addition, injury hospitalization charges were calculated to provide an estimate of the economic impact of older 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) *Injuries to North Carolina Children: 2004-2007* 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 older adult injury in North Carolina. Prevention of injuries is essential to helping older adults live long, healthy and productive lives. Attention to older adult injury prevention is imperative in light of the anticipated future growth of this population. From 2008 to 2029, the population of North Carolinians aged 65 or older is expected to increase 93% from 1.14 million to 2.19 million with an increase of 54% in the oldest age group of 85 or older (North Carolina Division of Aging and Adult Services, 2009). Therefore, understanding the causes of injury and identifying those at greatest risk for injury are important steps in lessening the burden of injury as the older adult population increases.

Highlighted within this report are the leading causes of injury in older adults in North Carolina from 2004 to 2007, including unintentional injuries (falls, motor vehicle crashes, unspecified, suffocation, fire/burn and poisoning), self-inflicted injuries, and assault injuries. The most common cause of injury in older adults is from an unintentional fall, which has the highest rate of fatalities and the greatest economic toll based on total hospitalization charges compared to all other causes of injury in older adults.

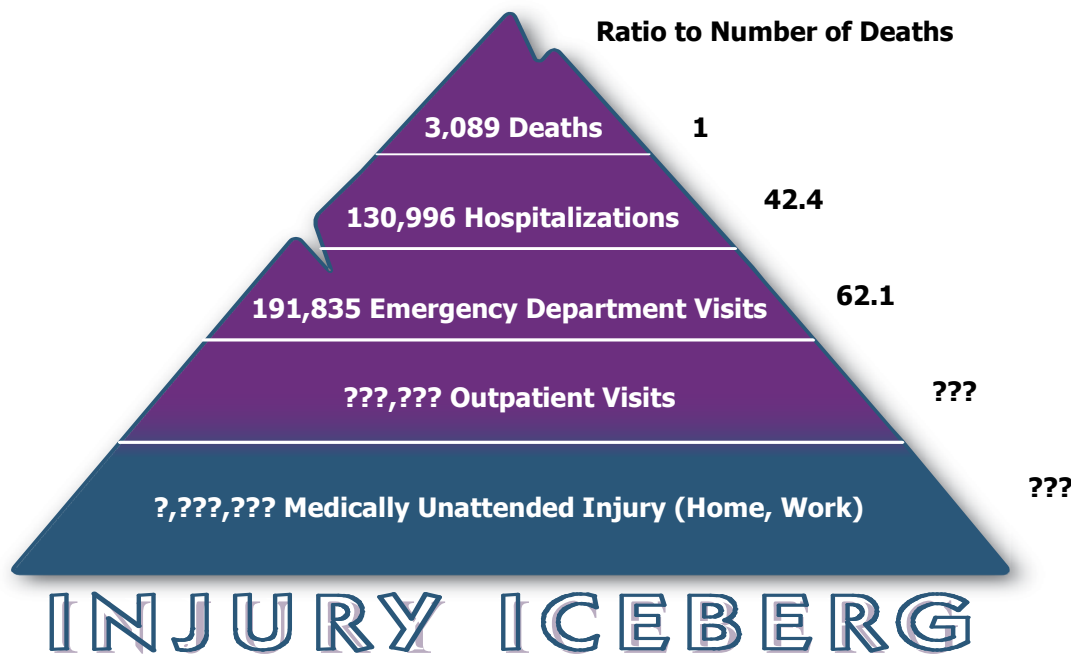
However, the most severe outcomes of injury-related deaths, hospitalizations and emergency department visits summarized in this report represent only a fraction of the occurrence of older adult injuries. This report does not reflect the full extent of the older adult injury problem in North Carolina because injuries that were self-treated or treated in urgent care centers, clinics, and physicians' offices are not included.

The burden of injury can be more clearly understood as an iceberg, as illustrated in Figure 1, with levels of injury severity and scope of medical intervention. Fatal injuries are the most visible to the public but represent the tip of the iceberg in describing the extent of injury occurrence. Non-fatal injuries requiring hospitalization or an emergency department visit are much more common than fatal injuries. For every older adult death caused by an injury, there were 42 hospitalizations and 62 emergency department visits for older adult injuries in North Carolina between 2006 and 2007.

Furthermore, the numbers of injuries are estimated to be even greater for those treated at outpatient visits and for those who do not seek medical care. Data on outpatient visits and medically unattended injuries were not available to capture the complete scope of older adult injury for this report.

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 older 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 older adults.

FIGURE 1: Injury Iceberg, North Carolina Older Adult Injuries, Age 65 and Older: 2006-2007 . Injury and Violence Prevention Branch, Chronic Disease and Injury Section, Division of Public Health.



The Problem of Older Adult Injury

Among North Carolina adults aged 65 or older, injuries caused 6,116 deaths (143 per 100,000) and 251,090 hospitalizations (5,886 per 100,000) from 2004 to 2007. Injuries in older adults also resulted in 191,835 emergency department visits (8,802 per 100,000) from 2006 to 2007 in North Carolina. The age group at greatest risk for injury was 85 years or older, accounting for 32.9% of all older adult injury deaths (380 per 100,000), 21.7% of all injury hospitalizations (10,271 per 100,000) and 24.1% of all injury-related emergency department visits (16,692 per 100,000).

Unintentional injuries caused 82% of deaths (Figure 2), 39% of hospitalizations (Figure 3) and 68% of emergency department visits (Figure 4) related to injury in older adults. Between 2004 and 2007 in North Carolina, unintentional injuries in older adults led to 5,007 deaths (117 per 100,000) and 97,357 hospitalizations (2,282 per 100,000). Additionally, 129,463 emergency department visits (5,940 per 100,000) in North Carolina were for treatment of unintentional injuries in older adults from 2006 to 2007.

Of all older adult injury deaths, 11% resulted from a self-inflicted injury (suicide) and 2% were from an assault (homicide). In contrast, self-inflicted injuries and assault injuries were reported in less than 1% of all injury-related hospitalizations and emergency department visits for older adults.

Other or undetermined intent of injury was reported for 5% of injury deaths, 34% of injury hospitalizations and 8% of emergency department visits related to injury in older adults. Approximately one-fourth of all older adult injury hospitalizations and emergency department visits were missing injury intent information. This is primarily due to incomplete e-coding.

FIGURE 2: N.C. Older Adult Injury Deaths by Intent, Age 65 and Older: 2004-2007 (N=6,116)

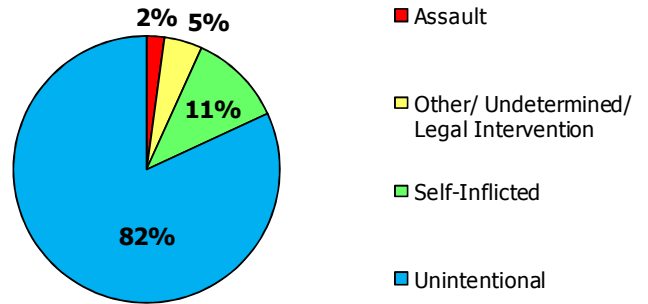


FIGURE 3: N.C. Older Adult Injury Hospitalizations by Intent, Age 65 and Older: 2004-2007 (N=251,090)

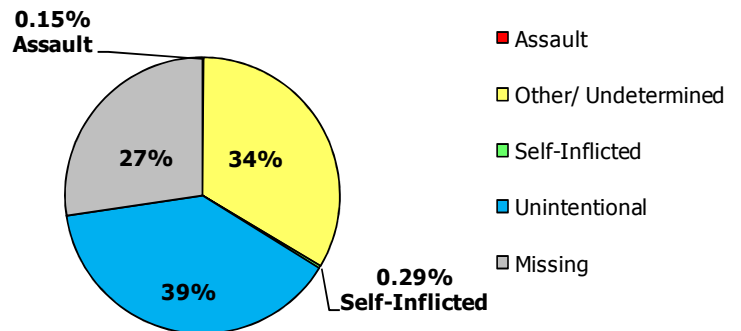
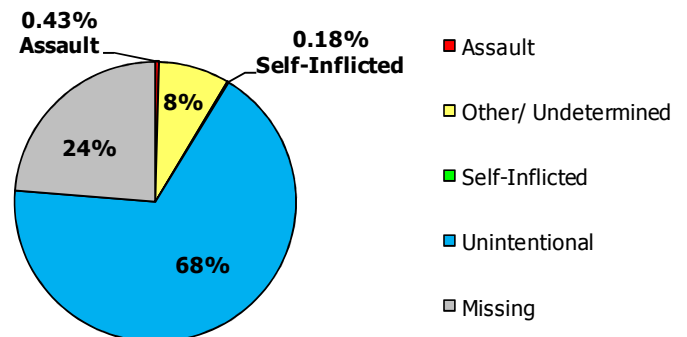


FIGURE 4: N.C. Older Adult Injury Emergency Department Visits by Intent: Age 65 and Older, 2006-2007 (N=191,835)



Causes of Older Adult Injury

During 2004 to 2007, unintentional fall was the first leading cause of injury deaths and the second leading cause of injury hospitalizations in older adults in North Carolina. Similarly, unintentional fall was the first leading cause of emergency department visits for older adult injury between 2006 and 2007. Unintentional falls caused 30.8% of all injury deaths (Table 1), 27.4% of all injury hospitalizations (Table 2), and 41.5% of all injury-related emergency department visits (Table 3) in older adults.

The first leading cause of injury hospitalizations for older adults was adverse effects of medical care and medications, which contributed to 33.2% of all injury hospitalizations among older adults in North Carolina between 2004 and 2007. Other than adverse effects, unintentional injuries comprised the remaining leading causes of injury hospitalizations and emergency department visits for older adults. Although the vast majority of injury deaths in adults aged 65 and older were from unintentional injuries, self-inflicted injuries were the fourth leading cause of injury death and assault injuries were the eighth leading cause of injury death in this population.

