# State Trauma Advisory Board
# 2015 Annual Report

Arizona Department of Health Services

## Cara M. Christ, MD, Director

**Terry Mullins, MBA, Bureau Chief**
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# State Trauma Advisory Board

# 2014 Annual Report

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## State Trauma Advisory Board

Listed below are the dedicated professionals and citizens who serve the State of Arizona as members of the State Trauma Advisory Board and the Trauma and EMS Performance Improvement Standing Committee by giving their time, expertise, and invaluable guidance to the Arizona trauma system. On behalf of the Arizona Department of Health Services and the citizens of Arizona, we thank them for their many contributions.

**Bentley J. Bobrow, MD, Chairman**
Medical Director
Bureau of EMS and Trauma System - Phoenix, AZ

**Bill Ashland, RN**
Regional EMS Council - Northern Region Representative
Flagstaff Medical Center - Flagstaff, AZ

**Laura Baker, Assistant Chief**
Fire Department - County with a Population of Five Hundred Thousand Persons or More - Representative - City of Tucson Fire Department - Tucson, AZ

**Judy Baum, PT, MSHA**
Statewide Rehabilitation Facility Representative
Mountain Valley Regional Rehabilitation Facility
Prescott Valley, AZ

**Vicki Bennett, RN**
Society of Trauma Nurses
Banner University Medical Center - Phoenix, AZ

**Jeff Farkas, NREMT-P**
Statewide Fire District Association Representative
Timber Mesa Fire and Medical District - Lakeside, AZ

**Iman Feiz-Erfan, MD**
Statewide Neurosurgical Society Representative
Maricopa Medical Center - Phoenix, AZ

**Garth Gemar, MD**
National Association of Retired Persons Representative
Rural/Metro-Southwest Ambulance, Glendale Fire Dept., Surprise Fire Dept. and Banner Healthcare, AZ

**Philip Johnson, MD**
Rural Base Hospital not a Trauma Center Representative
Summit Healthcare Regional Medical Center - Show Low, AZ

**Debbie Johnston, RN, Vice President, Advocacy**
Statewide Hospital Association Representative
Arizona Hospital and Healthcare Association - Phoenix, AZ

**Jennefer Kieran, MD**
Federal Indian Health Services Organization Representative
Phoenix Indian Medical Center - Phoenix, AZ

**Dan Millon**
Department of Public Safety Representative
Department of Public Safety - Phoenix, AZ

**David Notrica, MD, FACS, FAAP**
Statewide Pediatric Organization Representative
Phoenix Children's Hospital - Phoenix, AZ

**Scott Petersen, MD, Vice Chair**
American College of Surgeons Representative
St. Joseph's Hospital and Medical Center - Phoenix, AZ

**Michael Pfleger, MD**
National Organization of Emergency Physicians Representative - HonorHealth Scottsdale Osborn Medical Center - Scottsdale, AZ

**Rodney A. Reed, NREMT-P**
Regional EMS Council - Western Region Representative
City of Yuma Fire Department - Yuma, AZ

**Peter Rhee, MD, MPH**
Trauma Center Representative
Banner University Medical Center - Tucson, AZ

**Roy Ryals, CEP**
Regional EMS Council – Central Region Representative
Southwest Ambulance - Mesa, AZ

**Chris Salvino, MD, MS, FACS**
Trauma Center Representative - Havasu Regional Medical Center - Lake Havasu City, AZ

**Jeffrey Schaff, RN, CEN**
Regional EMS Council - Southeastern Region Representative
Banner University Medical Center - Tucson, AZ

**Jordan Smith, MD**
National Association of Orthopaedic Trauma Representative
University of Arizona - Tucson, AZ

**Tina L. Tessay, CEP**
Tribal Health Organization Representative
White Mountain Apache Tribe, EMS - Whiteriver, AZ

**Mark Venuti, CEP**
Statewide Ambulance Association Representative
Guardian Medical Transport - Flagstaff, AZ

**Laurie Wood, RN**
Urban Advanced Life Support Base Hospital not a Trauma Center Representative
Banner Thunderbird Medical Center - Glendale, AZ

**Trauma and EMS Performance Improvement Standing Committee Membership**

**Chris Salvino, MD, MS, FACS**
Chair
Havasu Regional Medical Center - Lake Havasu City, AZ

**Bill Ashland, RN**
Vice Chair/State Designated Level I Trauma Center Trauma Program Manager
Flagstaff Medical Center - Flagstaff, AZ

**Brian Bowling, BS, FP-C**
Air Ambulance Premier EMS Agency Quality Improvement
Native Air Ambulance - Tempe, AZ 85282

**Gail Bradley, MD**
Medical Direction Commission Liaison
Peoria, Sun City, and Goodyear Fire Departments - EMS Medical Director

**Robert Corbell, EMT-P**
EMS Registry Group Member
Northwest Fire District
Tucson, AZ

**Paul Dabrowski, MD**
Trauma Surgeon, Banner Good Samaritan Medical Center, Phoenix, AZ

**Robert Djergaian, MD**
Rehabilitation Specialist
Banner Good Samaritan Hospital - Phoenix, AZ

**Josh Gaither, MD**
EMS Researcher (AEMRC)
University Medical Center Base Hospital
Tucson, AZ

**Garth Gemar, MD**
EMS Medical Director of a Premier EMS Agency
Rural/Metro-Southwest Ambulance, Glendale Fire Dept., Surprise Fire Dept. and Banner Healthcare - Phoenix, AZ

**Pamela Goslar, PhD**
IPAC Representative
St. Joseph's Hospital & Medical Center
Phoenix, AZ

**Michelle Guadnola, RN**
State Designated Level I Trauma Center Trauma Program
St. Joseph's Hospital & Medical Center - Phoenix, AZ

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EMS Council Liaison
Sun City West Fire District - Phoenix, AZ

**Darlene Herlinger, RN, MSN**
Prehospital EMS Coordinator (SAEMS/AEMS)
University of Arizona South Campus
Tucson, AZ

**Ralph Zane Kelly, MD**
State Designated Level III Trauma Center Program Manager
Tuba City Regional Health Care Corporation - Tuba City, AZ

**Summer Magoteaux, RN**
Pediatric Representative (MD or RN)
Phoenix Children's Hospital - Phoenix, AZ

**Jill McAdoo, RN**
Ground Ambulance or First Responder Premier EMS Agency – Quality Improvement Officer (NAEMS/WACEMS), Life Line Ambulance Service, AZ

**Mary McDonald, RN, BSN**
Prehospital EMS Manager – (SAEMS/AEMS), Tucson Fire Department, Tucson, AZ

**Eric Merrill, EMT-P**
Ground Ambulance or First Responder Premier EMS Agency, Quality Improvement Officer (SAEMS/AEMS)
Rio Verde Fire Department, Rio Verde, AZ

**Heather Miller**
Western Arizona Council of Emergency Services
Kingman Regional Medical Center

**Melissa Moyer, CSTR**
Representative of the Trauma Registry Users Group
John C. Lincoln North Mountain Hospital
Phoenix, AZ

**Pam Noland, RN**
State Designated Level IV Trauma Center Program Manager
Northern Cochise Community Hospital
Willcox, AZ

**Jeffrey Schaff, RN, CEN**
ACS Verified Level I Trauma Program Manager
Banner University Medical Center - Tucson, AZ

**Danielle Stello, RN**
Prehospital EMS Coordinator - Base Hospital (NAEMS/WACEMS)
Havasu Regional Medical Center, Lake Havasu City, AZ

**Tiffiny Strever, RN**
State Designated Level I Trauma Center – Trauma Program Representative - West Valley Hospital – Goodyear, AZ

**Dale Woolridge, MD**
Injury Researcher
University of Arizona Department of Emergency Medicine
Tucson, AZ

**Annual Report to the Director**

## Introduction & Highlights

Trauma remains a huge public health problem in Arizona. In 2014, Arizona's trauma centers treated 39,373 injuries, including 21,468 young people under the age of 44 and 4,784 under the age of 15. For each of the six leading mechanisms of injury, Arizona's proportion of mortality is below the US average. This is a testament to the quality of Arizona's trauma system. Never-the-less, even with the best possible care, 871 people died from injuries in Arizona in 2014, including 367 young people under the age of 44 years, and 40 under the age of 15 years.

Arizona's Native American suffer disproportionally from injury compared to all other race and ethnicities; 3,815 were treated at Arizona's trauma centers (1,005 per 100,000). An unknown number of Native Americans were treated in neighboring states, so this number is likely to be an underestimate of the true burden of disease which trauma inflicts on the population.

Trauma center charges in 2014 were $1.6 B. The median charge to care for a trauma patient was $23,497. The average reimbursement for trauma care was 16% in this reporting period. Drug and alcohol use continue to be prevalent and are both strongly correlated with injury with 33% of young adults aged 18 to 24 and 15% of 15 to 17 year olds found to be under the influence of drugs and/or alcohol when treated for their injuries.

