



TRAUMATIC BRAIN INJURIES

ARIZONA RESIDENTS 2013



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EXECUTIVE SUMMARY

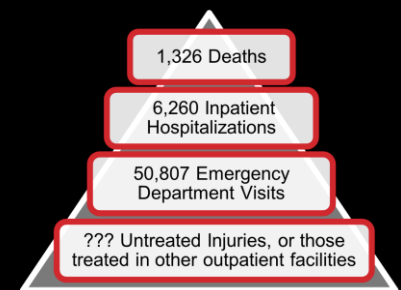
ARIZONA RESIDENTS 2013

Traumatic brain injuries (TBI) were the cause of death for 1,326 Arizona residents in 2013. Males ages 85 years and older had the highest rate of TBI deaths with 204.4 deaths per 100,000 residents. TBI death rates were highest among American Indians (35.0 per 100,000 residents) and non-Hispanic Whites (20.9 per 100,000 residents). Forty-three percent of TBI deaths in 2013 were due to unintentional injuries (n=574); 43 percent were due to suicides (n=570); and eight percent were due to homicides (n=106). The most common causes of TBI deaths were firearms (49 percent, n=646), falls (25 percent, n=325), and motor vehicle traffic crashes (12 percent, n=159).

In 2013, there were 6,260 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 582.0 hospitalizations per 100,000 residents, and among females 85 years and older, the rate was 631.5 hospitalizations per 100,000 residents. Age-adjusted TBI inpatient hospitalization rates were highest among American Indians (251.5 per 100,000 residents) and non-Hispanic Whites (100.9 per 100,000 residents). Unintentional injuries accounted for 86 percent of TBI hospitalizations (n=5,412). Falls were the most common cause of TBI hospitalizations (47 percent, n=2,966), followed by motor vehicle traffic crashes (28 percent, n=1,749). Total hospital charges for non-fatal inpatient hospitalizations due to TBIs were more than \$508.4 million, and Arizonans spent a total of 35,624 days hospitalized in 2013.

In 2013, there were 50,807 non-fatal TBI emergency department visits among Arizona residents. TBI emergency department visit rates were highest among children younger than one year of age for males and over 85 years of age for females. Males younger than one year of age had a rate of 2,593.7 visits per 100,000 residents, and females 85 years and older had a rate of 2,853.9 visits per 100,000 residents. Among children under one, 99.4 percent of the TBI-related emergency department visits were due to unintentional injuries. Overall, unintentional injuries accounted for 91 percent of the TBI emergency department visits. The leading causes of TBI emergency department visits were falls (53 percent, n=26,679), struck by/against injuries (23 percent, n=11,591), and motor vehicle traffic crashes (14 percent, n=7,083). Total hospital charges for non-fatal emergency department visits due to TBIs were more than \$306.8 million.

TBI: AT A GLANCE



For every TBI-related death in Arizona in 2013

there were:

5 Non-fatal inpatient hospitalizations and

38 Non-fatal emergency department visits

Resulting in over \$815.2 million 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 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 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.

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.

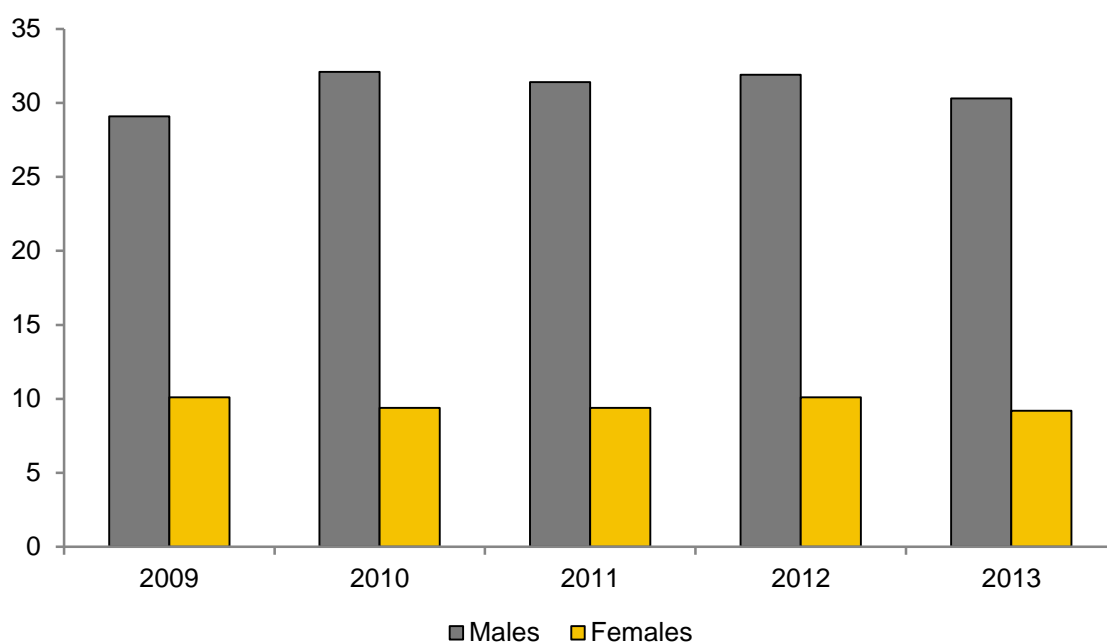
³ National Vital Statistics System (NVSS), 2006–2010. Data source is maintained by the CDC National Center for Health Statistics.

TRENDS IN TRAUMATIC BRAIN INJURIES AMONG ARIZONA RESIDENTS 2009-2013

Mortality

Between 2009 and 2013, the age-adjusted mortality rate of traumatic brain injury increased from 19.2 deaths per 100,000 Arizona residents in 2009 to 19.5 deaths per 100,000 residents in 2013. Age-adjusted mortality rates among males were more than double the rates among females. Rates for males and females increased less than 2 percent from 2009 through 2013. Figure 1 shows age-adjusted TBI mortality rates by sex from 2009 through 2013.

Figure 1. Age-Adjusted TBI Mortality Rates by Sex per 100,000 Residents, Arizona, 2009-2013



The 2013 age-adjusted rates of unintentional TBI-related deaths decreased by four percent from 2009 and decreased by nine percent from 2012. Suicide rates increased nine percent since 2009 and increased by two percent since 2012. Figure 2 shows age-adjusted TBI mortality rates by manner of death. The age-adjusted rates of motor vehicle crash TBI-related deaths have decreased 25 percent since 2009 while fall-related deaths increased two percent. Firearm-related TBI deaths also increased seven percent since 2009. 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, 2009-2013

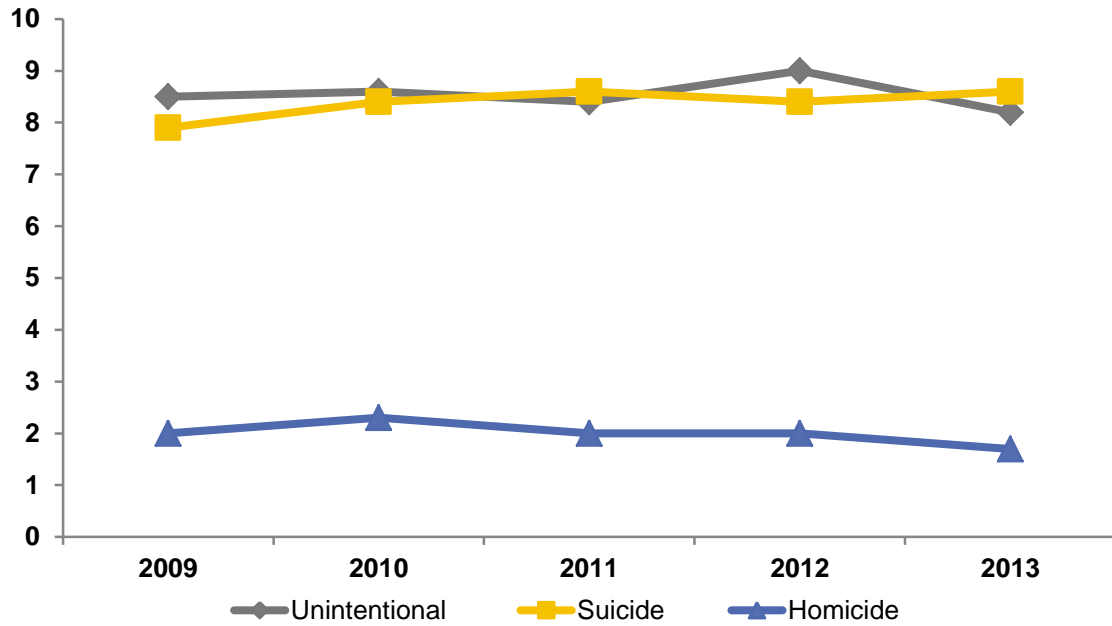
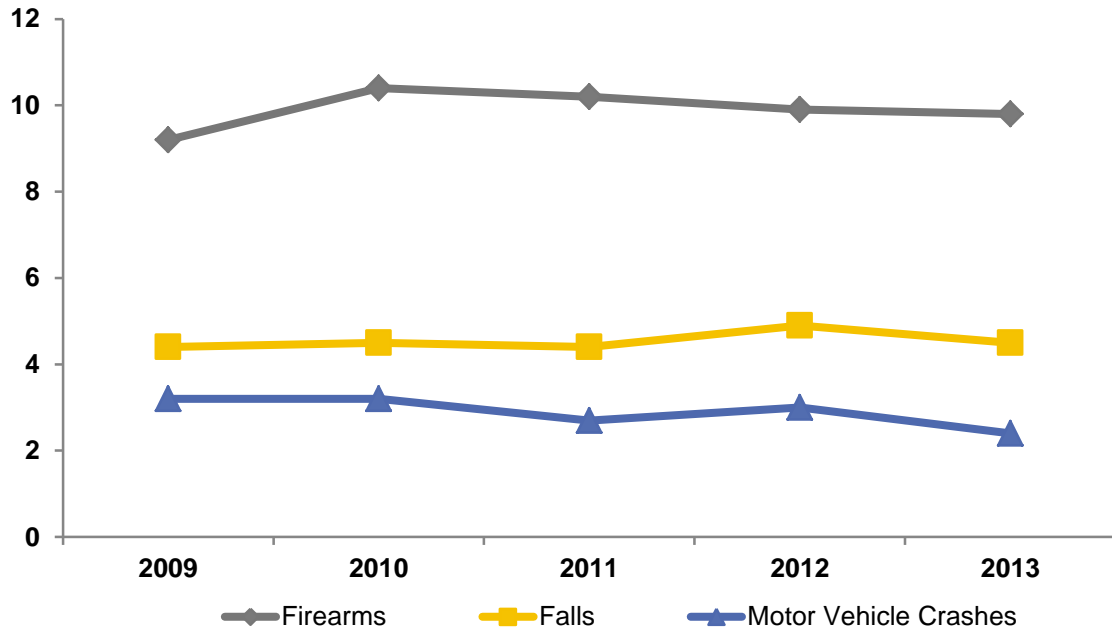


