TRAUMATIC BRAIN INJURIES

ARIZONA RESIDENTS, 2011

Arizona Department of Health Services

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EXECUTIVE SUMMARY

ARIZONA RESIDENTS, 2011

Traumatic brain injuries (TBI) were the cause of death for 1,317 Arizona residents in 2011. Males ages 85 years and older had the highest rate of TBI deaths with 202.7 deaths per 100,000 residents. TBI death rates were highest among American Indians (27.8 per 100,000 residents) and Non-Hispanic Whites (20.8 per 100,000 residents). Forty-two percent of TBI deaths in 2011 were due to unintentional injuries (n=558); 43 percent were due to suicides (n=561); and ten percent were due to homicides (n=128). The most common causes of TBI deaths were firearms (50 percent, n=664), falls (22 percent, n=294), and motor vehicle traffic crashes (13 percent, n=177).

In 2011, there were 6,690 non-fatal inpatient hospitalizations due to TBI. Adults 85 years and older had the highest rates of TBI inpatient hospitalizations. Males 85 years and older had a rate of 621.1 hospitalizations per 100,000 residents, and among females 85 years and older, the rate was 602.2 hospitalizations per 100,000 residents. Age-adjusted TBI inpatient hospitalization rates were highest among American Indians (196.2 per 100,000 residents) and Non-Hispanic Whites (108.9 per 100,000 residents). Unintentional injuries accounted for 86 percent of TBI hospitalizations (n=5,728). Falls were the most common cause of TBI hospitalizations (44 percent, n=2,933), followed by motor vehicle traffic crashes (29 percent, n=1,926). Total hospital charges for non-fatal inpatient hospitalizations due to TBIs were more than $451.8 million, and Arizonans spent a total of 32,572 days hospitalized in 2011.

In 2011, there were 47,395 non-fatal TBI emergency department visits among Arizona residents. TBI emergency department visit rates were highest among children younger than one year of age. Females younger than one year of age had a rate of 2683.7 visits per 100,000 residents, and males younger than one year of age had a rate of 2,605.2 visits per 100,000 residents. Among children under one, over 99 percent of the TBI-related emergency department visits were due to unintentional injuries. The leading causes of TBI emergency department visits were falls (52 percent, n=24,663), struck by/against injuries (24 percent, n=11,181), and motor vehicle traffic crashes (13 percent, n=5,991). Total hospital charges for non-fatal emergency department visits due to TBIs were more than $240.6 million.

TBI: AT A GLANCE

For every TBI-related death in Arizona in 2011, there were:

5 Non-fatal inpatient hospitalizations and

36 Non-fatal emergency department visits,

Resulting in over $692.4 million in hospital charges

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INTRODUCTION

Traumatic brain injury (TBI) is defined as damage to the brain following a sudden blow or impact to the head or by shaking the head violently. TBI can also be caused by a penetrating head injury that disrupts brain function. Approximately 1.4 million Americans sustain these injuries annually, 50,000 of whom die as a result of the trauma.[1] An additional 80,000 to 90,000 people experience permanent disability, and it is estimated that 5.3 million Americans are currently living with a TBI-related disability.[2,3] TBI can cause cognitive function deficits, which can lead to depression and other adverse secondary outcomes including problems working and performing daily activities such completing academic assignments, managing personal finances, or driving a vehicle.

The data presented in this report illustrate the public health burden associated with TBI in Arizona. Besides the obvious impacts TBI can have on overall health, traumatic brain injuries often result in considerable medical expenses, quality of life changes, and lost wages. TBI can occur throughout the life span, and the repercussions of these injuries may be experienced for many years. The consequences of TBI can extend beyond the injured individuals to their families and communities. For severe, but non-fatal TBI, families may be required to provide care, often resulting in time away from work, loss of income, and increases in stress. At the community level, the financial costs of TBI include medical expenses, rehabilitation, lost wages, and lost productivity. **Most TBI injuries are predictable and preventable.** Understanding the risk factors associated with TBI is an important step toward educating and empowering communities to implement effective prevention strategies.

[1] Langlois JA, Rutland-Brown W, Thomas KE. *Traumatic Brain Injury in the United States: Emergency Department Visits, Hospitalizations and Deaths*. Atlanta (GA): Centers for Disease Control and Prevention, National Center for Injury Prevention and Control; 2006

[2] Ibid

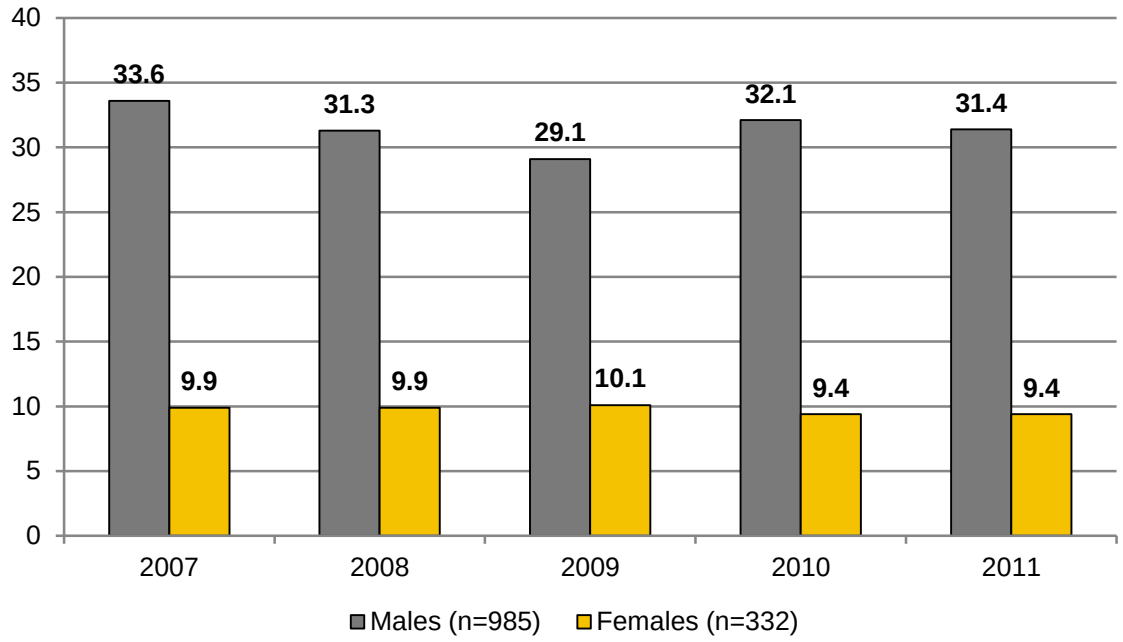
[3] Thurman D, Alverson C, Dunn K, Guerrero J, Sniezek J. Traumatic brain injury in the United States: a public health perspective. *Journal of Head Trauma Rehabilitation* 1999;14(6):602–15.

TRENDS IN TRAUMATIC BRAIN INJURIES AMONG ARIZONA RESIDENTS, 2007-2011

Mortality

Between 2007 and 2011, the age-adjusted mortality rate of traumatic brain injury decreased from 21.7 deaths per 100,000 Arizona residents in 2007 to 20.0 deaths per 100,000 residents in 2011. Age-adjusted mortality rates among males were more than double the rates among females. Rates for males decreased 7 percent from 2007 through 2011, and rates for females decreased 5 percent. Figure 1 shows age-adjusted TBI mortality rates by sex from 2007 through 2011.

Figure 1. Age-Adjusted TBI Mortality Rates by Sex, Arizona, 2007-2011



While total age-adjusted TBI mortality rates declined from 2007 through 2011, changes in rates varied by manner and mechanism of injury. Age-adjusted rates of unintentional TBI-related deaths continued to decrease in 2011, but suicide rates increased to their highest point in the six years surveyed. Figure 2 shows age-adjusted TBI mortality rates by manner of death, and Figure 3 shows age-adjusted TBI mortality rates by selected cause of injury.

Figure 2. Age-Adjusted TBI Mortality Rates per 100,000 Residents by Manner of Death, Arizona, 2007-2011

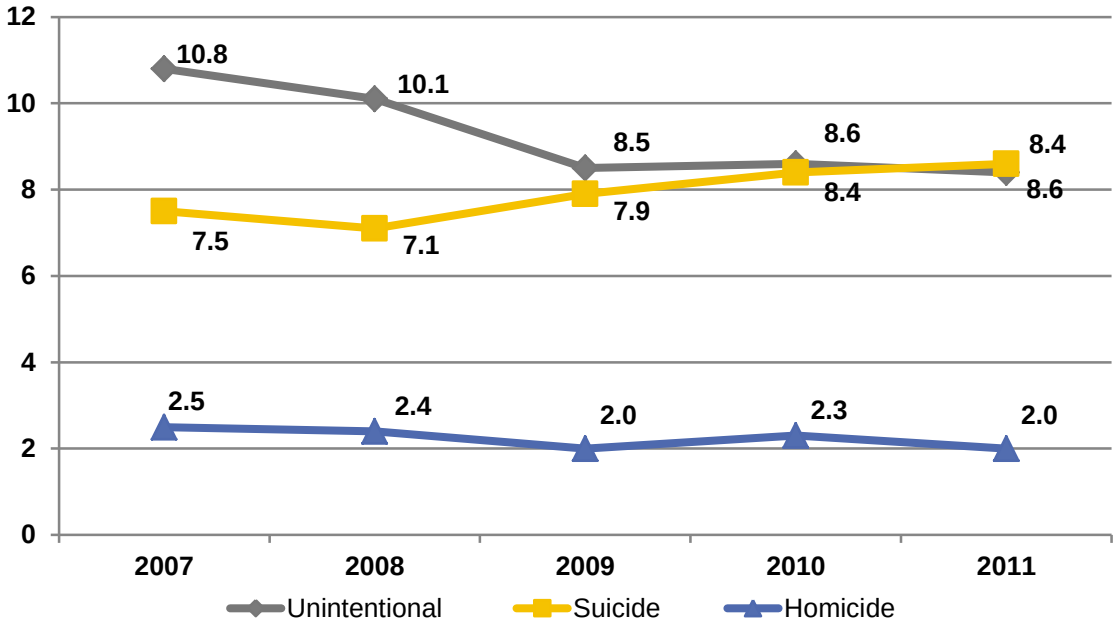
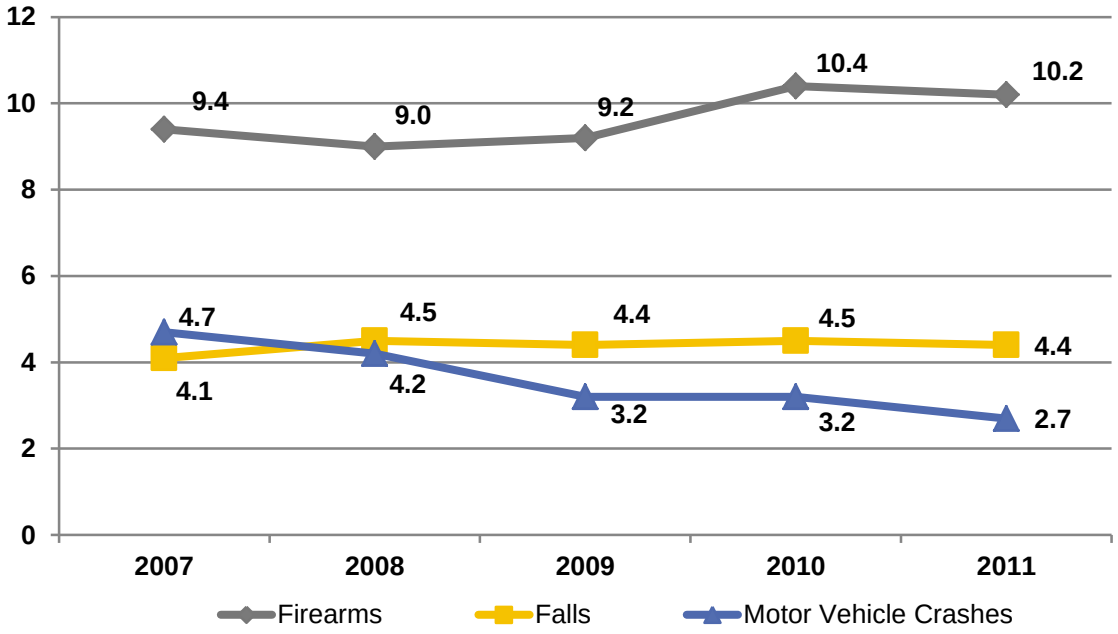