TABLE 1: N. C. Leading Types of Older Adult Injury Deaths, Age 65 and Older: 2004-2007 (N=6,116)	
Injury Type	Number of Deaths
Fall - Unintentional	1,883
Motor Vehicle - Unintentional	1,046
Unspecified - Unintentional	944
Self-Inflicted (Suicide)	695
Suffocation - Unintentional	509
Adverse Effects - Other	263
Fire/ Burn - Unintentional	180
Assault/ Homicide	131
Poisoning - Unintentional	117
All Other Causes	348
Total	6,116

TABLE 2: N. C. Leading Types of Older Adult Injury Hospitalizations, Age 65 and Older: 2004-2007 (N=251,090)	
Injury Type	Number of Hospitalizations
Adverse Effects - Other	83,415
Fall - Unintentional	68,770
Unspecified - Unintentional	9,689
Motor Vehicle - Unintentional	4,334
Other spec/class - Unintentional	3,740
Poisoning - Unintentional	2,847
Natural/ Environ - Unintentional	1,570
Overexertion - Unintentional	1,444
All Other Causes	6,586
Missing Cause	68,695
Total	251,090

TABLE 3: N. C. Leading Types of Older Adult Injury Emergency Department Visits, Age 65 and Older: 2006-2007 (N=191,835)	
Injury Type	Number of Visits
Fall - Unintentional	79,641
Adverse Effects - Other	15,364
Unspecified - Unintentional	10,453
Motor Vehicle - Unintentional	9,255
Struck - Unintentional	5,814
Overexertion - Unintentional	5,205
Cut/ Pierce - Unintentional	4,974
Natural/ Environ - Unintentional	4,510
All Other Causes	11,112
Missing Cause	45,507
Total	191,835

Causes of Older Adult Unintentional Injury

Considering only unintentional injuries, fall was the most common injury in older adults, significantly exceeding all other unintentional injury types in the rate of deaths, hospitalizations and emergency department visits. Falls represented 37.6% of all unintentional injury deaths (Table 4) and 70.6% of all unintentional injury hospitalizations (Table 5) from 2004 to 2007 and 61.5% of all unintentional injury emergency department visits (Table 6) from 2006 to 2007 for older adults in North Carolina.

In addition to falls, the top leading types of unintentional injury in older adults were motor vehicle-related injuries and unspecified injuries. Injuries sustained in a motor vehicle traffic crash caused 20.9% of deaths, 4.5% of hospitalizations and 7.1% of emergency department visits of all unintentional injuries in older adults. Unspecified injuries were reported for 18.9% of deaths, 10.0% of hospitalizations and 8.1% of emergency department visits of all unintentional injuries in North Carolinians aged 65 and older.

TABLE 4: N. C. Leading Types of Older Adult Unintentional Injury Deaths, Age 65 and Older: 2004-2007 (N=5,007)	
Unintentional Injury Type	Number of Deaths
Fall	1,883
Motor Vehicle	1,046
Unspecified	944
Suffocation	509
Fire/ Burn	180
Poisoning	117
Other spec/ NEC*	65
Natural/ Environ	51
Machinery	44
Drowning	40
Struck	28
All Other Causes	100
TOTAL	5,007

TABLE 5: N. C. Leading Types of Older Adult Unintentional Injury Hospitalizations, Age 65 and Older: 2004-2007 (N=97,357)	
Unintentional Injury Type	Number of Hospitalizations
Fall	68,770
Unspecified	9,689
Motor Vehicle	4,334
Other spec/ class	3,740
Poisoning	2,847
Natural/Environ	1,570
Overexertion	1,444
Other spec/ Not class	1,131
Struck	1,084
Suffocation	746
Fire/ Burn	646
All Other Causes	1,356
TOTAL	97,357

TABLE 6: N. C. Leading Types of Older Adult Unintentional Injury Emergency Department Visits, Age 65 and Older: 2006-2007 (N=129,463)	
Unintentional Injury Type	Number of Visits
Fall	79,641
Unspecified	10,453
Motor Vehicle	9,255
Struck	5,814
Overexertion	5,205
Cut/pierce	4,974
Natural/Environ	4,510
Other spec/ class	3,728
Poisoning	1,682
Other spec/ Not class	1,507
Fire/ Burn	857
All Other Causes	1,837
TOTAL	129,463

* Not Elsewhere Classified (NEC)

Deaths, Hospitalizations and Emergency Department Visits by Age and Gender

The most remarkable trend in the North Carolina older adult population over the evaluated time interval was a consistent increase in the rate of injury deaths, hospitalizations and emergency department visits with advancing age. By gender, older adult men had a higher rate of injury death than women, whereas older adult women had a slightly higher rate of injury hospitalizations and emergency department visits as compared to men.

From 2004 to 2007, adults aged 85 or older were 5.8 times more likely to die from an injury than adults aged 65 to 69 (380 vs. 66 deaths per 100,000, respectively) (Figure 5). Men were 1.5 times more likely to die from an injury than women (180 per 100,000 for males and 118 per 100,000 for females). In particular, men aged 85 or older had the highest injury death rate (495 per 100,000), while women aged 65 to 69 had the lowest rate (43 per 100,000).

In addition, adults aged 85 or older were 2.8 times more likely to be hospitalized than adults aged 65 to 69 (10,271 vs. 3,698 hospitalizations per 100,000, respectively) during 2004 to 2007 (Figure 6). Overall, women had a slightly higher injury hospitalization rate than men (6,026 per 100,000 for females and 5,685 per 100,000 for males) with the highest rate of hospitalization for injury occurring in women aged 85 or older (10,557 per 100,000).

Similarly, adults aged 85 or older were 2.8 times more likely to visit an emergency department between 2006 and 2007 for an injury as compared to the 65 to 69 age group (16,692 vs. 5,871 visits per 100,000, respectively) (Figure 7). Women were 1.3 times more likely to visit an emergency room for an injury than men (9,690 per 100,000 for women and 7,538 per 100,000 for men). Women aged 85 or older also had the highest rate of emergency department visits for injury (17,773 per 100,000).

FIGURE 5: N.C. Older Adult Injury Deaths by Age and Gender, Age 65 and Older: 2004-2007 (N=6,116)

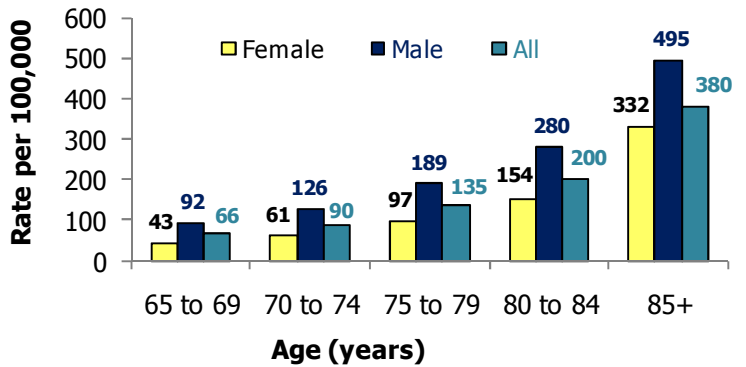


FIGURE 6: N.C. Older Adult Injury Hospitalizations by Age and Gender, Age 65 and Older: 2004-2007 (N=251,090)*

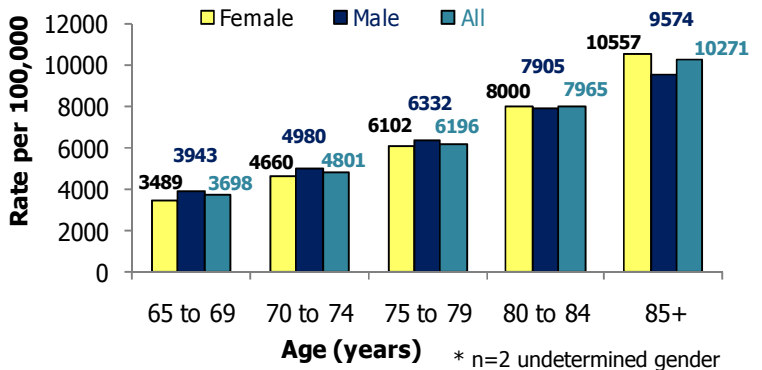
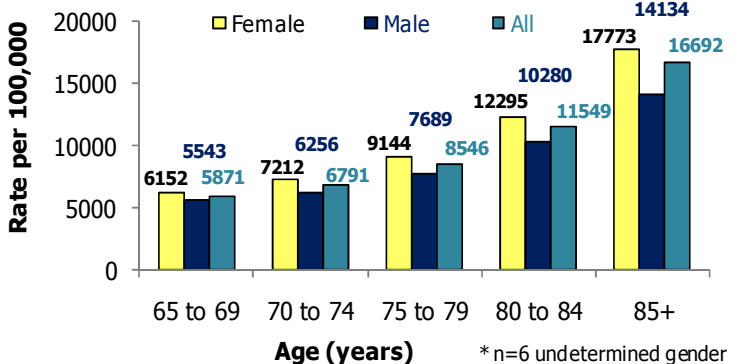


FIGURE 7: N.C. Older Adult Injury Emergency Department Visits by Age and Gender, Age 65 and Older: 2006-2007 (N=191,835)*

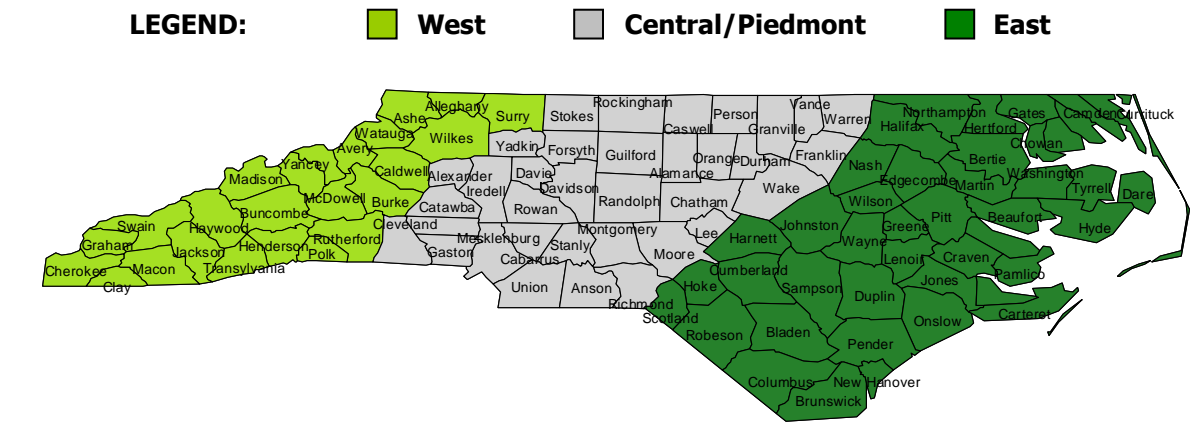


Regional Injury Rates

Figure 8 displays the older adult injury rate for deaths and hospitalizations from 2004 to 2007 and for emergency department visits from 2006 to 2007 in the western, central (Piedmont) and eastern regions of North Carolina. While the injury rates across the three regions were similar, older adults in the western region of North Carolina had the highest rate of mortality and the lowest rate of morbidity related to injury.

