

TRAUMATIC BRAIN INJURIES

ARIZONA RESIDENTS 2015



ARIZONA DEPARTMENT
OF HEALTH SERVICES

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EXECUTIVE SUMMARY

ARIZONA RESIDENTS 2015

Traumatic Brain Injuries (TBI) was the cause of death for 1,466 Arizona residents in 2015. Males ages 85 years and older had the highest rate of TBI deaths with 229.2 deaths per 100,000 residents. TBI death age-adjusted rates were highest among American Indian or Alaska Native (35.2 per 100,000 residents) and White non-Hispanic (22.9 per 100,000 residents) residents. In 2015, forty-six percent of TBI deaths were due to unintentional injuries (n=671), forty-six percent were suicides (n=595), and seven percent were homicides (n=107). The most common causes of TBI deaths were firearms (46%, n=672), falls (28%, n=414), and motor vehicle traffic crashes (12%, n=179).

In 2015, there were 7,226 non-fatal TBI Inpatient Hospitalizations (IP). Adults 85 years and older had the highest rate of TBI IP (746.5 per 100,000 people). For this age group, Males had a rate of 743.4 hospitalizations per 100,000 residents, and females had a rate was 748.4 hospitalizations per 100,000 residents. The age-adjusted TBI IP rates for Race/Ethnicity groups were highest among American Indians or Alaska Native (230.6 per 100,000 residents). The age-adjusted TBI IP rates for all other Race/Ethnicity groups were below the total age-adjusted rate (100.8 per 100,000 residents). Unintentional injuries accounted for eighty-five percent of TBI hospitalizations (n=6,180). Falls were the most common cause of TBI IP (48%, n=3,495), followed by motor vehicle traffic crashes (27%, n=1,919). Total hospital charges for non-fatal inpatient hospitalizations due to TBIs were more than \$657.7 million, and Arizonans spent a total of 40,978 days hospitalized in 2015.

In 2015, there were 64,561 non-fatal TBI Emergency Department Visits (EDV). TBI EDV rates were highest among adults 85 years and older (3,302.9 per 100,000 residents), infants less than 1 years (2,804.4 per 100,000 residents), and children 1-4 years of age (2,470.8 per 100,000 residents). Within the children 1-4 years of age and infants less than 1 year age groups, males (2,876.4 and 2,853.6 per 100,000 residents respectively) had higher rates than females (2,408.1 and 2,752.9 per 100,000 residents respectively). Females (3,615.9 per 100,000 residents) had a higher rate than males (206.2 per 100,000 residents) for the 85 and older age group. The age-adjusted TBI EDV rates were highest among African American and White non-Hispanic (1,098.1 and 1,060 per 100,000 residents respectively). Overall, unintentional injuries accounted for 90% of the TBI EDV. The leading causes of TBI EDV were falls (52%, n=33,360), struck by/against injuries (22%, n=14,370), and motor vehicle traffic crashes (13%, n=8,578). Total hospital charges for non-fatal emergency department visits due to TBIs were more than \$440 million.

TBI: AT A GLANCE



**For every TBI-related death
in Arizona in 2015 there
were:**

**5 Non-fatal inpatient
hospitalizations and**

**44 Non-fatal emergency
department visits**

**Resulting in just over
1 billion in hospital charges**

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INTRODUCTION

Traumatic brain injury (TBI) is a major cause of death and disability in the United States contributing to approximately 30% of all injury deaths.¹ A TBI is caused by a bump, blow, or jolt to the head or by a penetrating head injury that disrupts brain function.² From the most recent information posted on the Center for Disease Controls website regarding TBI's, in 2010 approximately 2.5 million Americans sustained a traumatic brain injury, in which over 50,000 died as a result of the trauma.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 as completing academic assignments, managing personal finances, or driving a vehicle.

The data presented in this report illustrates 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 preventable.** Understanding the risk factors associated with TBI is an important step toward educating and empowering communities to implement effective prevention strategies.

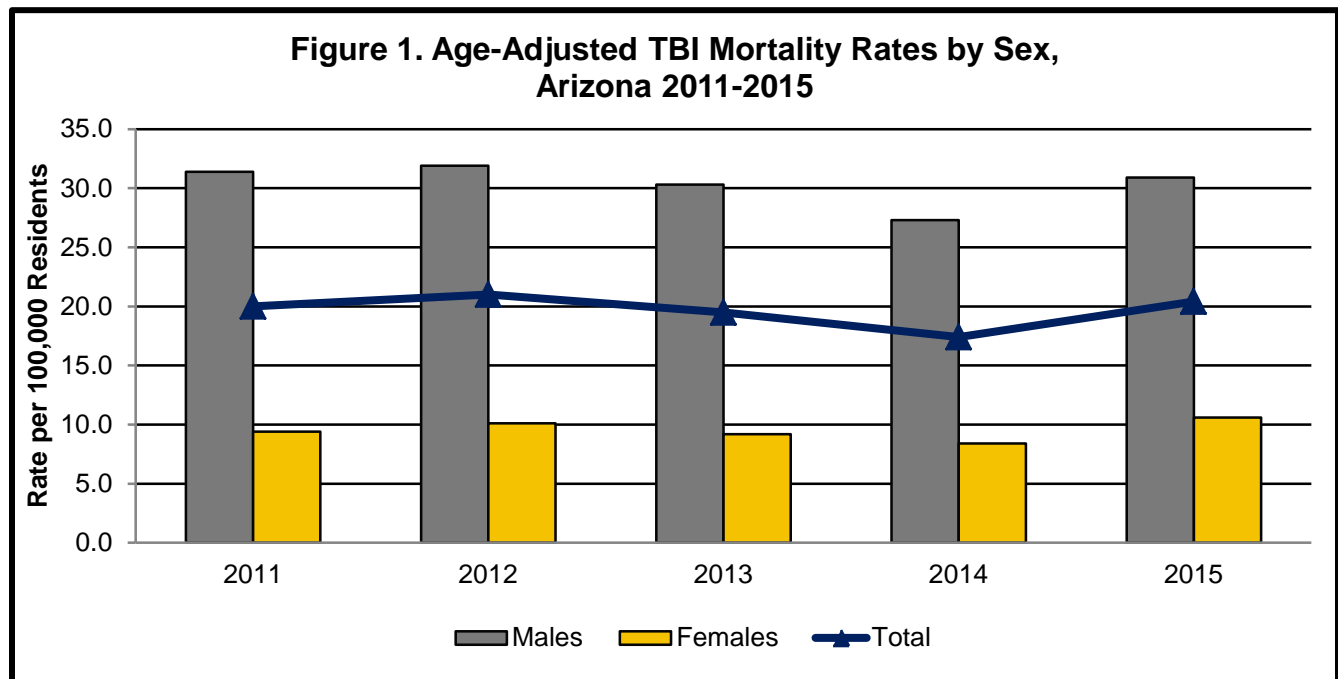
^{1,2} Faul M, Xu L, Wald MM, Coronado VG. Traumatic brain injury in the United States: emergency department visits, hospitalizations, and deaths. Atlanta (GA): Centers for Disease Control and Prevention, National Center for Injury Prevention and Control; 2010.

³ National Vital Statistics System (NVSS), 2006–2010. Data source is maintained by the CDC National Center for Health Statistics.

TRENDS IN TRAUMATIC BRAIN INJURIES AMONG ARIZONA RESIDENTS 2011-2015

Mortality

Between 2011 and 2015, the age-adjusted mortality rate due to traumatic brain injuries increased slightly by 2 percent, from 20.0 deaths per 100,000 Arizona residents in 2011 to 20.4 deaths per 100,000 residents in 2015. Although the male mortality rates decreased by 1.6%, the female mortality rates increased by 12.7%. The age-adjusted mortality rates among males were three times more than the rates of females. Figure 1 shows age-adjusted TBI mortality rates by sex from 2011 through 2015.



In 2015, all manners of TBI-related deaths increased from the previous year. The age-adjusted rate of unintentional TBI-related deaths increased eight percent from 2011 and twenty-four percent from 2014. Suicide mortality rates decreased one percent since 2011 and increased five percent since 2014. The age-adjusted rates of motor vehicle crash TBI-related deaths has increased by forty-two percent since 2014 while fall-related deaths have increased by twenty-three percent. Firearm-related TBI deaths decreased, by five percent since 2011. Figures 2 and 3 show the age-adjusted TBI mortality rates by manner of death and selected cause of injury.