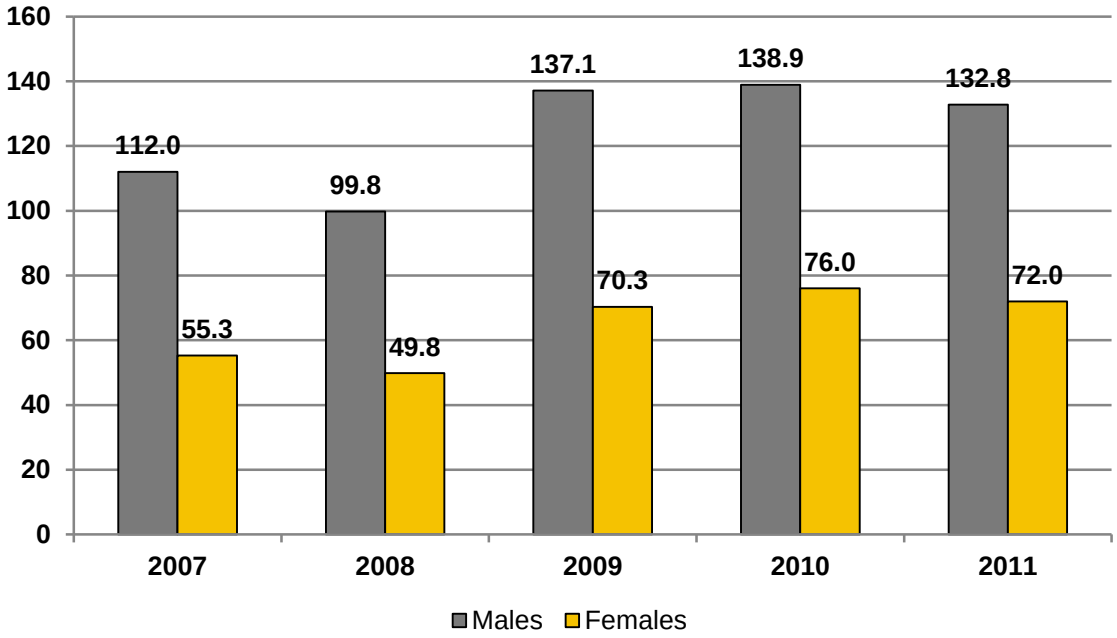
Figure 3. Age-Adjusted TBI Mortality Rates per 100,000 Residents by Mechanism, Arizona, 2007-2011



Non-Fatal Inpatient Hospitalizations

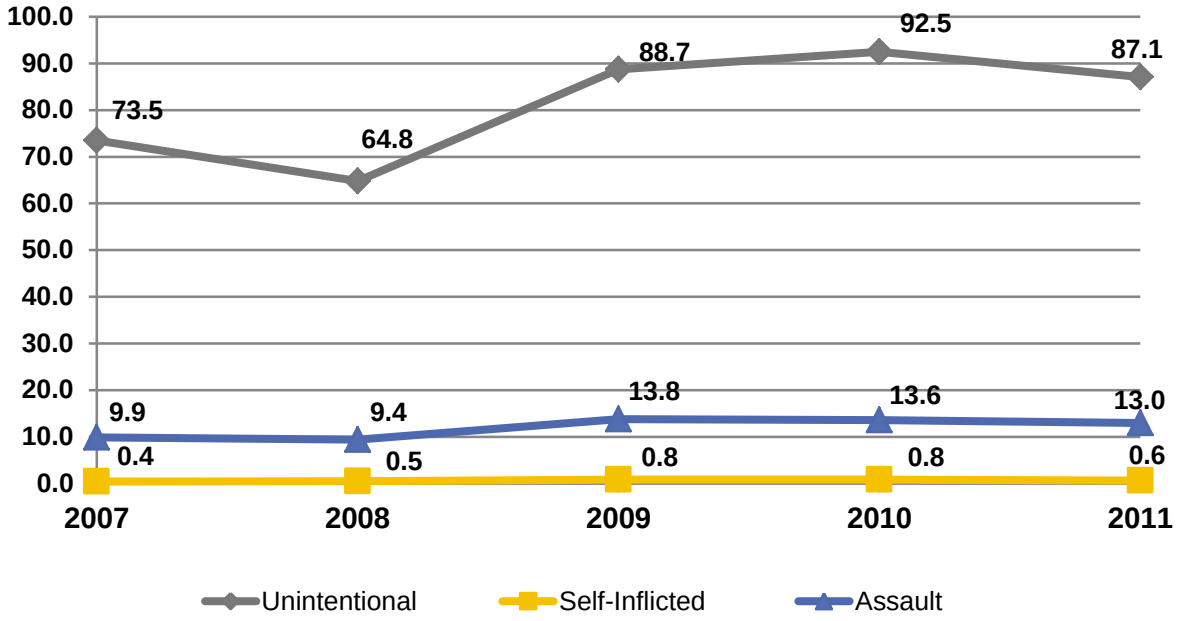
Between 2007 and 2011, the age-adjusted rate of TBI-related inpatient hospitalizations increased 22 percent, from 83.7 hospitalizations per 100,000 Arizona residents in 2007 to 102.5 hospitalizations per 100,000 residents in 2011. Despite that general upward trend, the 2011 rate was actually five percent lower than in 2010, when it was 107.5 hospitalizations per 100,000 residents. Age-adjusted hospitalization rates among males were almost double the rates among females. Rates for males increased 19 percent from 2007 through 2011, and rates for females increased 30 percent. Figure 4 shows age-adjusted non-fatal TBI-related inpatient hospitalization rates by sex from 2007 through 2011. Please refer to the Data Notes Section of this report for additional information regarding increased inpatient hospitalization rates beginning in 2009.

Figure 4. Age-Adjusted Non-Fatal TBI-Related Inpatient Hospitalization Rates by Sex, Arizona, 2007-2011



While total age-adjusted TBI-related inpatient hospitalization rates increased from 2007 through 2011, changes in rates varied by manner and mechanism of injury. Figure 5 shows age-adjusted TBI hospitalization rates by manner of injury.

Figure 5. Age-Adjusted Non-Fatal TBI-Related Inpatient Hospitalization Rates per 100,000 Residents by Manner of Injury, Arizona, 2007-2011

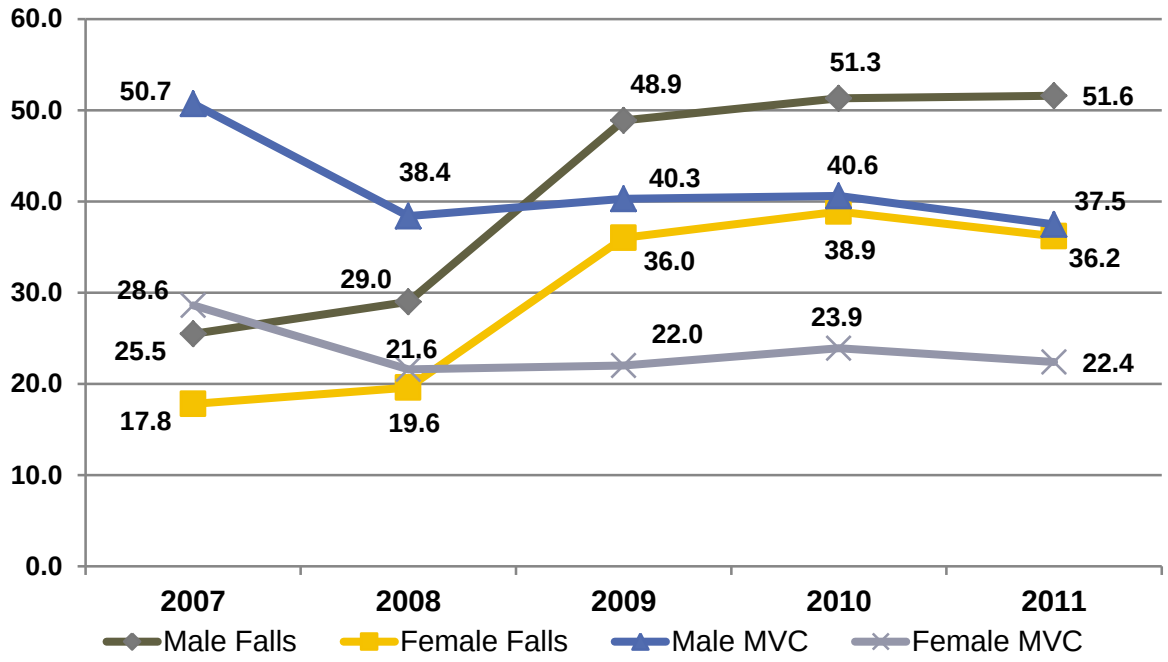


From 2007 through 2011, the rate of non-fatal inpatient hospitalizations due to fall-related traumatic brain injuries increased 102 percent, from 21.7 hospitalizations per 100,000 residents in 2007 to 43.9 hospitalizations per 100,000 residents in 2011. Males had a higher rate of fall-related TBI hospitalizations than females in each of the five years examined, and the disparity has grown over time.