Although vehicle restraint use has been found to save lives, it was least practiced among the ages of 9 to 44 years. When involved in a motor vehicle trauma, 63.9% of young adults between the ages of 9 and 14, 56.9% between the age of 15 and 17, 59.3 between the ages of 18 and 24, and 67.3% between the ages of 25 and 44 were using restraints. Unfortunately, this is the same age range that is most likely to be injured. Overall, the top six causes of trauma in Arizona are; falls (39.6%), motor vehicle related injury (26.8%), struck by/against (8.4%), transport-other (5.9%), cut/pierce (4.8%), and pedal cyclist-other (2.5%). Arizona proportion of mortality for each of these top six mechanisms of injury remain lower than for the US as a whole.

## State Trauma System Development

**Trauma Center Growth**: Two new Level I Trauma Centers in Maricopa County and two new Level III Trauma Centers (one in Coconino and one in Cochise County) were designated in 2014. While the pace of new trauma center applications has declined, there are still several facilities that have expressed an interest in becoming designated as trauma centers. Additionally, some existing trauma centers are considering changes in their level of designation. As of September 1, 2015 there are ten level I trauma centers, five level III trauma centers and twenty five level IV trauma centers in Arizona.

**Substantive Policy Statements**: Three Substantive Policy Statements (SPS) have been approved since the last Annual Report was published. A SPS is advisory only and does not impose additional requirements or penalties on regulated parties. It is used to communicate the method used by the Bureau to fulfill its oversight obligation when regulatory language is lacking or conflicting.

- SP-097-PHS-EMS "International classification of diseases codes for trauma centers" describes the time frame and methodology for trauma centers to meet the Centers for Medicare and Medicaid, the American College of Surgeons, and the Arizona requirements for transitioning from the International Classification for Diseases version 9 to version 10.
- SP-096-PHS-EMS "Clarification of provisional designation for trauma centers" clarifies language relating to the length of provisional designation and clarifies that facilities that voluntarily submit injury data to the Arizona State Trauma Registry are not submitting trauma service data as described in A.A.C. R9-25-1313(2).
- SP-095-PHS-EMS "Clarification of Arizona Administrative Code (A.A.C.) Title 9, Chapter 25, Article 13 Trauma Center Designation" describes the methodology that would be adopted by the Bureau in the event that the American College of Surgeons declined to notify the Bureau of a hospital's status vis-a-vis Arizona trauma center designation criteria following an ACS verification site visit.

**Trauma Registry Advancements**: The Bureau completed the testing and transition of many trauma centers to a web-based trauma registry platform. Beginning in January 2016, the Bureau will no longer purchase registry software licenses for Arizona's trauma centers. Instead, the Bureau will pay to maintain a single, web-based trauma registry platform that can be used free-of-charge by any trauma center. Trauma centers may continue to maintain a local copy of the registry onsite, but they will be responsible for the cost of maintaining the registry, updates, and for uploading data to the web-registry used by the Bureau.

**Trauma Triage Workgroup**

A workgroup examined this topic and created a preliminary report that was presented to the Trauma and EMS Performance Improvement Standing Committee this past spring. The standing committee tabled the draft after considerable discussion.

A close look at ISS data reveals a significant variation in mortality risk when age, injury type (blunt vs. penetrating) and head injury are considered in the statistical analysis. To simply use an ISS $\geq$ 16 when evaluating triage accuracy retrospectively is an incomplete method to assess the accuracy of EMS providers triaging due to the complexity of prehospital trauma triage.

As the Arizona trauma system continues to mature, this topic has gained importance. Bureau staff continue to work with the Trauma and EMS Performance Improvement Standing Committee to reconvene this workgroup in 2016 in order to evaluate this important quality measure.

**Trauma Plan Progress – Key Highlights**:

- **Priority 1 Items**

  **Continue Support for the Trauma Managers Workgroup**

  The Bureau continues to partner with the University of Arizona Center for Rural Health Policy to support regular meetings of the Trauma Program Managers group. Most recently, this workgroup was hosted by Tuba City Regional Hospital. The next meeting will be December 4th at Chandler Regional Medical Center.

  **Improve EMS data quality and completeness**.

  The Bureau recently launched a workgroup whose foci will be EMS data quality and completeness. The workgroup, with representatives from each of the four regions, is co-chaired by representatives from a trauma center and an EMS agency. They will meet throughout the fall and winter and present the report to the Trauma and EMS Performance Improvement standing committee next spring.

- **Priority 2 Items**

  **Create pediatric and geriatric specific trauma reports and include pediatric and geriatric specific subsets within the annual report.**

  While the Bureau staff were unable to develop specific pediatric and geriatric trauma reports, this annual report does contain icons to denote tables, charts or content specific to the geriatric and pediatric age groups

**Add age-specific data reporting to the annual trauma report.**

Each annual report and most ad-hoc reports produced by the Bureau present data using age stratifications.

- **Priority 3 Items**

  **Monitor communication systems developments**

  The Bureau Chief of EMS and Trauma System is on the Arizona FirstNet Planning Committee. Additionally, the Bureau maintains close relationships with the Arizona Department of Public Safety's Wireless Systems Bureau. This is the organization responsible for maintaining the Arizona Emergency Medical Services Communications (EMSCOM) radio system. Finally, the Bureau works closely with the ADHS Bureau of Public Health Emergency Preparedness to evaluate and make recommendations for the web-based hospital-status platform, "EMSystems".

**Looking Forward**

With the assistance of the trauma stakeholder community, some regulatory updates will be needed to address the three SPS documents identified above. We will evaluate trauma triage performance to ensure that we take full advantage of our high quality EMS providers and a trauma system composed of 40 trauma centers. We will continue to monitor special populations, including children, the elderly, and those with head injuries, to ensure that they receive the best care possible.

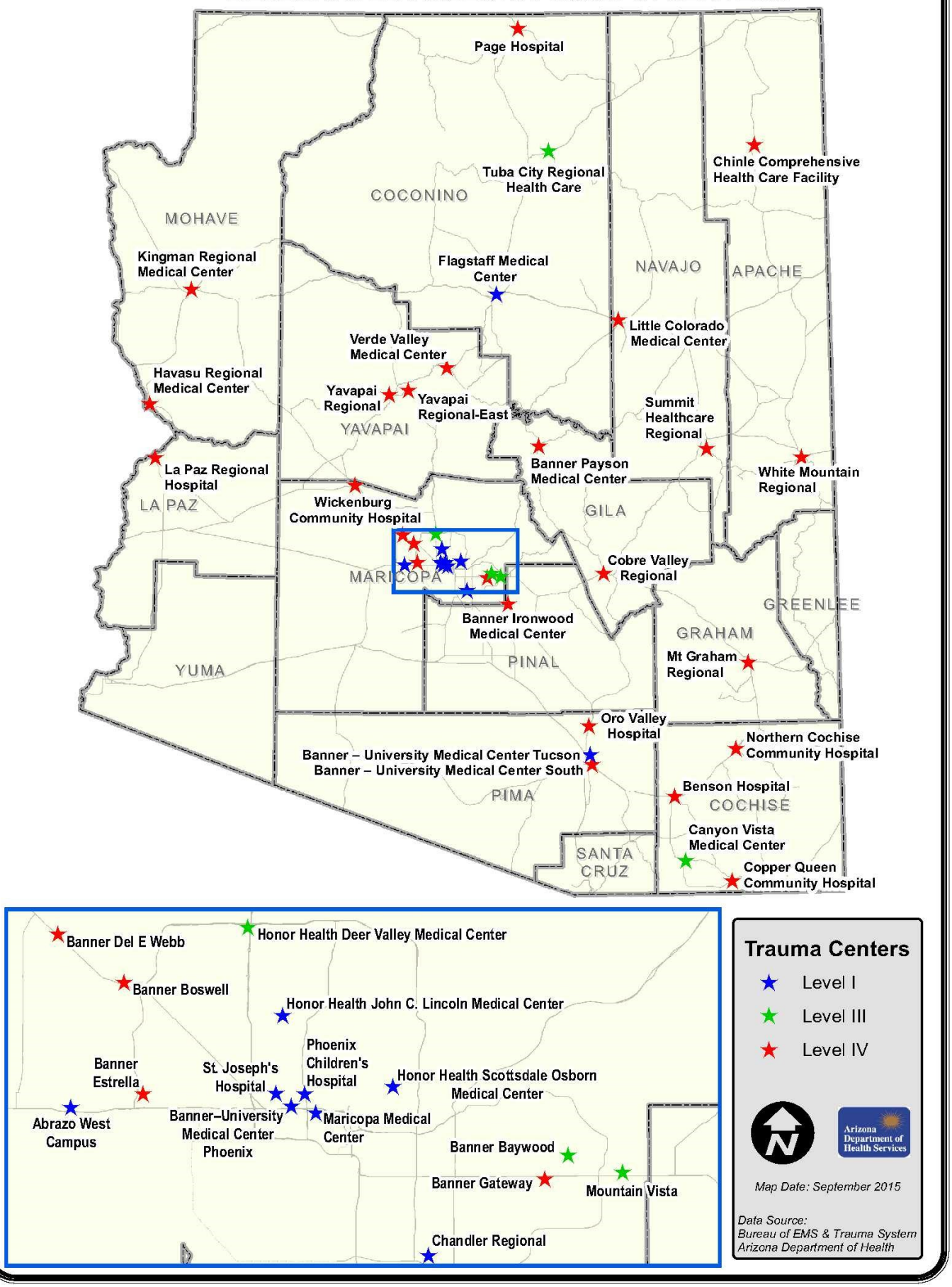
Arizona's state trauma system evolving from 8 hospitals to 40 hospitals over a relatively short period of time is a major accomplishment. This is the direct result of an engaged and expert trauma advisory board, a well-educated and prepared EMS community, hospitals willing to collaborate, and a team of professionals at the Bureau dedicated to the continuous measurement and improvement of trauma care in the state of Arizona.