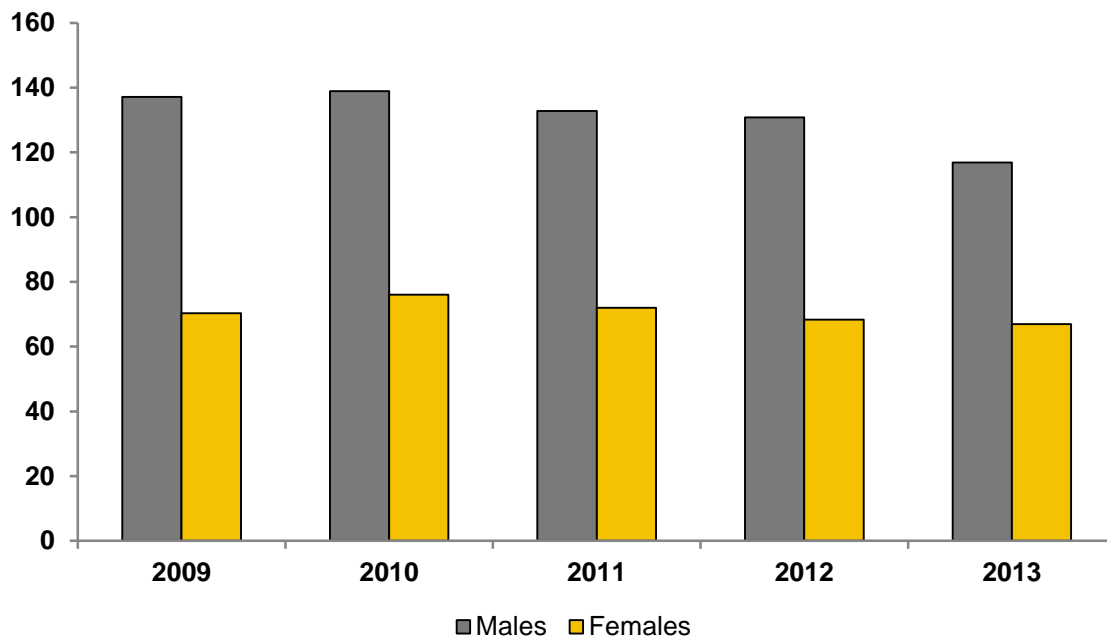
Figure 3. Age-Adjusted TBI Mortality Rates per 100,000 Residents by Mechanism, Arizona, 2009-2013



Non-Fatal Inpatient Hospitalizations

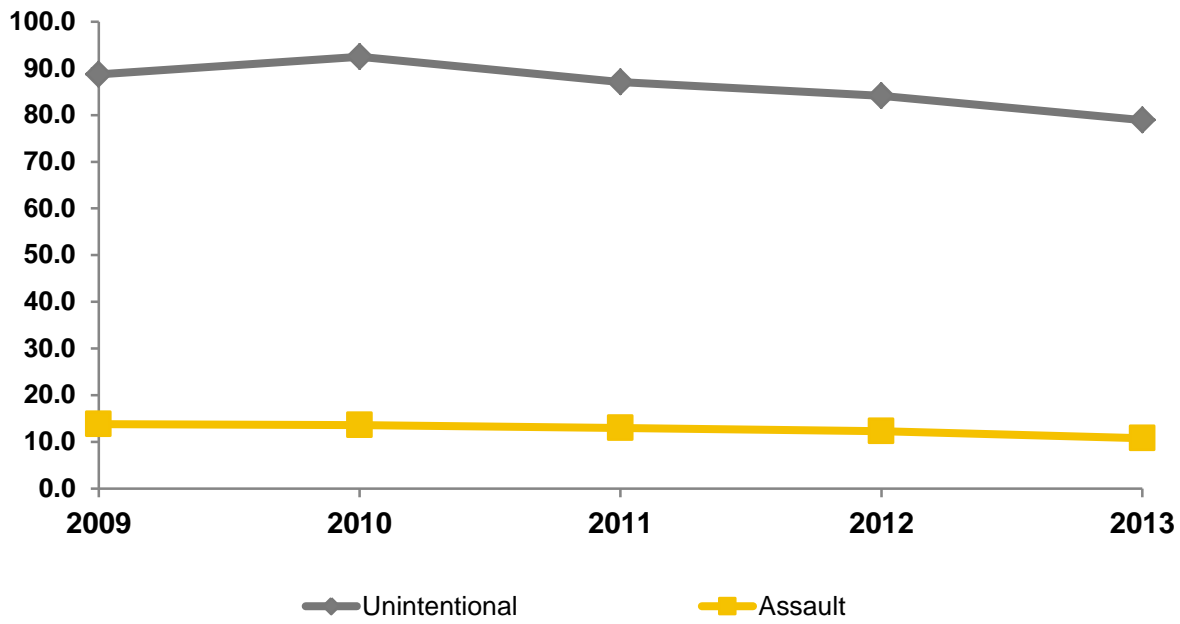
Between 2009 and 2013, the age-adjusted rate of TBI-related inpatient hospitalizations decreased seven percent, from 104.1 hospitalizations per 100,000 Arizona residents in 2009 to 96.4 hospitalizations per 100,000 residents in 2013. Age-adjusted hospitalization rates among males were almost double the rates among females. Rates for males decreased 15 percent from 2009 through 2013, and rates for females decreased five percent. Figure 4 shows age-adjusted non-fatal TBI-related inpatient hospitalization rates by sex from 2009 through 2013. *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, 2009-2013



The total age-adjusted TBI-related inpatient hospitalization rates have decreased from 2009 through 2013. Unintentional injuries have decreased by 11 percent from 2009 to 2013 while assault-related TBI decreased by 22 percent. 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, 2009-2013

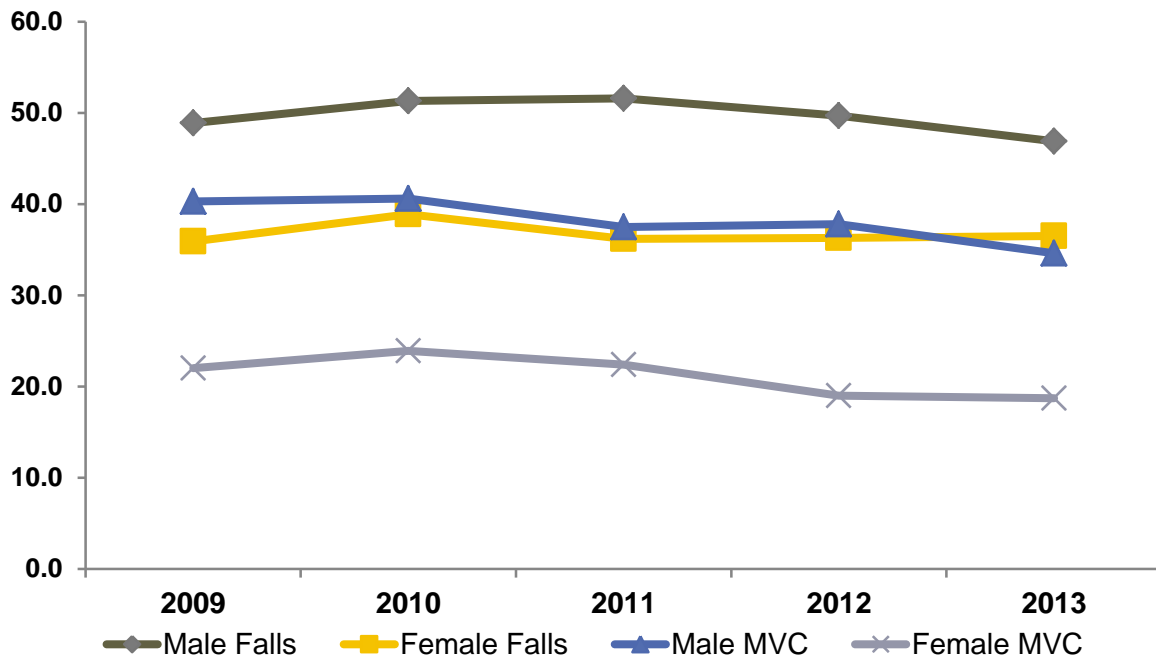


From 2009 through 2013, the rate of non-fatal inpatient hospitalizations due to fall-related traumatic brain injuries have remained stable decreasing only one percent, from 42.4 hospitalizations per 100,000 residents in 2009 to 41.9 hospitalizations per 100,000 residents in 2013. Males consistently had a higher rate of fall-related TBI hospitalizations than females in each of the five years examined, but the disparity has decreased slightly over time.

While the rate of fall-related TBI hospitalizations remained stable since 2009, the rate of motor vehicle crash-related TBI hospitalizations decreased 14 percent in the past five years, from 31.2 crash-related hospitalizations in 2009 to 26.7 crash-related hospitalizations per 100,000 residents in 2013. 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 (not shown in this report), 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 2009 through 2013.