While the rate of fall-related TBI hospitalizations increased since 2007, the rate of motor vehicle crash-related TBI hospitalizations decreased 25 percent in the past five years, from 39.7 crash-related hospitalizations in 2007 to 29.9 crash-related hospitalizations in 2011. As with falls, males had a higher rate of motor vehicle crash-related TBI hospitalizations than females in each of the years examined.

From 2005 through 2008, the rate of fall-related TBI hospitalizations remained lower than the rate for TBI hospitalizations due to motor vehicle crashes. From 2009 onward, however, the rate of motor vehicle crash-related TBI hospitalizations was lower than the rate of fall-related cases. Figure 6 shows the trend of fall- and motor vehicle crash-related TBI hospitalizations by sex from 2007 through 2011.

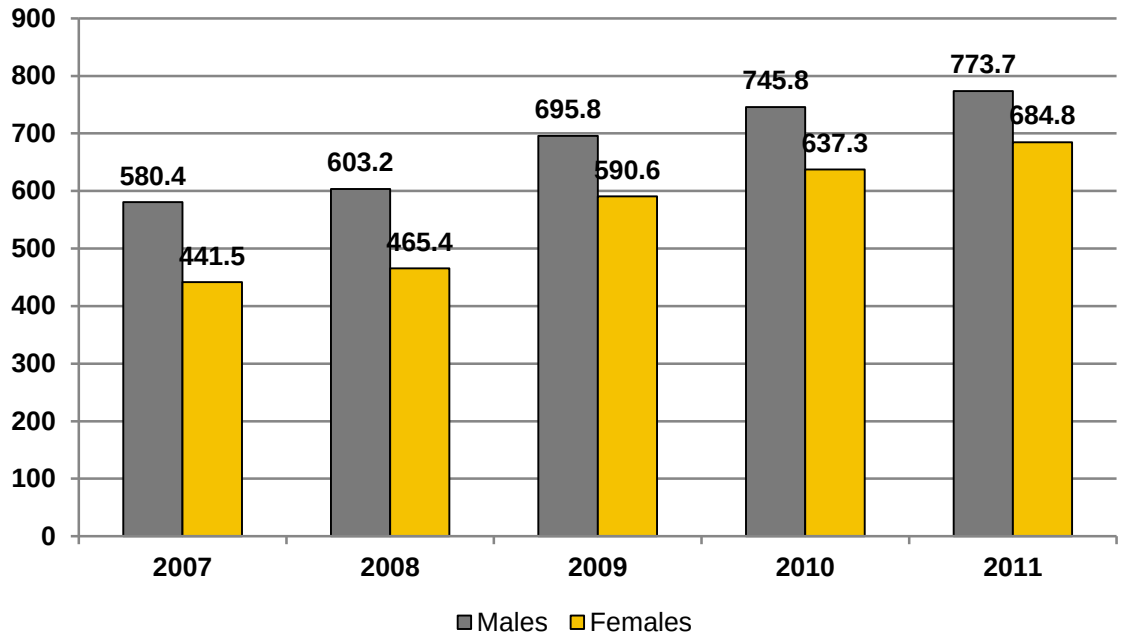
Figure 6. Age-Adjusted Non-Fatal TBI Inpatient Hospitalization Rates per 100,000 Residents by Mechanism and Sex, Arizona, 2007-2011



Non-Fatal Emergency Department Visits

From 2007 through 2011, the age-adjusted rate of non-fatal TBI-related emergency department visits increased among both males and females. Among males, the rates decreased 33 percent, from 580.4 visits per 100,000 Arizona residents in 2007 to 773.7 visits per 100,000 residents in 2011. Among females, rates increased 55 percent, from 441.5 visits per 100,000 in 2007 to 648.8 visits per 100,000 residents in 2011. Age-adjusted emergency department visit rates among males were higher than rates among females for the last five years. Figure 7 shows age-adjusted TBI-related emergency department visit rates by sex from 2007 to 2011. Please refer to the Data Notes Section of this report for additional information regarding increased emergency department visit rates beginning in 2009.

Figure 7. Age-Adjusted Non-Fatal TBI-Related Emergency Department Visit Rates by Sex, Arizona, 2007-2011



While total age-adjusted TBI-related emergency department visit rates increased from 2007 through 2011, changes in rates varied by manner and mechanism of injury. Unintentional injuries and injuries related to assaults increased at varying levels from 2007 through 2011. TBI-related hospitalizations due to self-harm are relatively low and are therefore not included in the figure. Figure 8 shows age-adjusted TBI emergency department visit rates by manner of injury, and Figure 9 shows age-adjusted rates for non-fatal TBI-related emergency department visits for selected causes of injury.

Figure 8. Age-Adjusted Non-Fatal TBI-Related Emergency Department Visit Rates per 100,000 Residents by Manner of Injury, Arizona, 2007-2011

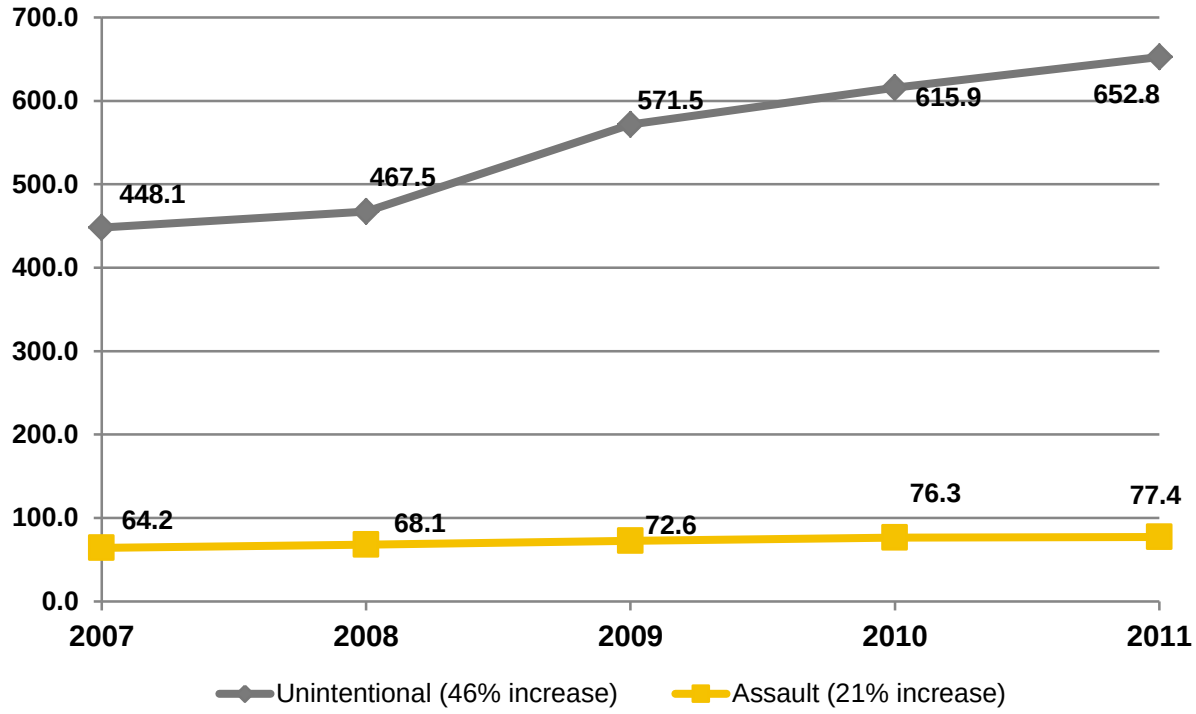
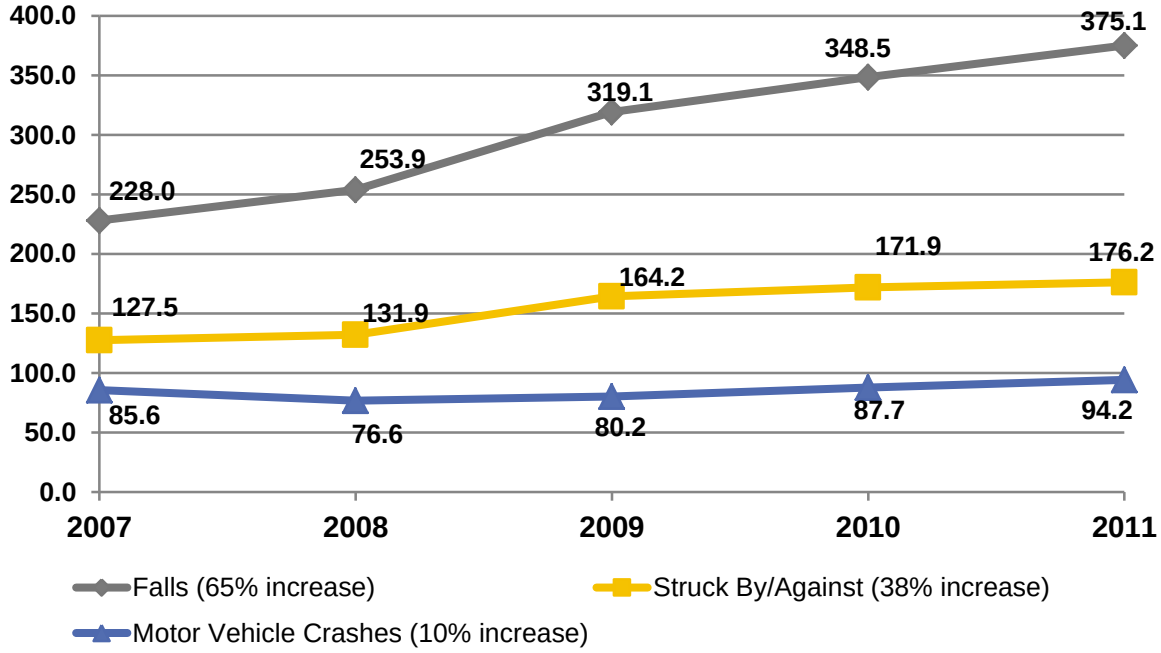