# Arizona State Designated Trauma Centers

| Health Care Institution | Address | Effective Date | Expiration Date |
|---|---|---|---|
| **Level I Trauma Centers** | | | |
| Abrazo West Campus (Provisional Designation) | 13677 W. McDowell Road, Goodyear, AZ 85395 | 7/21/14 | 1/21/16 |
| Banner - University Medical Center Phoenix | 925 E. McDowell Rd., Phoenix, AZ 85006 | 11/19/14 | 11/18/17 |
| Banner University Medical Center – Tucson Campus | 1501 N. Campbell Ave., Tucson, AZ 85724 | 11/12/14 | 11/11/15 |
| Dignity Health, dba Chandler Regional Medical Center (Provisional Designation) | 1955 W. Frye Rd., Chandler, AZ 85224 | 3/24/14 | 3/22/16 |
| Flagstaff Medical Center | 1200 N. Beaver St., Flagstaff, AZ 86001 | 05/27/14 | 05/27/17 |
| HonorHealth John C. Lincoln Medical Center | 250 E. Dunlap Ave., Phoenix, AZ 85020 | 04/24/14 | 04/24/17 |
| HonorHealth Scottsdale Osborn Medical Center | 7400 E. Osborn, Scottsdale, AZ 85251 | 10/25/14 | 10/25/17 |
| Maricopa Medical Center | 2601 E. Roosevelt, Phoenix, AZ 85008 | 12/20/14 | 12/19/15 |
| Phoenix Children's Hospital | 1919 E. Thomas Rd., Phoenix, AZ 85016 | 08/31/12 | 08/31/15 |
| St. Joseph's Hospital & Medical Center | 350 W. Thomas Rd., Phoenix, AZ 85013 | 11/20/13 | 11/20/16 |
| **Level III Trauma Centers** | | | |
| Banner Baywood Medical Center | 6644 E. Baywood Ave., Mesa, AZ 85206 | 02/25/15 | 02/25/17 |
| Canyon Vista Medical Center (Provisional Designation) | 5700 E. Highway 90, Sierra Vista, AZ 85635 | 05/1/15 | 11/1/16 |
| HonorHealth Deer Valley Medical Center | 19829 N. 27th Ave., Phoenix, AZ 85027 | 06/09/14 | 4/08/17 |
| Mountain Vista Medical Center | 1301 S. Crismon Rd., Mesa, AZ 85209 | 7/23/14 | 7/26/16 |
| Tuba City Regional Health Care Corp. | P.O. Box 600, 167 Main St., Tuba City, AZ 86045 | 4/07/15 | 12/10/17 |
| **Level IV Trauma Centers** | | | |
| Banner Boswell Medical Center | 10401 W. Thunderbird Blvd., Sun City, AZ 85351 | 12/17/12 | 12/17/15 |
| Banner Del E. Webb Medical Center | 14502 W. Meeker Blvd, Sun City West, AZ 85375 | 01/09/14 | 01/09/17 |
| Banner Estrella Medical Center | 9201 W. Thomas Road, Phoenix, AZ 85037 | 08/30/12 | 08/30/15 |
| Banner Gateway Medical Center | 1900 N. Higley Road, Gilbert, AZ 85234 | 01/02/13 | 01/02/16 |
| Banner Ironwood Medical Center | 37000 N. Gantzel Rd., San Tan Valley, AZ 85140 | 10/11/12 | 10/11/15 |
| Banner Page Hospital | 501 N. Navajo, Page, AZ 86040 | 11/05/14 | 11/05/17 |
| Banner Payson Medical Center | 807 S. Ponderosa Street, Payson, AZ 85541 | 11/22/13 | 11/22/16 |
| Banner University Medical Center – South Campus | 2800 E. Ajo Way, Tucson, AZ 85713 | 08/13/13 | 08/13/16 |
| Benson Hospital | 450 S. Ocotillo Ave., Benson, AZ 85602 | 03/03/14 | 03/03/17 |
| Chinle Comprehensive Health Care Facility | P.O. Drawer PH, Chinle, AZ 86503 | 09/09/13 | 09/09/16 |

| Health Care Institution | Address | Effective Date | Expiration Date |
|---|---|---|---|
| Cobre Valley Regional Medical Center | 5880 S. Hospital Dr., Globe, AZ 85501 | 11/26/12 | 11/26/15 |
| Copper Queen Community Hospital | 101 Cole Ave., Bisbee, AZ 85603 | 12/01/12 | 12/01/15 |
| Havasu Regional Medical Center | 101 Civic Center Ln., Lake Havasu City, AZ 86403 | 01/20/14 | 01/20/17 |
| Kingman Regional Medical Center | 3269 Stockton Hill Rd., Kingman, AZ 86409 | 10/15/12 | 10/15/15 |
| La Paz Regional Hospital | 1200 W. Mohave Rd., Parker, AZ 85344 | 06/02/15 | 06/02/18 |
| Little Colorado Medical Center | 1501 N. Williamson Blvd, Winslow, AZ 86047 | 6/22/15 | 6/22/18 |
| Mt. Graham Regional Medical Center | 1600 S. 20th Ave., Safford, AZ 85546 | 03/20/14 | 03/20/17 |
| Northern Cochise Community Hospital | 901 W. Rex Allen Dr., Willcox, AZ 85643 | 12/04/14 | 12/04/17 |
| Oro Valley Hospital | 1551 East Tangerine Road, Oro Valley, AZ 85755 | 4/18/13 | 4/18/16 |
| Summit Healthcare Regional Medical Center | 2200 Show Low Lake Rd., Show Low, AZ 85901 | 08/12/14 | 08/12/17 |
| Verde Valley Medical Center | 269 S. Candy Ln., Cottonwood, AZ 86326 | 08/18/14 | 08/18/17 |
| White Mountain Regional Medical Center | 118 S. Mountain Ave., Springerville, AZ 85938 | 06/18/15 | 06/18/18 |
| Wickenburg Community Hospital | 520 Rose Ln., Wickenburg, AZ 85390 | 08/08/14 | 08/08/17 |
| Yavapai Regional Medical Center – West Campus | 1003 Willow Creek Road, Prescott, AZ 86301 | 01/10/14 | 01/10/17 |
| Yavapai Regional Medical Center – East Campus | 7700 E. Florentine, Prescott Valley, AZ 86314 | 6/24/14 | 6/24/17 |

# DESIGNATED ARIZONA TRAUMA CENTERS



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Arizona Department of Health Services
Bureau of Emergency Medical Services and Trauma System

# State Trauma Advisory Board 2015 Annual Report


**Prepared by:**

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**Bentley Bobrow, MD, EMS & Trauma System Medical Director**

# Acknowledgements

The Arizona Department of Health Services' Bureau of Emergency Medical Services and Trauma System (BEMSTS) wishes to acknowledge the continued hard work and dedication of the many individuals involved in working to understand, prevent, and treat traumatic injury.

Special thanks are extended to the members of the State Trauma Advisory Board, Trauma and EMS Performance Improvement committee, participating trauma centers, medical directors, program managers, and registrars. Their dedication to continuously improving data collection makes it possible to fully evaluate and advance the trauma system in Arizona.

# 2015 ARIZONA STATE TRAUMA REGISTRY ANNUAL REPORT

## Purpose:

The purpose of this report is to describe the Arizona trauma system through the Arizona State Trauma Registry (ASTR). ASTR is dedicated to capturing information on the most severely injured patients in Arizona from all state designated trauma centers and other participating hospitals.

## Methods:

In 2014, ASTR captured 39,373 cases from forty one (41) participating healthcare facilities which included ten (10) Level I trauma centers, four (4) Level III trauma centers, twenty-five (25) Level IV trauma centers, and two (2) non-designated hospitals.

All Level I trauma centers in Arizona are located in urban areas of the state, including eight in Maricopa County, one in Coconino County and one in Pima County. Level III and Level IV trauma centers are located primarily in rural areas of the state.

Level I and III trauma centers are required to submit the full ASTR data set while Level IV trauma centers and non-designated facilities have the option to submit the full or reduced data set. A validation tool checks more than 800 state and national rules. Validation is run at the hospital and at the state level. Inconsistencies are flagged and returned to hospitals for review or correction. In addition to this check, a yearly Inter Rater Reliability assessment is performed statewide.

This report analyzed cases for patients with an Emergency Department/Hospital Arrival Date between January 1, 2014 and December 31, 2014 using SAS Version 9.4 (SAS Institute, Cary, NC).