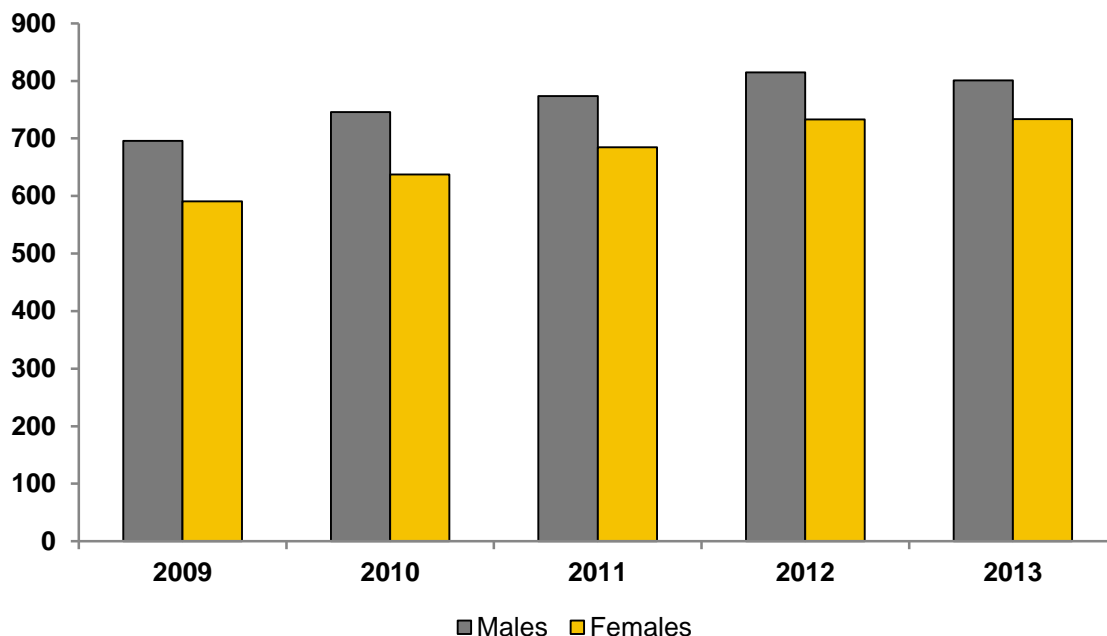
Figure 6. Age-Adjusted Non-Fatal TBI Inpatient Hospitalization Rates per 100,000 Residents by Mechanism and Sex, Arizona, 2009-2013



Non-Fatal Emergency Department Visits

From 2009 through 2013, the age-adjusted rate of non-fatal TBI-related emergency department visits increased among both males and females. Among males, the rate increased 15 percent, from 695.8 visits per 100,000 residents in 2009 to 800.7 visits per 100,000 residents in 2013. Among females, the rate increased 24 percent, from 590.6 visits per 100,000 in 2009 to 733.4 visits per 100,000 residents in 2013. 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 2009 to 2013. *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, 2009-2013



While total age-adjusted TBI-related emergency department visit rates increased from 2009 through 2013, changes in rates varied by manner and mechanism of injury. Unintentional injuries and injuries related to assaults increased at varying levels from 2009 through 2013. 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, 2009-2013

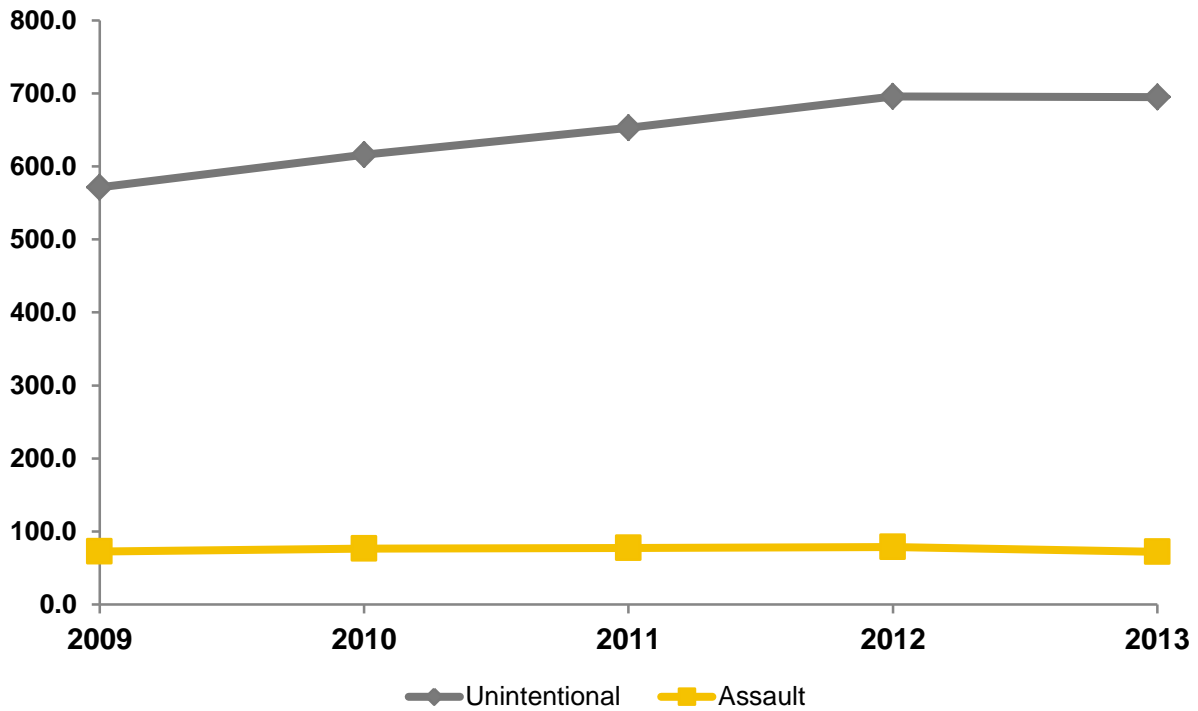
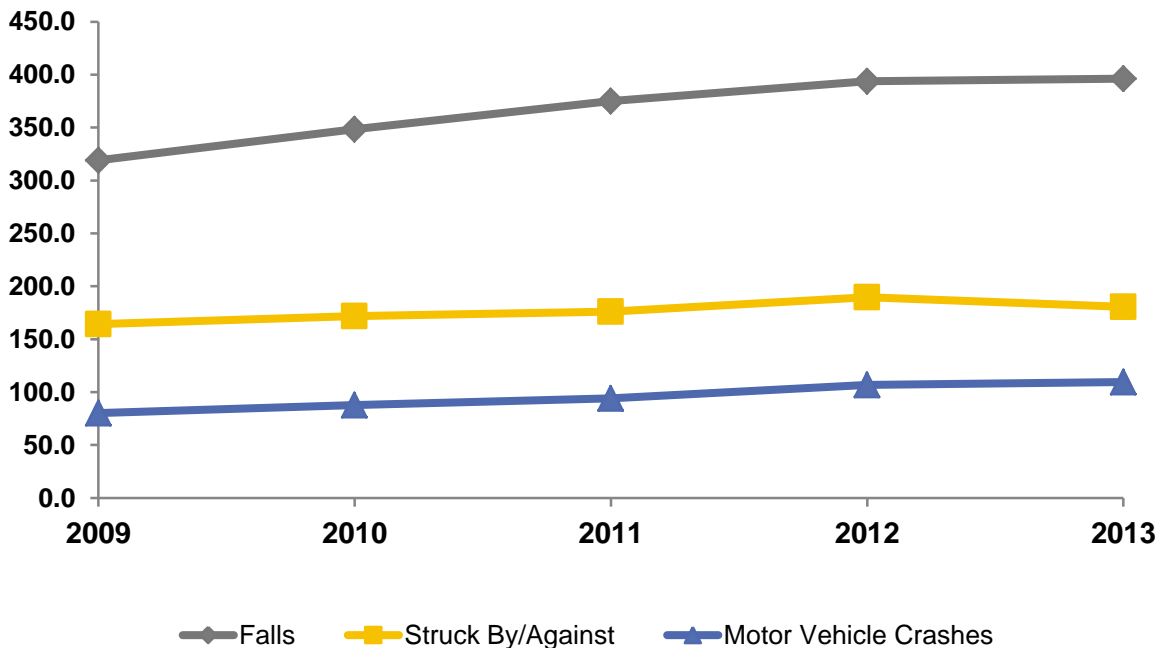


Figure 9. Age-Adjusted Non-Fatal TBI-Related Emergency Department Visit Rates per 100,000 Residents by Selected Cause of Injury, Arizona, 2009-2013

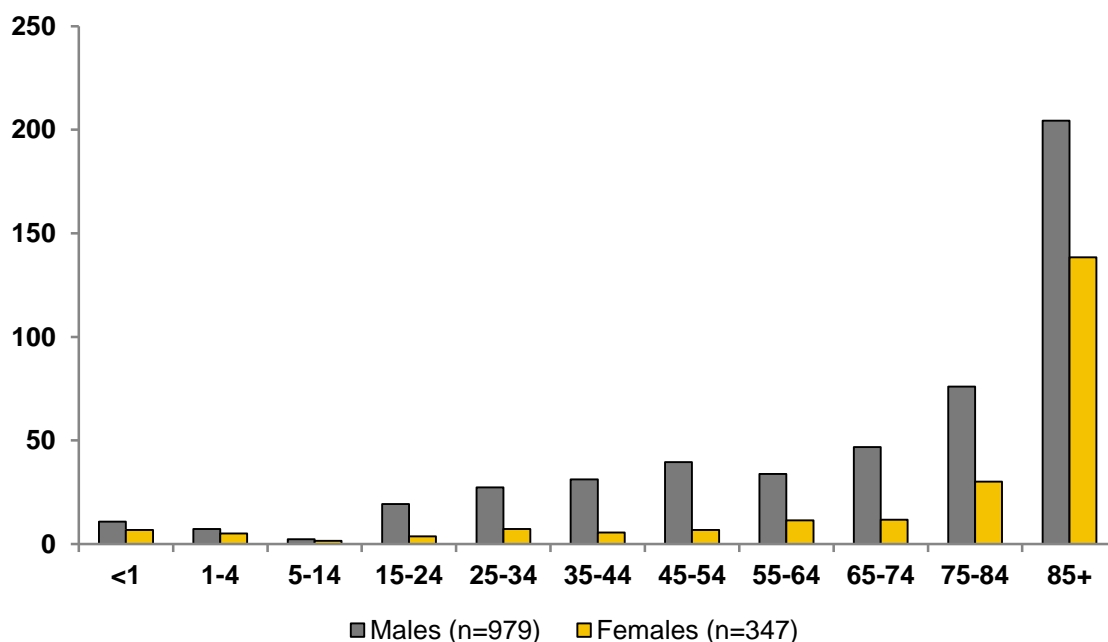


DEATHS AMONG ARIZONA RESIDENTS DURING 2013

In 2013, 1,326 Arizona residents died as a result of TBI. The majority of deaths were among males (74 percent, n=979), while females accounted for 26 percent of TBI deaths (n=347). Males had higher rates of TBI-related mortality across all age groups.