Figure 2. Age-Adjusted TBI Mortality Rates by Manner of Death, Arizona 2011-2015

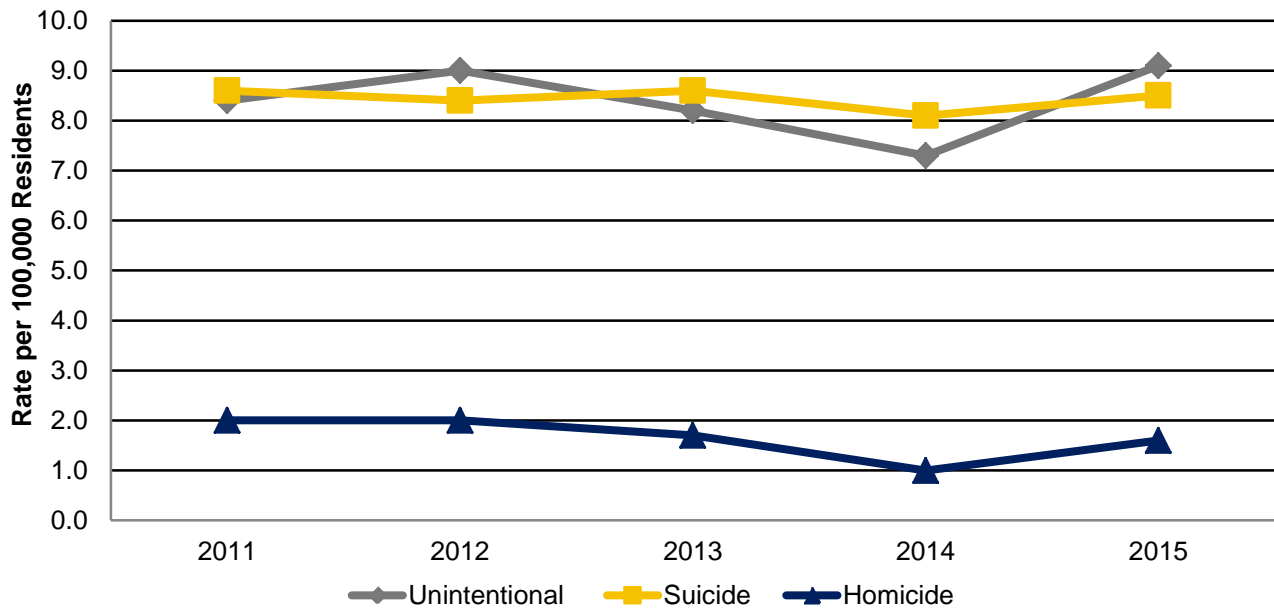
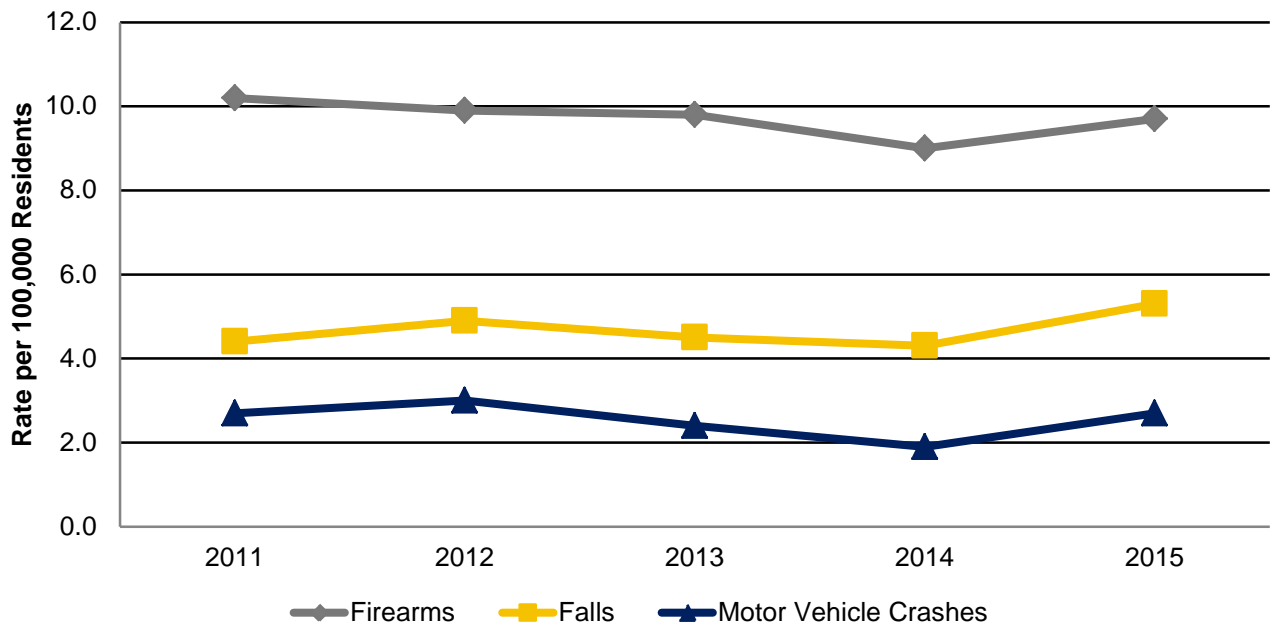
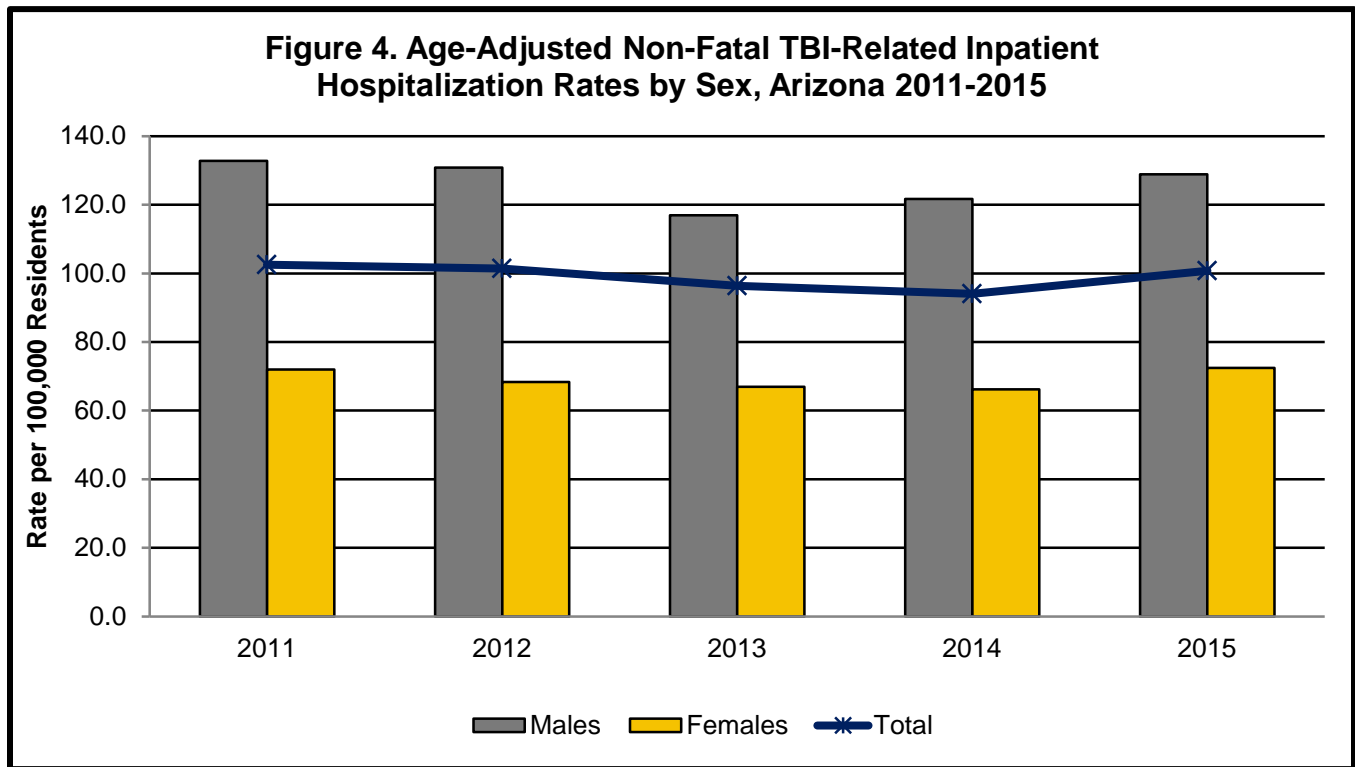


Figure 3. Age-Adjusted TBI Mortality Rates By Lead Cause of Death, Arizona 2011-2015



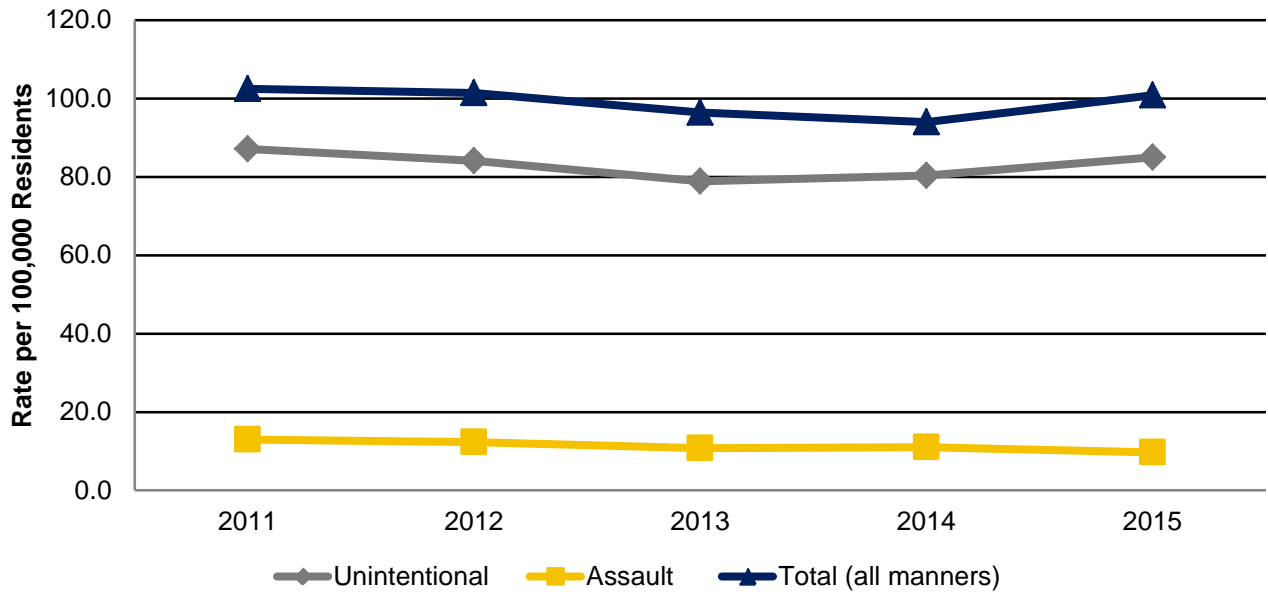
Non-Fatal Inpatient Hospitalizations

Between 2011 and 2015, the age-adjusted rate of TBI-related Inpatient Hospitalizations (IP) decreased 1.6%, from 102.5 hospitalizations per 100,000 residents in 2011 to 100.8 hospitalizations per 100,000 residents in 2015. On average, the age-adjusted hospitalization rates among males were 1.8 times higher than the rates of females during the same 5 year period. Rates for males decreased 3% from between 2011 and 2015, and rates for females increased slightly by 0.5%. Figure 4 shows the age-adjusted non-fatal TBI-related inpatient hospitalization rates by sex from 2011 through 2015.



Overall the age-adjusted rate of TBI-related IP by all manners has decreased since 2011. From 2011 to 2015 there was a 2.5% decrease in unintentional injuries and 25% decrease in assault-related TBI. Figure 5 shows age-adjusted TBI hospitalization rates by manner of injury.

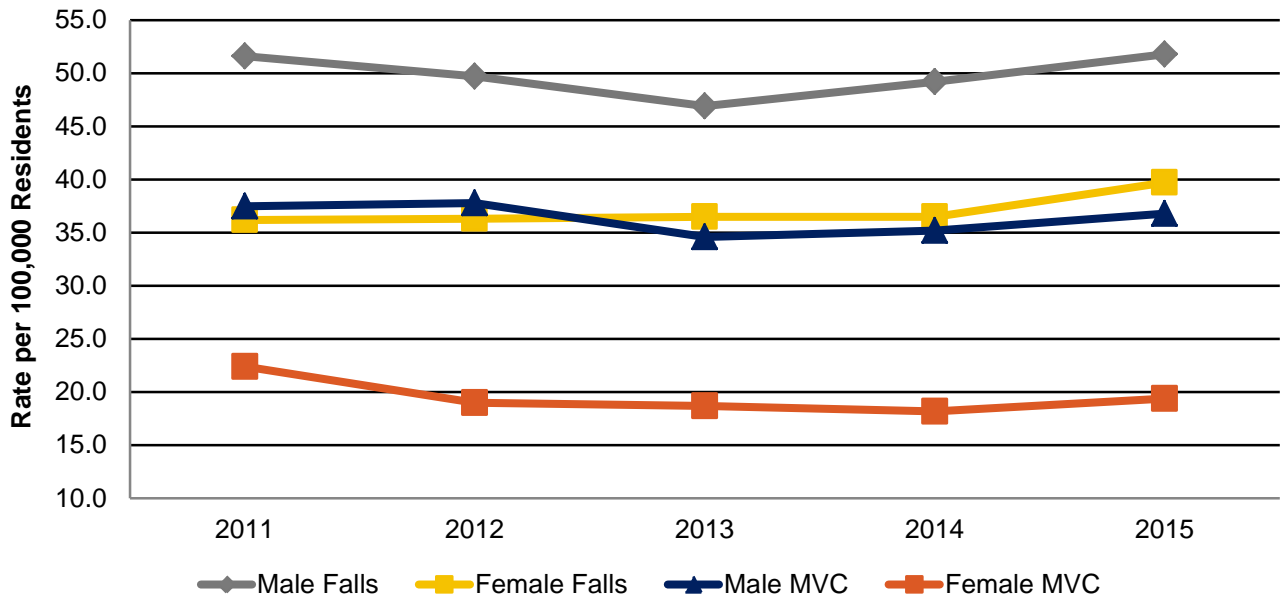
Figure 5. Age-Adjusted Non-Fatal TBI-Related Inpatient Hospitalization By Manner of Injury, Arizona 2011-2015



The most common non-fatal inpatient hospitalizations TBI injuries are due to falls and motor vehicle crashes. The rate of non-fatal IP due to fall-related traumatic brain injuries in 2015 was 45.7 hospitalizations per 100,000 residents and represents a seven percent increase from the previous year (42.8 hospitalizations per 100,000 residents). Males consistently had a higher rate of fall-related TBI hospitalizations than females in each of the five years examined and can be seen in Figure 6 on the next page.