The older adult injury death rate was 146 per 100,000 in the western region, 144 per 100,000 in the central region, and 141 per 100,000 in the eastern region of the state. The eastern region had the highest hospitalization rate for older adult injury (6,012 per 100,000) followed by the central region (5,899 per 100,000) and the western region (5,641 per 100,000). The rate of emergency department visits for older adult injuries was highest in the central region (9,617 per 100,000), then the eastern region (8,750 per 100,000) and the western region (6,400 per 100,000) of North Carolina.

**FIGURE 8: North Carolina Older Adult Injury Rates by Region, Age 65 and Older
Deaths (n=6,116) and Hospitalizations (n=251,090): 2004-2007
Emergency Department Visits (n=191,835): 2006-2007**

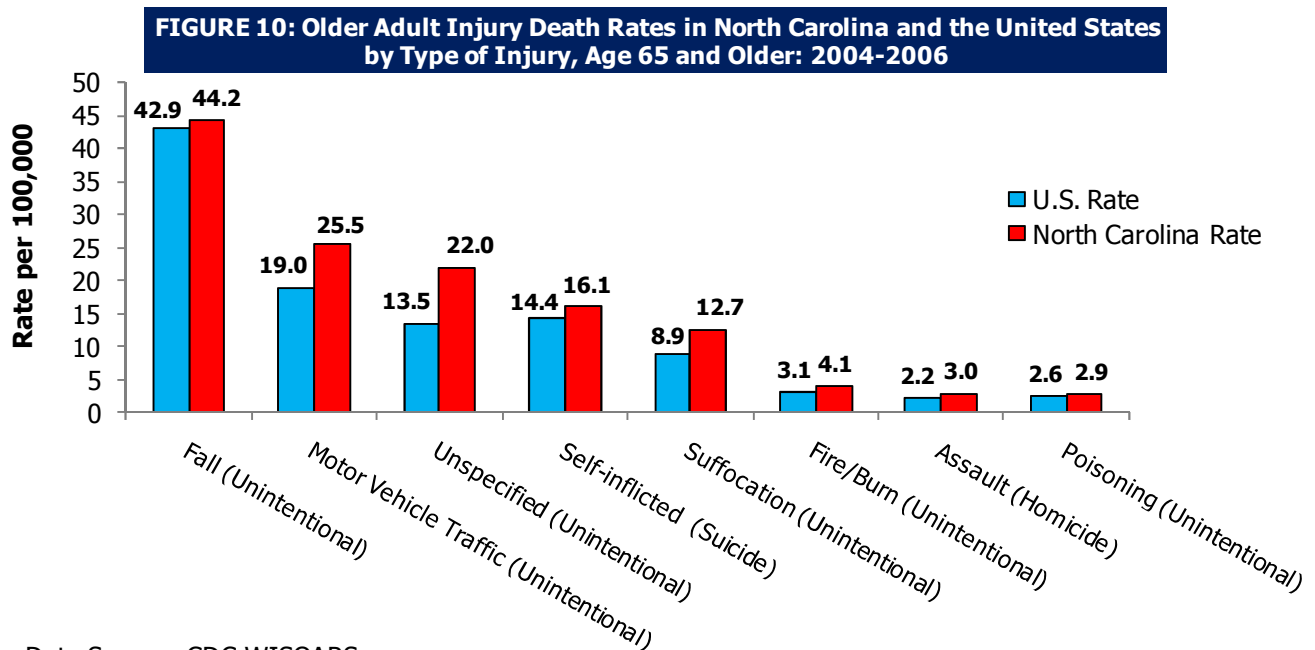
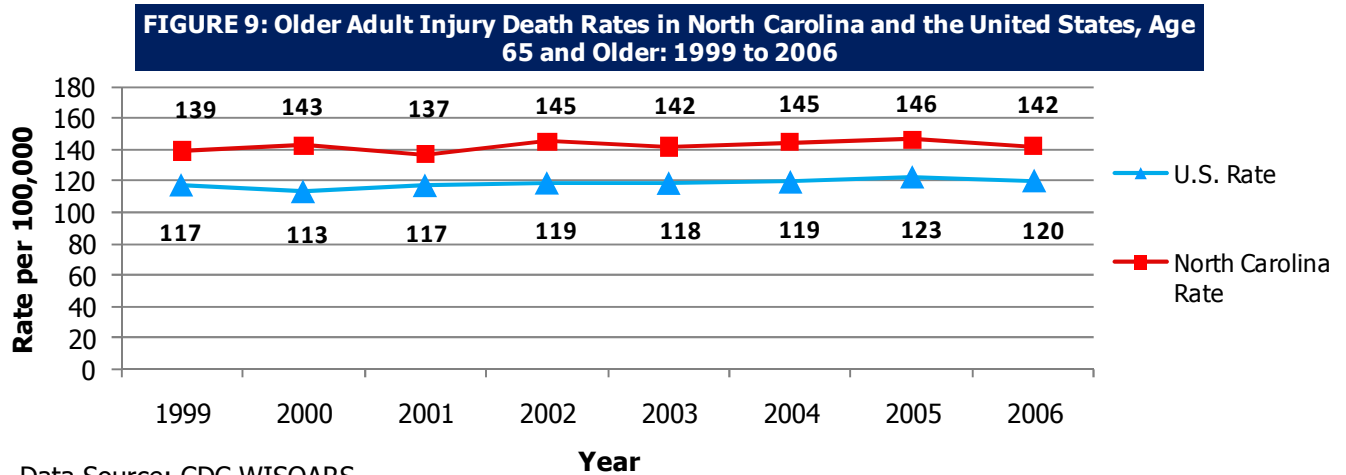


	West	Central	East
Deaths per 100,000	146	144	141
Hospitalizations per 100,000	5,641	5,899	6,012
Emergency Visits per 100,000	6,400	9,617	8,750

Comparison to United States and Comparison Over Time

The older adult injury death rate in North Carolina and the U.S. remained relatively unchanged from 1999 to 2006 (Figure 9). North Carolina had a higher injury death rate for older adults as compared to the U.S. during this time period. The older adult injury death rate was 142 per 100,000 in North Carolina and 120 per 100,000 in the U.S. for the most recent year that national data were available in 2006.

Unintentional fall was the leading cause of older adult injury death in both North Carolina (44.2 per 100,000) and in the U.S. (42.9 per 100,000) from 2004 to 2006 (Figure 10). For each of the most common causes of injury deaths in older adults during this time, North Carolina had a higher rate of deaths than the U.S. Compared to the U.S., the older adult injury death rate in North Carolina was 1.3 times higher for motor vehicle traffic injury (19.0 U.S. vs. 25.5 North Carolina per 100,000), 1.4 times higher for unintentional suffocation (8.9 U.S. vs. 12.7 North Carolina per 100,000), and 1.6 times higher for unspecified unintentional injury (13.5 U.S. vs. 22.0 North Carolina per 100,000).



Hospitalization Charges for Older Adult Injuries in 2004-2007

The considerable economic burden of older adult injury is demonstrated by the total hospitalization charges of \$8.0 billion in North Carolina from 2004 to 2007, including \$2.1 billion for all unintentional injuries in older adults (Figure 11). The vast majority of the remaining \$5.9 billion in total charges was for hospitalizations for other causes, such as adverse effects, and hospitalizations without cause data. These charges provide an estimate of the financial toll of the medical care requiring hospitalization for older 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.

The magnitude of unintentional fall as a major concern for older adults is evident by the estimated \$1.4 billion in total charges for hospitalization related to a fall injury in North Carolina between 2004 and 2007 (Figure 12). Other types of older adult injury with a large economic impact based on total hospitalization charges were unspecified unintentional injury (\$213 million) and motor vehicle-related unintentional injury (\$159 million).

Although unintentional fall was the most frequent type of injury in older adults with the greatest total hospitalization charges, the most expensive median hospitalization charges were for motor vehicle injuries (\$19,448) (Figure 13). Median hospitalization charges provide an estimate of the per injury charges. Differences in median hospitalization charges by injury type are related to the extent of damage to the body, the procedures required for treatment, and the length of the hospitalization stay. The injury types with the second and third highest median hospitalization charges for older adults were unintentional suffocation (\$16,634) and unintentional fall (\$16,516). The least expensive median hospitalization charges were for unintentional poisonings (\$8,848).

FIGURE 11: Total Hospitalization Charges for Older Adult Injuries in North Carolina, Age 65 and Older: 2004-2007

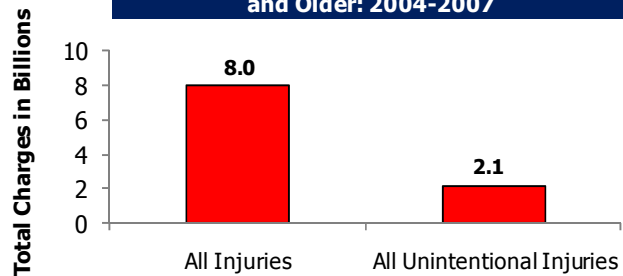


FIGURE 12: Total Hospitalization Charges for Older Adult Injuries in North Carolina by Type of Injury, Age 65 and Older: 2004-2007

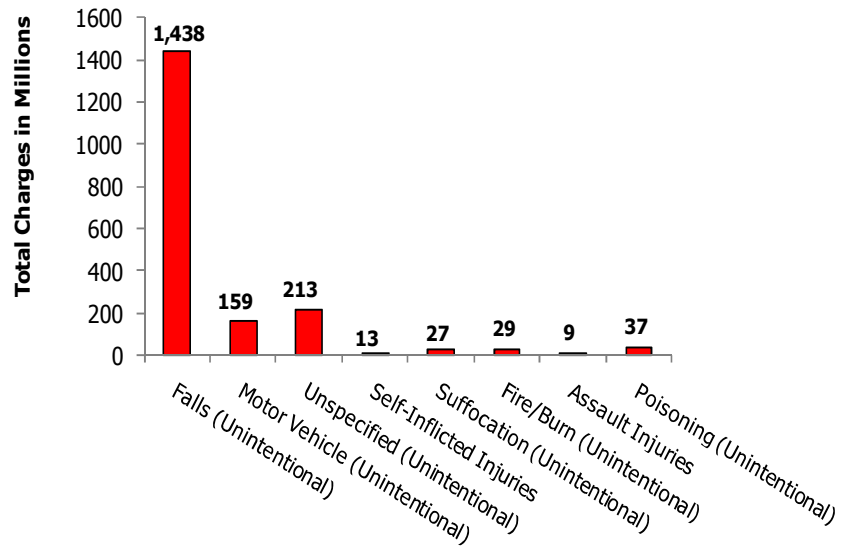
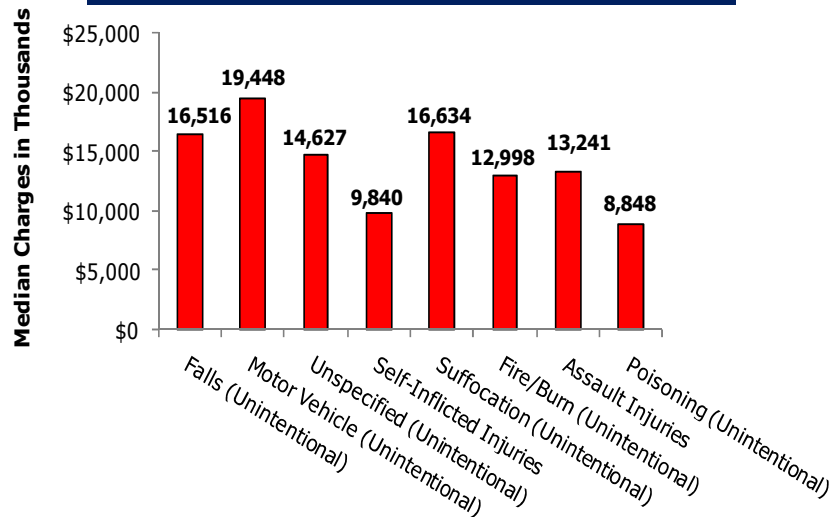