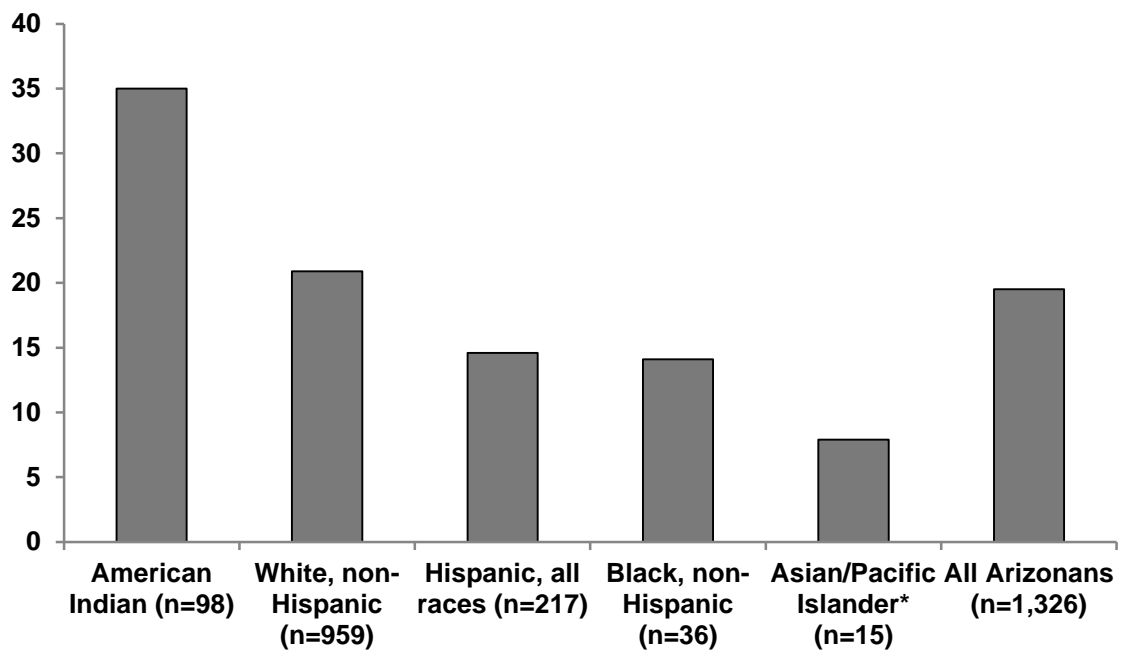
Males 85 years and older accounted for 85 deaths and had by far the highest rate of TBI deaths in 2013 (204.4 per 100,000 residents). Among adults 85 years and older, 72 percent of TBI deaths were due to unintentional falls (n=132). Figure 10 shows the 2013 TBI death rates by age group and sex for Arizona residents.

Figure 10. Age-Specific TBI-Related Mortality Rates per 100,000 Residents by Sex, Arizona, 2013 (n=1,326)



Age-adjusted TBI death rates were highest among American Indians (35.0 deaths per 100,000 residents) and non-Hispanic Whites (20.9 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 2013 age-adjusted TBI death rates by race/ethnicity in Arizona.

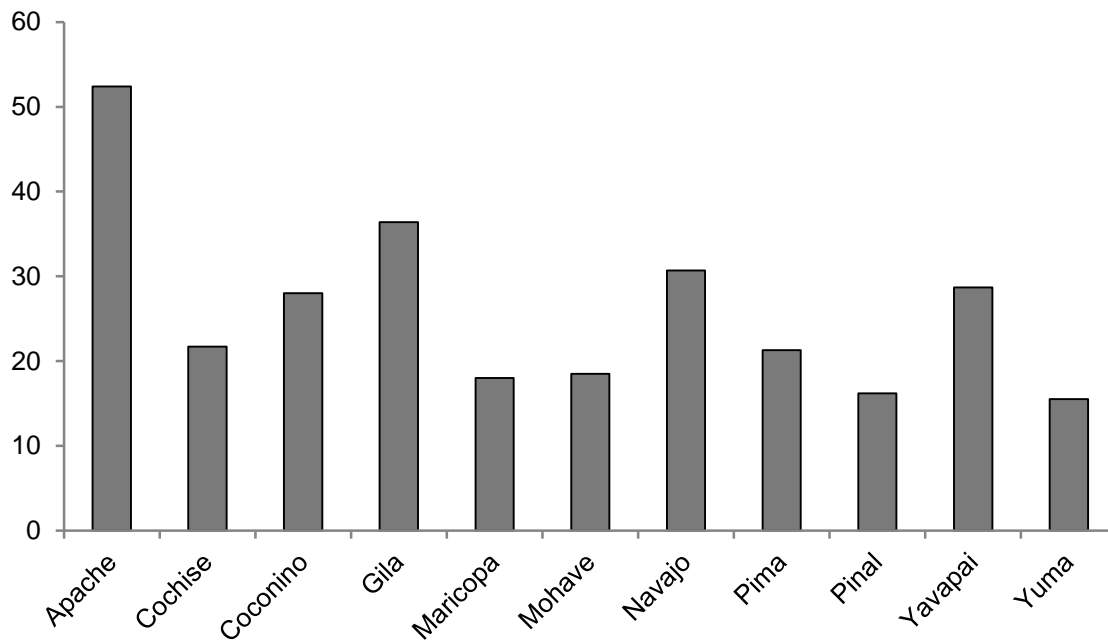
Figure 11. Age-Adjusted TBI-Related Mortality Rates per 100,000 Residents by Race/Ethnicity, Arizona, 2013 (n=1,326)



*Rates are unstable due to low counts (n<20)

Apache County had the highest age-adjusted TBI mortality rate in 2013 (52.4 deaths per 100,000 residents). The second highest TBI mortality rate was in Gila County with 36.4 deaths per 100,000 residents. Figure 12 shows the TBI mortality rate by county for 2013 in Arizona.

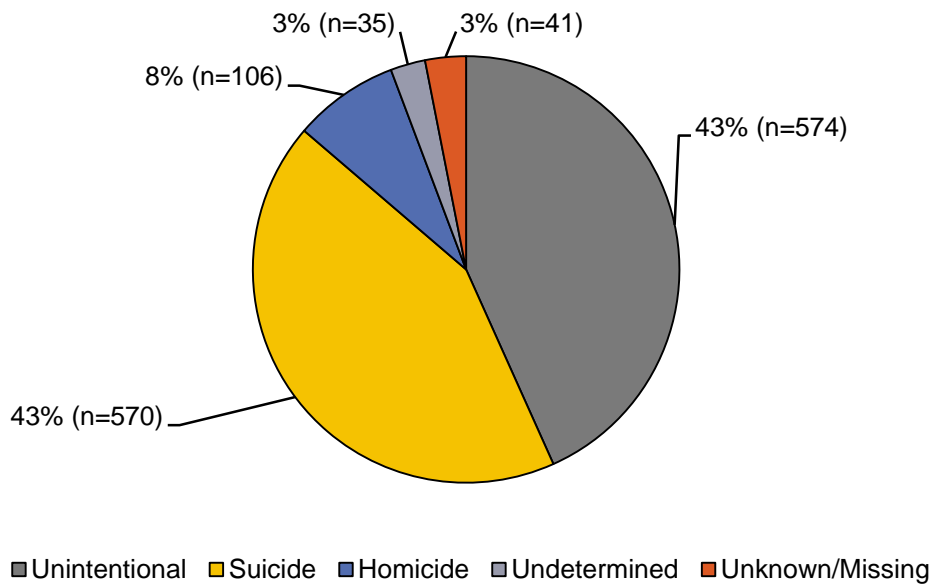
Figure 12. Age-Adjusted TBI-Related Mortality Rates per 100,000 Residents by County, Arizona, 2013 (n=1,326)*



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

Forty-three percent of the TBI deaths in 2013 were due to unintentional injuries (n=574); 43 percent were due to suicides (n=570); and eight percent were due to homicides (n=106). Figure 13 shows TBI deaths by manner of injury during 2013 in Arizona.

Figure 13. TBI-related Deaths by Manner, Arizona, 2013 (n=1,326)



The most common causes of deaths were firearms (49 percent, n=646), falls (25 percent, n=325), and motor vehicle traffic crashes (12 percent, n=159). Causes of TBI deaths during 2013 in Arizona are shown in Table 1. Descriptions of these causes are given in Appendix A.

Cause	Number	Percentage
Firearm	646	49%
Fall	325	25%
Motor vehicle traffic	159	12%
Other/unspecified/unknown	157	12%
Other land transport	16	1%
Other pedestrian/bicycle	10	<1%
Poisoning	13	<1%
Total	1326	100%

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 residents. Figures 14 and 15 show the percentages of TBI-related deaths for each race/ethnicity by cause and manner of death.

Figure 14. TBI-related Deaths by Manner and Race/Ethnicity, Arizona, 2013 (n=1,326)

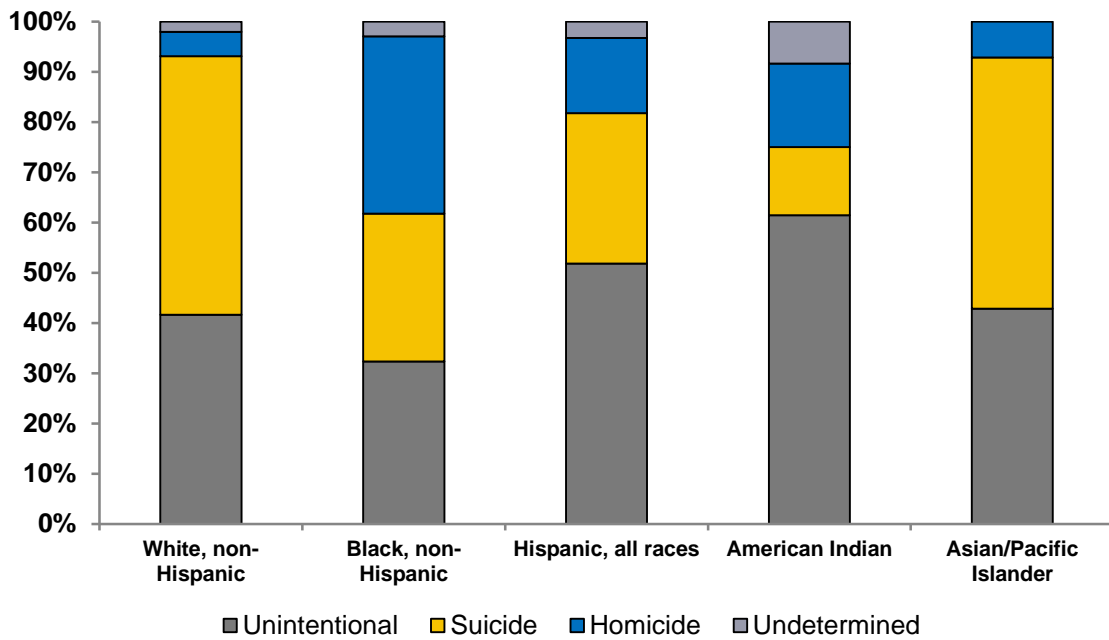
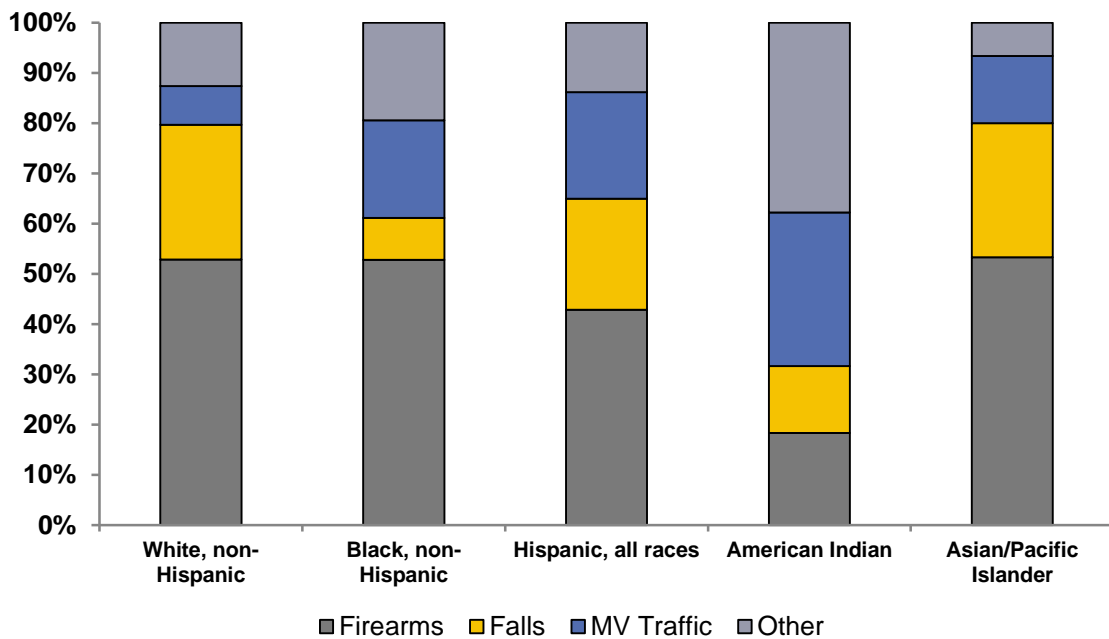