Figure 9. Age-Adjusted Non-Fatal TBI-Related Emergency Department Visit Rates per 100,000 Residents by Selected Cause of Injury, Arizona, 2007-2011

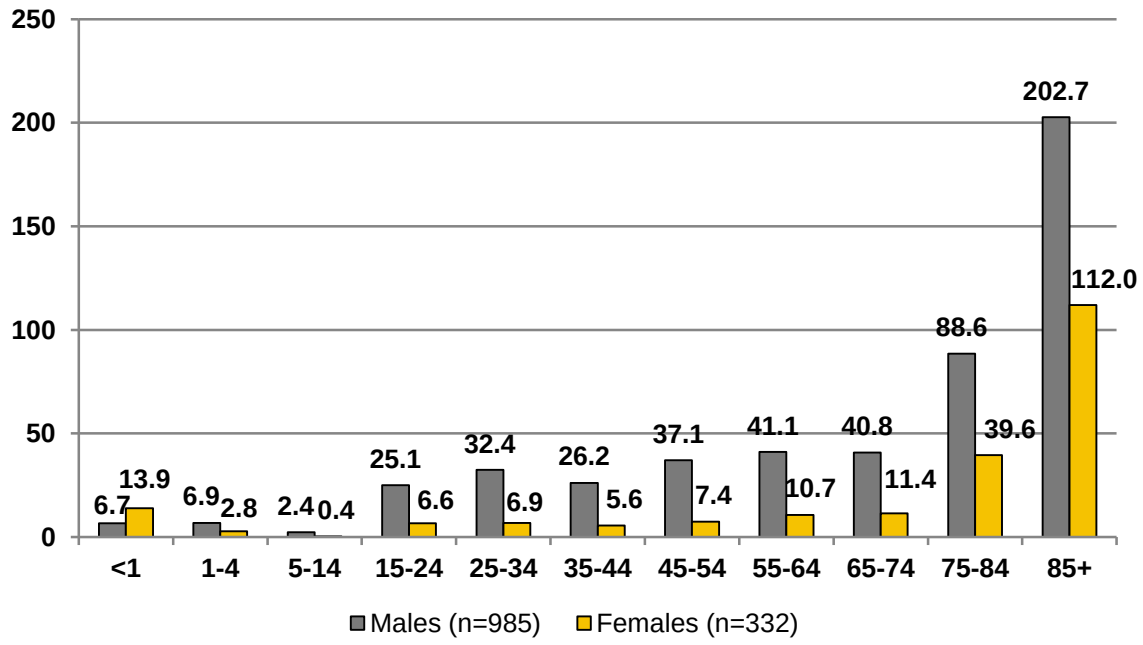


DEATHS AMONG ARIZONA RESIDENTS DURING 2011

In 2011, 1,317 Arizona residents died as a result of TBI. The majority of deaths were among males (75 percent, n=985), while females accounted for 25 percent of TBI deaths (n=332). Males had higher rates of TBI-related mortality across all age groups, except among children under one year.

Males 85 years and older accounted for 77 deaths and had by far the highest rate of TBI deaths in 2011 (202.7 per 100,000 residents). Among adults 85 years and older, 67 percent of TBI deaths were due to unintentional falls (n=102). Figure 10 shows the 2011 TBI death rates by age group and sex for Arizona residents.

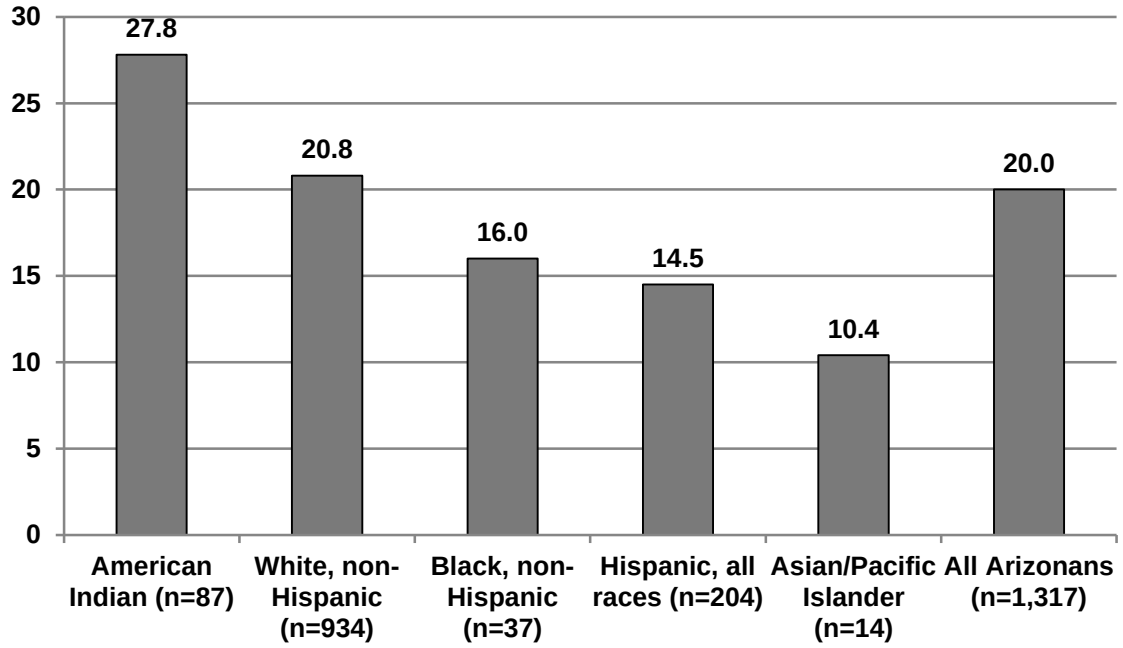
Figure 10. Age-Specific TBI-Related Mortality Rates per 100,000 Residents by Sex, Arizona, 2011 (n=1,317)



Excludes 1 male of unknown age

Age-adjusted TBI death rates were highest among American Indians (27.8 deaths per 100,000 residents) and Non-Hispanic Whites (20.8 deaths per 100,000 residents). Rates were lowest among Asian/Pacific Islanders, however the number of TBI-related death among this group were too low to calculate a reliable rate. Figure 11 shows the 2011 age-adjusted TBI death rates by race/ethnicity in Arizona.

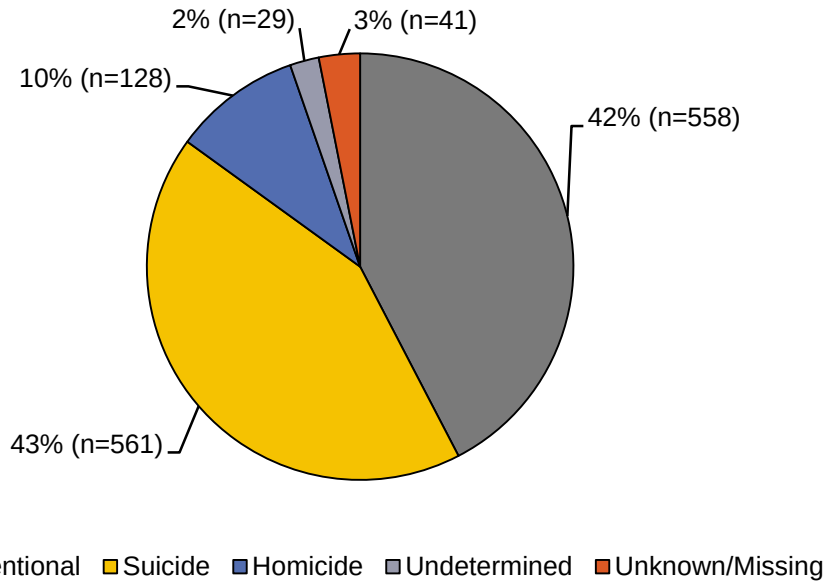
Figure 11. Age-Adjusted TBI-Related Mortality Rates per 100,000 Residents by Race/Ethnicity, Arizona, 2011 (n=1,317)



41 deaths were among individuals of other or unknown race/ethnicity

Forty-two percent of the TBI deaths in 2011 were due to unintentional injuries (n=558); 43 percent were due to suicides (n=561); and ten percent were due to homicides (n=128). Figure 12 shows TBI deaths by manner of injury during 2011 in Arizona.

Figure 12. TBI-related Deaths by Manner, Arizona, 2011 (n=1,317)



The most common causes of deaths were firearms (50 percent, n=664), falls (22 percent, n=294), and motor vehicle traffic crashes (13 percent, n=177). Causes of TBI deaths during 2011 in Arizona are shown in Table 1. Descriptions of these causes are given in Appendix A.

Table 1. TBI Deaths by Cause, Arizona 2011

Cause	Number	Percentage
Firearm	664	50%
Fall	294	22%
Motor vehicle traffic	177	13%
Other/unspecified/unknown	154	12%
Other land transport	19	1%
Other pedestrian	9	<1%
Total	**1,288**	**100%**

The causes and manners of TBI-related mortality varied greatly by race/ethnicity. Suicides, due primarily to firearms, were highest among White, non-Hispanic Arizonans, while unintentional injuries, specifically due to motor vehicle crashes, were the leading cause and manner of TBI-related death among American Indian residents. Figures 13 and 14 show the percentages of TBI-related deaths for each race/ethnicity by cause and manner of death.