FIGURE 13: Median Hospitalization Charges of Older Adult Injuries in North Carolina by Type of Injury, Age 65 and Older: 2004-2007



2. Types of Older Adult Injury

Falls (Unintentional)

For older adults in North Carolina, unintentional fall extensively exceeded other injury types in the rate of serious injury resulting in death or requiring a visit to the hospital or emergency department. Unintentional fall was the first leading cause of injury deaths and emergency department visits and the second leading cause of injury hospitalizations during the evaluated time period among North Carolinians aged 65 or older.

Between 2004 and 2007, 1,883 older adults (44 per 100,000) in North Carolina died as a result of an unintentional fall. During this same time, injuries from unintentional falls necessitated hospitalization of 68,770 older adults (1,612 per 100,000). From 2006 to 2007, 79,641 older adults (3,654 per 100,000) visited an emergency department for an unintentional fall injury. The economic consequences of fall injuries in older adults are astounding. From 2004 to 2007 in North Carolina, unintentional fall injuries resulted in \$1.4 billion in total hospitalization charges with median charges of \$16,516 and average charges of \$20,919 (Table 7).

Adults aged 85 or older were 18 times more likely to die from an unintentional fall compared to adults aged 65 to 69 (162 vs. 9 per 100,000, respectively) (Figure 14). Similarly, injury from an unintentional fall was significantly more likely to require hospitalization (Figure 15) or an emergency department visit (Figure 16) with advancing age. The fall injury rate per 100,000 was 4,550 hospitalizations and 8,957 emergency visits for adults aged 85 and older contrasted with 523 hospitalizations and 1,705 emergency visits for adults aged 65 to 69.

The older adult death rate from a fall injury was about equal for men and women. However, women were nearly twice as likely as men to be hospitalized or visit an emergency department for a fall injury.

TABLE 7: Estimated Hospitalization Charges Resulting from Older Adult Fall-Related Unintentional Injuries in North Carolina, Age 65 and Older: 2004-2007

Total Charges	\$1,438,293,686
Median Charges	\$16,516
Average Charges	\$20,919

FIGURE 14: N.C. Older Adult Fall-Related Unintentional Injury Deaths by Age and Gender, Age 65 and Older: 2004-2007 (N=1,883)

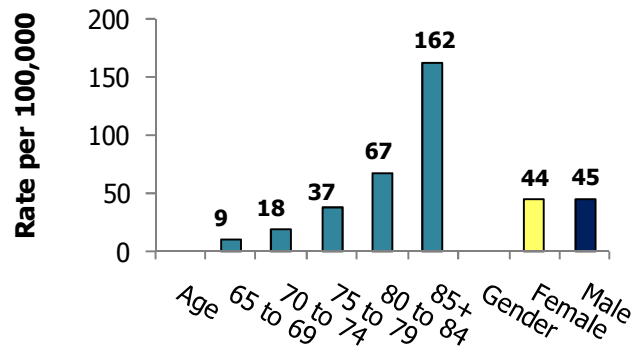


FIGURE 15: N.C. Older Adult Fall-Related Unintentional Injury Hospitalizations by Age and Gender, Age 65 and Older: 2004-2007 (N=68,770)

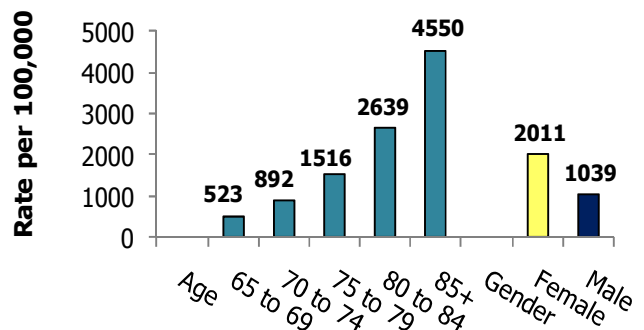
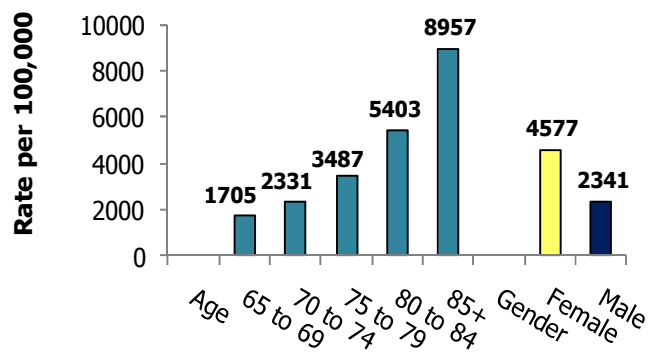


FIGURE 16: N.C. Older Adult Fall-Related Unintentional Injury Emergency Department Visits by Age and Gender, Age 65 and Older: 2006-2007 (N=79,641)



Motor Vehicle Injuries (Unintentional)

Motor vehicle traffic crashes were another major cause of injury mortality and morbidity in adults aged 65 or older. Unintentional motor vehicle injury was the second leading cause of injury deaths and the third leading cause of injury hospitalizations and emergency department visits for older adults in North Carolina over the measured time interval.

Motor vehicle-related injuries in North Carolina older adults led to 1,046 deaths (25 per 100,000) and 4,334 hospitalizations (102 per 100,000) from 2004 to 2007. Furthermore, 9,255 emergency department visits (425 per 100,000) were related to motor vehicle injuries in older adults in North Carolina from 2006 to 2007. Total hospitalization charges were \$159 million for motor vehicle injuries among older adults in North Carolina from 2004 to 2007 (Table 8). Motor vehicle injuries were the most expensive per injury of all causes of older adult injury based on the highest median hospitalization charges of \$19,448 with average charges of \$36,603.

The rate of motor vehicle injury death varied by age, increasing between the ages of 65 to 84 years (18 to 33 per 100,000, correspondingly) and then decreasing slightly for adults aged 85 or older (30 per 100,000) (Figure 17). Hospitalizations for motor vehicle injuries in older adults followed the same age trend (Figure 18). Conversely, the rate of emergency department visits related to a motor vehicle injury was highest for adults aged 65 to 69 (484 per 100,000) and lowest for adults aged 85 or older (287 per 100,000) (Figure 19).

Older adult men were 1.9 times more likely to die from a motor vehicle injury compared to women (34 vs. 18 per 100,000, respectively). The rate of hospitalization from a motor vehicle injury was 1.2 times greater for older adult men than women. The rate of emergency department visits for a motor vehicle injury was approximately equal by gender among older adults.

TABLE 8: Estimated Hospitalization Charges Resulting from Older Adult Motor Vehicle-Related Unintentional Injuries in North Carolina, Age 65 and Older: 2004-2007

Total Charges	\$158,565,965
Median Charges	\$19,448
Average Charges	\$36,603

FIGURE 17: N.C. Older Adult Motor Vehicle-Related Unintentional Injury Deaths by Age and Gender, Age 65 and Older: 2004-2007 (N=1,046)

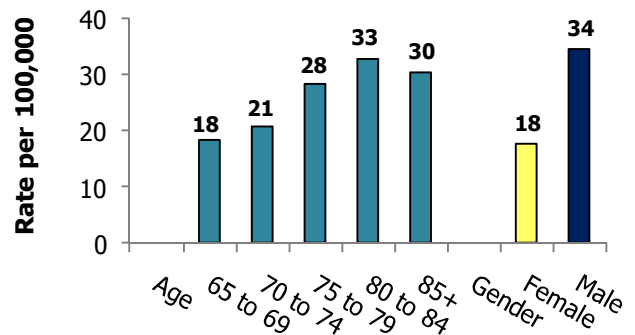


FIGURE 18: N.C. Older Adult Motor Vehicle-Related Unintentional Injury Hospitalizations by Age and Gender, Age 65 and Older: 2004-2007 (N=4,334*)

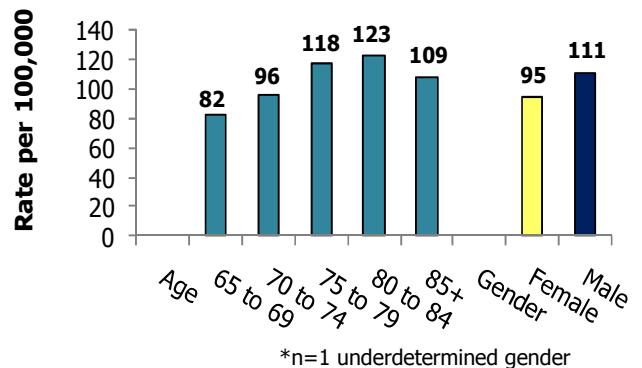
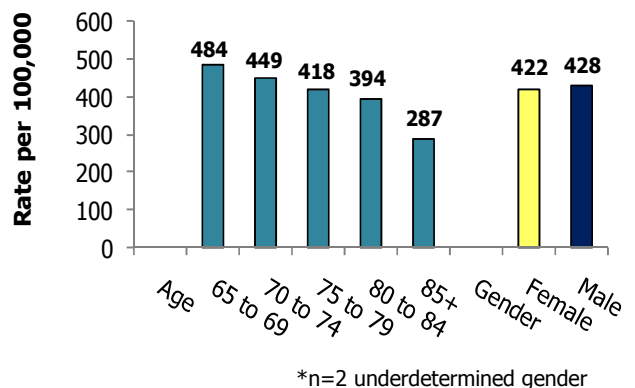


FIGURE 19: N.C. Older Adult Motor Vehicle-Related Unintentional Injury Emergency Department Visits by Age and Gender, Age 65 and Older: 2006-2007 (N=9,255*)



Unspecified Injuries (Unintentional)

Unspecified unintentional injury was the third leading cause of injury deaths and the second leading cause of injury hospitalizations and emergency department visits for older adults in North Carolina during the time period assessed. Although the reasons why the cause was unspecified for a significant proportion of unintentional injuries in older adults are unknown, older adults may have other health conditions that complicate the specification of an injury cause. Nevertheless, unspecified unintentional injuries deserve further attention because they may mask the magnitude of injury from other specified causes.