Figure 15. TBI-related Deaths by Mechanism and Race/Ethnicity, Arizona, 2013 (n=1,326)



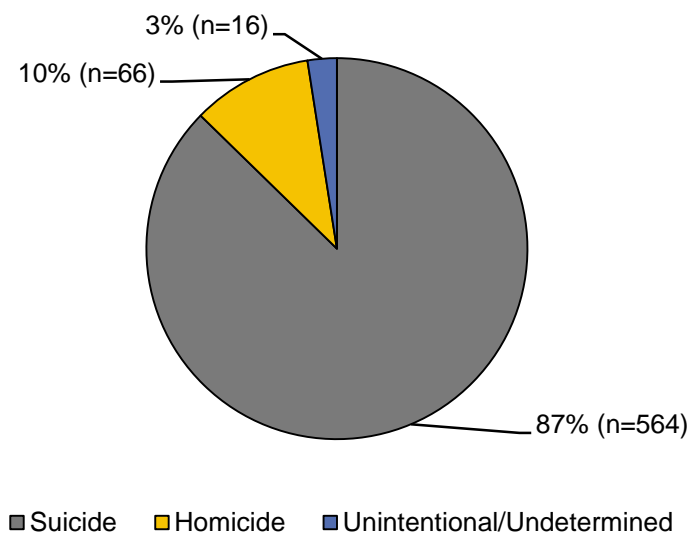
Firearm-Related TBI Mortality

Among the 646 Arizona residents who died as a result of a firearm-related TBI, the majority were male (85 percent, n=549) and 15 percent were female (n=97).

The highest age-adjusted rate of firearm-related TBI deaths was among White non-Hispanics (12.0 per 100,000 residents, n=507). The second highest rate was among African Americans (6.7 per 100,000 residents, n=19) but is not considered a stable rate due to a count less than 20. Hispanics had the second highest count of firearm-related TBI (n=93) however the rate for this group was low, 4.9 per 100,000 residents.

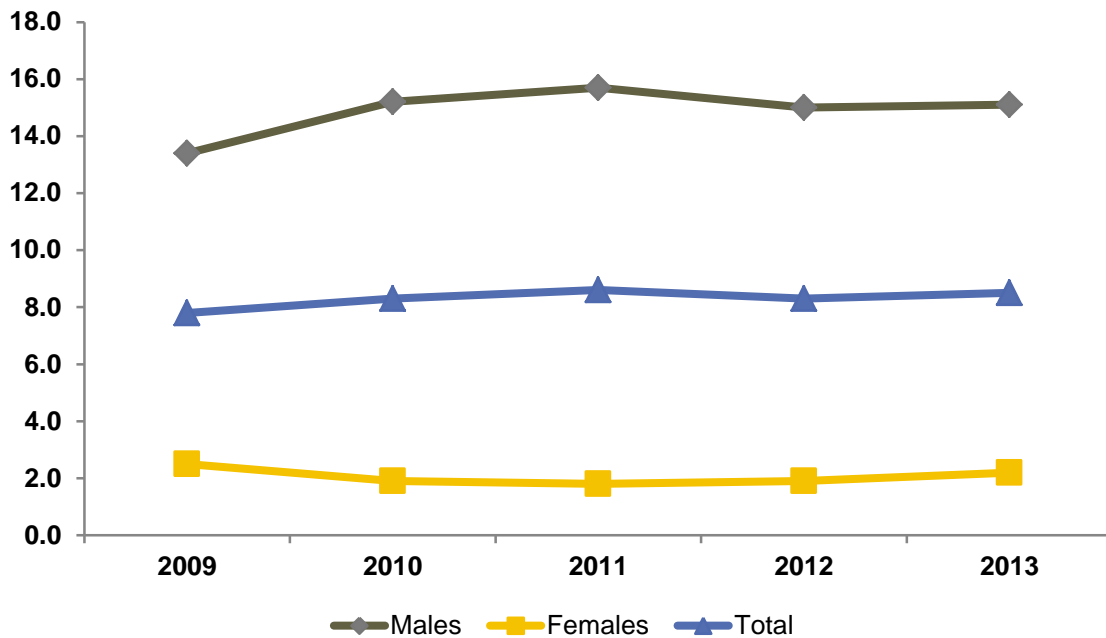
The majority of firearm-related TBI deaths were suicides (87 percent, n=564). Ten percent of the deaths were due to homicides (n=66) and two percent were due to undetermined intent (n=10). Figure 16 shows TBI deaths due to firearms by manner of injury.

Figure 16. Firearm-related TBI Deaths by Manner, Arizona, 2013 (n=646)



Among the 564 TBI deaths resulting from firearm-related suicides, 86 percent were among males (n=487) and 14 percent were among females (n=77). The age-adjusted rate of TBI deaths resulting from firearm-related suicides was 8.5 deaths per 100,000 residents which is an overall increase of nine percent since 2009. The highest age-specific rates were among adult males, particularly among those 85 years and older (40.9 per 100,000). Age-adjusted rates were substantially higher among males than among females over each of the years from 2009-2013. Figure 17 shows the age-adjusted rate of TBI deaths resulting from firearm-related suicides by sex and year from 2009 through 2013.

Figure 17. Age-Adjusted TBI Mortality Rate due to Firearm Suicides by Sex and Year, Arizona, 2009-2013

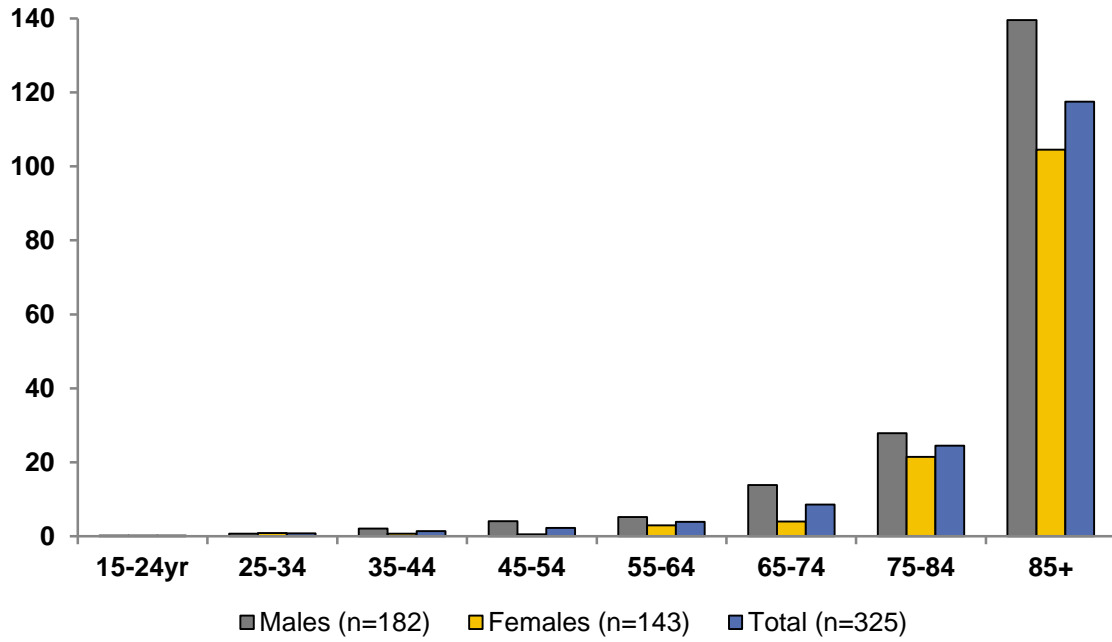


The highest age-adjusted rate of firearm-related TBI suicides was among White non-Hispanics (11.1 per 100,000 residents, n=471). This high race-specific mortality rate coupled with the large population propelled the age-adjusted mortality rate for all Arizonans. The age-adjusted rate among Hispanics was 3.5 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 325 TBI deaths due to falls, 56 percent were among males (n=182) and 44 percent were among females (n=143). All but two of the falls were unintentional. Less than one percent of TBI-related fall deaths were among children and young adults ages 24 years and younger (n=3). Twenty-one percent of the deaths were among adults ages 25 through 64 years (n=68); and 78 percent were among adults 65 years and older (n=255). The age-adjusted rate of all fall-related TBI deaths in Arizona for 2013 was 5.8 deaths per 100,000 residents, however the highest age-specific mortality rate was among adults 85 years and older (136.1 per 100,000 residents) followed by adults 75 through 84 years of age (29.4 per 100,000 residents).