When comparing to national trauma data, ASTR was restricted by admission, transfer, and outcome status in order to match ASTR inclusion criteria to those of the National Trauma Data Bank (NTDB)[1].

Population denominators were taken from the Arizona Health Status and Vital Statistics database and death records were taken from the Vital Statistics Information Management System – Electronic Death Registry System.

## Geo-Population:

Arizona is 400 miles long and 310 miles wide for a total area of 114,006 square miles. The topography has a blend of deserts, mountains, and plateaus.

The total Arizona population increased from 2013 by 1.3% for a total number of residents of 6,667,241 in 2014.[2] Urban counties (Maricopa, Pima, Pinal, and Yuma) accounted for 84.4% of the population. The remaining counties (Apache, Cochise, Coconino, Gila, Graham, Greenlee, La Paz, Mohave, Navajo, Santa Cruz, and Yavapai) accounted for 15.6% of the population.

There are twenty-two (22) federally recognized American Indian tribes in Arizona with a total population of 379,590 in 2014.

[1] http://www.facs.org/trauma/ntdb/pdf/ntdb-annual-report-2012.pdf
[2] http://azdhs.gov/plan/menu/info/pop/index.php

## Rates and 95% Confidence Intervals

All trauma rates were calculated per 100,000 Arizona residents using 2014 population denominators from the Arizona Health Status and Vital Statistics database. 95% Confidence Intervals (CI) were calculated for all rate estimates. CIs provide a range of values that describe the uncertainty surrounding an estimate and may be used to assess statistical significance. When comparing trauma rates within a table, if the range of the CIs for two rates do not overlap, the rates are considered statistically significant ($p < 0.05$). If the range of the CIs do overlap, then the difference is not significant.

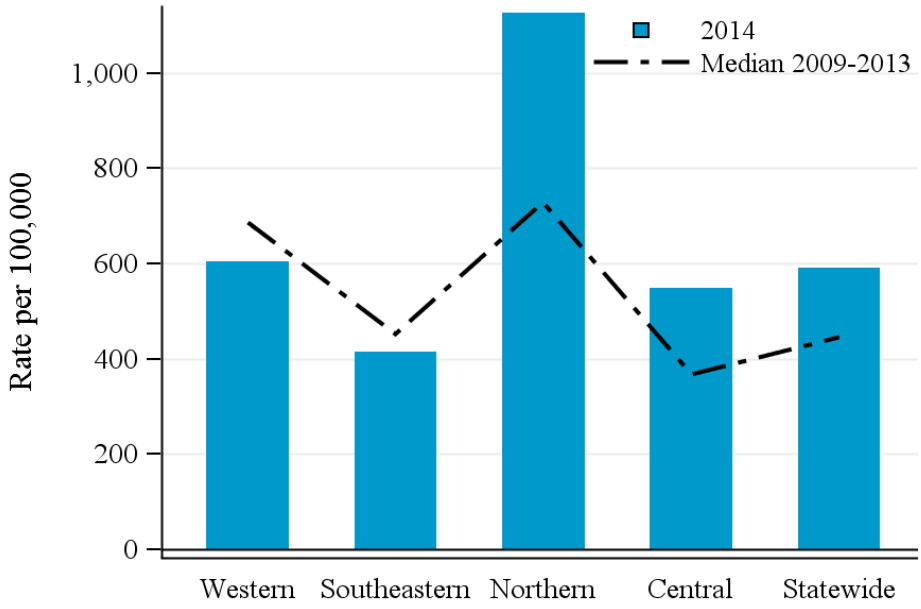
**Example:**

| Group | Rate per 100,000 (95% CI) |
|---|---|
| A | 437 (430, 443) |
| B | 435 (425, 444) |
| C | 871 (841, 902) |

In the table above, there is no statistically significant difference in rate between group A and group B. This is because the CIs for groups A and B share a range of values (430-443). There is however, a statistically significant difference in rate between group A and group C and between group B and group C. In both cases, the ranges of the CIs do not overlap.

# Demographics

**Figure 1/Table 1: Region-specific trauma rates per 100,000 Arizona residents**



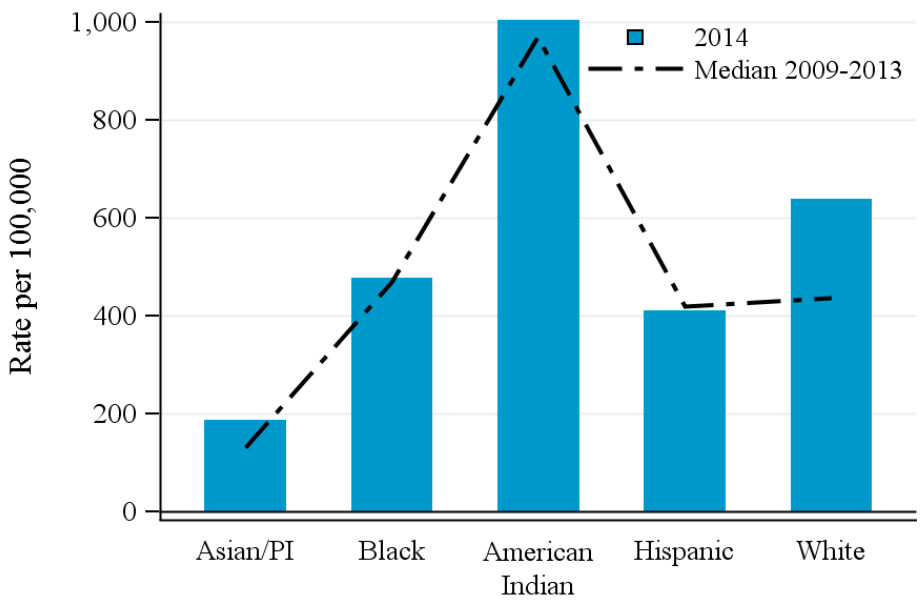

Data source: Arizona State Trauma Registry 2009-2014, Arizona Vital Statistics 2009-2014

In 2014, the Southeastern Region reported the lowest trauma rate, while the Northern Region reported the highest trauma rate. Despite being the most densely populated and having the highest volume of trauma, the Central Region had the lowest five year median.

| Injury Region | Total Trauma Cases | Rate per 100,000 (95%CI) |
|---|---|---|
| Western | 2,647 | 605 [582, 628] |
| Southeastern | 5,116 | 414 [403, 426] |
| Northern | 6,033 | 1,126 [1,098, 1,154] |
| Central | 24,441 | 548 [541, 555] |
| Statewide | 39,373 | 591 [585, 596] |

***CI= Confidence interval***

**Figure 2/Table 2: Race-specific trauma rates per 100,000 Arizona residents**




Data source: Arizona State Trauma Registry 2009-2014, Arizona Vital Statistics 2009-2014

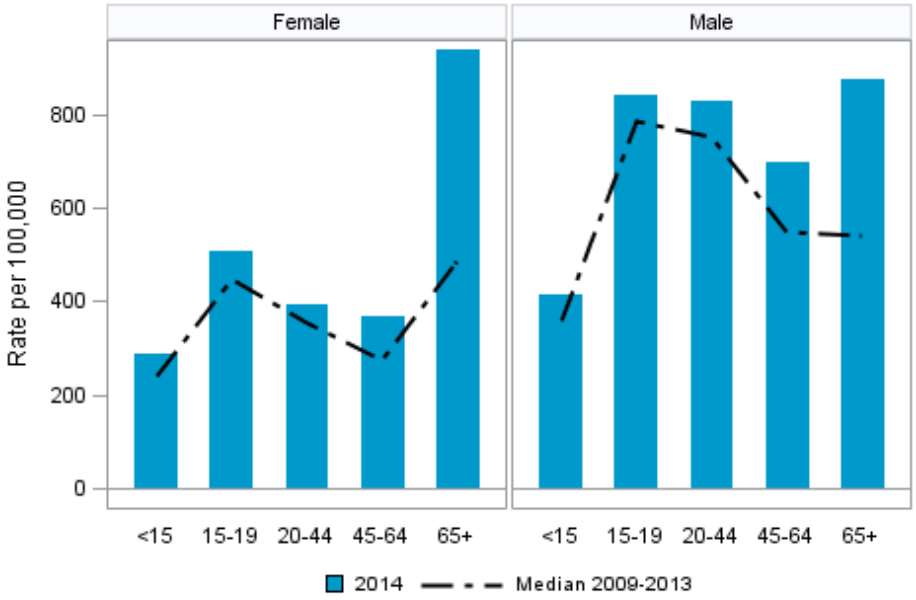
Although White non-Hispanics had the highest volume of trauma in 2014, American Indian/ Alaska Natives had the highest trauma rate. Asian/Pacific Islanders had the lowest trauma rate. These results are similar to those of the five year median.