Figure 13. TBI-related Deaths by Manner and Race/Ethnicity, Arizona, 2011 (n=1,317)

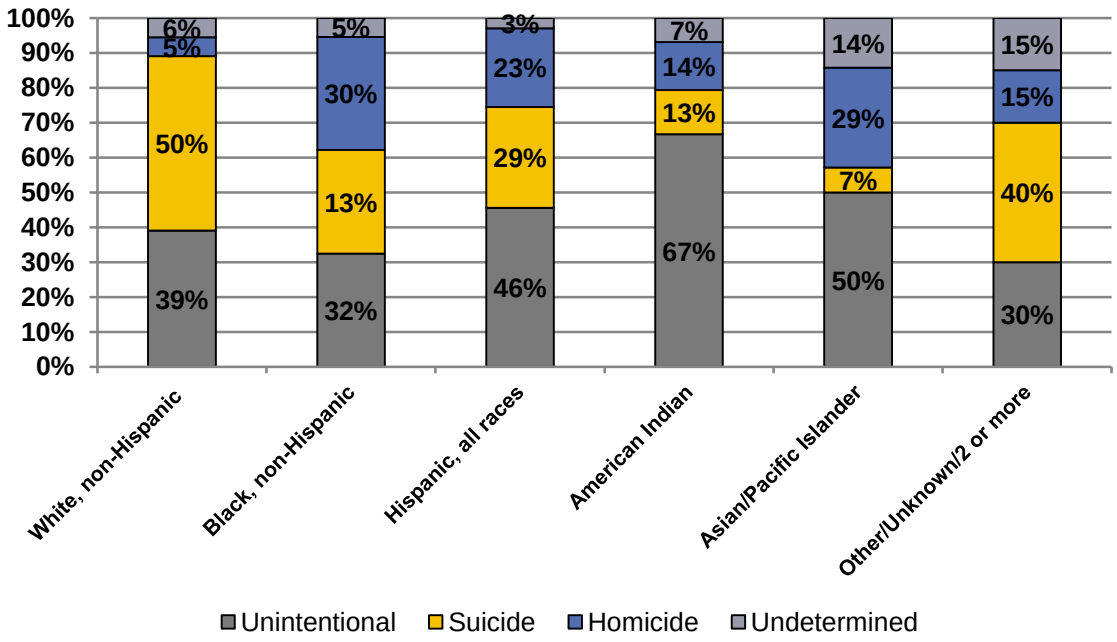
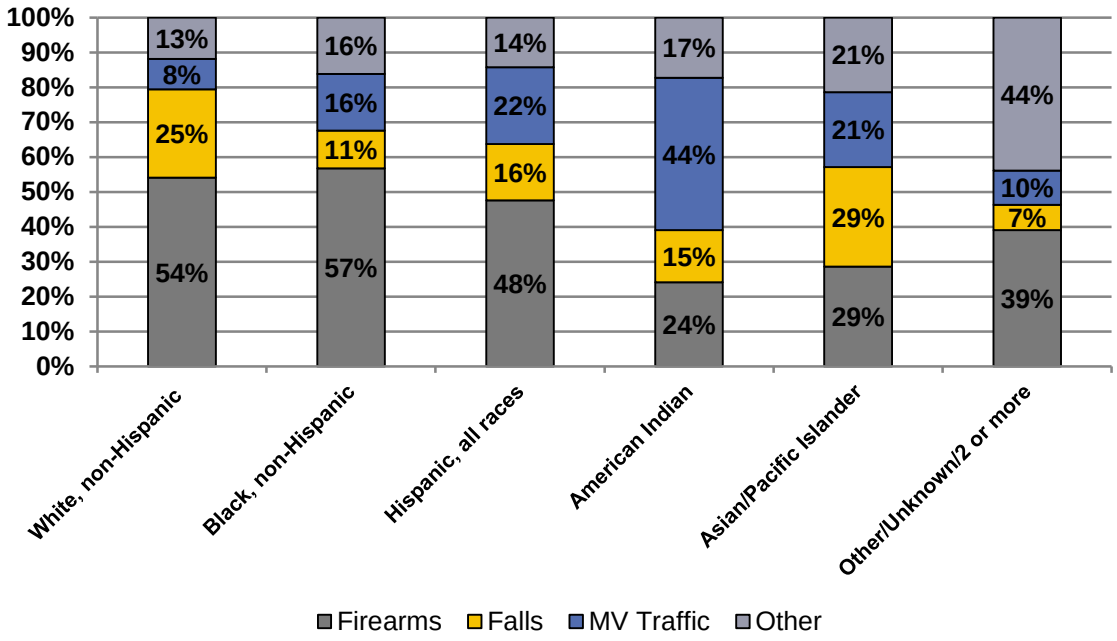


Figure 14. TBI-related Deaths by Mechanism and Race/Ethnicity, Arizona, 2011 (n=1,317)



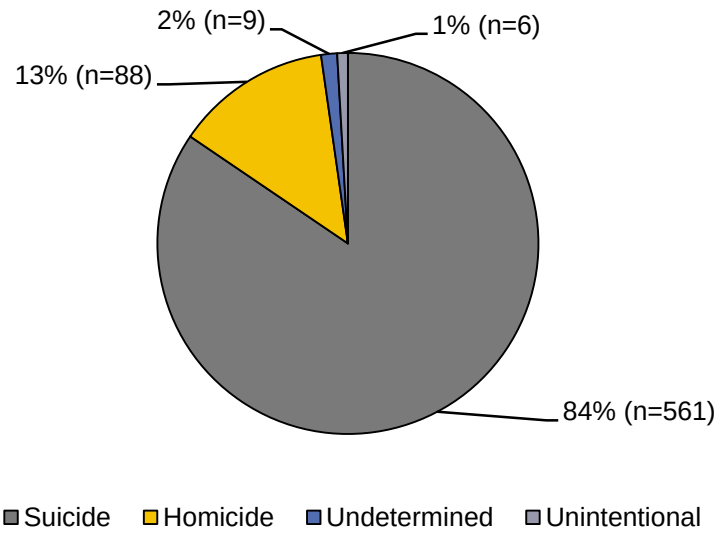
Firearm-Related TBI Mortality

Among the 664 Arizona residents who died as a result of a firearm-related TBI, the majority were male (87 percent, n=579) and 13 percent were female (n=85).

The highest age-adjusted rate of firearm-related TBI deaths was among White Non-Hispanics (12.1 per 100,000 residents, n=505). The second highest rate was among African Americans (7.8 per 100,000 residents, n=21). Hispanic Arizonans had the second highest count of firearm-related TBI (n=97) however the rate for this group was low, only 5.7 per 100,000 residents.

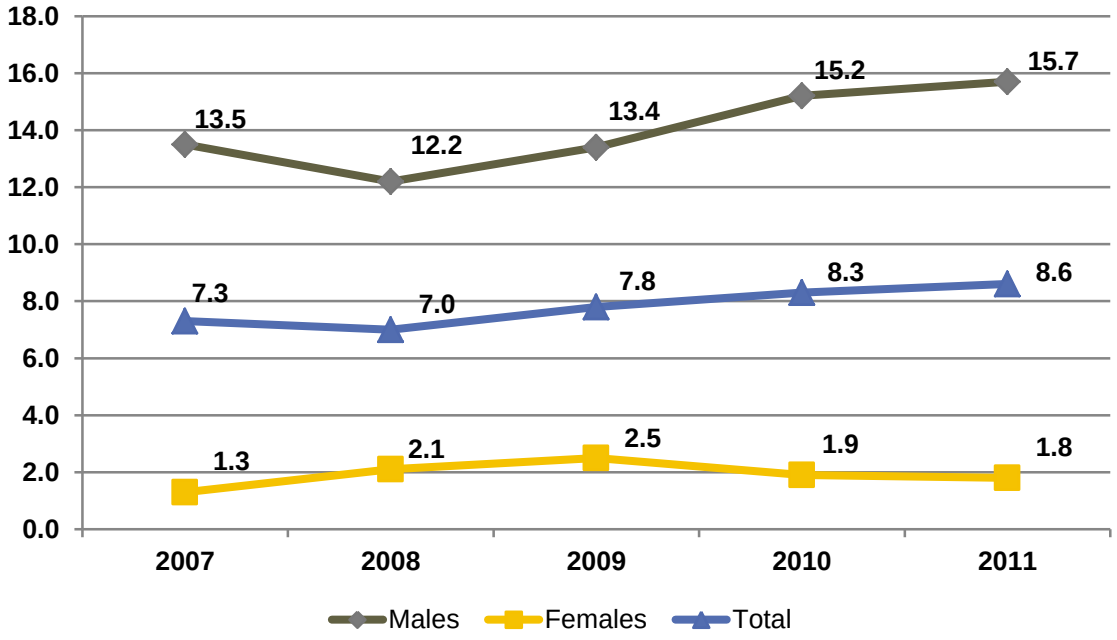
The majority of firearm-related TBI deaths were suicides (84 percent, n=561). Thirteen percent of the deaths were due to homicides (n=88); two percent were due to undetermined intent (n=9) and one percent were unintentional injuries (n=6). Figure 15 shows TBI deaths due to firearms by manner of injury.

Figure 15. Firearm-related TBI Deaths by Manner, Arizona, 2011 (n=664)



Among the 561 TBI deaths resulting from firearm-related suicides, 89 percent were among males (n=500) and 11 percent were among females (n=61). The age-adjusted rate of TBI deaths resulting from firearm-related suicides was 8.6 deaths per 100,000 residents, the highest rate of such deaths over the previous five years. The highest age-specific rates were among adult males, particularly among those 85 years and older (57.9 per 100,000). Age-adjusted rates were substantially higher among males than among females over each of the years from 2007-2011. Figure 16 shows the age-adjusted rate of TBI deaths resulting from firearm-related suicides by sex and year from 2007 through 2011.

Figure 16. Age-Adjusted TBI Mortality Rate due to Firearm Suicides by Sex and Year, Arizona, 2007-2011



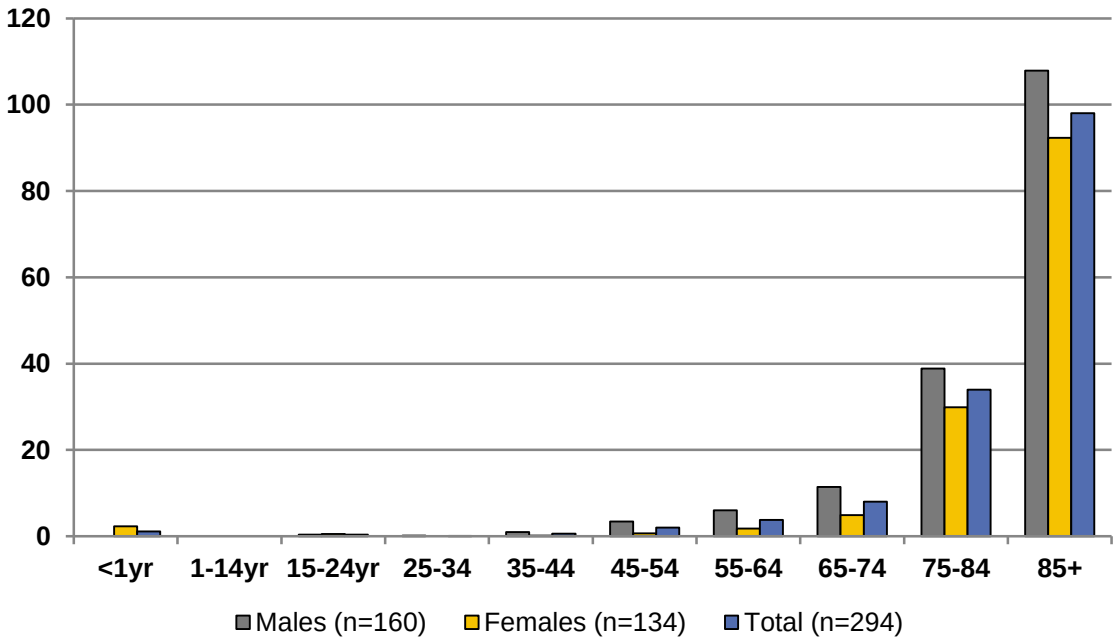
The highest age-adjusted rate of firearm-related TBI suicides was among White Non-Hispanics (11.1 per 100,000 residents, n=467). This high race-specific mortality rate coupled with the large population

propelled the age-adjusted mortality rate for all Arizonans. The age-adjusted rate among Hispanic Arizonans was 3.7 deaths per 100,000 residents. For all other races, the total number of firearm-related suicides was too low to calculate a stable rate (n<20).