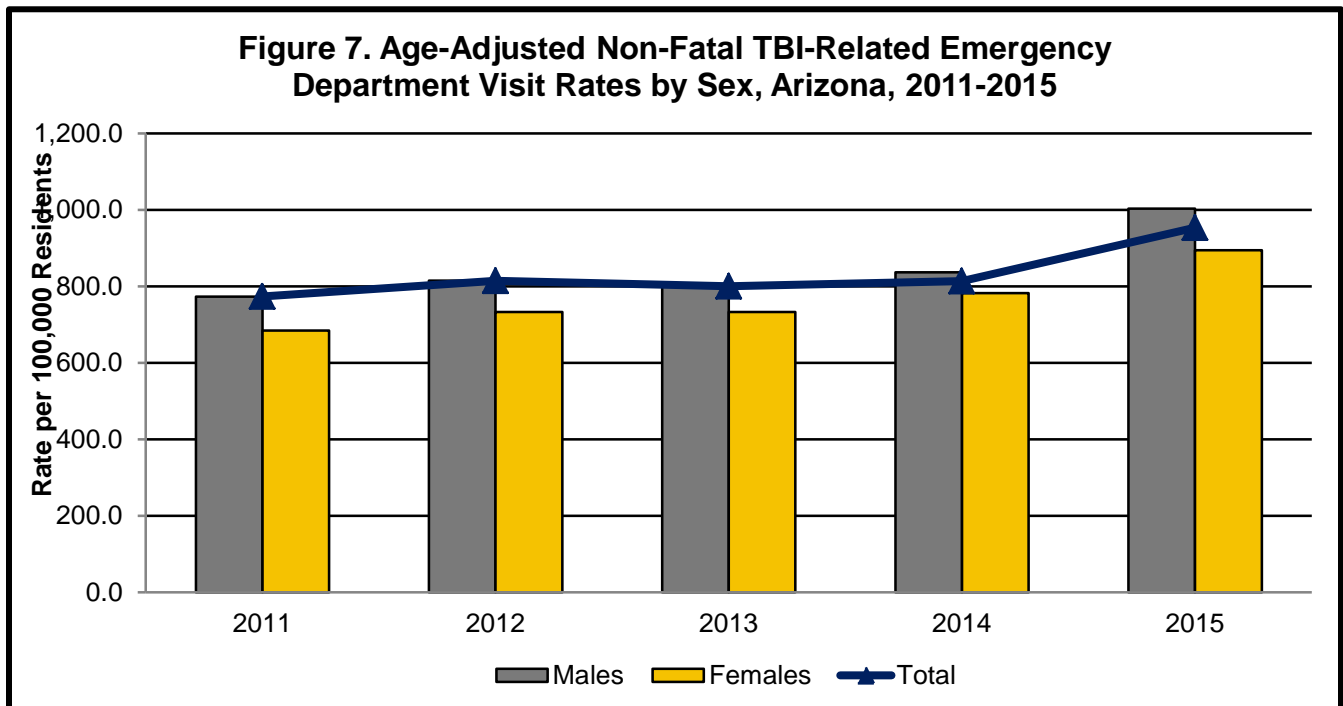
In 2015, the rate of motor vehicle crash-related TBI hospitalizations increased by 4.5% for males and 6.6% for females from the previous year. As with falls, males had a higher rate of motor vehicle crash-related TBI hospitalizations than females in each of the years examined. Figure 6 shows the trend of fall and motor vehicle crash-related TBI hospitalizations by sex from 2011 through 2015.

Figure 6. Age-Adjusted Non-Fatal TBI Inpatient Hospitalization Rates by Mechanism and Sex, Arizona 2011-2015



Non-Fatal Emergency Department Visits

From 2011 through 2015, the age-adjusted rate of non-fatal TBI-related emergency department visits (EDV) increased by 23% overall, from 773.7 visits per 100,000 residents in 2011 to 954.1 visits in 2015. The rates among males and females have increased steadily since 2011. Among males, the rate increased 30%, from 773.7 visits per 100,000 people in 2011 to 1,003.8 visits per 100,000 residents in 2015. Among females, the rate increased 31%, from 684.8 visits per 100,000 residents in 2011 to 895.1 visits per 100,000 people in 2015. The age-adjusted EDV 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 2011 to 2015.



The total age-adjusted TBI-related emergency department visit rates by manner and mechanism of injury have increased from 2011 to 2015. Unintentional injuries have increased by 30.6% while assault injuries have decreased by 0.5% since 2011.

The most common non-fatal emergency department visit TBI injuries are falls, being struck by/against an object and motor vehicle crashes. From 2011 to 2015, there has been a 27.5% increase in falls (375.1 to 478.2 visit per 100,000 residents), 25.4% increase in being struck by/against an object (176.2 to 221.0 visit per 100,000 residents), and 37.3% increase in motor vehicle crashes (94.2 to 129.3 visit per 100,000 residents).

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 by leading causes of injury.

Figure 8. Age-Adjusted Non-Fatal TBI-Related Emergency Department Visit Rates By Manner Of Injury, Arizona 2011-2015

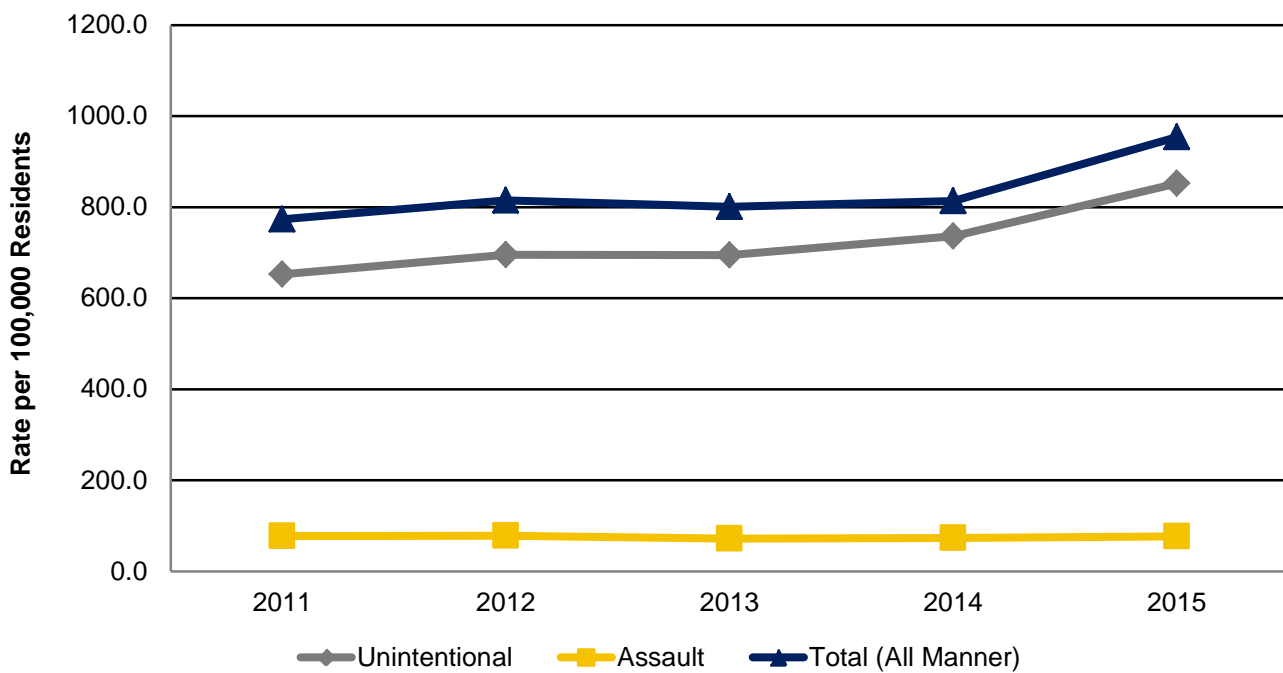
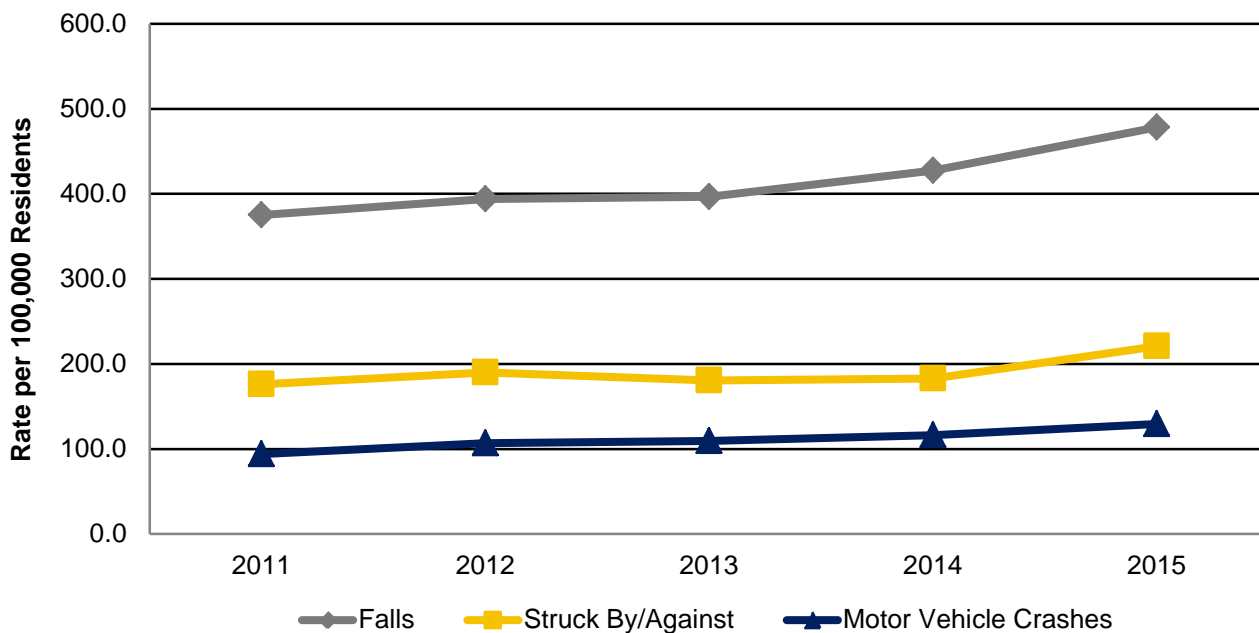


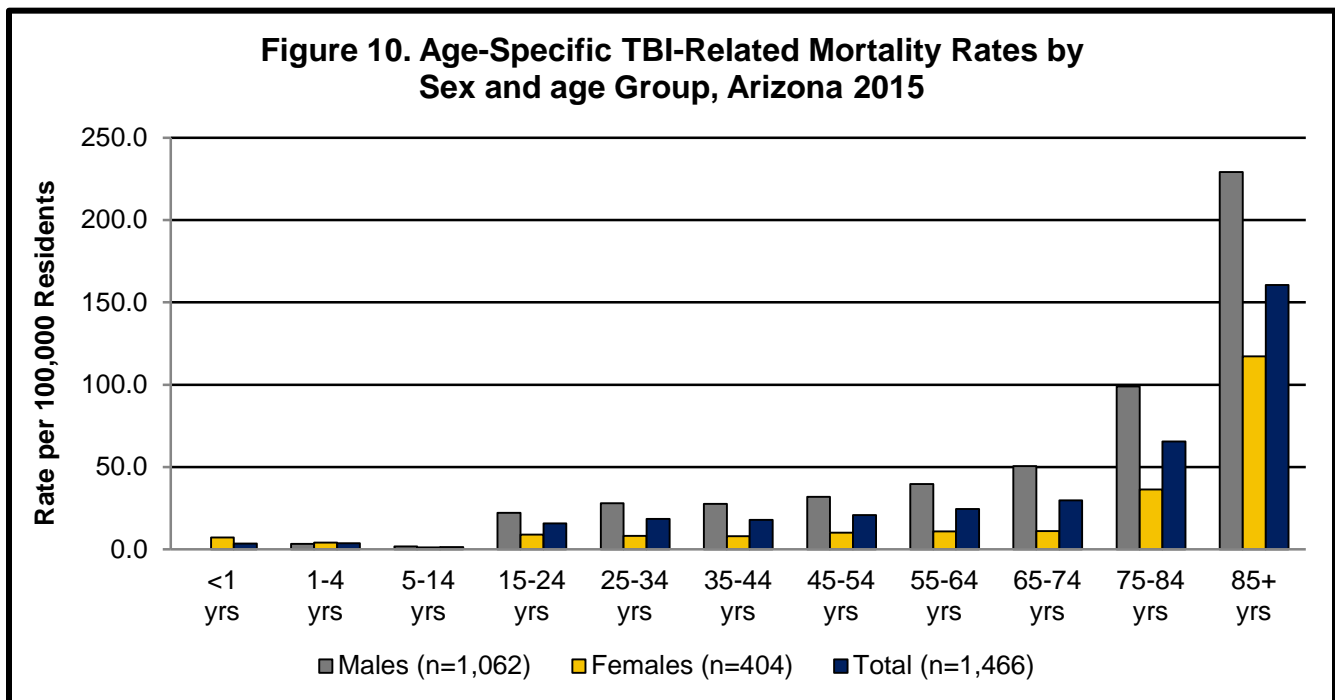
Figure 9. Age-Adjusted Non-Fatal TBI-Related Emergency Department Visit By Selected Cause Of Injury, Arizona 2011-2015