Figure 18. Fall-Related TBI Mortality Rates per 100,000 Residents by Age and Sex, Arizona, 2013 (n=325)

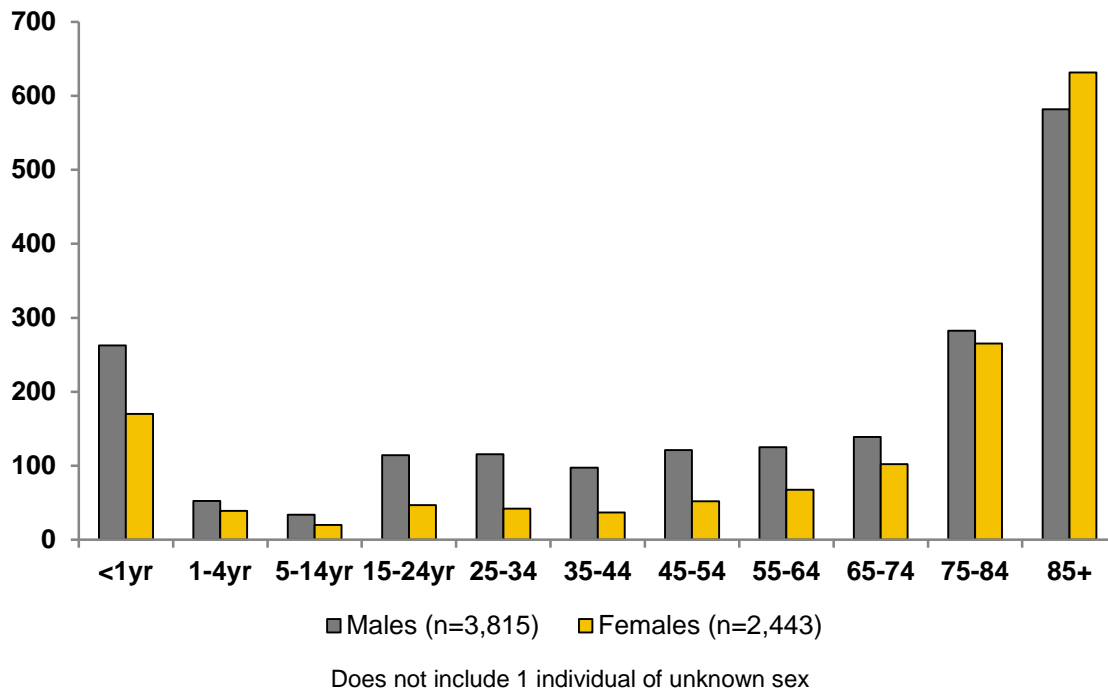


Non-Fatal Inpatient Hospitalizations among Arizona Residents During 2013

In 2013, 6,260 Arizona residents were hospitalized due to non-fatal TBI. Males comprised 61 percent of the total TBI hospitalizations (n=3,816) and females accounted for 39 percent (n=2,443). There was also one individual of unknown sex.

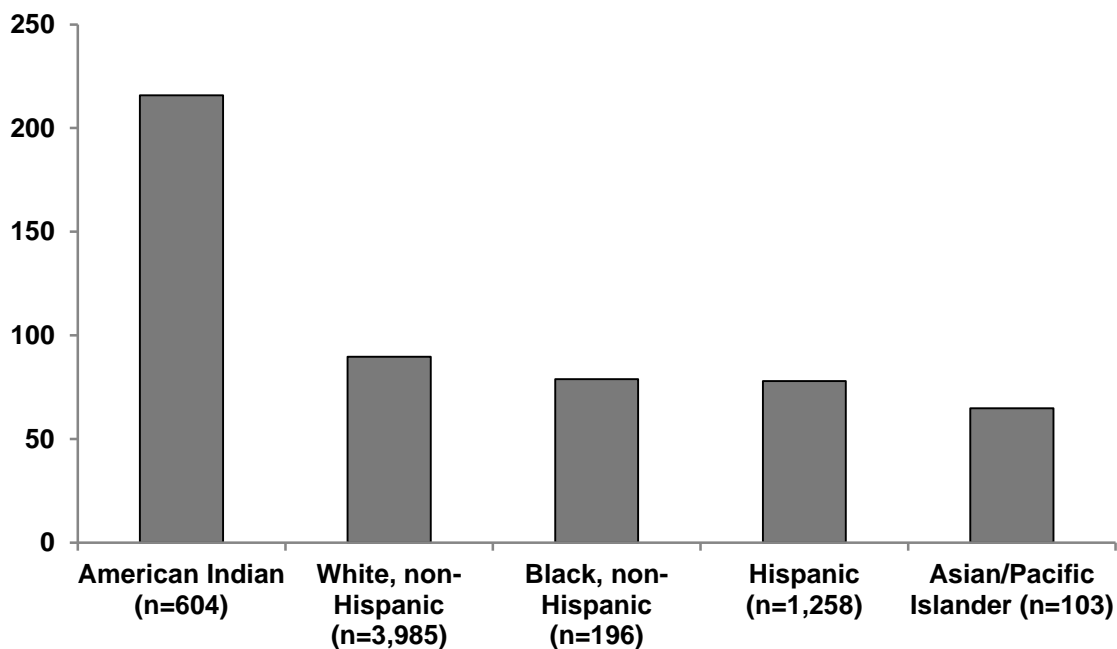
Adults 85 years and older had the highest rates of TBI inpatient hospitalizations in 2013. Females 85 years and older had a rate of 631.5 hospitalizations per 100,000 residents (n=447), an increase of 28 percent from 2012. The rate for males 85 years and older was 582.0 hospitalizations per 100,000 residents (n=242), a 13 percent decrease from the 2012 rate. For adults 85 years and older, 98 percent of TBI hospitalizations were due to unintentional falls (n=674). Figure 19 shows the 2013 TBI inpatient hospitalization rates by age group and sex for Arizona residents.

Figure 19. TBI-Related Non-Fatal Inpatient Hospitalization Rates per 100,000 Residents By Age Group and Sex, Arizona, 2013



Age-adjusted TBI inpatient hospitalization rates were highest among American Indians (215.9 hospitalizations per 100,000 residents), this represents a 14 percent increase from 2012, when the rate for this group was 251.5 hospitalizations per 100,000 residents. Non-Hispanic Whites had the second highest hospitalization rate (89.7 hospitalizations per 100,000 residents), representing an 11 percent decrease since 2012, when the rate was 100.9 hospitalizations per 100,000 residents. Figure 20 shows the 2013 age-adjusted TBI inpatient hospitalization rates by race/ethnicity in Arizona.

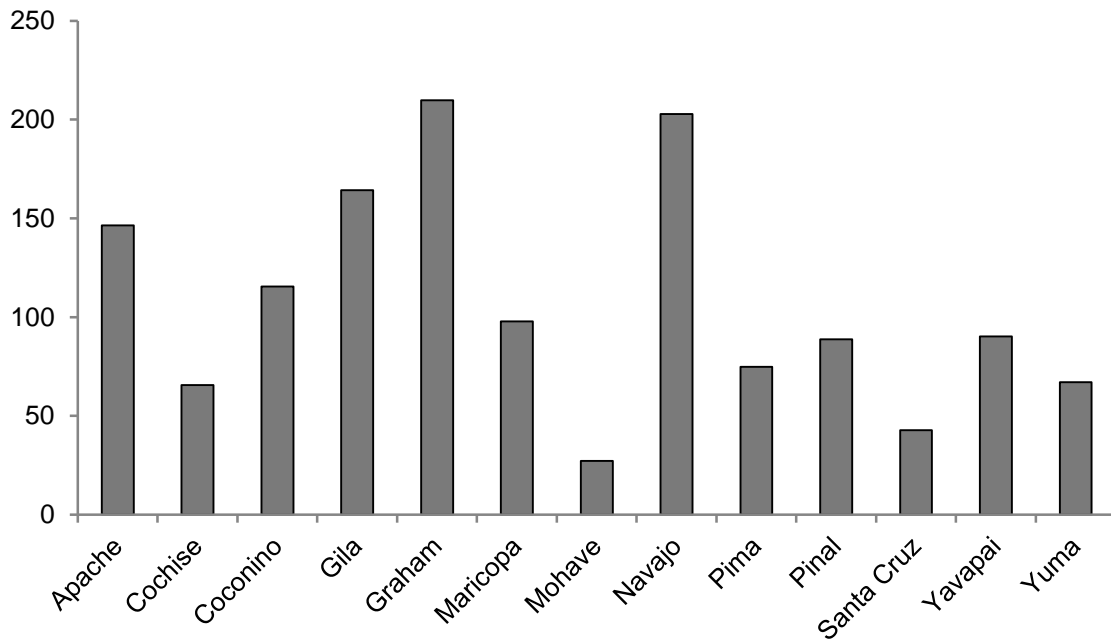
Figure 20. Age-Adjusted TBI-Related Non-Fatal Inpatient Hospitalization Rates per 100,000 Residents, by Race/Ethnicity, Arizona, 2013 (n=6,260)



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

Graham County had the highest non-fatal TBI-related inpatient hospitalization rate in 2013 with 209.7 hospitalizations per 100,000 residents and Navajo County had the second highest rate (202.8 per 100,000 residents). Figure 21 shows the age-adjusted non-fatal TBI-related inpatient hospitalizations by county for Arizona in 2013.

Figure 21. Age-Adjusted TBI-Related Non-Fatal Inpatient Hospitalization Rates per 100,000 Residents, by County, Arizona, 2013 (n=6,260)*



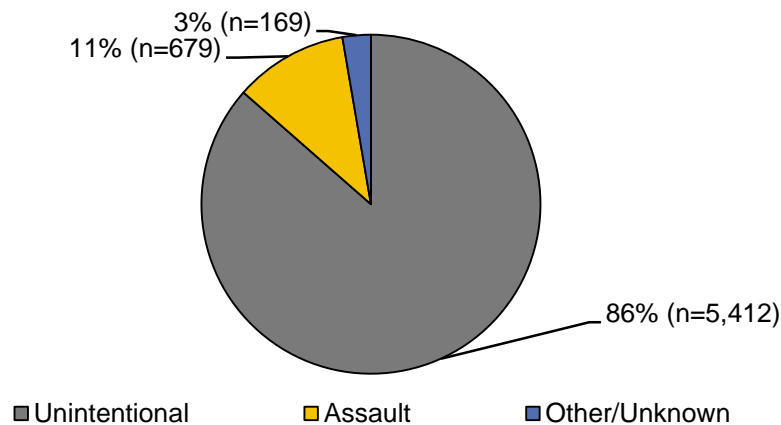
*Only Counties with 20 or more records were included in graph

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 165 days. In total, Arizonans spent 35,624 days hospitalized for TBI in 2013.

TBI inpatient hospitalization charges in 2013 totaled more than \$508.4 million, with 41 percent paid by the Arizona Health Care Cost Containment System (AHCCCS)/Medicaid and Medicare (n=2,772 cases, over \$207.5 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=5,412). There were 53 hospitalizations due to self-inflicted TBI (less than one percent) and 679 due to assaults (13 percent). Figure 22 shows the TBI inpatient hospitalizations by manner of injury for Arizona in 2013.

Figure 22. TBI-related Non-Fatal Inpatient Hospitalizations by Manner, Arizona, 2013 (n=6,260)



Fall-related injuries were the most common cause of TBI hospitalizations (47 percent, n=2,966), followed by motor vehicle traffic injuries (28 percent, n=1,749). Table 2 shows causes of TBI inpatient hospitalizations in Arizona during 2013. Descriptions of these causes are given in Appendix A.