A complete, in-depth report on American Indian trauma in Arizona can be found at: http://www.azdhs.gov/bems/data/quality-assurance-reports.php?pg=county-regional

| Race/ethnicity | Total Trauma Cases | Rate per 100,000 (95%CI) |
|---|---|---|
| Asian/PI | 475 | 188 [171, 205] |
| Black | 1,669 | 478 [455, 501] |
| American Indian | 3,815 | 1,005 [973, 1,037] |
| Hispanic | 7,598 | 412 [403, 421] |
| White | 24,562 | 640 [632, 648] |

***CI= Confidence interval, PI=Pacific Islander***

**Figure 3/Table 3: Gender & age-specific trauma rates per 100,000 Arizona residents**




Data source: Arizona State Trauma Registry 2009-2014, Arizona Vital Statistics 2009-2014

In 2014, males had higher trauma rates than females for all age groups except older adults (65+). Females 65 and over had the highest trauma rate in the state. The 2014 rates among both genders were higher than the five year median. This may be due to reporting from newly established trauma centers.

| Gender | Age | Total Trauma Cases | Rate per 100,000 (95%CI) |
|---|---|---|---|
| Female | <15 | 1,925 | 290 [277, 303] |
| | 15-19 | 1,119 | 508 [479, 538] |
| | 20-44 | 4,238 | 393 [381, 405] |
| | 45-64 | 3,083 | 369 [356, 382] |
| | 65+ | 5,202 | 939 [913, 964] |
| Male | <15 | 2,859 | 414 [398, 429] |
| | 15-19 | 1,968 | 843 [806, 880] |
| | 20-44 | 9,358 | 827 [810, 844] |
| | 45-64 | 5,489 | 696 [678, 715] |
| | 65+ | 4,131 | 877 [850, 904] |

***CI= Confidence interval***

**Table 4: Age-specific trauma incidence and mortality proportion**

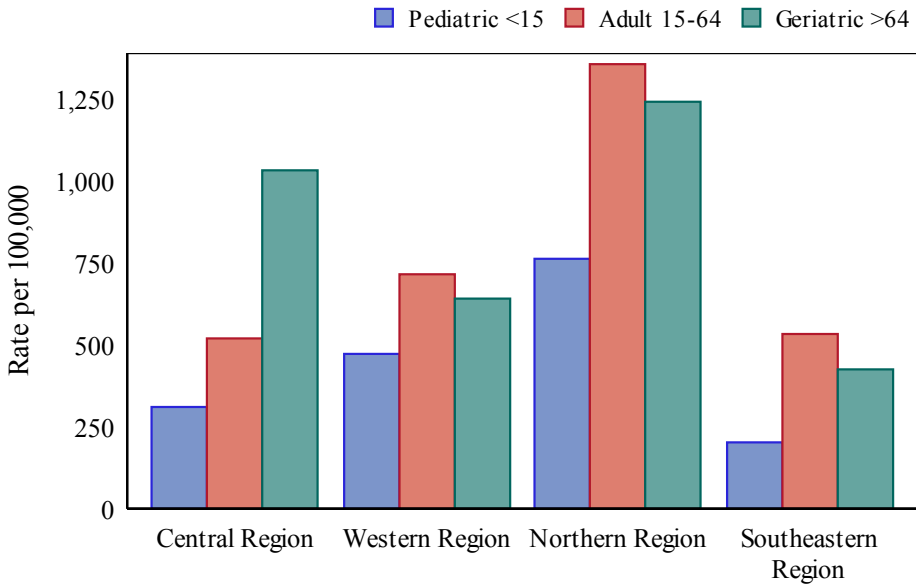
| Age | Count | Percent | Deaths | Mortality Proportion |
|---|---|---|---|---|
| Total | 39,373 | 100% | 871 | 2.2% |
| <1 | 468 | 1.1% | 4 | 0.8% |
| 1-4 | 1,318 | 3.3% | 16 | 1.2% |
| 5-9 | 1,369 | 3.4% | 12 | 0.8% |
| 10-14 | 1,629 | 4.1% | 8 | 0.4% |
| 15-19 | 3,087 | 7.8% | 34 | 1.1% |
| 20-24 | 3,624 | 9.2% | 66 | 1.8% |
| 25-34 | 5,819 | 14.7% | 136 | 2.3% |
| 35-44 | 4,154 | 10.5% | 91 | 2.1% |
| 45-54 | 4,475 | 11.3% | 94 | 2.1% |
| 55-64 | 4,097 | 10.4% | 117 | 2.8% |
| 65-74 | 3,528 | 8.9% | 104 | 2.9% |
| 75-84 | 3,194 | 8.1% | 93 | 2.9% |
| >85 | 2,611 | 6.6% | 96 | 3.6% |

Trauma affects people of all ages and is the leading cause of death among persons 1-44 years of age.*

In Arizona, there were 39,373 trauma cases reported for the year 2014. Of those, 2.2 percent were fatal. The age group with the highest mortality proportion were those over 85 years of age (3.6%).

* http://www.cdc.gov/Traumacare/pdfs/TraumaCentersFactsheet20090921-a.pdf

**Figure 4/Table 5: Trauma rates per 100,000 Arizona residents by region and age**




Data source: Arizona State Trauma Registry 2014, Arizona Vital Statistics 2014

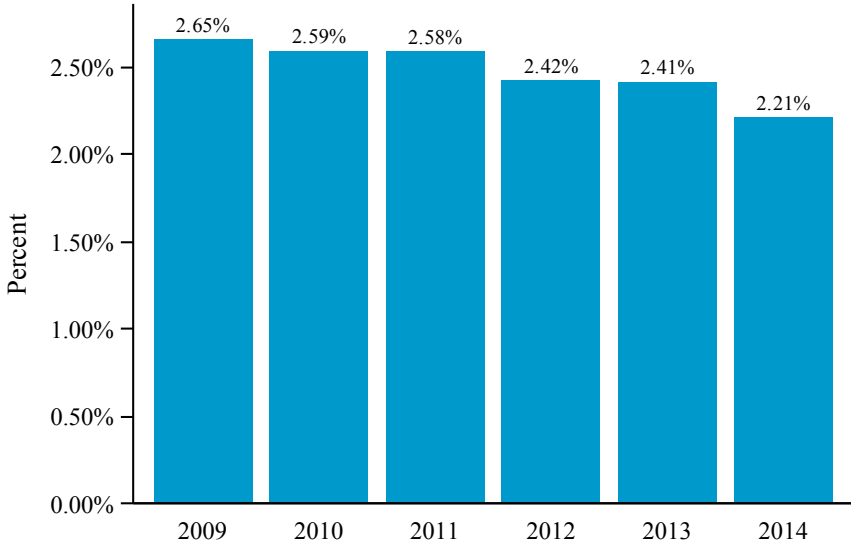
In the Northern, Southeastern and Western regions Adults (15-64) had the highest rates of trauma in 2014. In the Central region, Geriatrics (> 64) had the highest trauma rate.

| Region | Age | Total Trauma Cases | Rate per 100,000 (95%CI) |
|---|---|---|---|
| Central | Pediatric <15 | 2,939 | 312 [301, 324] |
| | Adult 15-64 | 15,094 | 521 [512, 529] |
| | Geriatric >64 | 6,408 | 1,035 [1,010, 1,060] |
| Northern | Pediatric <15 | 765 | 762 [708, 816] |
| | Adult 15-64 | 4,036 | 1,357 [1,315, 1,399] |
| | Geriatric >64 | 1,232 | 1,244 [1,175, 1,314] |
| Southeastern | Pediatric <15 | 477 | 205 [187, 223] |
| | Adult 15-64 | 3,744 | 531 [514, 548] |
| | Geriatric >64 | 895 | 424 [396, 452] |
| Western | Pediatric <15 | 388 | 472 [425, 519] |
| | Adult 15-64 | 1,646 | 714 [679, 748] |
| | Geriatric >64 | 613 | 638 [588, 689] |

***CI= Confidence interval***

# Trauma Mortality

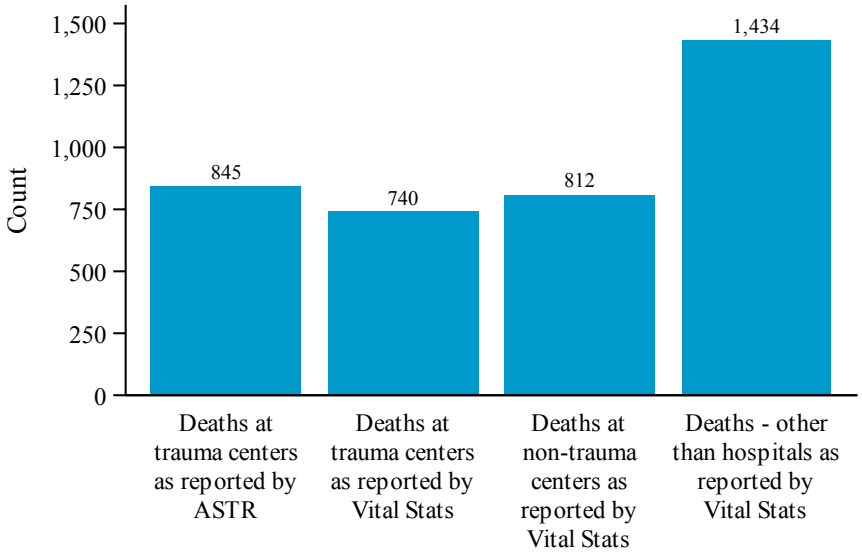
**Figure 5: Trauma related mortality proportion**




Data source: Arizona State Trauma Registry 2009-2014

The mortality proportion has been steadily decreasing from 2.65 percent in 2009, to 2.21 percent in 2014. This decline may be due to reporting of less severely injured patients by newly established Level IV trauma centers.