DEATHS AMONG ARIZONA RESIDENTS DURING 2015

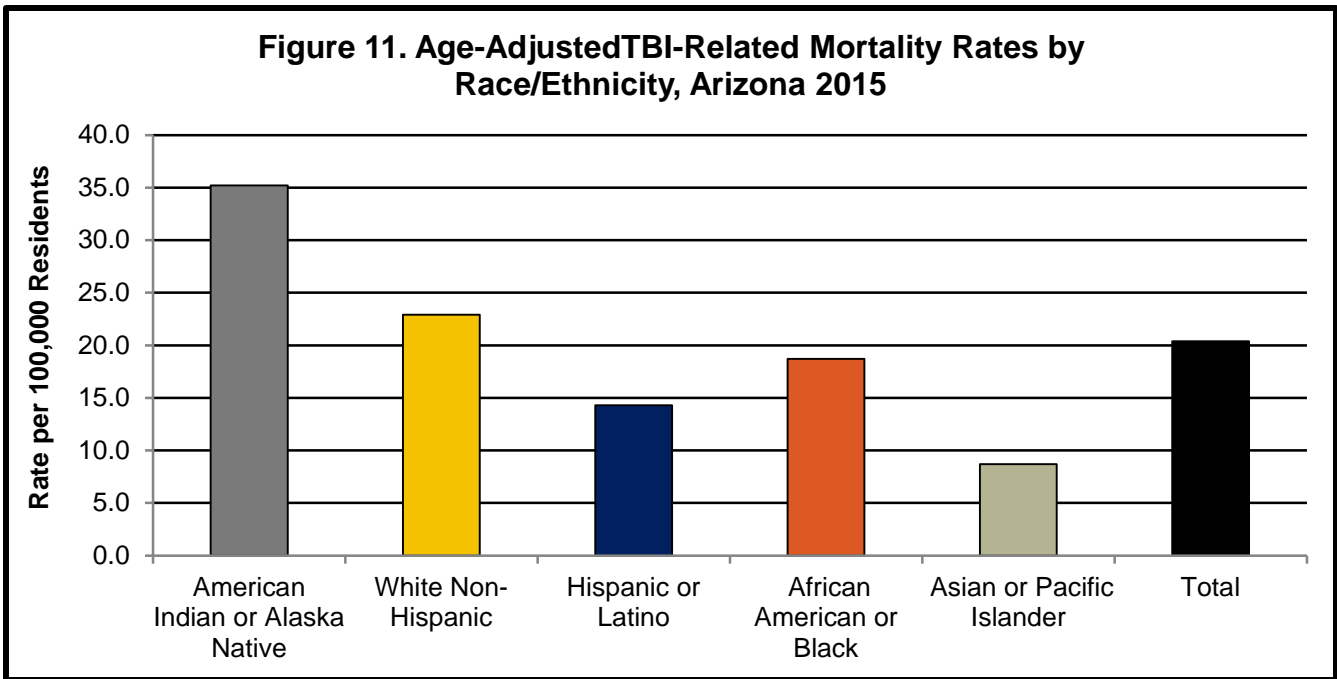
In 2015, 1,466 Arizona residents died as a result of a TBI. Seven-two percent of TBI deaths were among males (n=1,062), while females accounted for twenty-eight percent of TBI deaths (n=404). Males had higher rates of TBI-related mortality across all age groups.

Males 85 years and older had the highest rate of TBI deaths at 229.2 per 100,000 residents in 2015. Among the 201 deaths in those 85 years and older, 75.1% were due to unintentional falls (n=151). Figure 10 shows the 2015 TBI death rates by age group and sex for Arizona residents.



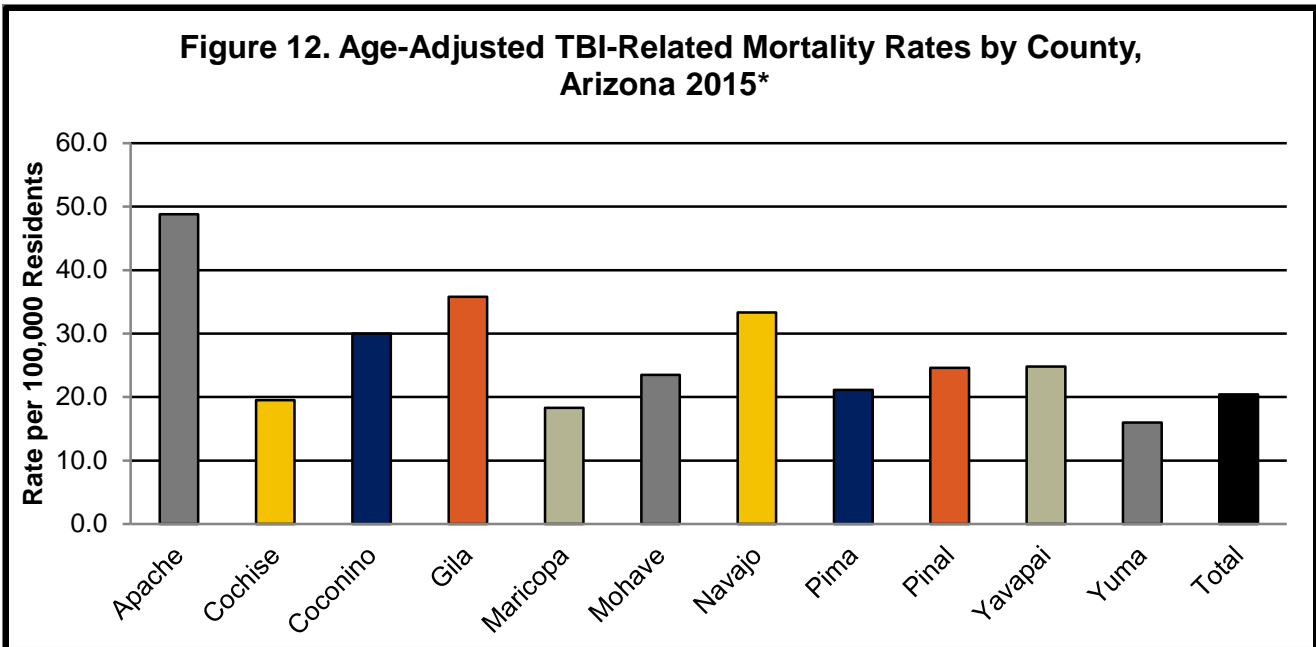
Age-adjusted TBI death rates were highest among American Indian or Alaska Native (35.2 deaths per 100,000 residents) and White non-Hispanics (22.9 deaths per 100,000 residents). Rates were lowest among Asian or Pacific Islanders (8.7 deaths per 100,000 residents). Figure 11 shows the 2015 age-adjusted TBI death rates by race/ethnicity in Arizona.

Figure 11. Age-Adjusted TBI-Related Mortality Rates by Race/Ethnicity, Arizona 2015



There were eight counties that had age-adjusted TBI mortality rates higher than the state rate (20.4 deaths per 100,000 residents) in 2015. Apache (48.8), Gila (35.0), and Navajo (33.3) had the highest age-adjusted TBI mortality rates per 100,000 residents. Figure 12 shows the TBI mortality rate by county in Arizona.

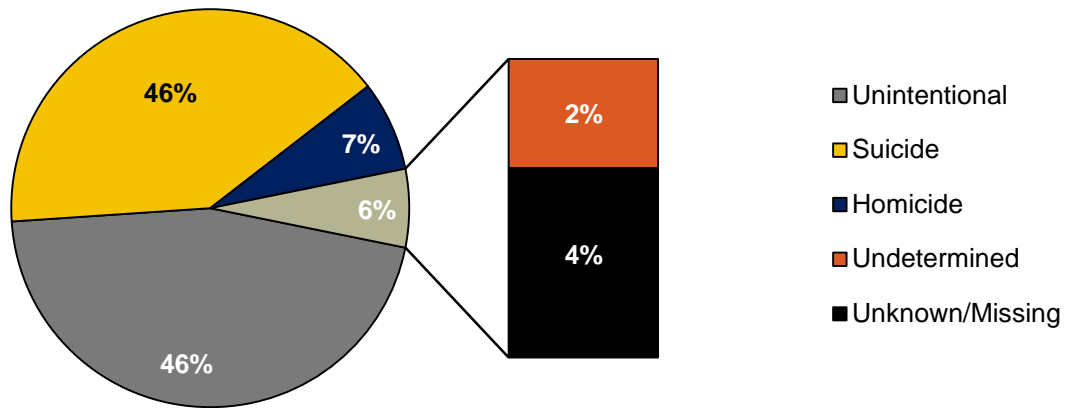
Figure 12. Age-Adjusted TBI-Related Mortality Rates by County, Arizona 2015*



*Only Counties with 20 or more records were included in graph

Forty-six percent of the TBI deaths in 2015 were due to unintentional injuries (n=671); forty-six percent were due to suicides (n=595); and seven percent were due to homicides (n=107). Figure 13 shows TBI deaths by manner of injury during 2015 in Arizona.

Figure 13. Percentage of TBI-related Deaths by Manner, Arizona 2015



The most common causes of TBI deaths were firearms (46%, n=672), falls (28%, n=414), and motor vehicle traffic crashes (11%, n=179). Causes of TBI deaths during 2015 in Arizona are shown in Table 1. Descriptions of these causes are given in Appendix A.

The causes and manners of TBI-related mortality varied greatly by race/ethnicity. Suicides, due primarily to firearms, were highest among White non-Hispanics, while unintentional injuries, specifically due to motor vehicle crashes, were the leading cause and manner of TBI-related death among American Indian or Alaska Native residents. Figures 14 and 15 show the percentages breakdown of TBI-related deaths for each race/ethnicity by cause and manner of death. The cause of death refers to the injury that resulted in death, whereas the manner of death refers to the intentionality of the death.

Table 1. Number and Percentage of TBI Deaths by Cause, Arizona 2015

Cause	Number	Percentage
Firearm	672	46%
Fall	414	28%
Motor vehicle traffic	179	12%
Other/unspecified/unknown	151	10%
Other land transport	23	2%
Other Specified	19	<1%
Other pedestrian/pedal cycle	8	<1%
Total	1,466	100%