Fall-Related TBI Mortality

Among the 294 TBI deaths due to falls, 54 percent were among males (n=160) and 46 percent were among females (n=134). All but one of the falls were unintentional. Two percent of TBI-related fall deaths were among children and young adults ages 24 years and younger (n=5). Seventeen percent of the deaths were among adults ages 25 through 64 years (n=51); and 81 percent were among adults 65 years and older (n=238). The age-adjusted rate of all fall-related TBI deaths in Arizona for 2011 was 4.4 deaths per 100,000 residents, however the highest age-specific mortality rate was among adults 85 years and older (98 per 100,000 residents) followed by adults 75 through 84 years of age (34 per 100,000 residents).

Figure 17. Fall-Related TBI Mortality Rates per 100,000 Residents by Age and Sex, Arizona, 2011 (n=6,690)

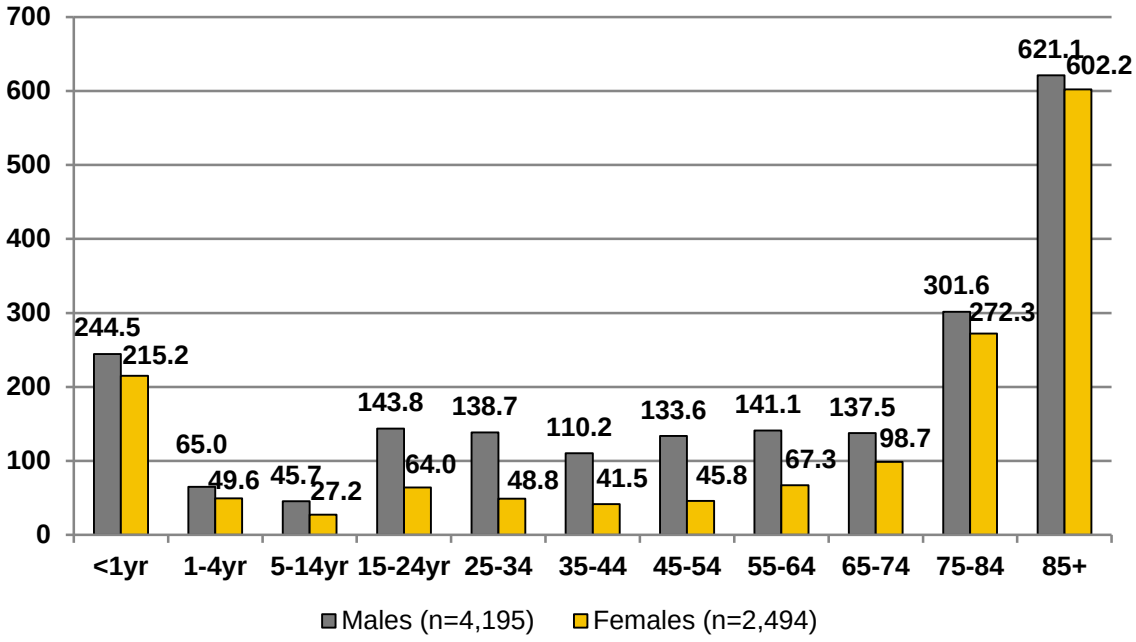


Non-Fatal Inpatient Hospitalizations among Arizona Residents During 2011

In 2011, 6,690 Arizona residents were hospitalized due to non-fatal TBI. Males comprised 63 percent of total TBI hospitalizations (n=4,195) and females accounted for 37 percent (n=2,494). There was also one individual of unknown sex.

Adults 85 years and older had the highest rates of TBI inpatient hospitalizations in 2011. Males 85 years and older had a rate of 621.1 hospitalizations per 100,000 residents (n=236), and the rate for females 85 years and older was 602.2 hospitalizations per 100,000 residents (n=398). For adults 85 years and older, 98 percent of hospitalizations were due to unintentional falls (n=619). Figure 18 shows the 2011 TBI inpatient hospitalization rates by age group and sex for Arizona residents.

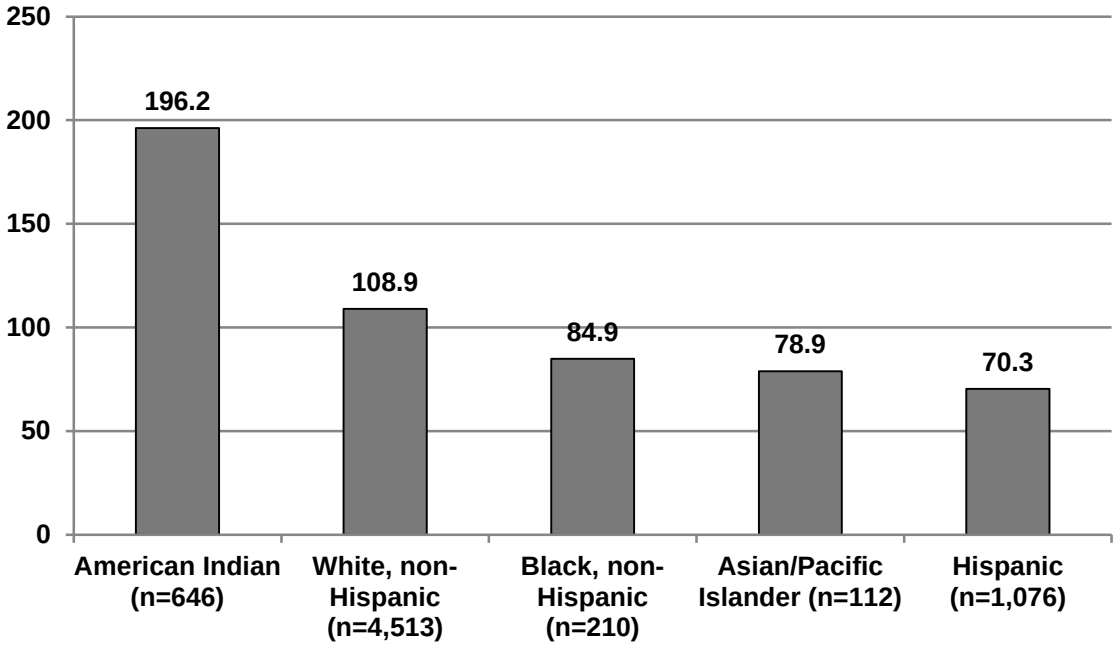
Figure 18. TBI-Related Non-Fatal Inpatient Hospitalization Rates per 100,000 Residents By Age Group and Sex, Arizona, 2011



Does not include 1 individual of unknown sex

Age-adjusted TBI inpatient hospitalization rates were highest among American Indians (196.2 hospitalizations per 100,000 residents), but this represents a 14 percent decrease from 2010, when the rate for this group was 228.0 hospitalizations per 100,000 residents. Non-Hispanic Whites had the second highest hospitalization rate (108.9 hospitalizations per 100,000 residents), representing a seven percent decrease since 2010, when the rate was 116.7 hospitalizations per 100,000 residents. Figure 19 shows the 2011 age-adjusted TBI inpatient hospitalization rates by race/ethnicity in Arizona.

Figure 19. Age-Adjusted TBI-Related Non-Fatal Inpatient Hospitalization Rates per 100,000 Residents, by Race/Ethnicity, Arizona, 2011 (n=6,690)



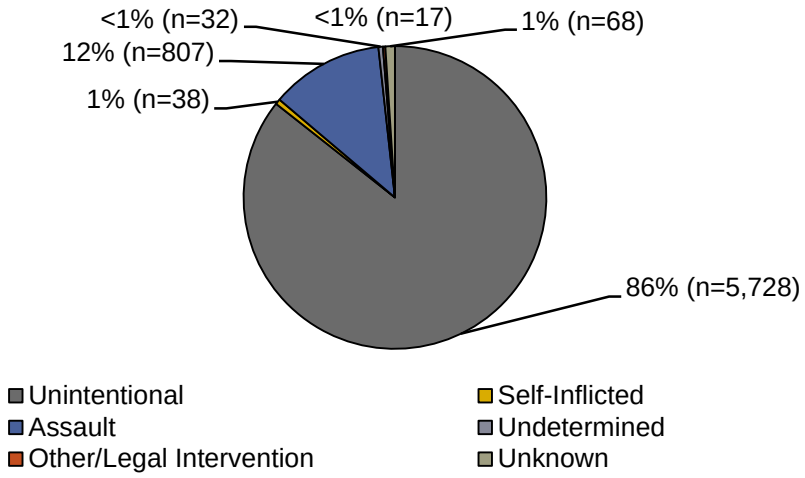
133 hospitalizations were among individuals of other or unknown race/ethnicity

For TBI inpatient hospitalizations, the average length of stay was five days (median=3 days), and hospital stays due to TBI ranged from less than one full day to 122 days. In total, Arizonans spent 32,572 days hospitalized for TBI in 2011.

TBI inpatient hospitalization charges in 2011 totaled more than $451.8 million, with 48 percent paid by the Arizona Health Care Cost Containment System (AHCCCS)/Medicaid and Medicare (n=3,319 cases, over $215.6 million). This total does not include costs related to physician care, rehabilitation, lost wages, or long-term costs of disability.

Unintentional injuries accounted for 86 percent of TBI hospitalizations (n=5,728). There were 38 hospitalizations due to self-inflicted TBI (less than one percent) and 807 due to assaults (12 percent). Figure 20 shows the TBI inpatient hospitalizations by manner of injury for Arizona in 2011.