**Figure 6: Total trauma deaths reported in 2014, ASTR vs. Vital Statistics**

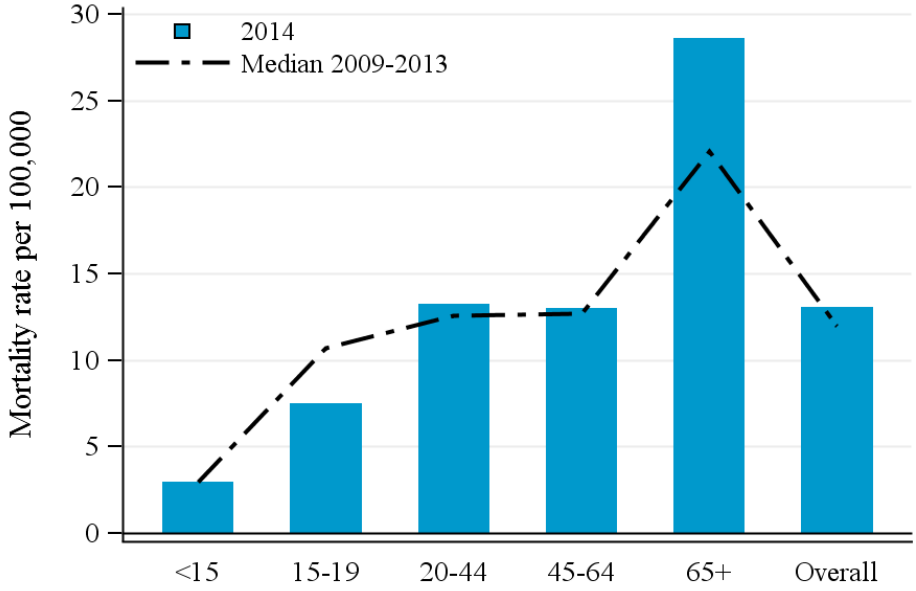



Data source: Arizona State Trauma Registry 2014, Arizona Vital Statistic Registry 2014

The number of reported deaths occurring at state designated trauma centers was higher in ASTR than in Arizona Vital Statistics.

Arizona Vital Statistics captured 812 trauma deaths that occurred at non-designated facilities and 1,434 trauma deaths that occurred outside of the hospital.

**Figure 7/Table 6: Age-specific trauma mortality rates per 100,000 Arizona residents**



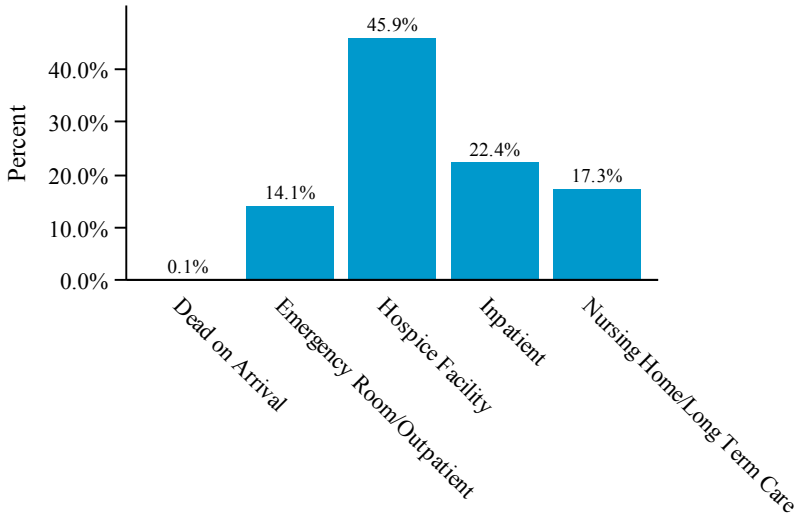

Data source: Arizona State Trauma Registry 2009-2014, Arizona Vital Statistics 2009-2014

In 2014, older adults (65+) had the highest trauma mortality rate when compared to all other age groups and the five year median. Trauma patients under 15 years of age had the lowest trauma mortality rate. The trauma mortality rate for 15 to 19 year olds was lower than the five year median.

| Age | Total Trauma Deaths | Rate per 100,000 (95%CI) |
|---|---|---|
| <15 | 40 | 3 [2, 4] |
| 15-19 | 34 | 7 [5, 10] |
| 20-44 | 293 | 13 [12, 15] |
| 45-64 | 211 | 13 [11, 15] |
| 65+ | 293 | 29 [25, 32] |
| Overall | 871 | 13 [12, 14] |

***CI= Confidence interval***

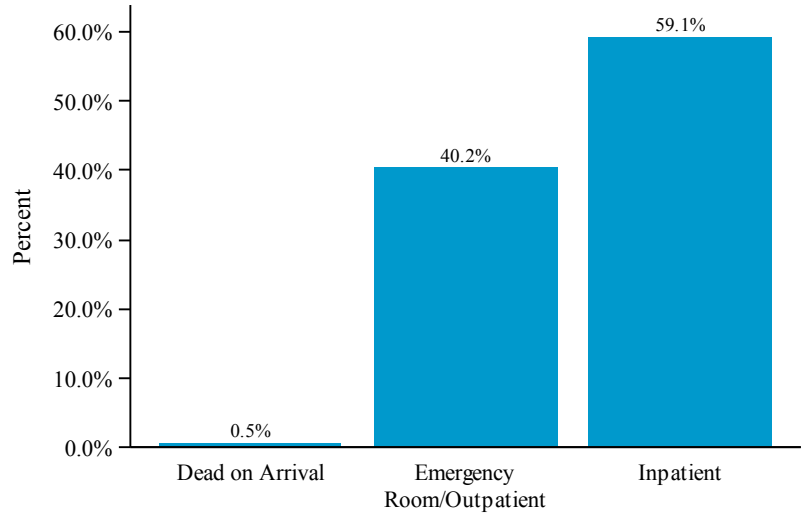
**Figure 8: Deaths at non-trauma facilities reported through Arizona Vital Statistics (n=812)**




As reported by the Office of Vital records, the majority of non-trauma center deaths in Arizona occurred at Hospice Facilities.

Data source: Arizona Vital Statistic Registry 2014

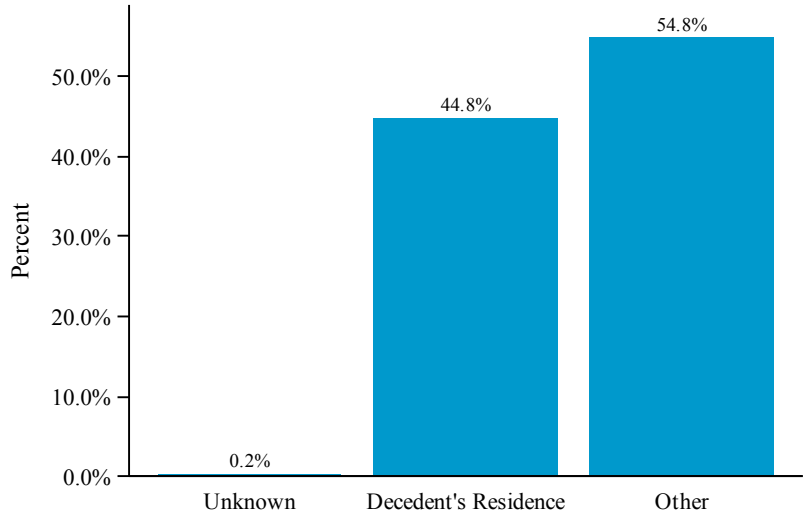
**Figure 9: Trauma center injury deaths reported through Vital Statistics (n=740)**




As reported by the Office of Vital records, the majority of trauma center deaths occurred after admission.

Data source: Arizona Vital Statistic Registry 2014

**Figure 10: Out of hospital trauma deaths reported through Vital Statistics (n=1,434)**

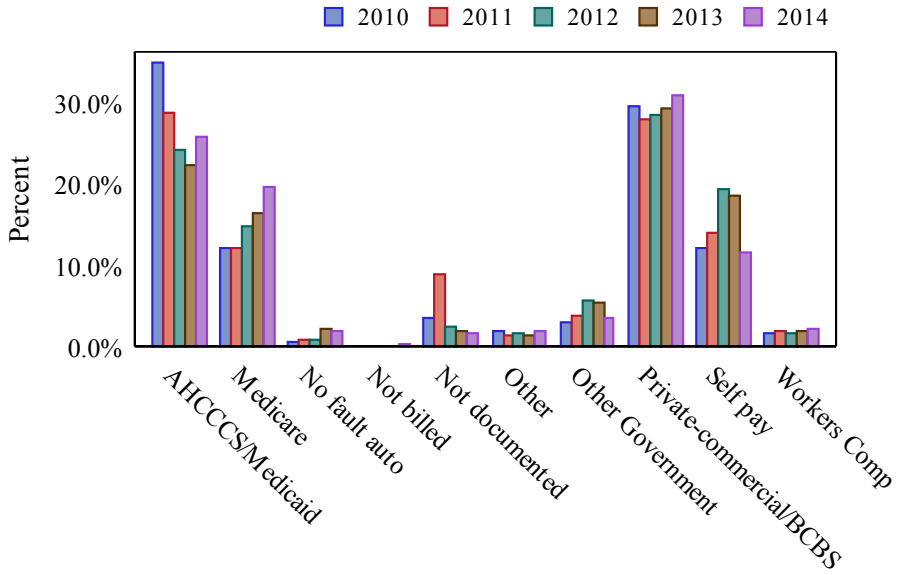



As reported by the Office of Vital records, 44.8 percent of out of hospital trauma deaths occurred at the Decedent's Residence.