Source: Arizona Vital Statistics

Figure 14. TBI-Related Deaths by Manner and Race/Ethnicity, Arizona 2015

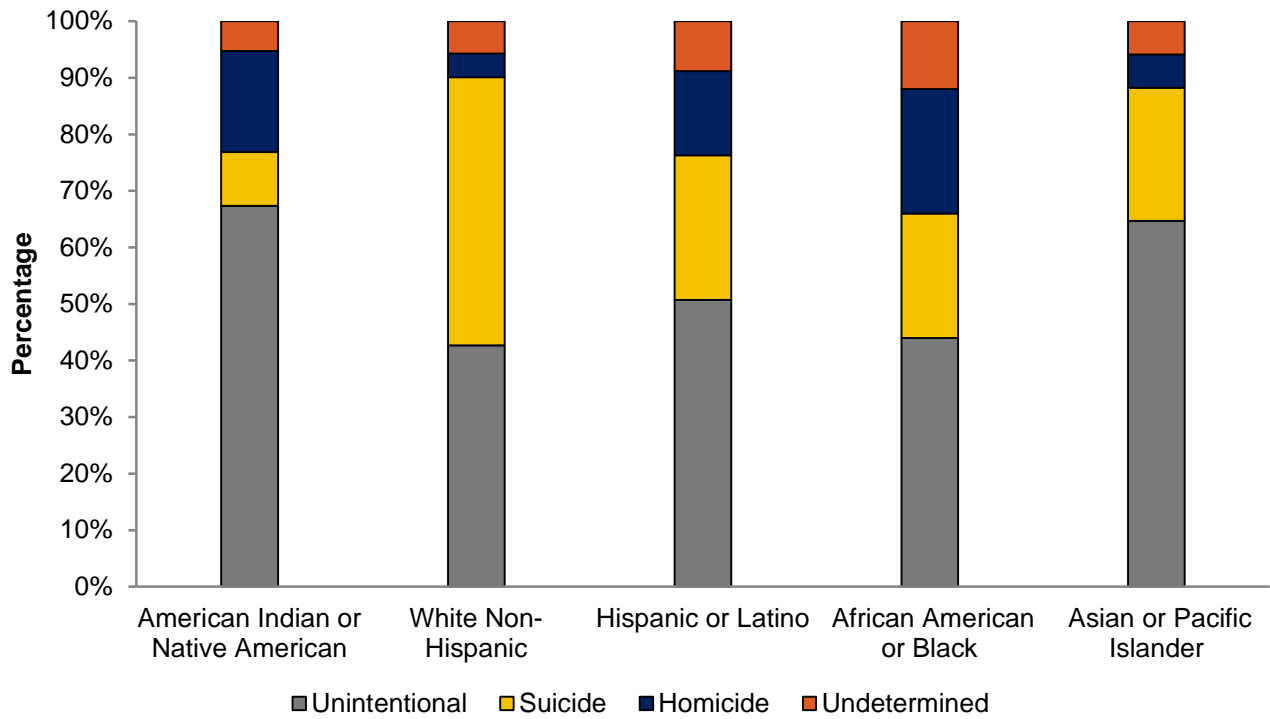
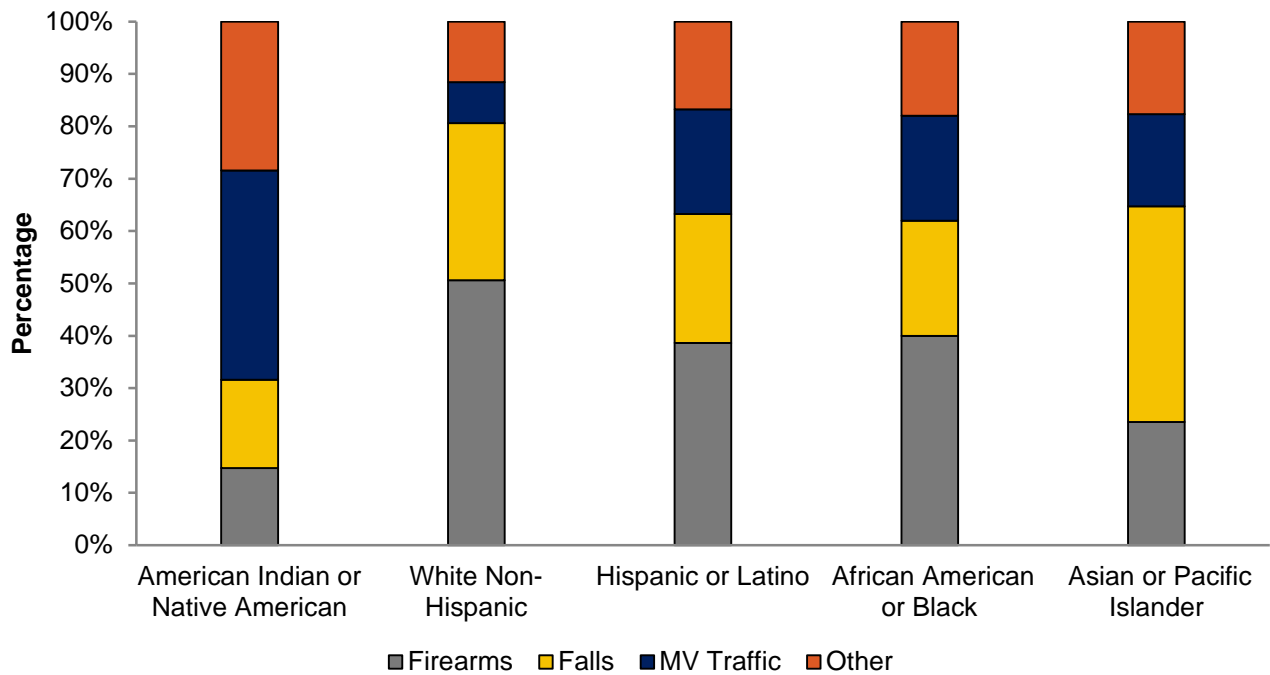


Figure 15. TBI-Related Deaths by Cause and Race/Ethnicity, Arizona 2015



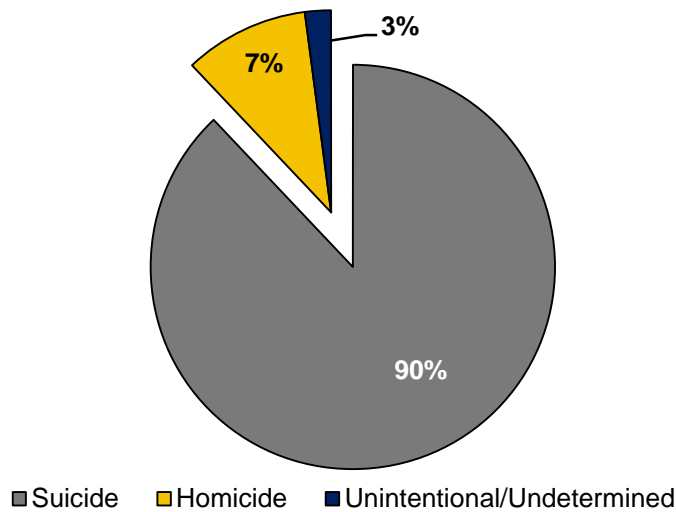
Firearm-Related TBI Mortality

Among the 672 Arizona residents who died as a result of a firearm-related TBI, the majority were male (82%, n=550) and 18% were female (n=122).

The highest age-adjusted rate of firearm-related TBI deaths was among White non-Hispanics (12.9 deaths per 100,000 residents, n=551). The second highest rate was among Black or African Americans residents (6.0 per 100,000 residents, n=20).

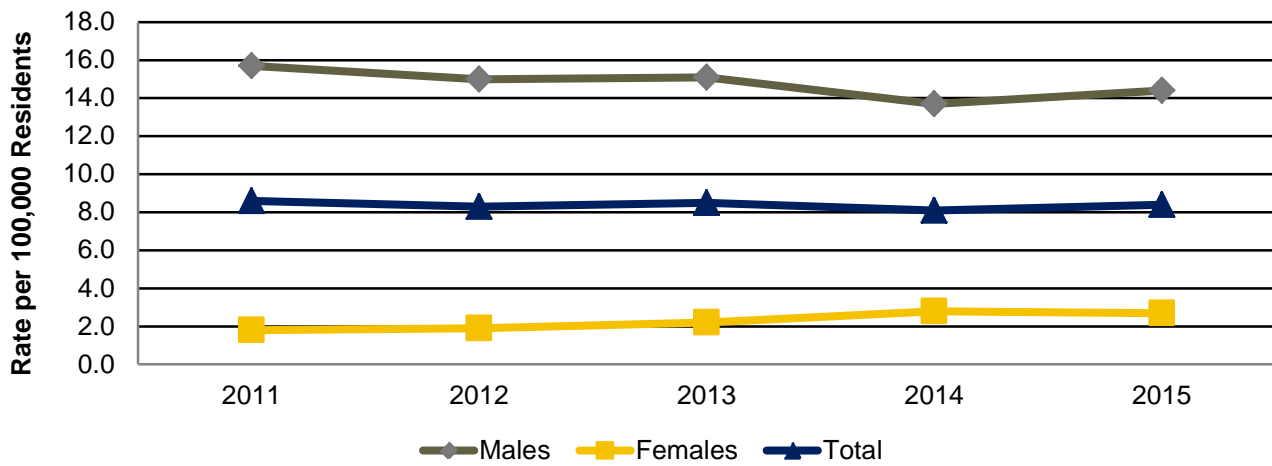
The majority of firearm-related TBI deaths were suicides (ninety percent, n=591). Seven percent of the deaths were due to homicides (n=67) and one percent were due to undetermined intent (n=7). Figure 16 shows the percentage of TBI deaths due to firearms by manner of injury.

Figure 16. Percentage of Firearm-Related TBI Deaths by Manner, Arizona 2015



Among the 591 TBI deaths resulting from firearm-related suicides, 84% were among males (n=498) and 16% were among females (n=93). The age-adjusted rate of TBI deaths resulting from firearm-related suicides was 8.4 deaths per 100,000 residents, a five percent increase since 2014. The highest age-specific rates were among adult males, particularly among those 85 years and older (45.4 per 100,000 residents). Age-adjusted rates were substantially higher among males than among females over each of the years from 2011-2015 but female suicide rates have increased 50% since 2011. Figure 17 shows the age-adjusted rate of TBI deaths resulting from firearm-related suicides by sex and year.

Figure 17. Age-Adjusted TBI Mortality Rates Due To Suicides from Firearms by Sex And Year, Arizona 2011-2015

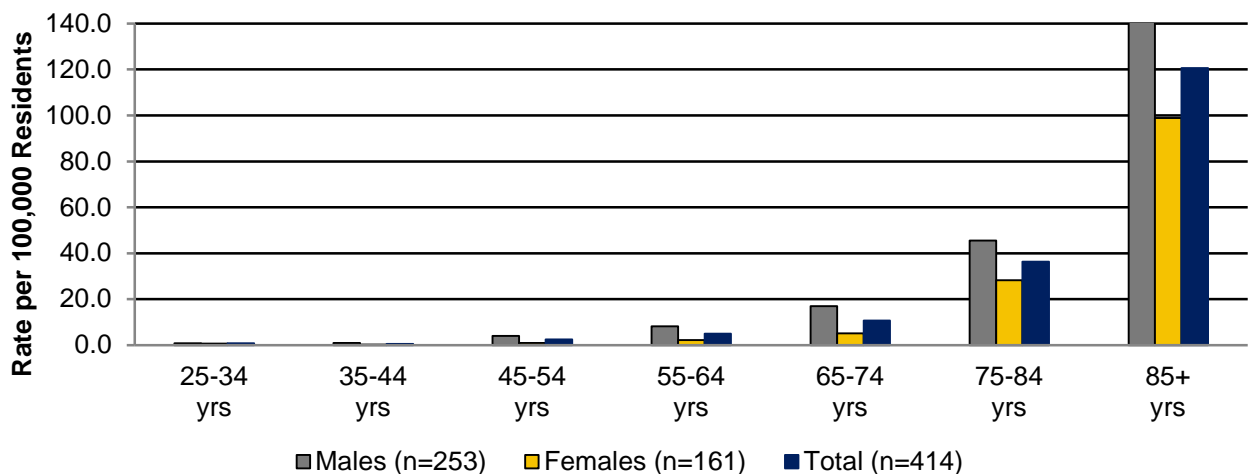


The highest age-adjusted rate of firearm-related TBI suicides was among White non-Hispanics residents (11.8 per 100,000 residents, n=513). This high race-specific mortality rate coupled with the large population propelled the age-adjusted mortality rate for all Arizonans. The age-adjusted rate among Hispanics or Latinos was 2.8 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 414 TBI deaths due to falls, 61% were among males (n=253) and 39% were among females (n=161). Almost 100 percent of the falls were unintentional and among adults over the age of 25. Eighteen percent of the deaths were among adults ages 25 through 64 years (n=73); and eighty-one percent were among adults 65 years and older (n=336). The age-adjusted rate of all fall-related TBI deaths in Arizona for 2015 was 5.3 deaths per 100,000 people, however the highest age-specific mortality rate was among adults 85 years and older (120.6 per 100,000 residents) followed by adults 75 through 84 years of age (36.3 per 100,000 residents).