Unspecified unintentional injuries accounted for 944 deaths (22 per 100,000) and 9,689 hospitalizations (227 per 100,000) from 2004 to 2007 and 10,453 emergency department visits (480 per 100,000) from 2006 to 2007 for North Carolinians aged 65 or older. Unspecified unintentional injuries had the second highest total hospitalization charges for older adult injuries in North Carolina from 2004 to 2007 (Table 9). Total hospitalization charges incurred from unspecified injuries in older adults were \$213 million with median charges of \$14,627 and average charges of \$22,022.

The rate of injury deaths (Figure 20), hospitalizations (Figure 21) and emergency department visits (Figure 22) for unspecified unintentional injuries increased with older age. Most notably, adults aged 85 or older were 23 times more likely to die from unspecified unintentional injuries compared to adults aged 65 to 69 (91 vs. 4 per 100,000, respectively). Adults aged 85 or older were 3.7 times more likely to be hospitalized and 2.3 times more likely to visit the emergency department for unspecified unintentional injuries than adults aged 65 to 69. Older adult women had rates of unspecified unintentional injury deaths, hospitalizations and emergency visits that were 1.2 to 1.4 times higher than for men.

TABLE 9: Estimated Hospitalization Charges Resulting from Older Adult Unspecified Unintentional Injuries in North Carolina, Age 65 and Older: 2004-2007

Total Charges	\$213,324,173
Median Charges	\$14,627
Average Charges	\$22,022

FIGURE 20: N.C. Older Adult Unspecified Unintentional Injury Deaths by Age and Gender, Age 65 and Older: 2004-2007 (N=944)

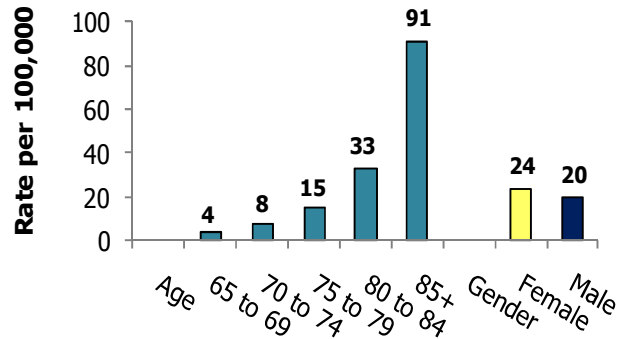


FIGURE 21: N.C. Older Adult Unspecified Unintentional Injury Hospitalizations by Age and Gender, Age 65 and Older: 2004-2007 (N=9,689)

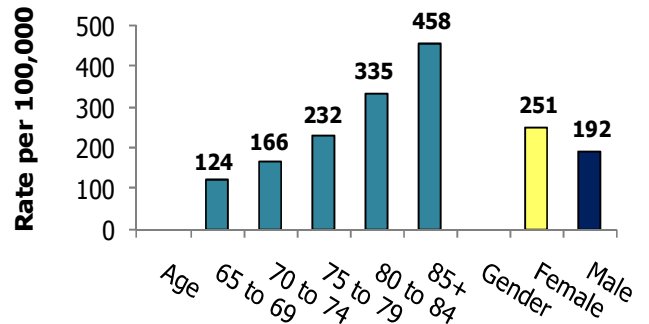
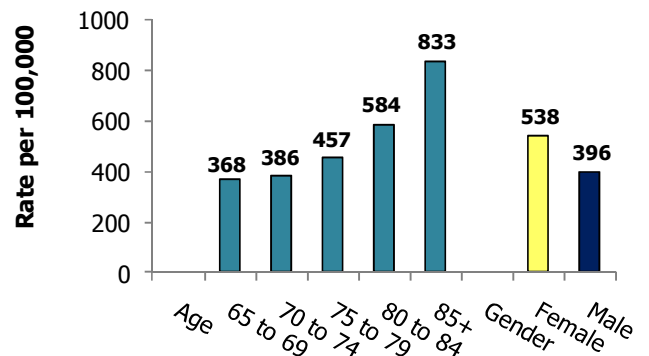


FIGURE 22: N.C. Older Adult Unspecified Unintentional Injury Emergency Department Visits by Age and Gender, Age 65 and Older: 2006-2007 (N=10,453)



Self-Inflicted Injuries

Self-inflicted injury ending in a suicide death was the fourth leading cause of injury death from 2004 to 2007 among older adults in North Carolina. In contrast, self-inflicted injury was not reported as a leading cause of older adult injury for hospitalizations (2004 to 2007) or for emergency department visits (2006 to 2007). However, older adults may be unlikely or unwilling to report self-inflicted injuries as intentional at the hospital or emergency department.

During 2004 to 2007 in North Carolina, 695 older adults (16 per 100,000) died and 731 older adults (17 per 100,000) were hospitalized as a result of self-inflicted injuries. From 2006 to 2007, 345 older adults (16 per 100,000) visited an emergency department for self-inflicted injuries. Hospitalization charges for self-inflicted injuries in older adults totaled \$13 million between 2004 and 2007 in North Carolina with median charges of \$9,840 and average charges of \$17,821 (Table 10).

The rate of death from self-inflicted injury was similar across older adult age groups (Figure 23). Contrary to most other injury types, older adults in the youngest age group had twice the rate of hospitalizations (Figure 24) and emergency department visits (Figure 25) for self-inflicted injury as adults in the oldest age group. The rate of self-inflicted injury per 100,000 was 24 hospitalizations and 25 emergency visits for adults aged 65 to 69 compared to 10 hospitalizations and 11 emergency visits for adults aged 85 or older.

The rate of hospitalizations and emergency department visits for self-inflicted injury by gender reflects that older adult men and women had a similar occurrence of attempted suicide requiring medical care. However, older adult men were 6.6 times more likely to successfully complete suicide than women (33 vs. 5 per 100,000, respectively). The gender difference in the suicide death rate is because males tend to use more lethal means such as firearms, whereas females more commonly attempt suicide by less fatal methods such as poisoning.

TABLE 10: Estimated Hospitalization Charges Resulting from Older Adult Self-Inflicted Injuries in North Carolina, Age 65 and Older: 2004-2007

Total Charges	\$13,009,321
Median Charges	\$9,840
Average Charges	\$17,821

FIGURE 23: N.C. Older Adult Self-Inflicted Injury (Suicide) Deaths by Age and Gender, Age 65 and Older: 2004-2007 (N=695)

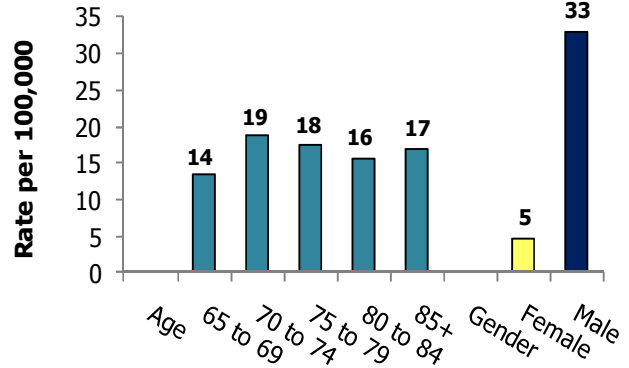


FIGURE 24: N.C. Older Adult Self-Inflicted Injury Hospitalizations by Age and Gender, Age 65 and Older: 2004-2007 (N=731)

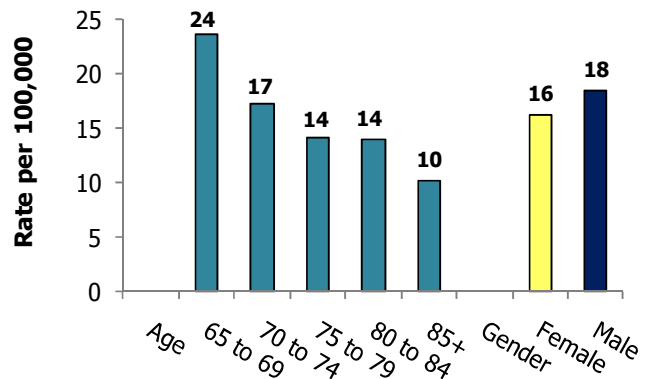
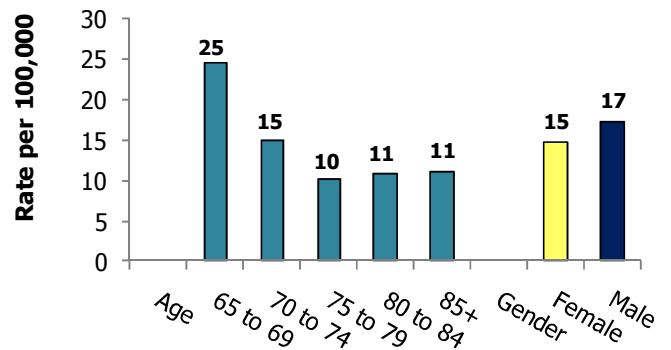


FIGURE 25: N.C. Older Adult Self-Inflicted Injury Emergency Department Visits by Age and Gender, Age 65 and Older: 2006-2007 (N=345)



Older Adult Injuries in North Carolina: 2004 to 2007

The most common type of self-inflicted injury resulting in death for older adults was from a firearm. In 2004 to 2007 in North Carolina, 542 older adults successfully completed suicide using a firearm and 90.8% of these older adults were male. Firearm deaths represented 78.0% of all self-inflicted injury deaths for older adults (Table 11). Firearm injuries were the third most common type of self-inflicted injury for older adults that required hospitalization or a visit to the emergency department. In North Carolina, 47 older adults were hospitalized between 2004 and 2007 (Table 12) and 33 older adults attended the emergency department between 2006 and 2007 (Table 13) for treatment of a self-inflicted firearm injury.

Poisoning was the leading self-inflicted injury requiring hospitalization or an emergency department visit, accounting for 78.0% of hospitalizations and 72.2% of emergency department visits for self-inflicted injuries in older adults. Self-inflicted poisoning led to 70 deaths and 570 hospitalizations from 2004 to 2007 and 249 emergency department visits from 2006 to 2007 for North Carolinians aged 65 and older. Over 60% of the hospitalizations and emergency department visits for self-inflicted poisoning were for female older adults.