Cause	Number	Percentage
Fall	2,966	47%
Motor vehicle traffic	1,749	28%
Struck by/against	606	10%
Other/unspecified	483	8%
Transport	247	4%
Other pedal cycle	125	2%
Firearm	53	1%
Cut/pierce	31	<1%
Total	6,260	100%

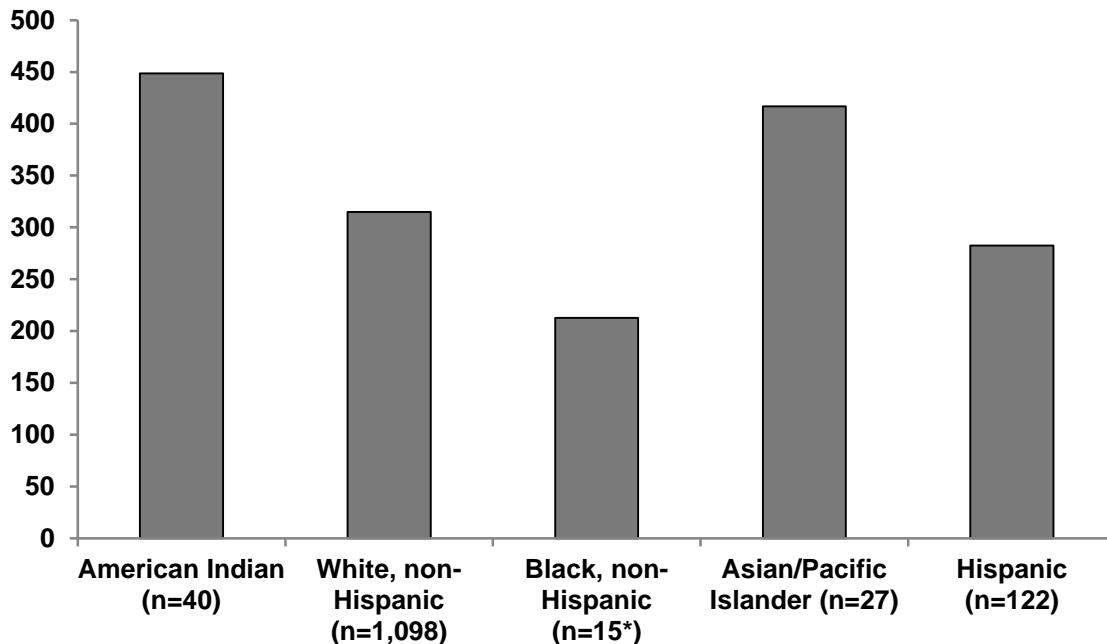
Non-Fatal Fall-Related TBI Inpatient Hospitalizations

There were 2,966 inpatient hospitalizations due to fall-related TBI. Fifty-two percent were among males (n=1,531) and 48 percent were among females (n=1,435). Falls were unintentional more than 99 percent of the time (n=2,954), with only 12 cases in which another manner was identified.

American Indians had the highest age-adjusted rate of fall-related TBI hospitalizations with 74.3 hospitalizations per 100,000 residents (n=172). The second highest rate was among non-Hispanic Whites (42.2 hospitalizations per 100,000 residents; n=2,173). The age-adjusted rate for non-fatal fall-related inpatient hospitalizations among all Arizonans was 41.9 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 American Indians. Figure 23 shows the age-specific hospitalization rates for fall-related TBI among Arizonan seniors 75 years of age and older, by race/ethnicity.

Figure 23. Elder Fall-Related Non-Fatal TBI Inpatient Hospitalization Rates per 100,000 Residents 75 years of age and older, by Race/Ethnicity, Arizona, 2013



Does not include 49 cases in which race/ethnicity information is unknown.
 *Count <20 so rate is unstable.

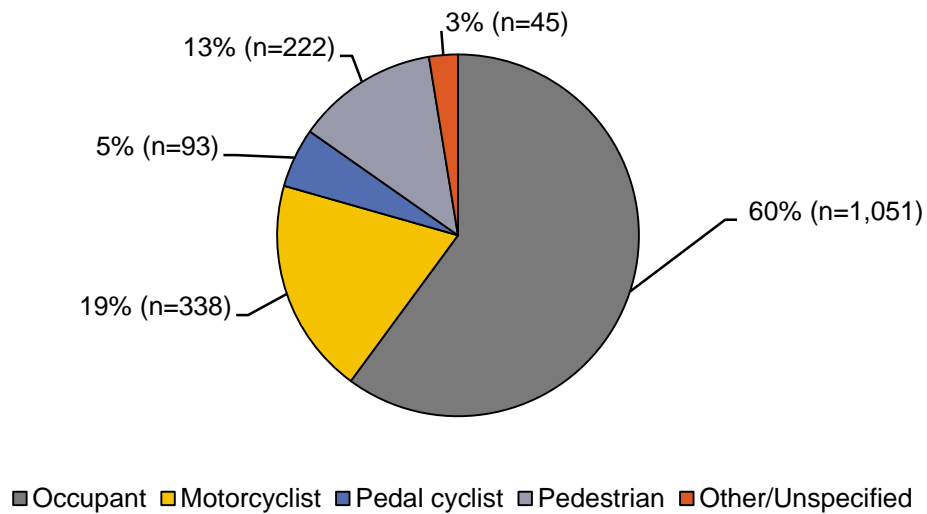
Non-Fatal Motor Vehicle Traffic Crash-Related TBI Inpatient Hospitalizations

Of the 1,749 TBI hospitalizations due to motor vehicle traffic crashes, 65 percent were among males (n=1,131) and 35 percent were among females (n=617). As with falls, over 99 percent 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 (44.7 hospitalizations per 100,000 residents), for both males (56.1 hospitalizations per 100,000 residents) and females (32.4 hospitalizations per 100,000 residents).

American Indians had the highest rate of TBI hospitalizations for motor vehicle traffic crashes with 54.7 hospitalizations per 100,000 residents (n=166), representing a 13 percent increase since 2012. With 26.0 hospitalizations per 100,000 residents, non-Hispanic Whites had the second highest rate (n=988). The age-adjusted rate for non-fatal motor vehicle traffic-related inpatient hospitalizations among all Arizonans was 26.7 hospitalizations per 100,000 residents, a six percent decrease since 2013.

The majority of TBI inpatient hospitalizations due to motor vehicle traffic crashes were among occupants of motor vehicles (60 percent, n=1,051). Nineteen percent were motorcyclists (n=338); 13 percent were pedestrians (n=222); and five percent were pedal cyclists (n=93). This distribution is consistent with data from previous years. Figure 24 shows TBI inpatient hospitalizations due to motor vehicle traffic crashes by injured person.

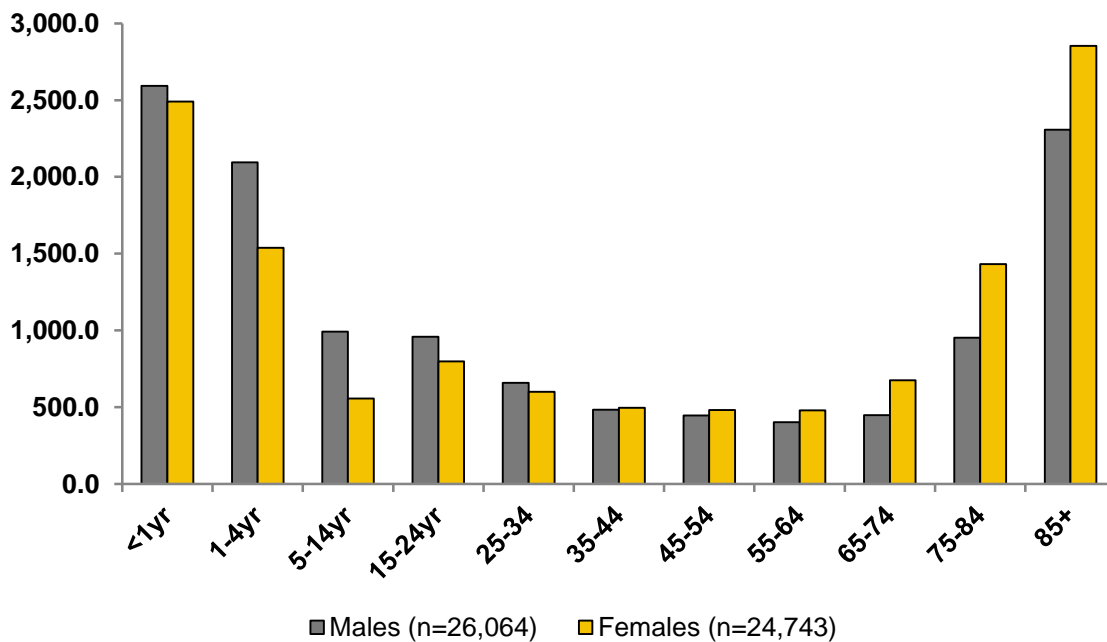
Figure 24. Non-Fatal Motor Vehicle Crash-Related TBI Inpatient Hospitalizations by Injured Person, Arizona, 2013 (n=1,749)



Non-Fatal Emergency Department Visits among Arizona Residents During 2013

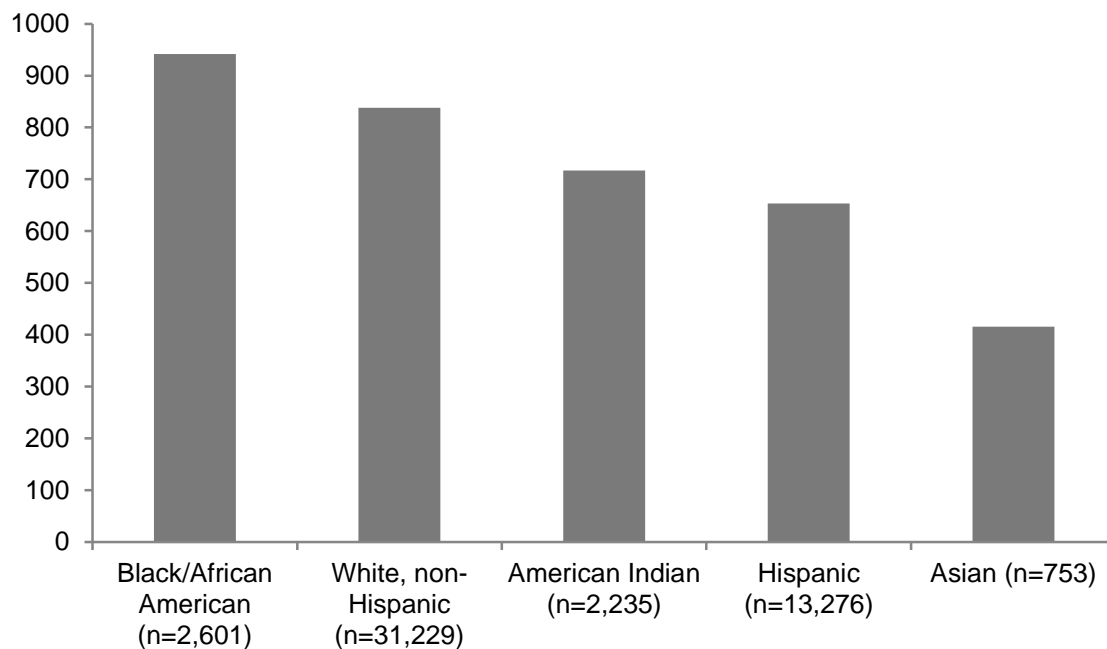
In 2013, there were 50,807 TBI emergency department visits among Arizona residents. Males accounted for just over half of TBI emergency department visits (51 percent, n=26,064), while females accounted for 49 percent of visits (n=24,743). TBI emergency department visit rates were highest among adults 85 years and older. There were 2,020 emergency department visits among females 85 years and older (a rate of 2,853.9 visits per 100,000 residents), and 959 visits among males 85 and older (a rate of 2,306.4 visits per 100,000 residents). For all children younger than one year of age, 94 percent of TBI emergency department visits were due to unintentional falls (n=2,809). Figure 25 shows the 2013 TBI emergency department visit rates per 100,000 Arizona residents.