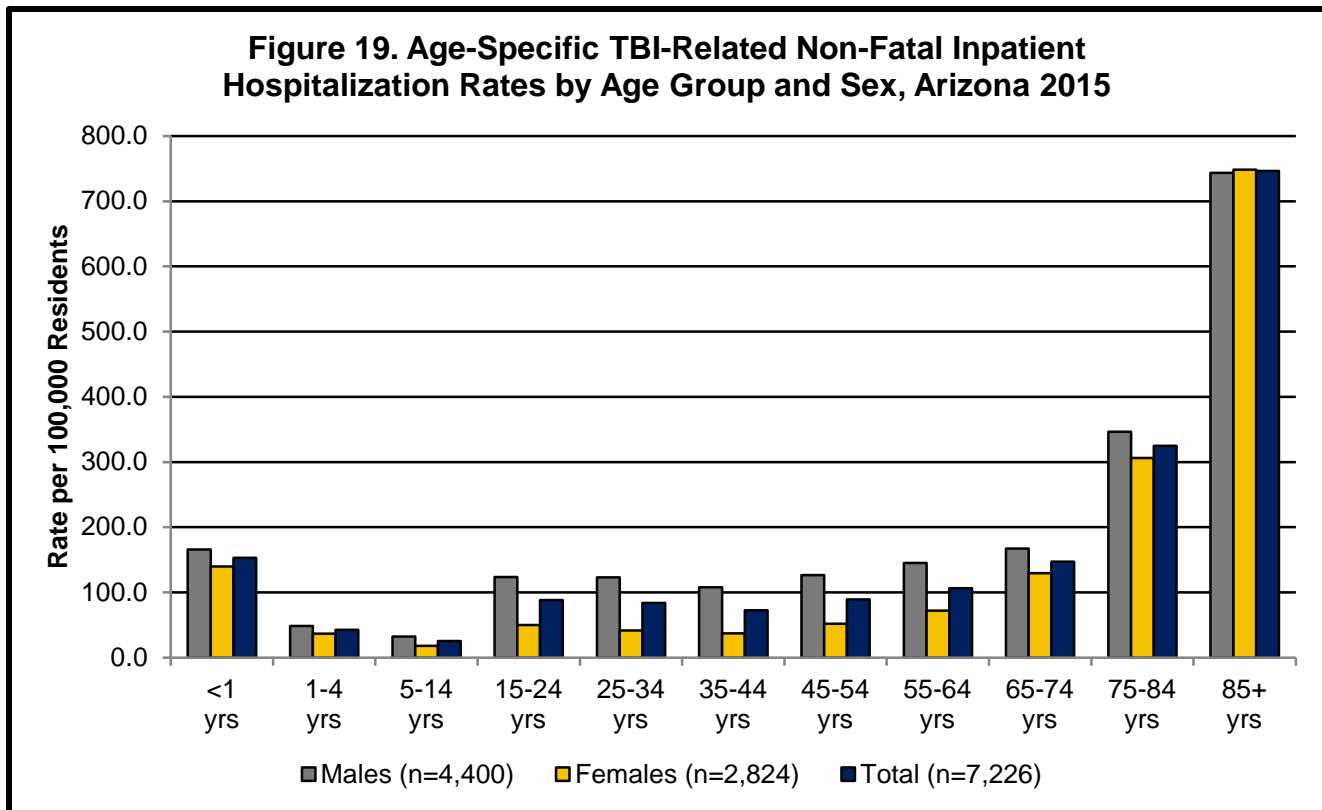
Figure 18. Age-Specific Fall-Related TBI Mortality Rates by Age and Sex, Arizona 2015



Non-Fatal Inpatient Hospitalizations among Arizona Residents During 2015

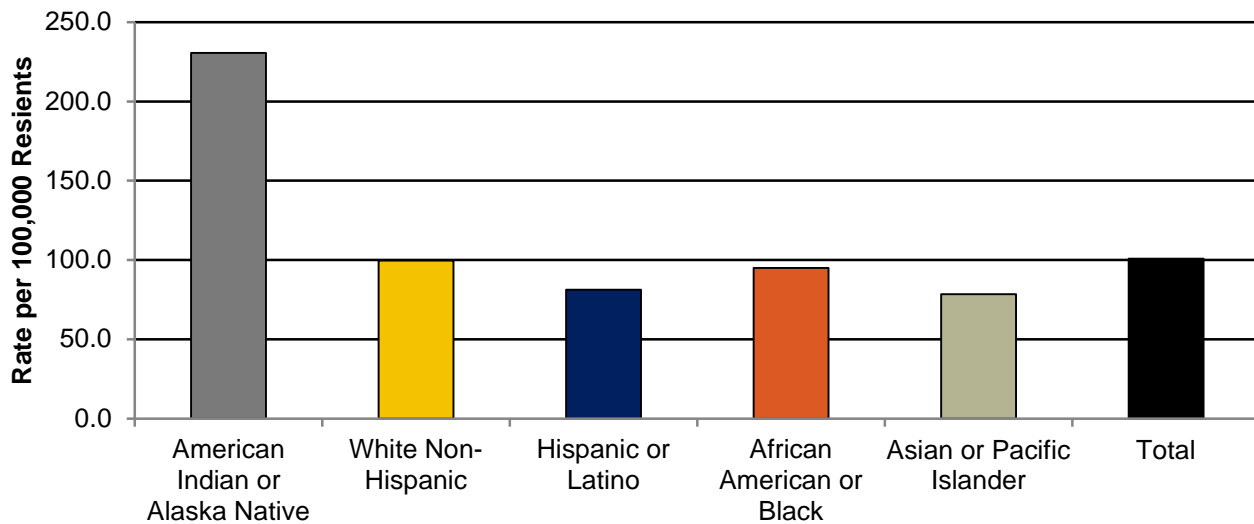
In 2015, 7,226 Arizona residents were hospitalized due to non-fatal TBI. Continuing the trend over the years, males comprised 61% of the total TBI hospitalizations (n=4,440) and females accounted for 39 percent (n=2,824).

Adults 85 years and older had the highest rates of TBI inpatient hospitalizations (IP) in 2015. Within this age group, the age-adjusted rate of TBI hospitalizations for females was 748.4 per 100,000 residents (n=575), and the rate for males was 743.4 hospitalizations per 100,000 residents (n=360). For adults 85 years and older, 89% of TBI hospitalizations were due to unintentional falls (n=829). Figure 19 shows the 2015 TBI inpatient hospitalization rates by age group and sex for Arizona residents.



Age-adjusted TBI IP rates were highest among American Indian or Alaska Native (230.6 hospitalizations per 100,000 residents), and represents a 25% percent increase from 2014, when the rate for this group was 184.2 hospitalizations per 100,000 residents. White non-Hispanics had the second highest hospitalization rate (99.6 hospitalizations per 100,000 residents), and represents a 24% increase since 2014, when the rate was 80.4 hospitalizations per 100,000 residents. Figure 20 shows the 2015 age-adjusted TBI Inpatient Hospitalization rates by race/ethnicity in Arizona.

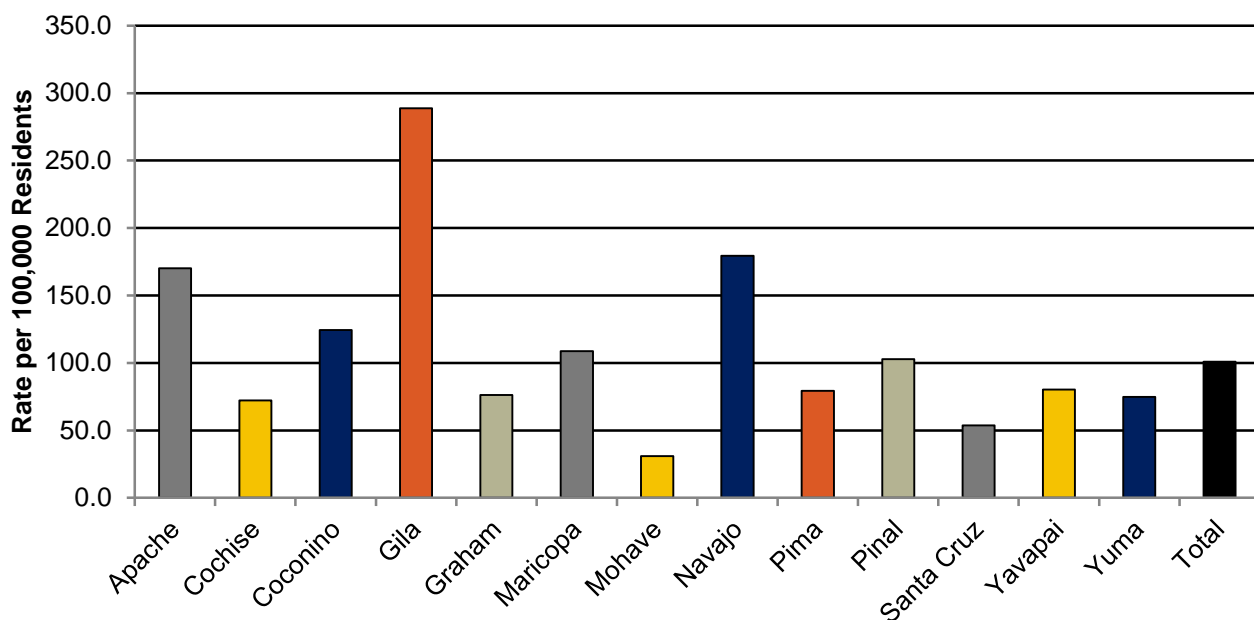
Figure 20. Age-Adjusted TBI-Related Non-Fatal Inpatient Hospitalization Rates by Race/Ethnicity, Arizona 2015*



*162 hospitalizations were among individuals of other or unknown race/ethnicity.

There were five counties that had non-fatal TBI-related inpatient hospitalization rates higher than the state rate (100.8 hospitalizations per 100,000 residents) in 2015. Gila (288.8), Navajo (179.5), Apache (170.2), and Coconino (124.3) had the highest non-fatal TBI related inpatient hospitalization rates per 100,000 residents. Figure 21 shows the age-adjusted non-fatal TBI-related inpatient hospitalizations by county for Arizona in 2015.

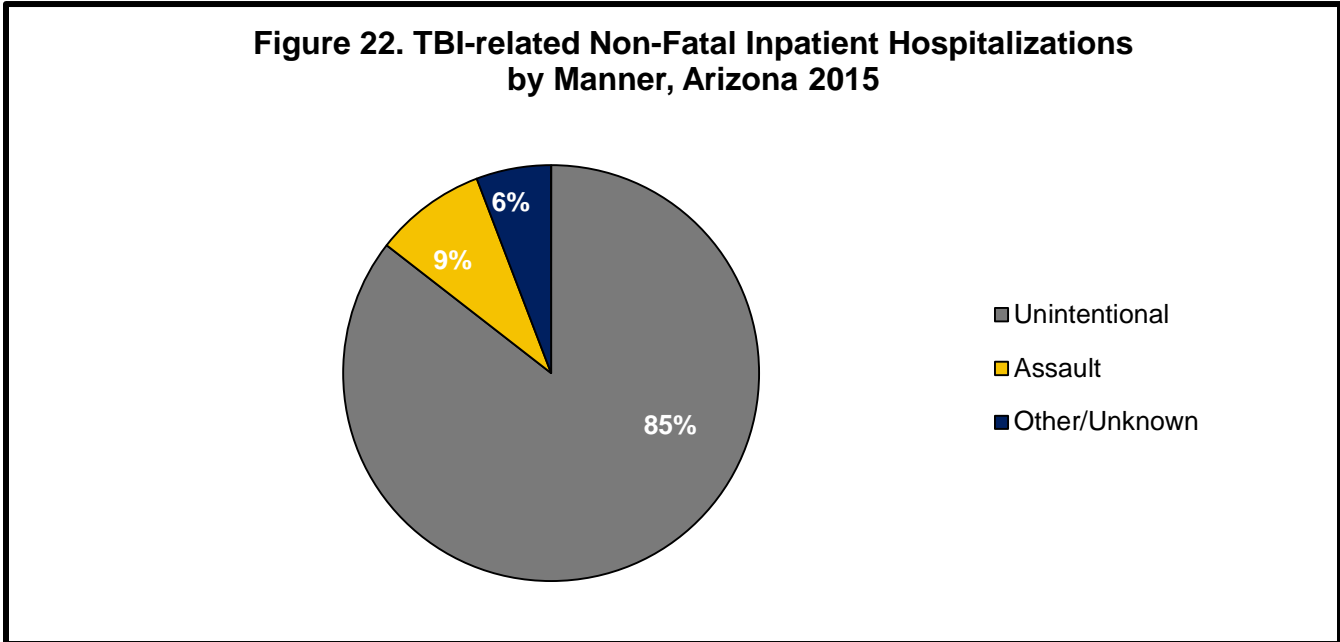
Figure 21. Age-Adjusted TBI-Related Non-Fatal Inpatient Hospitalization Rates, by County, Arizona 2015*



*Only Counties with 20 or more records were included in graph.

For TBI inpatient hospitalizations, the average length of stay was six days (median=3 days), and hospital stays due to TBI ranged from less than one full day to 199 days. In total, Arizonans spent 40,978 days hospitalized for TBI in 2015. TBI inpatient hospitalization charges in 2015 totaled more than \$657.7 million, with 71% paid by the Arizona Health Care Cost Containment System (AHCCCS)/Medicaid and Medicare (n=5,142 cases, over \$461.6 million). This total does not include costs related to physician care, rehabilitation, lost wages, or long-term costs of disability.