TABLE 11: N. C. Types of Older Adult Self-Inflicted Injury Deaths, Age 65 and Older: 2004-2007 (N=695)	
Self-Inflicted Injury Type	Number of Deaths
Firearm	542
Poisoning	70
Suffocation	42
Cut/ Pierce	14
Drowning	7
Fall	6
Fire/ Burn	6
Other Injury Types	8
Total	695

TABLE 12: N. C. Types of Older Adult Self-Inflicted Injury Hospitalizations, Age 65 and Older: 2004-2007 (N=731)	
Self-Inflicted Injury Type	Number of Hospitalizations
Poisoning	570
Cut/ Pierce	66
Firearm	47
Other spec/ Not Class	26
Unspecified	9
Other spec/Class	7
Drowning	2
Other Injury Types	4
Total	731

TABLE 13: N. C. Types of Older Adult Self-Inflicted Injury Emergency Department Visits, Age 65 and Older: 2006-2007 (N=345)	
Self-Inflicted Injury Type	Number of Visits
Poisoning	249
Cut/ Pierce	35
Firearm	33
Other spec/ Not Class	17
Unspecified	4
Other spec/ Class	3
Suffocation	2
Other Injury Types	2
Total	345

Suffocation (Unintentional)

In North Carolina, 509 older adults (12 per 100,000) died and 746 older adults (17 per 100,000) were hospitalized as a result of unintentional suffocation between 2004 and 2007. Furthermore, 297 older adults (14 per 100,000) were seen at the emergency department because of unintentional suffocation injuries during 2006 to 2007. The total estimated hospitalization charges for unintentional suffocation injuries in older adults were \$27 million between 2004 and 2007 in North Carolina (Table 14). Moreover, unintentional suffocation had the second most expensive median hospitalization charges (\$16,634) and third highest average hospitalization charges (\$35,794) of all causes of older adult injury.

Unintentional suffocation most frequently occurred in adults aged 85 or older with an increase in injury rate with older age. Compared to adults aged 65 to 69, adults aged 85 or older were 13 times more likely to die from unintentional suffocation (Figure 26). Following the same trend, adults aged 85 or older were 3.5 times more likely to be hospitalized (Figure 27) or to visit an emergency department (Figure 28) for an unintentional suffocation injury than adults aged 65 to 69. The unintentional suffocation injury rate per 100,000 in adults aged 85 or older was 39 deaths, 35 hospitalizations and 28 emergency visits, whereas the rate per 100,000 in adults aged 65 to 69 was 3 deaths, 10 hospitalizations, and 8 emergency visits.

For unintentional suffocation injuries in older adults, the death and hospitalization rates were 1.2 to 1.3 times higher for men than women (13 vs. 11 deaths per 100,000 and 20 vs. 16 hospitalizations per 100,000 for men vs. women, respectively). The rate of emergency department visits related to unintentional suffocation among older adults was equal by gender.

TABLE 14: Estimated Hospitalization Charges Resulting from Older Adult Suffocation Unintentional Injuries in North Carolina, Age 65 and Older: 2004-2007	
Total Charges	\$26,701,951
Median Charges	\$16,634
Average Charges	\$35,794

FIGURE 26: N.C. Older Adult Suffocation Unintentional Injury Deaths by Age and Gender, Age 65 and Older: 2004-2007 (N=509)

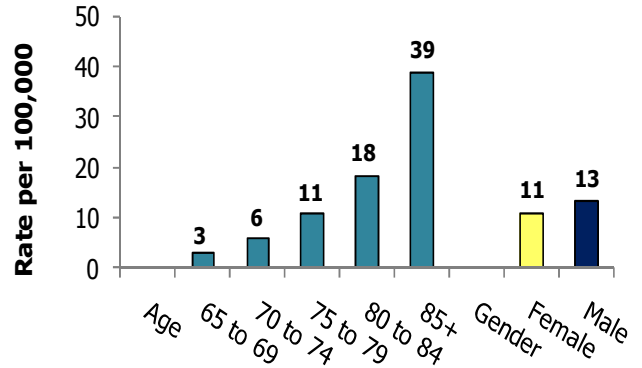


FIGURE 27: N.C. Older Adult Suffocation Unintentional Injury Hospitalizations by Age and Gender, Age 65 and Older: 2004-2007 (N=746)

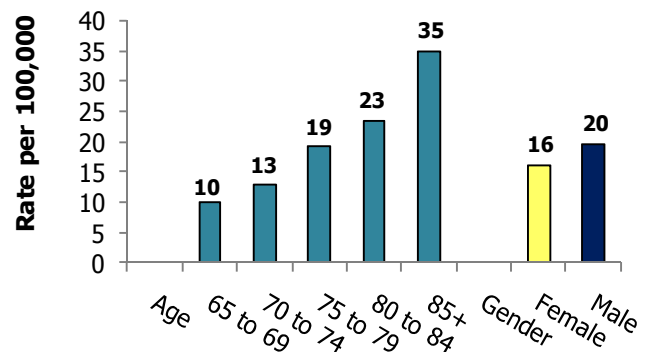
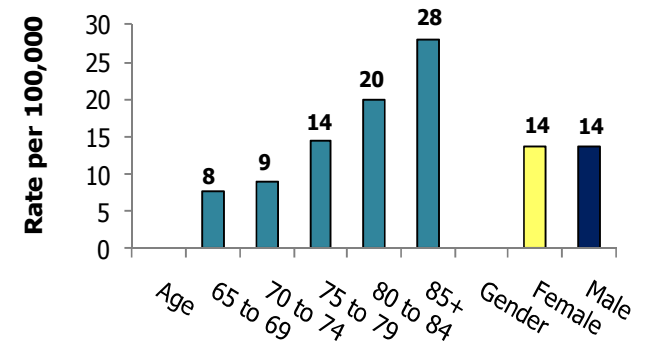


FIGURE 28: N.C. Older Adult Suffocation Unintentional Injury Emergency Department Visits by Age and Gender, Age 65 and Older: 2006-2007 (N=297)



Fire/Burn Injuries (Unintentional)

Unintentional injuries suffered by older adults from a fire or burn led to 180 deaths (4 per 100,000) and 646 hospitalizations (15 per 100,000) from 2004 to 2007 in North Carolina. Treatment of fire- or burn-related unintentional injuries among North Carolinians aged 65 or older required 857 emergency department visits (39 per 100,000) from 2006 to 2007. In addition, fire- or burn-related unintentional injuries resulted in total hospitalization charges of \$29 million, median hospitalization charges of \$12,998, and the most expensive average hospitalization charges of \$44,495 for older adults in North Carolina between 2004 and 2007 (Table 15).

The highest rate of deaths (Figure 29) and hospitalizations (Figure 30) for fire- or burn-related unintentional injuries was for adults aged 85 or older and the lowest rate was for adults aged 65 to 69. Adults aged 85 or older as compared to aged 65 to 69 were 2.3 times more likely to die (7 vs. 3 per 100,000, respectively) and 1.5 times more likely to be hospitalized (20 vs. 13 per 100,000, respectively) from an unintentional injury related to a fire or burn. On the other hand, the rate of emergency department visits for fire- or burn-related injuries did not show a consistent trend across the older adult age groups (Figure 31).

Among older adults, men had higher rates of deaths, hospitalizations and emergency department visits for an unintentional injury caused by a fire or burn than women (6 male vs. 3 female deaths per 100,000; 18 male vs. 13 female hospitalizations per 100,000; and 41 male vs. 38 female emergency department visits per 100,000).

TABLE 15: Estimated Hospitalization Charges Resulting from Older Adult Fire/Burn-Related Unintentional Injuries in North Carolina, Age 65 and Older: 2004-2007	
Total Charges	\$28,743,696
Median Charges	\$12,998
Average Charges	\$44,495

FIGURE 29: N.C. Older Adult Fire/Burn-Related Unintentional Injury Deaths by Age and Gender, Age 65 and Older: 2004-2007 (N=180)

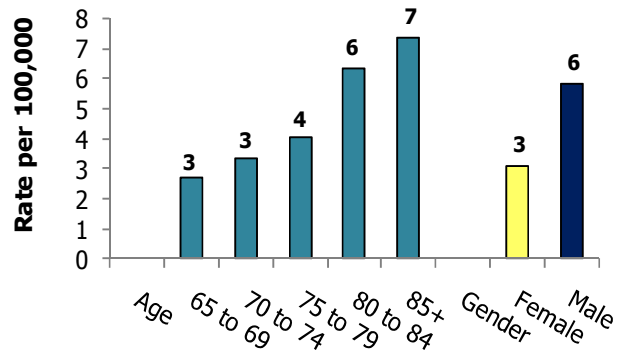


FIGURE 30: N.C. Older Adult Fire/Burn-Related Unintentional Injury Hospitalizations by Age and Gender, Age 65 and Older: 2004-2007 (N=646)

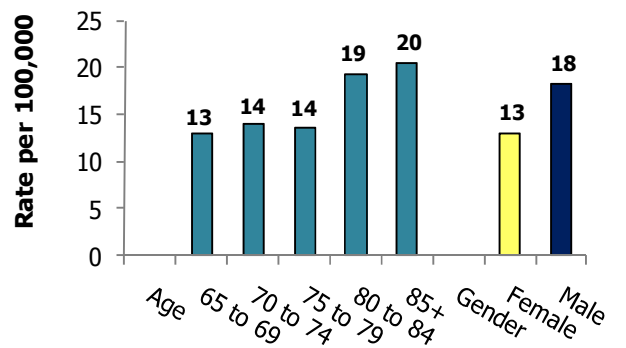
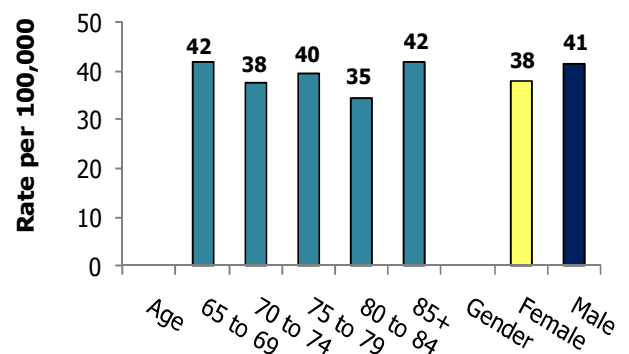


FIGURE 31: N.C. Older Adult Fire/Burn-Related Unintentional Injury Emergency Department Visits by Age and Gender, Age 65 and Older: 2006-2007 (N=857)



Assault Injuries

Older adults are at risk for being the victim of an assault. Homicide was the eighth leading cause of injury death in adults aged 65 or older in North Carolina between 2004 and 2007. During this time, 131 older adults (3 per 100,000) died and 378 older adults (9 per 100,000) were hospitalized after an assault. In 2006 to 2007, 820 older adults (38 per 100,000) visited an emergency department for assault injuries. Although assault injuries had one of the lowest total hospitalization charges (\$9 million) among older adult injury types, the median charges (\$13,241) and average charges (\$22,861) were high between 2004 and 2007 in North Carolina (Table 16).