Figure 25. Age-Specific TBI Emergency Department Visit Rates per 100,000 Residents, by Sex, Arizona, 2013 (n=50,807)



Age-adjusted TBI emergency department visits were highest among African Americans (941.6 hospitalizations per 100,000 residents). Non-Hispanic Whites had the second highest emergency department visit rate with 838.1 visits per 100,000 residents. The age-adjusted rate for non-fatal TBI-related emergency department visits among all Arizonans was 771.1 hospitalizations per 100,000 residents a less than one percent decrease since 2012. Figure 26 shows the age-adjusted emergency department rates by race/ethnicity.

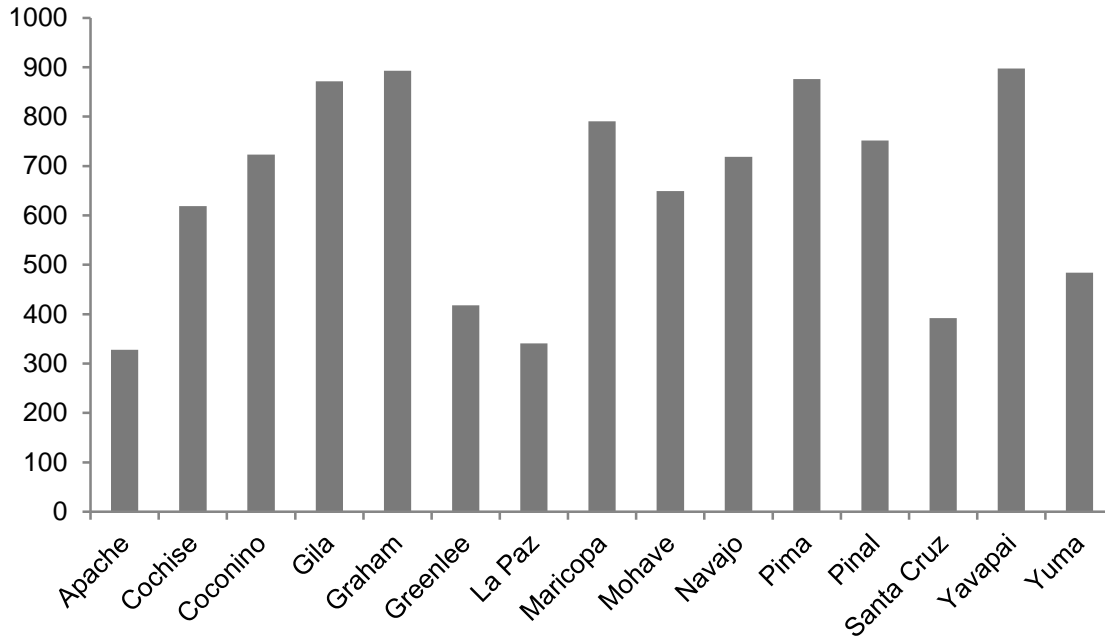
Figure 26. Age-Adjusted TBI-Related Non-Fatal Emergency Department Rates per 100,000 Residents, by Race/Ethnicity, Arizona, 2013 (n=50,807)



Does not include 713 cases in which race/ethnicity information is unknown.

As in 2012, Yavapai County had the highest non-fatal TBI-related emergency department visits in 2013 (897.3 visits per 100,000 residents), which decreased by ten percent since 2012. Graham County had the second highest rate with 892.8 visits per 100,000 residents. Figure 27 shows the age-adjusted TBI-related non-fatal emergency department visits by county.

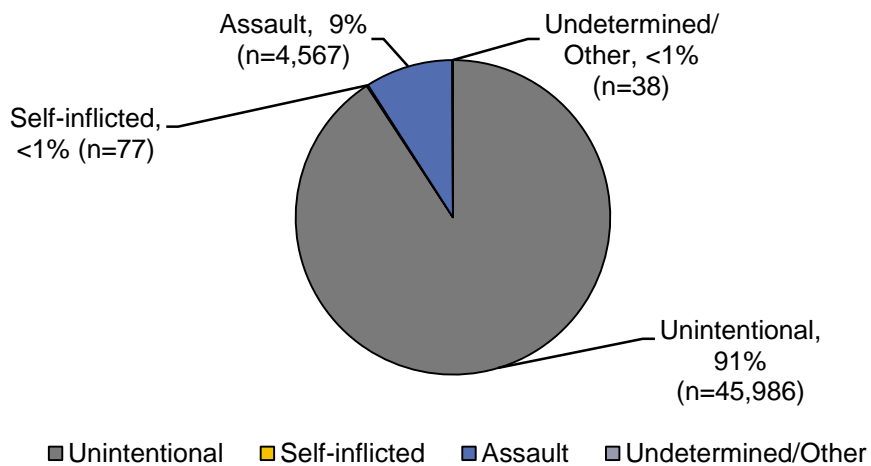
Figure 27. Age-Adjusted TBI-Related Non-Fatal Emergency Department Rates per 100,000 Residents, by County, Arizona, 2013 (n=50,807)



TBI emergency department charges in 2013 totaled more than \$206.8 million, with 39 percent paid by the Arizona Health Care Cost Containment System (AHCCCS)/Medicaid and Medicare (n=21,338, over \$119.6 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 (91 percent, n=45,986), and nine percent were assaults (n=4,567). Figure 28 shows TBI emergency department visits by intent during 2013 in Arizona.

Figure 28. TBI Emergency Department Visits by Manner of Injury, Arizona 2013 (n=50,807)



The leading causes of TBI emergency department visits were falls (53 percent, n=26,679), struck by/against injuries (23 percent, n=11,591), and motor vehicle traffic crashes (14 percent, n=7,083). Table 3 shows TBI emergency department visits by cause for Arizona in 2013. Descriptions of these causes are given in Appendix A.

Cause	Number	Percentage
Fall	26,679	53%
Struck by/against	11,591	23%
Motor vehicle traffic	7,083	14%
Other/unspecified	3,167	6%
Other pedal cycle	1,161	2%
Transport	1,126	2%
Total	50,807	100%

Non-Fatal Fall-Related Emergency Department Visits

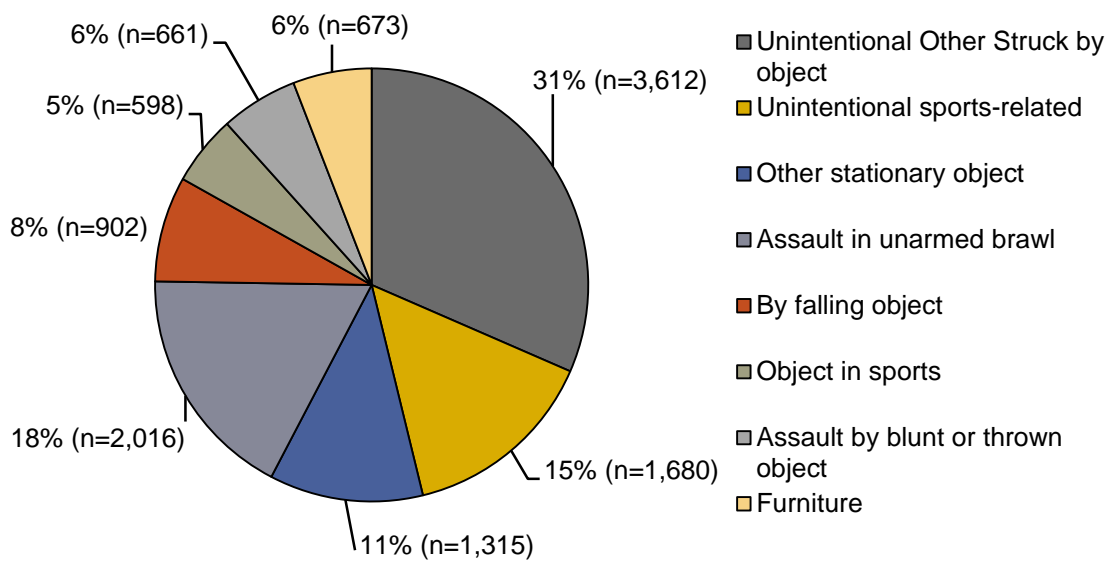
There were 26,679 emergency department visits due to fall-related TBI. Forty-six percent were among males (n=12,303) and 54 percent were among females (n=14,376). Over 99 percent of these falls were unintentional (n=26,666). As with all TBI emergency department visits, those due to falls are most common among the oldest and youngest members of the population. Among children under one year of age, the rate of fall-related TBI is 2,180.6 visits per 100,000 residents; among adults 85 and older, the rate is 2,500.0 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 11,591 TBI emergency department visits due to struck by/against injuries, 61 percent were among males (n=7,047) and 39 percent were among females (n=4,544). Seventy-six percent of these injuries were unintentional (n=8,805), and 24 percent were assaults (n=2,677). Fifty-nine percent of TBI emergency department visits from struck by/against injuries were among individuals one and 24 years of age (n=6,789).

The emergency department discharge database did not include specific information regarding contributing event for 30 percent of the struck by/against injuries (n=3,618). The most frequently specified contributing events were assaults in unarmed fights (18 percent of specified events, n=2,097) and unintentional blows while playing sports (15 percent of specified events, n=1,840). 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, 2013 (n=11,591)



Data Notes

All rates were calculated using the 2013 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 2013. Inpatient hospitalization and emergency department visit data were compiled from the 2013 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 2012 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.