Figure 20. TBI-related Non-Fatal Inpatient Hospitalizations by Manner, Arizona, 2011 (n=6,690)



Fall-related injuries were the most common cause of TBI hospitalizations (44 percent, n=2,933), followed by motor vehicle traffic injuries (29 percent, n=1,926). Table 2 shows causes of TBI inpatient hospitalizations in Arizona during 2011. Descriptions of these causes are given in Appendix A.

Table 2. TBI Inpatient Hospitalizations by Cause, Arizona 2011 (n=6,690)

Cause	Number	Percentage
Fall	2,933	44%
Motor vehicle traffic	1,926	29%
Struck by/against	743	11%
Other/unspecified	494	7%
Transport	329	5%
Other pedal cycle	173	3%
Firearm	50	<1%
Cut/pierce	42	<1%
Total	**6,690**	**100%**

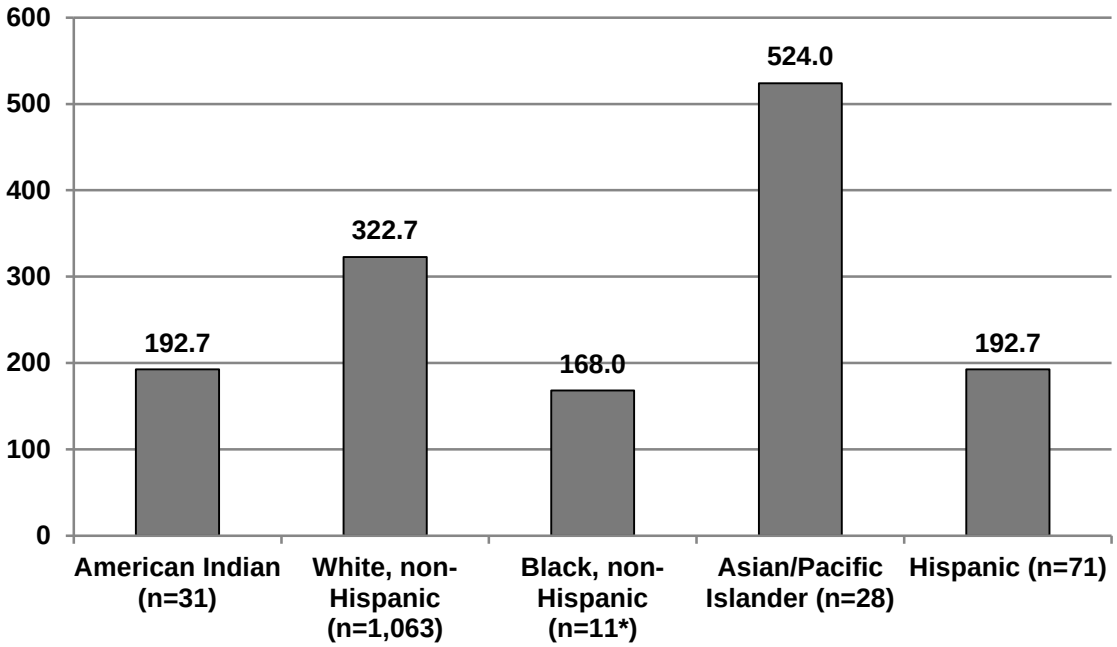
Non-Fatal Fall-Related TBI Inpatient Hospitalizations

There were 2,933 inpatient hospitalizations due to fall-related TBI. Fifty-five percent were among males (n=1,604) and 45 percent were among females (n=1,329). Falls were unintentional more than 99 percent of the time (n=2,970), with only 11 cases in which another manner was identified.

American Indians had the highest age-adjusted rate of fall-related TBI hospitalizations with 53.1 hospitalizations per 100,000 residents (n=136). The second highest rate was among Non-Hispanic Whites (47.0 hospitalizations per 100,000 residents; n=2,224). The age-adjusted rate for non-fatal fall-related inpatient hospitalizations among all Arizonans was 43.9 hospitalizations per 100,000 residents.

Despite the relationship between age-adjusted rates by race/ethnicity, the differences in age specific rates for adults 75 years of age and older paint a different picture of fall-related TBI. Among adults 75 years of age and older, the rate of fall-related TBI hospitalization is highest among Asian/Pacific Islanders, despite the low overall hospitalization rate for that group. Also notable is that despite historically high fall-related TBI hospitalization rates among American Indians, the age specific rate for seniors in that group is half as high as the rate among Asian/Pacific Islanders in that range. Figure 21 shows the age-specific hospitalization rates for fall-related TBI among Arizonan seniors 75 years of age and older, by race/ethnicity.

Figure 21. Elder Fall-Related Non-Fatal TBI Inpatient Hospitalization Rates per 100,000 Residents 75 years of age and older, by Race/Ethnicity, Arizona, 2011



Does not include 55 cases in which race/ethnicity information is unknown.
*Count <20 so rate is unstable.

Non-Fatal Motor Vehicle Traffic Crash-Related TBI Inpatient Hospitalizations

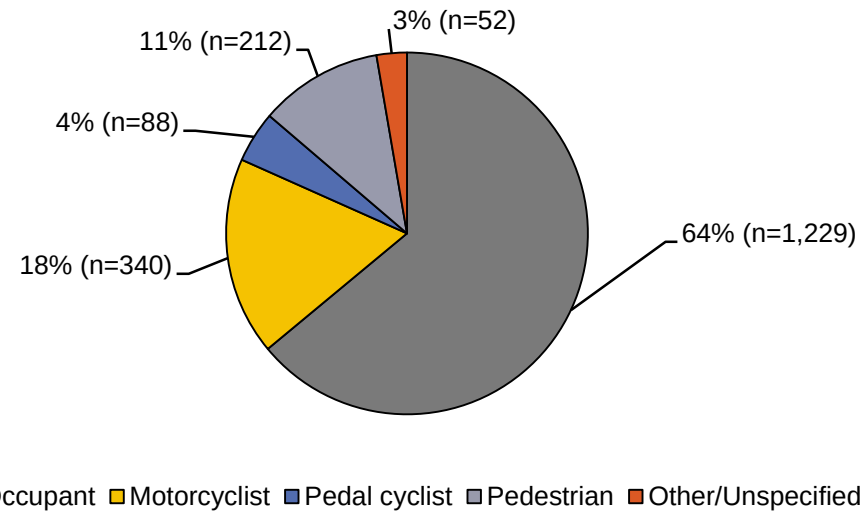
Of the 1,926 TBI hospitalizations due to motor vehicle traffic crashes, 62 percent were among males (n=1,201) and 38 percent were among females (n=725). Only five of the crashes were not unintentional. The highest hospitalization rates for motor vehicle-related TBI were among teens and young adults 15 through 24 years of age (53.6 hospitalizations per 100,000 residents), for both males (63.2 hospitalizations per 100,000 residents) and females (43.4 hospitalizations per 100,000 residents).

American Indians had the highest rate of TBI hospitalizations for motor vehicle traffic crashes (51.1 hospitalizations per 100,000 residents; n=187), representing a 19 percent decrease since 2010. With 32.7 hospitalizations per 100,000 residents, Non-Hispanic Whites had the second highest rate

(n=1,222). The age-adjusted rate for non-fatal motor vehicle traffic-related inpatient hospitalizations among all Arizonans was 29.9 hospitalizations per 100,000 residents.

The majority of TBI inpatient hospitalizations due to motor vehicle traffic collisions were among occupants of motor vehicles (64 percent, n=1,229). Eighteen percent were motorcyclists (n=340); 11 percent were pedestrians (n=212); and four percent were pedal cyclists (n=88). This distribution is consistent with data from previous years. Figure 22 shows TBI inpatient hospitalizations due to motor vehicle traffic crashes by injured person.

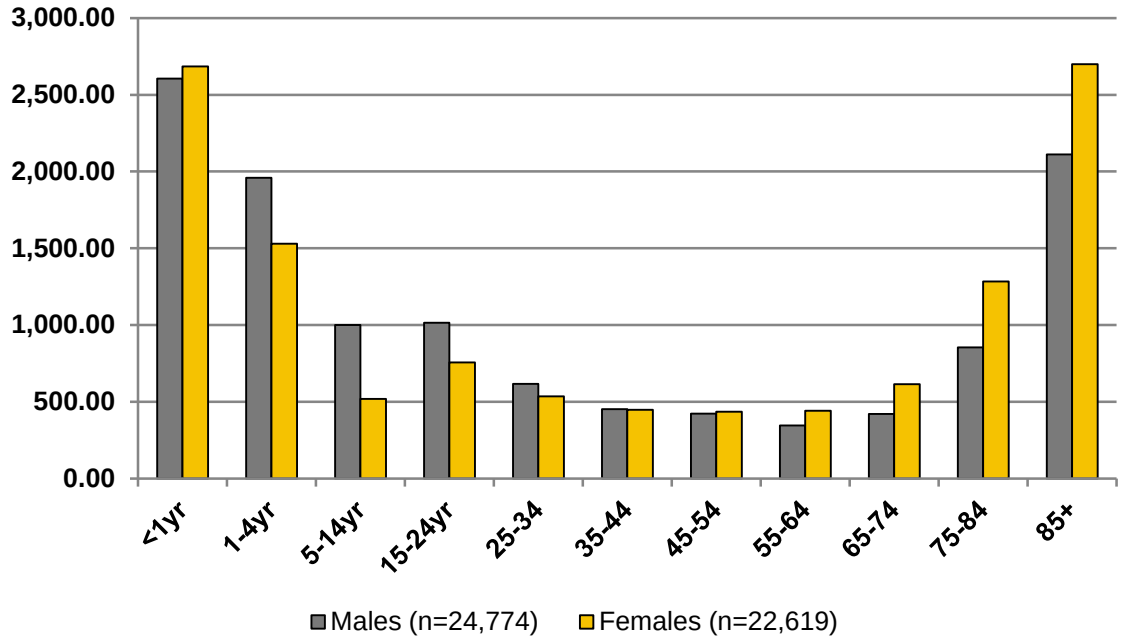
Figure 22. Non-Fatal Motor Vehicle Crash-Related TBI Inpatient Hospitalizations by Injured Person, Arizona, 2011 (n=1,926)



Non-Fatal Emergency Department Visits among Arizona Residents During 2011

In 2011, there were 47,395 TBI emergency department visits among Arizona residents. Males accounted for more than half of TBI emergency department visits (52 percent, n=24,774), while females accounted for 48 percent of visits (n=22,619). There were two cases among individuals of unknown sex. TBI emergency department visit rates were highest among children younger than one year of age. There were 1,160 emergency department visits among females younger than one year of age (a rate of 2683.7 visits per 100,000 residents), and 1,172 visits among males younger than one year of age (a rate of 2,605.2 visits per 100,000 residents). For all children younger than one year of age, nearly 100 percent of TBI emergency department visits were due to unintentional falls (n=2,327). Figure 23 shows the 2011 TBI emergency department visit rates per 100,000 Arizona residents.