Unintentional injuries accounted for 85% of TBI hospitalizations (n=6,180). There were 61 hospitalizations due to self-inflicted TBI (less than one percent) and 626 due to assaults (nine percent). Figure 22 shows the TBI inpatient hospitalizations by manner of injury for Arizona in 2015.



Fall-related injuries were the most common cause of TBI hospitalizations (48%, n=3,495), followed by motor vehicle traffic injuries (27%, n=1,919). Table 2 shows causes of TBI inpatient hospitalizations in Arizona during 2015.

Table 2. Number and Percentage of TBI Inpatient Hospitalizations by Cause, Arizona 2015

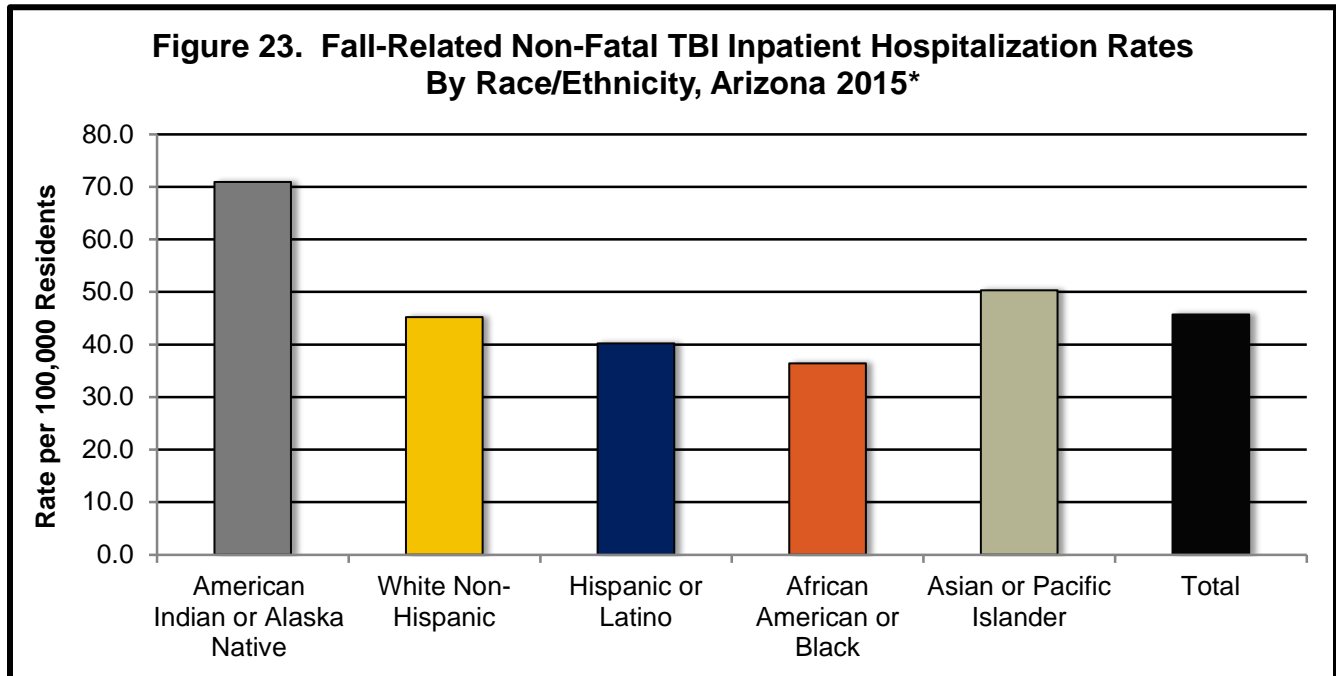
Cause	Number	Percentage
Fall	3,495	48%
Motor vehicle traffic	1,919	27%
Other/unspecified	734	10%
Struck by/against	584	8%
Transport	247	3%
Other pedestrian/pedal cycle	153	2%
Firearm	52	<1%
Cut/pierce	42	<1%
Total	7,226	100

Source: Arizona Hospital Discharge Database

Non-Fatal Fall-Related TBI Inpatient Hospitalizations

There were 3,495 inpatient hospitalizations due to fall-related TBI. Fifty-two percent were among males (n=1,802) and forty-eight percent were among females (n=1,693). Falls were unintentional more than 99 percent of the time (n=3,476), with only 19 cases in which another manner was identified.

American Indians or Alaska Natives had the highest age-adjusted rate of fall-related TBI hospitalizations with 70.9 hospitalizations per 100,000 residents (n=160). The second highest rate was among Asian or Pacific Islanders (50.3 hospitalizations per 100,000 residents; n=83). The age-adjusted rate for non-fatal fall-related inpatient hospitalizations among all Arizonans was 45.7 hospitalizations per 100,000 residents.



*Does not include 49 cases in which race/ethnicity information is unknown.

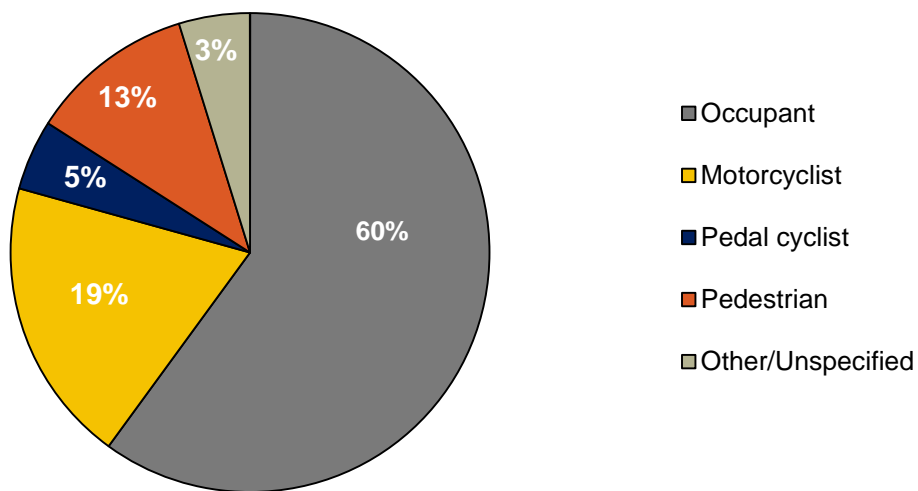
Non-Fatal Motor Vehicle Traffic Crash-Related TBI Inpatient Hospitalizations

Of the 1,919 TBI hospitalizations due to motor vehicle traffic crashes, 65% were among males (n=1,254) and 35% were among females (n=665). As with falls, over 99% of the motor vehicle traffic crashes resulting in a hospitalization were unintentional. The highest hospitalization rates for motor vehicle-related TBI were among teens and young adults 15 through 24 years of age (49.9 hospitalizations per 100,000 residents), for both males (63.4 hospitalizations per 100,000 residents) and females (35.5 hospitalizations per 100,000 residents).

American Indians or Alaska Natives had the highest rate of TBI hospitalizations for motor vehicle traffic crashes with 61.3 hospitalizations per 100,000 residents (n=179), representing a 42 percent increase from 2014 (43.0 hospitalizations per 100,000 residents, n=162). With 27.9 hospitalizations per 100,000 residents, White non-Hispanic residents had the second highest rate (n=1,092). The age-adjusted rate for non-fatal motor vehicle traffic-related inpatient hospitalizations among all Arizonans was 28.2 hospitalizations per 100,000 residents, a six percent increase from 2014.

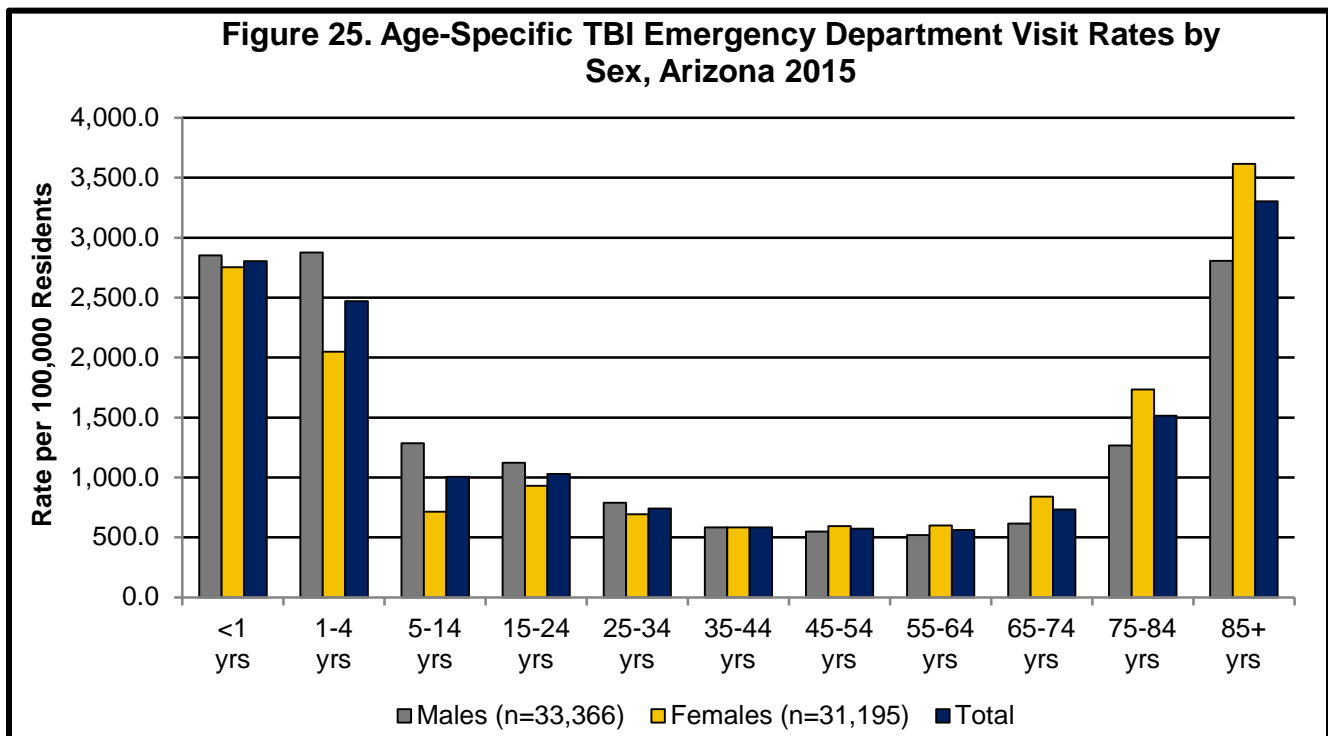
The majority of TBI inpatient hospitalizations due to motor vehicle traffic crashes were among occupants of motor vehicles (60%, n=1,152), followed by motorcyclists (19%, n=370), pedestrians (13%, n=225), and pedal cyclists (5%, n=91). This distribution is consistent with data from previous years. Figure 24 shows TBI inpatient hospitalizations due to motor vehicle traffic crashes by injured person.

Figure 24. Non-Fatal Motor Vehicle Crash-Related TBI Inpatient Hospitalizations by Injured Person, Arizona 2015



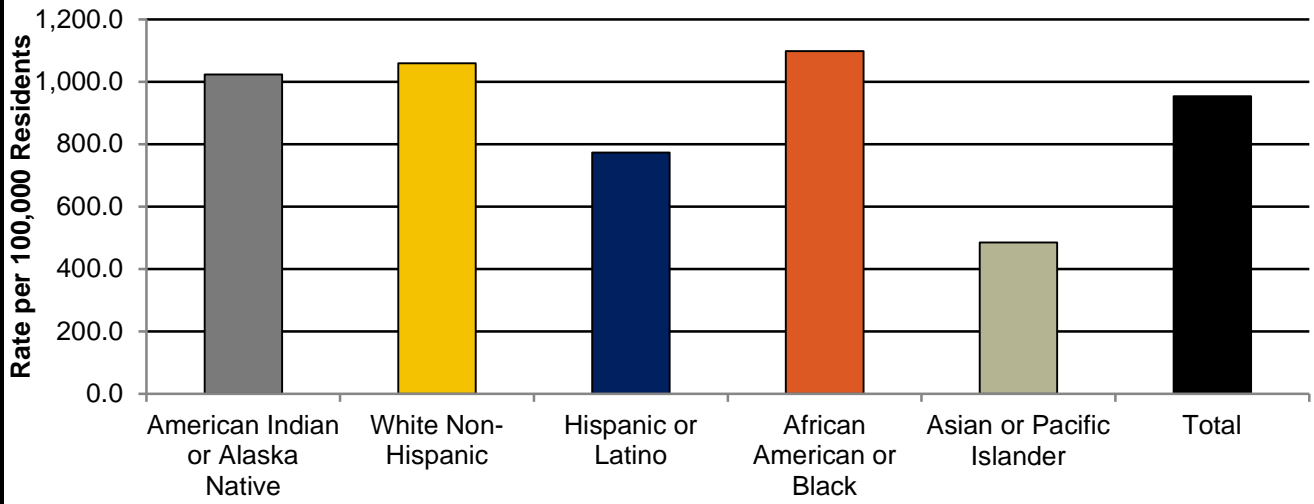
Non-Fatal Emergency Department Visits among Arizona Residents During 2015

In 2015, there were 64,561 TBI Emergency Department Visits (EDV) among Arizona residents. Males accounted for just over half of TBI EDV (51.7%, n=33,336), while females accounted for 48.3% of visits (n=31,195). TBI EDV rates were highest among adults 85 years and older followed by those less than one year of age. There were 2,778 EDV among females 85 years and older (of 3,615.9 visits per 100,000 residents), and 1,359 visits among males 85 and older (2,806.2 visits per 100,000 residents). For all children younger than one year of age, 85% of TBI EDV were due to unintentional falls (n=2,050). Figure 25 shows the 2015 TBI emergency department visit rates for Arizona residents.