Data source: Arizona Vital Statistic Registry 2014

# Trauma Charges

**Figure 11/Table 7: Primary payment source proportion**




Data source: Arizona State Trauma Registry 2010-2014

From 2013 to 2014, the Arizona Health Care Cost Containment System (AHCCCS) increased as a primary payer source, while Self-pay decreased as a primary payer source. The proportion of Medicare as a primary payer source has been increasing gradually since 2011.

| Primary payment source | 2010 | 2011 | 2012 | 2013 | 2014 |
|---|---|---|---|---|---|
| AHCCCS/Medicaid | 34.9% | 28.8% | 24.1% | 22.4% | 25.9% |
| Medicare | 12.1% | 12.0% | 14.8% | 16.5% | 19.7% |
| No fault auto | 0.5% | 0.8% | 0.8% | 2.1% | 1.9% |
| Not billed | 0.0% | 0.1% | 0.0% | 0.1% | 0.4% |
| Not documented | 3.4% | 8.9% | 2.6% | 1.8% | 1.6% |
| Other | 1.9% | 1.5% | 1.6% | 1.3% | 1.9% |
| Other Government | 3.1% | 3.8% | 5.6% | 5.5% | 3.6% |
| Private-commercial/BCBS | 29.6% | 27.9% | 28.6% | 29.3% | 30.8% |
| Self-pay | 12.1% | 14.0% | 19.5% | 18.4% | 11.6% |
| Workers Comp | 1.7% | 1.8% | 1.8% | 2.0% | 2.2% |

**Table 8: Primary payer, total trauma charges and total reimbursements, ASTR 2014**

| Primary payer | Total Charges* | Median Charges | Total Reimbursement** |
|---|---|---|---|
| AHCCCS/Medicaid | $446,697,480 | $20,916 | $42,762,446 |
| Medicare | $350,454,654 | $28,363 | $55,742,721 |
| No fault auto | $19,493,891 | $13,834 | $1,142,093 |
| Not billed | $3,478,815 | $14,305 | $95,683 |
| Not documented | $951,997 | $13,422 | $70,127 |
| Other | $31,146,429 | $20,353 | $2,639,546 |
| Other Government | $52,954,640 | $21,548 | $4,517,459 |
| Private-commercial/BCBS | $511,454,378 | $24,953 | $137,460,682 |
| Self pay | $149,570,611 | $22,610 | $2,661,835 |
| Workers Comp | $36,717,576 | $24,419 | $14,063,913 |
| *Total* | *$1,602,920,471* | *$23,497* | *$261,156,506* |

Trauma charges in Arizona totaled $1,602,920,471 in the year 2014. The median hospital charge for a trauma patient was $23,497. Medicare was billed the highest median trauma charges in the state ($28,363).

**Table 9: Age-specific trauma charges and reimbursements, ASTR 2014**

| Age | Total Charges | Median Charges | Total Reimbursement |
|---|---|---|---|
| <15 | $98,060,324 | $12,325 | $17,258,601 |
| 15-19 | $90,889,256 | $18,190 | $16,703,162 |
| 20-44 | $572,523,384 | $24,268 | $81,797,068 |
| 45-64 | $422,057,243 | $28,157 | $76,724,918 |
| 65+ | $419,390,265 | $29,843 | $68,672,757 |
| *Total* | *$1,602,920,471* | *$23,497* | *$261,156,506* |

Adult trauma patients 65 and older had the highest median trauma charges in 2014 ($29,843). Patients less than 15 years of age had the lowest median trauma charges ($12,325).

* Total charges is defined as the whole dollar amount for services provided during an episode of care in the hospital.
**Total reimbursement represents the amount reported at the time data were finalized.

**Table 10: Trauma charges and reimbursements by mechanism of injury, ASTR 2014**

| Mechanism | Total Charges | Median Charges | Total Reimbursement |
|---|---|---|---|
| MVT - Occupant | $631,862,262 | $25,126 | $96,396,754 |
| Falls | $519,003,385 | $24,576 | $92,610,490 |
| Other Transport | $100,005,194 | $21,378 | $18,548,774 |
| Struck by/Against | $92,075,840 | $18,422 | $13,029,785 |
| Firearm | $68,055,512 | $32,050 | $8,630,421 |
| Cut/Pierce | $54,775,767 | $22,973 | $7,321,843 |
| *Pedal Cyclist, Other | $31,540,737 | $21,556 | $6,850,749 |
| Not Specified | $29,232,721 | $23,837 | $3,588,468 |
| Other Specified | $20,025,059 | $17,157 | $3,526,282 |
| Natural/Environmental | $12,384,153 | $20,311 | $2,234,698 |
| Machinery | $9,330,306 | $23,160 | $3,294,588 |
| Fire/Burn | $8,714,051 | $5,914 | $1,019,340 |
| Not elsewhere classifiable | $7,923,855 | $17,405 | $1,229,900 |
| Other Pedestrian | $7,279,823 | $25,404 | $1,036,914 |
| Suffocation | $4,345,701 | $27,025 | $469,060 |
| Overexertion | $3,907,293 | $8,460 | $928,124 |
| Drowning | $1,672,946 | $19,970 | $262,377 |
| Poisoning | $500,141 | $15,794 | $99,150 |
| *Missing | $285,727 | $8,754 | $78,789 |
| *Total* | *$1,602,920,471* | *$23,497* | *$261,156,506* |

Trauma charges for Motor Vehicle Traffic accidents and Falls totaled $1,150,865,647 in 2014. Firearm related trauma had the highest median charges ($32,050) and Fire/Burn had the lowest median charges ($5,914).

* Pedal Cyclist, Other are non motor vehicle traffic related traumas.

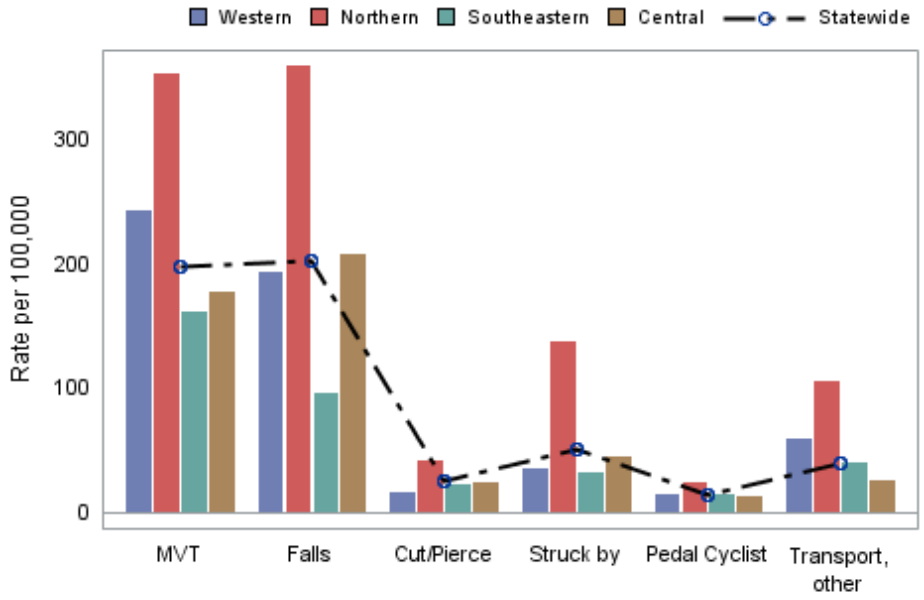
# Injury Characteristics: Mechanism of Injury

**Table 11: Trauma incidence and mortality proportion by mechanism of injury, ASTR 2014**

| Mechanism | Count | Percent | Deaths | Mortality Proportion |
|---|---|---|---|---|
| Falls | 13,541 | 34.39% | 232 | 1.71% |
| Motor Vehicle Traffic | 13,169 | 33.44% | 326 | 2.47% |
| Struck by/Against | 3,385 | 8.59% | 17 | 0.50% |
| Other Transport | 2,682 | 6.81% | 29 | 1.08% |
| Cut/Pierce | 1,678 | 4.26% | 25 | 1.48% |
| Pedal Cyclist, Other | 1,006 | 2.55% | 8 | 0.79% |
| Firearm | 990 | 2.51% | 171 | 17.27% |
| Other Specified | 649 | 1.64% | 5 | 0.77% |
| Unspecified | 581 | 1.47% | 24 | 4.13% |
| Natural/Environmental | 429 | 1.08% | 3 | 0.69% |
| Machinery | 289 | 0.73% | 1 | 0.34% |
| Not elsewhere classifiable | 254 | 0.64% | 2 | 0.78% |
| Fire/Burn | 237 | 0.60% | 2 | 0.84% |
| Overexertion | 161 | 0.40% | 0 | 0.00% |
| Pedestrian, Other | 158 | 0.40% | 2 | 1.26% |
| Suffocation | 96 | 0.24% | 18 | 18.75% |
| Drowning | 34 | 0.08% | 6 | 17.64% |
| Poisoning | 16 | 0.04% | 0 | 0.00% |
| Missing/NA/ND | 18 | 0.04% | 0 | 0.00% |

In 2014, the top six mechanisms of traumatic injury in Arizona were Falls, Motor Vehicle Traffic, Struck by/Against, Other Transport, Cut/Pierce and Other Pedal Cyclist. The mechanisms with the highest mortality proportions were Suffocation (18.8%), Drowning (17.6%) and Firearm (17.3%).