The homicide rate ranged between 2 and 4 deaths per 100,000 across older adult age groups (Figure 32). Compared to adults between 65 and 79 years of age, adults aged 80 or older were 1.4 to 1.5 times more likely to be hospitalized for assault injuries (8 per 100,000 for ages 65 to 79; 11 per 100,000 for ages 80 to 84; and 12 per 100,000 for ages 85 and older) (Figure 33). The frequency of attending the emergency department (Figure 34) related to an assault was highest for the oldest age group of 85 or older (58 per 100,000), followed by the youngest age group of 65 to 69 (44 per 100,000), and then ages 70 to 84 (ranged from 28 to 32 per 100,000).

Older adult men were at greatest risk for severe outcomes of assault. Relative to women, assault injuries in men were twice as likely to cause death (2 female vs. 4 male deaths per 100,000), 1.7 times more likely to require hospitalization (7 female vs. 12 male hospitalizations per 100,000), and 1.9 times more likely to involve an emergency department visit (27 female vs. 52 male visits per 100,000).

TABLE 16: Estimated Hospitalization Charges Resulting from Older Adult Assault Injuries in North Carolina, Age 65 and Older: 2004-2007	
Total Charges	\$8,641,370
Median Charges	\$13,241
Average Charges	\$22,861

FIGURE 32: N.C. Older Adult Assault Injury Deaths (Homicide) by Age and Gender, Age 65 and Older: 2004-2007 (N=131)

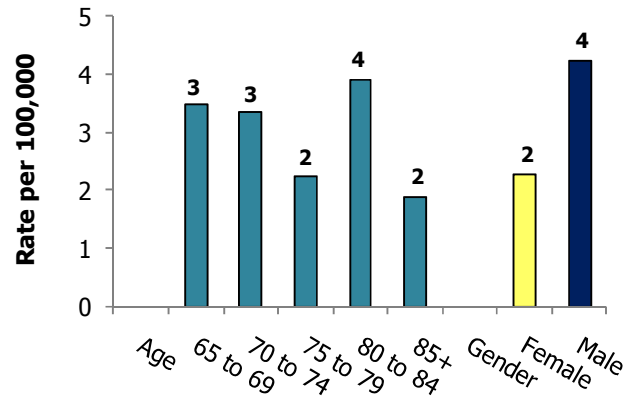
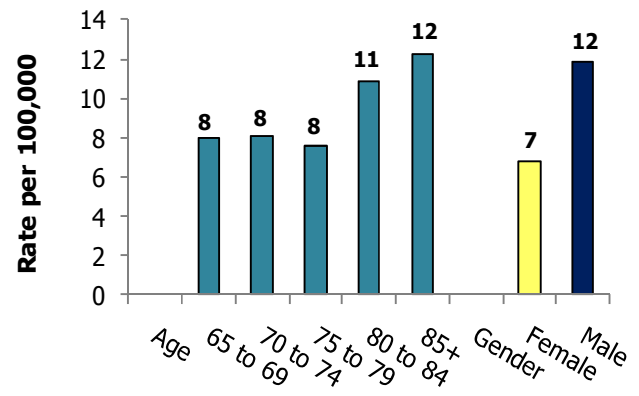
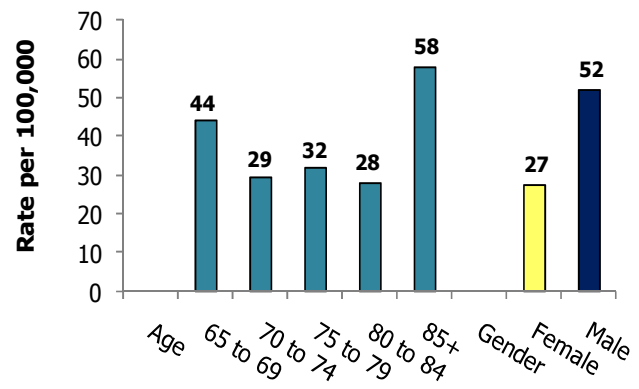


FIGURE 33: N.C. Older Adult Assault Injury Hospitalizations by Age and Gender, Age 65 and Older: 2004-2007 (N=378*)



*n=1 underdetermined gender

FIGURE 34: N.C. Older Adult Assault Injury Emergency Department Visits by Age and Gender, Age 65 and Older: 2006-2007 (N=820*)



*n=3 underdetermined gender

Older Adult Injuries in North Carolina: 2004 to 2007

Similar to self-inflicted injuries, firearm was the leading type of assault injury resulting in death of older adults in North Carolina. Firearms took the lives of 61 older adults in North Carolina between 2004 and 2007 and accounted for 46.6% of all assault injury deaths in older adults (Table 17). In addition, 28 older adults were hospitalized in 2004 to 2007 (Table 18) and 32 older adults visited the emergency department in 2006 to 2007 (Table 19) for an assault injury from a firearm in North Carolina.

The most common assault injury to require hospitalization or an emergency department visit for older adults was an injury suffered from being struck. From 2004 to 2007, 124 older adults were hospitalized after being struck, which represented 32.8% of hospitalizations related to assault injuries among older adults in North Carolina. Furthermore, 373 older adults visited the emergency department during 2006 to 2007 for an injury sustained from being struck, accounting for 45.5% of emergency department visits for assault injuries among North Carolinians aged 65 or older.

TABLE 17: N. C. Types of Older Adult Assault Injury Deaths, Age 65 and Older: 2004-2007 (N=131)	
Assault Injury Type	Number of Deaths
Firearm	61
Unspecified	31
Cut/ Pierce	25
Other spec/ NEC*	5
Suffocation	5
Poisoning	2
Other Injury Types	2
Total	131

TABLE 18: N. C. Types of Older Adult Assault Injury Hospitalizations, Age 65 and Older: 2004-2007 (N=378)	
Assault Injury Type	Number of Hospitalizations
Struck	124
Unspecified	82
Other spec/ Class	56
Other spec/ Not Class	54
Firearm	28
Cut/ Pierce	24
Other Injury Types	10
Total	378

TABLE 19: N. C. Types of Older Adult Assault Injury Emergency Department Visits, Age 65 and Older: 2006-2007 (N=820)	
Assault Injury Type	Number of Visits
Struck	373
Unspecified	136
Other spec/ Not Class	128
Other spec/ Class	76
Cut/ Pierce	69
Firearm	32
Other Injury Types	6
Total	820

* Not Classified Elsewhere (NEC)

Poisoning (Unintentional)

Unintentional poisoning was the sixth leading cause of injury-related hospitalizations between 2004 and 2007 among older adults. During this time in North Carolina, unintentional poisoning of older adults caused 117 deaths (3 per 100,000) and 2,847 hospitalizations (67 per 100,000). Additionally, 1,682 emergency department visits (77 per 100,000) during 2006 to 2007 were for treatment of unintentional poisoning in older adults. The total hospitalization charges in North Carolina related to unintentional poisoning of older adults between 2004 and 2007 was estimated at \$37 million with median charges of \$8,848 and average charges of \$13,058 (Table 20).

Once again, the rate of injury from unintentional poisoning tended to increase with older age. The death rate for unintentional poisoning was 3 times higher in adults aged 85 or older (6 per 100,000) than adults aged 65 to 69 (2 per 100,000) (Figure 35). The rate of hospitalization for unintentional poisoning peaked for ages 80 to 84 (83 per 100,000) and this age group was 1.5 times more likely to be hospitalized as adults aged 65 to 69 (56 per 100,000) (Figure 36). Likewise, adults aged 85 or older had an emergency department visit rate for unintentional poisoning that was 1.4 times greater than for adults aged 65 to 69 (97 vs. 69 per 100,000, respectively) (Figure 37).

Older adult men had a slightly higher rate of death from unintentional poisoning than women (3 male vs. 2 female deaths per 100,000). On the contrary, women were 1.3 times more likely than men to be hospitalized (73 female vs. 58 male hospitalizations per 100,000) or to visit an emergency department (86 female vs. 64 male visits per 100,000) as a result of injuries sustained from unintentional poisoning.

TABLE 20: Estimated Hospitalization Charges Resulting from Older Adult Poisoning Unintentional Injuries in North Carolina, Age 65 and Older: 2004-2007	
Total Charges	\$37,175,190
Median Charges	\$8,848
Average Charges	\$13,058

FIGURE 35: N.C. Older Adult Poisoning Unintentional Injury Deaths by Age and Gender, Age 65 and Older: 2004-2007 (N=117)

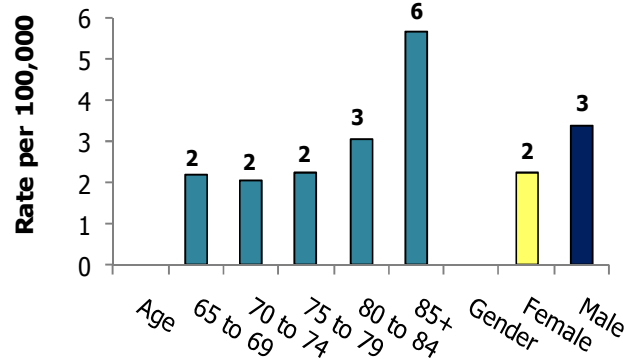


FIGURE 36: N.C. Older Adult Poisoning Unintentional Injury Hospitalizations by Age and Gender, Age 65 and Older: 2004-2007 (N=2,847)

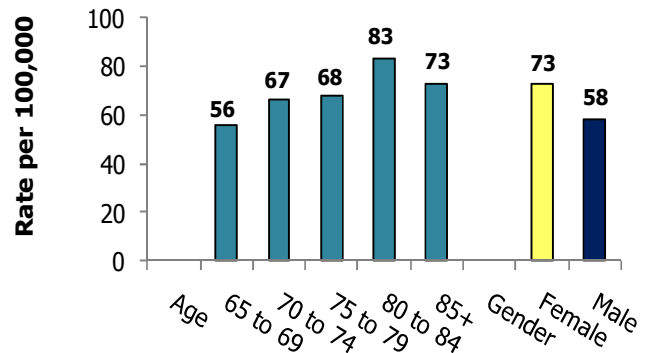
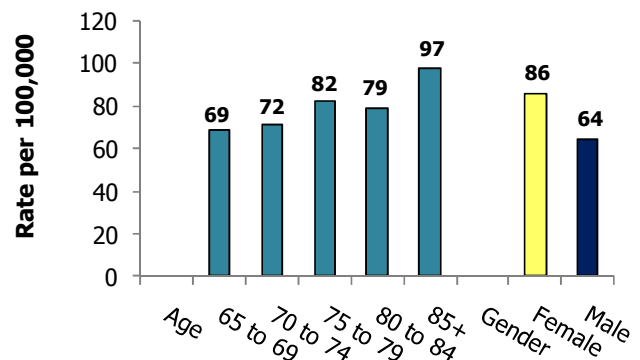