Age-adjusted TBI emergency department visits were highest among Black or African American residents (1,098.1 visits per 100,000 residents). White non-Hispanics residents had the second highest emergency department visit rate with 1,060.0 visits per 100,000 residents. The age-adjusted rate for non-fatal TBI-related emergency department visits among all Arizonans in 2015 (954.1 visits per 100,000 residents) increased by 17% from 2014 (813.8 visits per 100,000 residents). Figure 26 shows the age-adjusted emergency department rates by race/ethnicity.

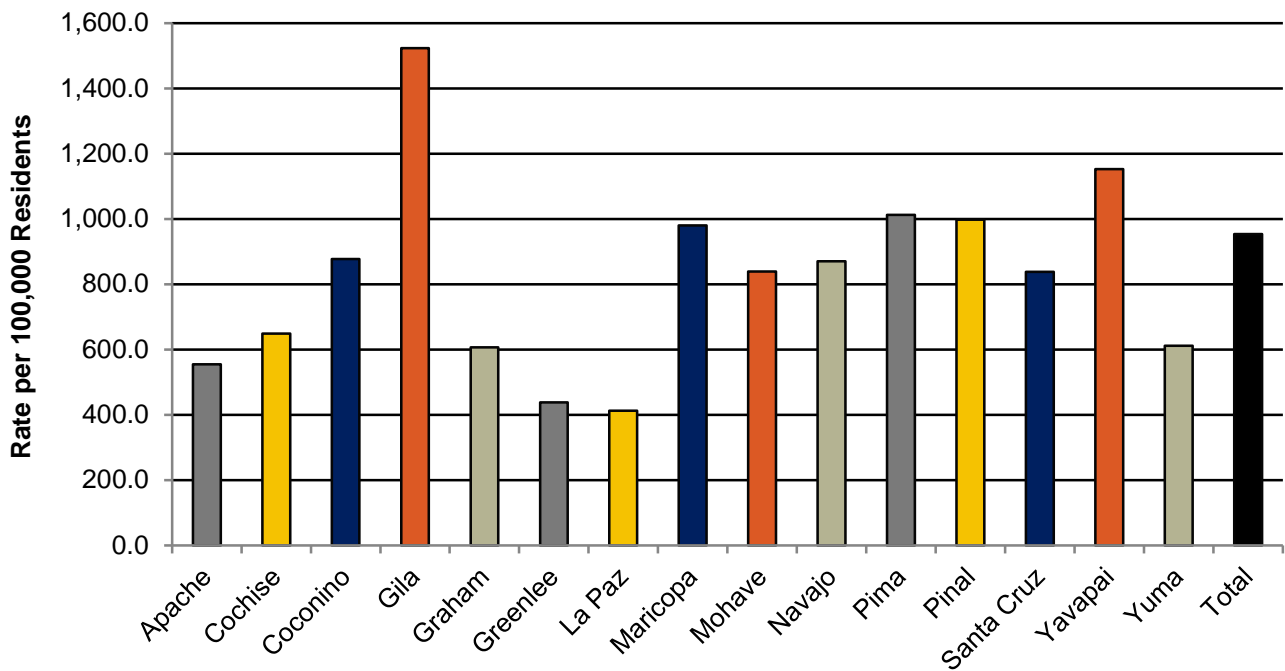
Figure 26. Age-Adjusted TBI-Related Non-Fatal Emergency Department Rates by Race/Ethnicity, Arizona 2015*



*Does not include 969 cases in which race/ethnicity information is unknown.

There were five counties that had higher non-fatal TBI-related emergency department visits than the state rate in 2015 (954.1 visits per 100,000 residents). Gila (1,523.2), Yavapai (1,153.1), Pima (1,012.7), Pinal (997.5), and Maricopa (980.4) counties had the highest non-fatal TBI-related EDV per 100,000 residents. Figure 27 shows the age-adjusted TBI-related non-fatal emergency department visits by county.

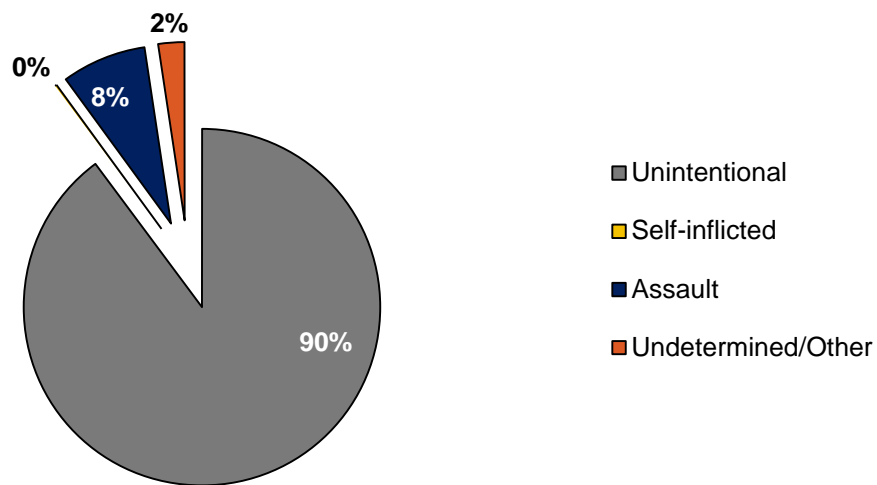
Figure 27. Age-Adjusted TBI-Related Non-Fatal Emergency Department Rates by County, Arizona 2015



TBI emergency department charges in 2015 totaled more than \$440 million, with 58% paid by the Arizona Health Care Cost Containment System (AHCCCS)/Medicaid and Medicare (n=37,450, over \$262.9 million). This total does not include costs related to physician care, rehabilitation, lost wages, or long-term costs of disability.

The majority of TBI emergency department visits were due to unintentional injuries (90%, n=57,989), followed by assaults (8%, n=4,678). Figure 28 shows TBI emergency department visits by intent during 2015 in Arizona.

Figure 28. Percentage of TBI Emergency Department Visits by Manner of Injury, Arizona 2015



The leading causes of TBI emergency department visits were falls (52%, n=33,360), struck by/against injuries (22%, n=14,370), and motor vehicle traffic crashes (14%, n=8,578). Table 3 shows TBI emergency department visits by cause for Arizona in 2015. Descriptions of all causes are given in Appendix A.

Table 3. Number and Percentage of TBI Emergency Department Visits by Cause, Arizona 2015

Cause	Number	Percentage
Fall	33,360	52
Struck by/against	14,370	22
Motor vehicle traffic	8,578	13
Other/unspecified	5,854	9
Other pedestrian/pedal cycle	1,279	2
Transport	1,120	2
Total	64,561	100%

Source: Arizona Hospital Discharge Database

Non-Fatal Fall-Related Emergency Department Visits

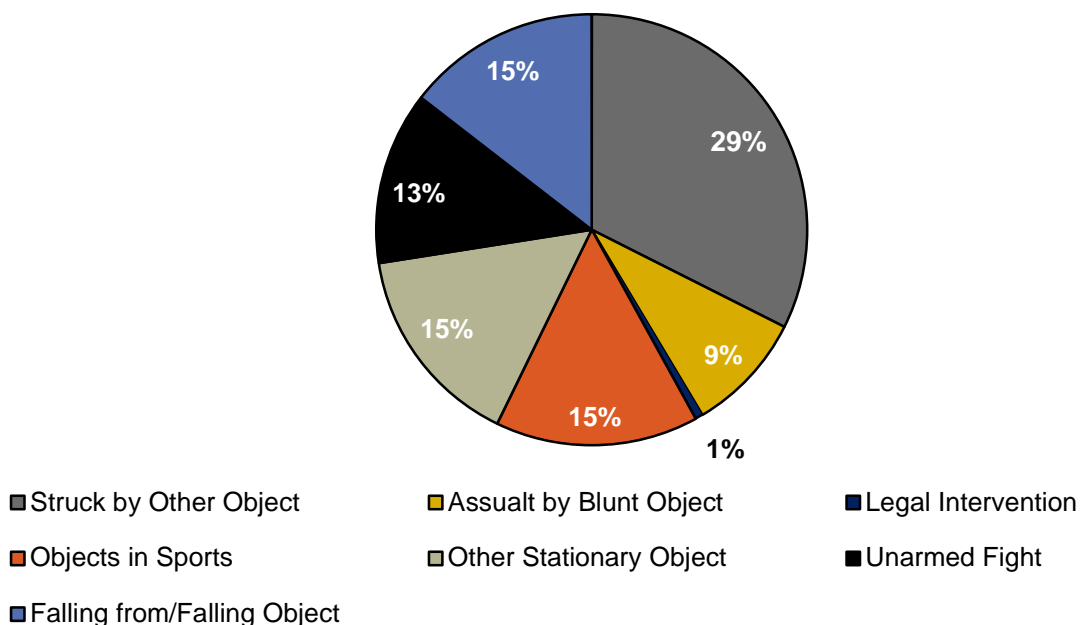
There were 33,360 emergency department visits due to fall-related TBI. Majority of fall-related TBI were among females (53%, n=17,828) and males were not far behind (47%, n= 15,532). Over 99% of these falls were unintentional (n=33,342). As with all TBI emergency department visits, those due to falls 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 was 2,377.6 visits per 100,000 residents; and among adults 85 and older, the rate was 3,041.8 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 14,370 TBI emergency department visits due to struck by/against injuries, 60% were among males (n=8,645) and 40% were among females (n=3,145). Seventy-seven percent of these injuries were unintentional (n=11,131), and twenty-two percent were assaults (n=2,647). Forty-six percent of TBI emergency department visits from struck by/against injuries were among individuals five and 24 years of age (n=6,673).

The emergency department discharge database did not include specific information regarding contributing event for 29% of the struck by/against injuries. The most frequently specified contributing events were objects in sports (15%, n=2,187), other stationary objects (15%, n=2,198), and falling from/falling object (15%, n=2,086). Figure 29 shows TBI emergency department visits due to struck by/against injuries by specified contributing event.

Figure 29. TBI Emergency Department Visits due to Struck by/Against by Specified Contributing Event, Arizona 2015



Data Notes

All rates were calculated using the 2015 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 2015. Inpatient hospitalization and emergency department visit data were compiled from the 2015 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.

Codes from the International Classification of Diseases (ICD), Version 9, clinical modification (ICD-9-CM) were used for determining TBI cases among hospital and emergency department data for the first three quarters of 2015 (January-September). In October 2015, the federal government's new mandate for ICD, the conversion of ICD-9 diagnostic and procedural codes to the implementation and use of ICD-10 codes, went into effect. This new mandate provides health providers a wider and more detail range for diagnosing diseases for the last quarter year of 2015 (October.-December). The last quarter uses ICD-10 codes that are comparable or approximately similar to ICD-9 codes to identify Traumatic brain Injuries. This mandate will cause significant changes in annual disease surveillance, reporting, and may not be comparable to previous years. ICD-10 codes were also 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 department
Unknown cause	Cause not listed.