Figure 23. Age-Specific TBI Emergency Department Visit Rates per 100,000 Residents, by Sex, Arizona, 2011 (n=47,395)



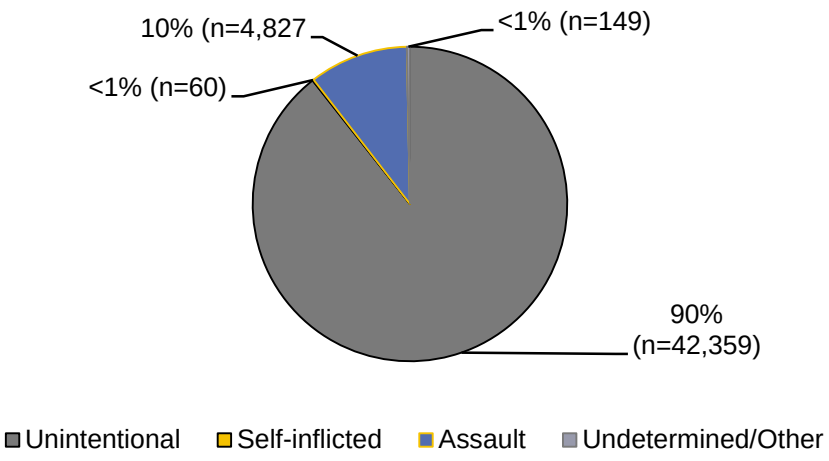
Does not include two individuals of unknown sex.

TBI emergency department charges in 2011 totaled more than $240.6 million, with 45 percent paid by the Arizona Health Care Cost Containment System (AHCCCS)/Medicaid and Medicare (n=22,067, over $108.4 million). This total does not include costs related to physician care, rehabilitation, lost wages, or long-term costs of disability.

Unlike with mortality and hospitalization rate, age-adjusted TBI emergency department visit rates were not consistent across county and race/ethnicity. Apache and Navajo Counties have lower rates of TBI-related non-fatal emergency department rates than expected, but this is likely an artifact of the data rather than a truly low rate in these counties. A large area of the Navajo Nation is situated within the borders of Apache and Navajo Counties, and tribal residents tend to seek medical care for less severe injuries at local health facilities operated by the tribe or Indian Health Services (IHS). Since the Arizona Hospital Discharge Database only collects data from private, non-federal facilities, injuries seen exclusively at tribal or IHS facilities are not included in the data shown here, accounting for a potential undercount among tribal residents. For this reason, race/ethnicity and county information is not presented for emergency department data.

The majority of TBI emergency department visits were due to unintentional injuries (90 percent, n=42,359), and 10 percent were assaults (n=4,827). Figure 24 shows TBI emergency department visits by intent during 2011 in Arizona.

Figure 24. TBI Emergency Department Visits by Manner of Injury, Arizona 2011 (n=47,395)



The leading causes of TBI emergency department visits were falls (52 percent, n=24,663), struck by/against injuries (24 percent, n=11,181), and motor vehicle traffic crashes (13 percent, n=5,991). Table 3 shows TBI emergency department visits by cause for Arizona in 2011. Descriptions of these causes are given in Appendix A.

Table 3. TBI Emergency Department Visits by Cause, Arizona 2011

Cause	Number	Percentage
Fall	24,663	52%
Struck by/against	11,181	24%
Motor vehicle traffic	5,991	13%
Other/unspecified	3,246	7%
Other pedal cycle	1,198	3%
Transport	1,116	2%
Total	**44,507**	**100%**

Non-Fatal Fall-Related Emergency Department Visits

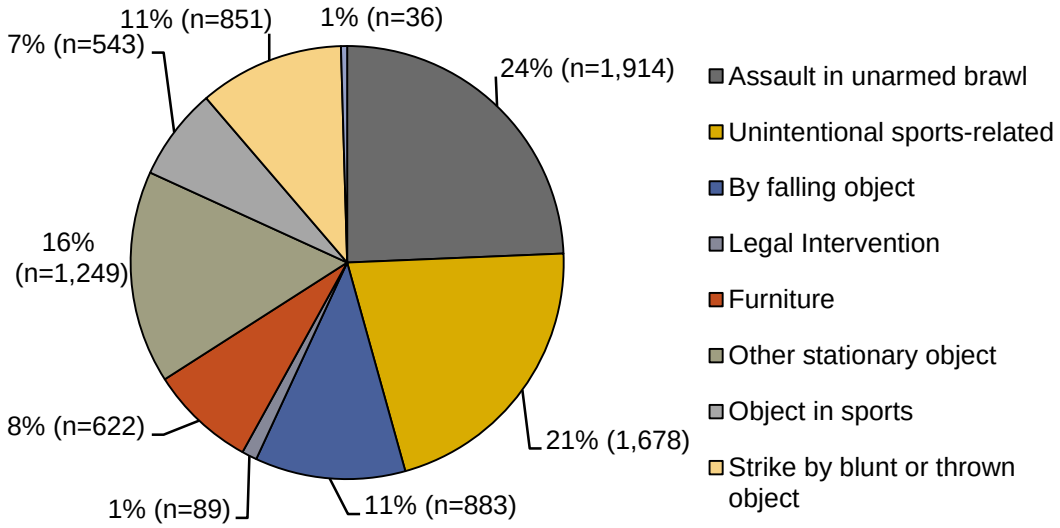
There were 24,663 emergency department visits due to fall-related TBI. Forty-six percent were among males (n=11,439) and 54 percent were among females (n=13,223). Nearly all of these falls were unintentional (n=24,648). As with all TBI emergency department visits, those due to falls are most common among the oldest and youngest members of the population. Among children under one year of age, the rate of fall-related TBI is 2,237.8 visits per 100,000 residents; among adults 85 and older, the rate is 2,344.1 visits per 100,000 residents.

Non-Fatal Struck By/Against-Related TBI Emergency Department Visits

Struck by/against injuries include being struck by an object (such as falling furniture), striking against an object (such as the edge of a bathtub), or being struck by other people (such as when playing sports). Of the 11,181 TBI emergency department visits due to struck by/against injuries, 62 percent were among males (n=6,939) and 38 percent were among females (n=4,242). Seventy-four percent of these injuries were unintentional (n=8,322), and 25 percent were assaults (n=2,765). One percent of emergency department visits resulted from struck by/against injuries due to legal intervention (n=94). Sixty-three percent of TBI emergency department visits from struck by/against injuries were among individuals 24 years and younger (n=7,022).

The emergency department discharge database did not include specific information regarding contributing event for 30 percent of the struck by/against injuries (n=3,316). The most frequently specified contributing events were assaults in unarmed fights (24 percent of specified events, n=1,914) and unintentional blows while playing sports (21 percent of specified events, n=1,678). Figure 25 shows TBI emergency department visits due to struck by/against injuries by specified contributing event.

Figure 26. TBI Emergency Department Visits due to Struck by/Against by Specified Contributing Event, Arizona, 2011 (n=7,865)



Data Notes

All rates were calculated using the 2011 Arizona Vital Statistics population estimates, available on the internet from the AZ Vital Statistics website. Age-adjusted rates were standardized to the 2000 U.S. standard population using the direct standardization method. Age-adjusted rates have been presented when possible, as age-adjusting controls for the effects of age differences in populations (e.g., a large proportion of older adults or young children) and allows for more accurate rate comparisons.

Mortality data were tabulated from death certificates for Arizona residents who died in 2011. Inpatient hospitalization and emergency department visit data were compiled from the 2011 Arizona Hospital Discharge Database.

The discharge databases contain information from private, acute-care facilities in the state of Arizona, and do not include visits to federal facilities, such as Veterans' Affairs Hospitals or Indian Health Services facilities. The discharge databases do not contain data from urgent care facilities, private physician practices, or medical clinics. Additionally, discharge data include hospital transfers and readmissions. Therefore, a single injured individual may be counted more than once. These data should be interpreted as episodes of medical treatment, not individual injuries.

Hospital discharge data collected since January 1, 2008 are maintained in a different data layout from earlier hospital discharge data, and comparisons between data from each time period should be treated with caution. Enhanced understanding of the new data layout may have contributed to more thorough reporting of ICD-9-CM E-Codes in 2011 and a subsequent increase in the rate of inpatient hospitalizations and emergency department visits for traumatic brain injuries since 2008.

Codes from the International Classification of Diseases, Version 9, clinical modification (ICD-9-CM) were used for determining TBI cases among hospital and emergency department data. ICD-10 codes were used for mortality data. The specific codes used are described in *Traumatic Brain Injury in the United States: Emergency Department Visits, Hospitalizations and Deaths*, published in 2006 by the U.S. Centers for Disease Control and Prevention (CDC). Traumatic brain injury-related inpatient hospitalizations and emergency department visits resulting from medical misadventures have been excluded from this report.

APPENDIX A. DEFINITIONS OF MECHANISMS OF INJURY

Cause of Injury	Definition
Fall	Includes falls from furniture, stairs, playground equipment, and those that occur while playing sports.
Firearm	Includes injuries from handguns, shotguns, BB guns, etc.
Motor vehicle traffic	Includes collisions that occur on public highways and streets. These collisions may include pedestrians, pedal cyclists, motorcyclists, and occupants of motor vehicles.
Other land transport	Includes collisions involving railway transport or all-terrain vehicles operating off-road. This cause only applies to deaths and is not used in hospitalization or emergency department databases.
Other pedal cycle	Includes injured pedal cyclists struck by pedestrians, pedal cycles, or non-motorized vehicles.
Other pedestrian	Includes injured pedestrians struck by pedal cycles, non-motorized vehicles, or other pedestrians.
Other/unspecified	Unspecified events or other rare events.
Struck by/against	Includes being struck by furniture, struck by other people while playing sports, or hit by objects while playing sports.
Transport	Other non-motorized, off-road vehicle, or rail transport. This cause only applies to hospitalization and emergency
Unknown cause	Cause not listed.