FIGURE 37: N.C. Older Adult Poisoning Unintentional Injury Emergency Department Visits by Age and Gender, Age 65 and Older: 2006-2007 (N=1,682)



3. Conclusions and Recommendations

- Injury is a significant source of morbidity and mortality for North Carolinians aged 65 or older that endangers their life, health and productivity and creates a substantial economic toll on individuals, families and society.
- Prevention of injuries in older adults is essential to reducing the public health burden, especially given the expected considerable growth of the North Carolina older adult population over the next 20 years. Injury in older adults is largely preventable, and understanding the most common causes of injury and identifying those at greatest risk are the first steps in guiding prevention efforts.
- Severe injury-related outcomes of deaths, hospitalizations and emergency department visits represent only a fraction of the burden of older adult injury in North Carolina. The full scope of the older adult injury problem is estimated to be greater when considering injuries treated at outpatient visits and medically unattended injuries.
- The majority of older adult injuries resulting in death, hospitalization or a visit to the emergency department are unintentional. In addition, a significant proportion of deaths, hospitalizations and emergency department visits for unintentional injuries in older adults have no specified cause. Unspecified unintentional injuries in older adults warrant further investigation of the reasons for the lack of a specified cause to be able to make progress on reducing their occurrence.
- The financial consequences of older adult injuries are estimated at \$8 billion in total hospitalization charges from 2004 to 2007 in North Carolina. Efforts to reduce this expense should focus on decreasing hospitalizations of older adults for "other" causes, such as adverse effects; ensuring coding of the cause is captured for all hospitalizations; and preventing falls.
- Overall, the risk of death, hospitalization and attendance at an emergency department from injury increases markedly with older age with the greatest risk in adults aged 85 or older. In particular, the risk of death or serious injury from an unintentional fall, unspecified unintentional injury, and unintentional suffocation are much higher with advanced age. The oldest age groups require special attention with targeted interventions to reduce their risk for injury. Efforts should include addressing health conditions that make older adults more vulnerable to injury and are more prevalent with advanced age, such as frailty, osteoporosis, arthritis and visual impairment.
- Unintentional fall is the leading cause of injury deaths and emergency department visits and the second leading cause of injury hospitalizations among older adults in North Carolina. Unintentional falls far exceed all other causes of older adult injury in the rate of death and serious injuries and total hospitalization charges incurred. Therefore, public health and community resources should focus policies and programs on prevention of falls in older adults as a top priority. Education of older adults on ways to reduce the risk of unintentional falls includes: exercising regularly to improve strength and balance; improving lighting in their home; identifying potential hazards in the home that can cause a fall; asking their doctor to review medications to reduce potential side effects or interactions; and having their eyes checked by an eye doctor yearly (CDC, 2009c).
- Motor vehicle is the second leading cause of injury deaths and the third leading cause of injury hospitalizations and emergency department visits for older adults in North Carolina. In addition, motor vehicle injuries have the most expensive median hospitalization charges. To help prevent motor vehicle injuries, older adults drivers should: always wear seat belts; limit driving to daytime and good weather conditions; leave a large following distance; reduce distractions while driving; ask their doctor to review medications to reduce potential side effects or interactions; exercise regularly to increase strength and flexibility; have their eyes checked by an eye doctor yearly; and consider other transportation alternatives (CDC, 2010a).

- Self-inflicted injury is the fourth leading cause of injury death among North Carolinians aged 65 or older. Firearm injury is the most common fatal self-inflicted injury, whereas poisoning is the most common non-fatal self-inflicted injury among older adults. Suicide prevention strategies should be directed at older adults, especially men who are much more likely to successfully complete suicide than women.
- Older adults are vulnerable to assault, which is the eighth leading cause of injury death among older adults in North Carolina. Being shot with a firearm or being struck are the most common types of assault injuries that result in death or serious injury for older adults. Men are at greater risk for assault injuries than women. Strategies to prevent violence against older adults are important in prevention of assault injuries.
- Other leading causes of unintentional injury among older adults in North Carolina include suffocation, poisoning and fire/burn injuries. To prevent these injuries in older adults, interventions should focus on removing the underlying injury hazard, such as identifying and treating health conditions that impair swallowing in older adults to reduce the risk of suffocation. Accidental overdose or misuse of medications can be prevented by educating older adults to: read all warning labels on medications and follow directions on the label; turn on the light at night to ensure the correct amount and type of medication; keep medications in their original container; never share medication; dispose of unused, unneeded and expired medications; and have their eyes checked by an eye doctor yearly (CDC, 2008). Education of older adults on prevention of fire/burn injuries may include: providing safety information on the use of space heaters, smoking and cooking; installing smoke detectors; and planning escape routes in the event of a fire (CDC, 2010b).
- The older adult injury death rate has not shown any significant change between 1999 and 2006 in the United States and in North Carolina. However, North Carolina consistently has had higher death rates than the U.S. for all types of older adult injury, especially for motor vehicle injury, unspecified unintentional injury and unintentional suffocation injury. New strategies to prevent injury in older adults may be needed to lower the injury rates in both the nation and in the state.
- Attention to documenting more complete coding of hospitalizations and emergency department visits is needed to fully capture the underlying causes of older adult injury, which will facilitate identification of suitable methods for injury prevention.

4. Appendix

Appendix A: Data Sources and Technical Notes

Comparison of U.S. and North Carolina Injury Rates 1999-2006

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 U.S. and North Carolina fatal injury rates for the years 1999 to 2006 and by injury type for 2004 to 2006. Crude rates were reported unless otherwise noted. The WISQARS injury mortality reports were retrieved January 10, 2010 from:

http://webappa.cdc.gov/sasweb/ncipc/mortrate10_sy.html.

North Carolina Population Estimates 2004-2007

The North Carolina State Center for Health Statistics (SCHS) provided North Carolina population data for the years 2004 to 2007. SCHS obtained the population data from the CDC National Center for Health Statistics bridged population file (2007 version).

North Carolina Death Data 2004-2007

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 65 years or older 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 2004 -2007

The North Carolina State Center for Health Statistics provided data for every North Carolina hospital discharge of North Carolina residents aged 65 or older. 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 2006-2007

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 2007, NC DETECT was receiving data daily from 108 of the 112 24/7 EDs in North Carolina. In 2006, NC DETECT was receiving data daily from 89 of the 112 24/7 EDs in North Carolina. Therefore, data for these years are not representative of all EDs in the state, although the majority of EDs were reporting. The ED data, hospital discharge data and death 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.

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-E-886.9, E888.

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 Unspecified

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

Self-Inflicted

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

Unintentional Suffocation

Unintentional suffocation injuries were categorized with an unintentional intent by any suffocation mechanism, such as accidental strangulation, threat to breathing, and inhalation of food or foreign body. Cause of death codes: W75-W84. Hospital and emergency department E-codes: E911-E913.9.

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.

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.

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.

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 2004 to 2007. Emergency department visit rates were calculated based on NC DETECT for 2006 to 2007. 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 (2004-2007 for deaths and hospitalizations; 2006-2007 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

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

Acting Director: Robin Ikeda, MD, MPH, CAPT, USPHS

Injury and Violence Prevention Branch

Chronic Disease and Injury, 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; Fax: (919) 870-4803

Email: beinjuryfreenc@ncmail.net

www.communityhealth.dhhs.state.nc.us/injury

Chief, Chronic Disease and Injury Section: Ruth Petersen

CDC Centers of Excellence

UNC Injury Prevention Research Center

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; Fax: (919) 966-0466

www.iprc.unc.edu/

Director: Carol Runyan, MPH, PhD

Associate Director: Andres Villaveces, MD, PhD

UNC Institute on Aging

University of North Carolina

720 Martin Luther King Jr. Blvd., CB# 1030

Chapel Hill, NC 27599-1030

Phone: (919) 966-9444; Fax: (919) 966-0510

Email: ioa@unc.edu

www.aging.unc.edu/

North Carolina Division of Aging and Adult Services

North Carolina Department of Health and Human Services

2101 Mail Service Center

Raleigh, NC 27699-2101

Phone: (919) 733-3983; Fax: (919) 733-0443

www.dhhs.state.nc.us/aging/

Director: Dennis Streets, MPH, MAT, LNHA

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Centers for Disease Control and Prevention (CDC), National Center for Injury Prevention and Control. (2008). *Tips to prevent poisonings*. Retrieved February 20, 2010 from: <http://www.cdc.gov/ncipc/factsheets/poisonprevention.htm>

Centers for Disease Control and Prevention (CDC), National Center for Injury Prevention and Control. (2009a). *WISQARS leading causes of death reports, 1999-2006*. Retrieved January 16, 2010 from: <http://webappa.cdc.gov/sasweb/ncipc/leadcaus10.html>

Centers for Disease Control and Prevention (CDC), National Center for Injury Prevention and Control. (2009b). *WISQARS non-fatal injury reports*. Retrieved January 16, 2010 from: <http://webappa.cdc.gov/sasweb/ncipc/nfirates2001.html>

Centers for Disease Control and Prevention (CDC), National Center for Injury Prevention and Control. (2009c). *Falls among older adults: an overview*. Retrieved February 4, 2010 from: <http://www.cdc.gov/HomeandRecreationalSafety/Falls/adultfalls.html>

Centers for Disease Control and Prevention (CDC), National Center for Injury Prevention and Control. (2010a). *Older adult drivers: fact sheet*. Retrieved February 4, 2010 from: http://www.cdc.gov/MotorVehicleSafety/Older_Adult_Drivers/adult-drivers_factsheet.html

Centers for Disease Control and Prevention (CDC), National Center for Injury Prevention and Control. (2010b). *Fire deaths and injuries: prevention tips*. Retrieved February 4, 2010 from: <http://www.cdc.gov/HomeandRecreationalSafety/Fire-Prevention/fireprevention.html>

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**State of North Carolina
Beverly Eaves Perdue, Governor**

**Department of Health and Human Services
Lanier M. Cansler, Secretary**

**Division of Public Health
Jeffrey P. Engel, M.D., State Health Director**

Injury and Violence Prevention Branch

www.injuryfreenc.ncdhhs.gov

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