**Figure 12/Table 12: Trauma rates per 100,000 Arizona residents by region and top six mechanisms of injury**




In 2014, the Northern Region had the highest trauma rates for all top six mechanisms of traumatic injury.

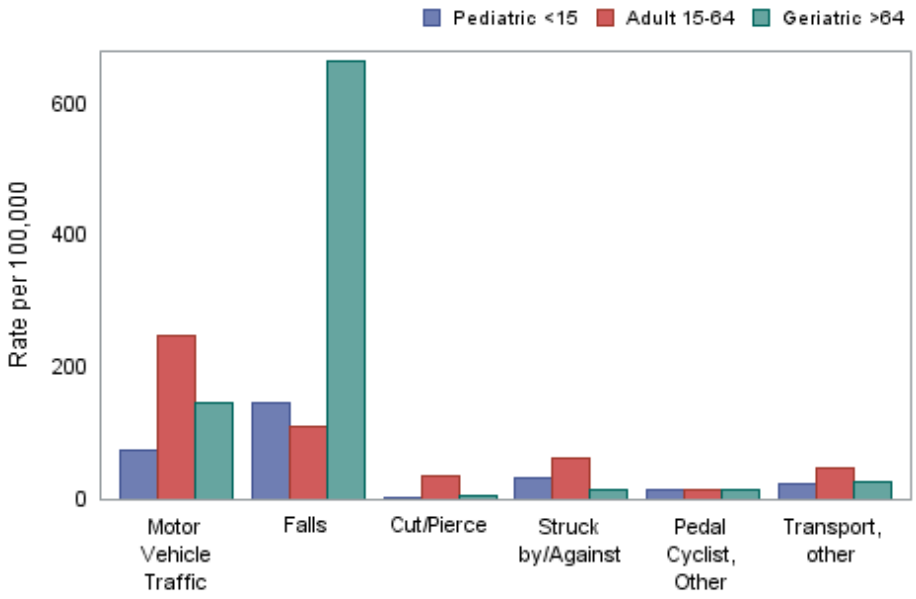
The Northern and Central regions reported Falls as the top mechanism while the Southeastern and Western regions reported Motor Vehicle Traffic as the top mechanism.

Data source: Arizona State Trauma Registry 2014, MVT=Motor vehicle traffic

| Region | Mechanisms | Total Trauma Cases | Rate per 100,000 (95%CI) |
|---|---|---|---|
| Central | MVT | 7,895 | 177 [173, 181] |
| | Falls | 9,249 | 207 [203, 212] |
| | Cut/Pierce | 1,067 | 24 [22, 25] |
| | Struck by/Against | 2,002 | 45 [43, 47] |
| | Pedal Cyclist, Other | 604 | 14 [12, 15] |
| | Other Transport | 1,165 | 26 [25, 28] |
| Northern | MVT | 1,889 | 353 [337, 368] |
| | Falls | 1,925 | 359 [343, 375] |
| | Cut/Pierce | 223 | 42 [36, 47] |
| | Struck by/Against | 739 | 138 [128, 148] |
| | Pedal Cyclist, Other | 133 | 25 [21, 29] |
| | Other Transport | 568 | 106 [97, 115] |
| Southeastern | MVT | 1,993 | 161 [154, 168] |
| | Falls | 1,180 | 96 [90, 101] |
| | Cut/Pierce | 286 | 23 [20, 26] |
| | Struck by/Against | 403 | 33 [29, 36] |
| | Pedal Cyclist, Other | 171 | 14 [12, 16] |
| | Other Transport | 490 | 40 [36, 43] |
| Western | MVT | 1,061 | 243 [228, 257] |
| | Falls | 845 | 193 [180, 206] |
| | Cut/Pierce | 71 | 16 [12, 20] |
| | Struck by/Against | 155 | 35 [30, 41] |
| | Pedal Cyclist, Other | 65 | 15 [11, 18] |
| | Other Transport | 260 | 59 [52, 67] |
| Statewide | MVT | 13,169 | 198 [194, 201] |
| | Falls | 13,541 | 203 [200, 207] |
| | Cut/Pierce | 1,678 | 25 [24, 26] |
| | Struck by/Against | 3,385 | 51 [49, 52] |
| | Pedal Cyclist, Other | 1,006 | 15 [14, 16] |
| | Other Transport | 2,682 | 40 [39, 42] |

***CI= Confidence interval***

**Figure 13/Table 13: Trauma rates per 100,000 Arizona residents by age and the top six mechanisms**



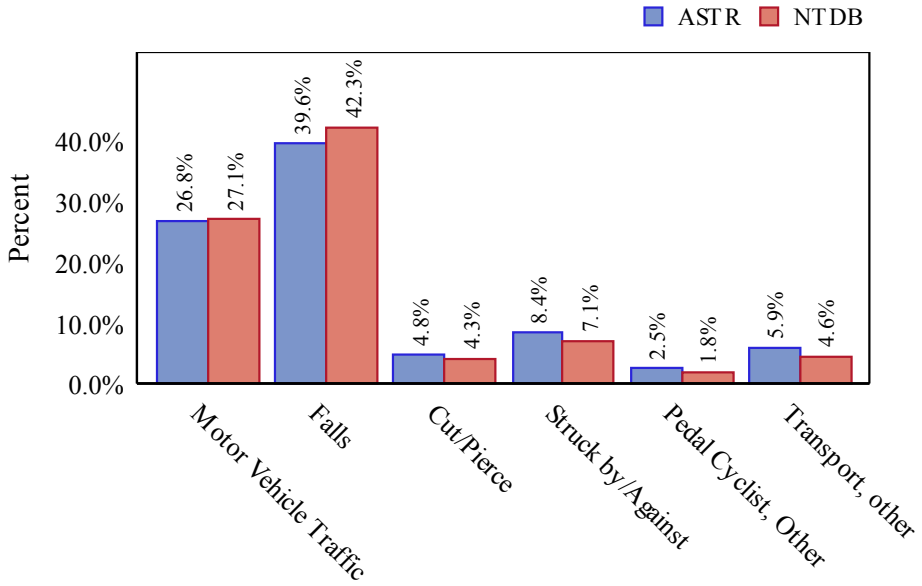

Data source: Arizona State Trauma Registry 2014, Arizona Vital Statistics 2014

In 2014, the top mechanism of injury among Pediatrics (<15) and Geriatrics (>64), was Falls. Among Adults (15-64) the top mechanism of injury was Motor Vehicle Traffic.

| Age | Mechanism | Total Trauma Cases | Rate per 100,000 (95%CI) |
|---|---|---|---|
| Adult 15-64 | Motor Vehicle Traffic | 10,654 | 249 [244, 253] |
| | Falls | 4,740 | 111 [107, 114] |
| | Struck by/Against | 2,772 | 65 [62, 67] |
| | Transport, other | 2,068 | 48 [46, 50] |
| | Cut/Pierce | 1,555 | 36 [34, 38] |
| | Pedal Cyclist, Other | 624 | 15 [13, 16] |
| Geriatric >64 | Falls | 6,813 | 665 [649, 680] |
| | Motor Vehicle Traffic | 1,494 | 146 [138, 153] |
| | Transport, other | 272 | 27 [23, 30] |
| | Struck by/Against | 161 | 16 [13, 18] |
| | Pedal Cyclist, Other | 161 | 16 [13, 18] |
| | Cut/Pierce | 67 | 7 [5, 8] |
| Pediatric <15 | Falls | 1,988 | 147 [140, 153] |
| | Motor Vehicle Traffic | 1,021 | 75 [71, 80] |
| | Struck by/Against | 452 | 33 [30, 36] |
| | Transport, other | 342 | 25 [23, 28] |
| | Pedal Cyclist, Other | 221 | 16 [14, 18] |
| | Cut/Pierce | 56 | 4 [3, 5] |

***CI= Confidence interval***

**Figure 14: Trauma proportion by Arizona's top six mechanisms of injury, ASTR vs. NTDB**

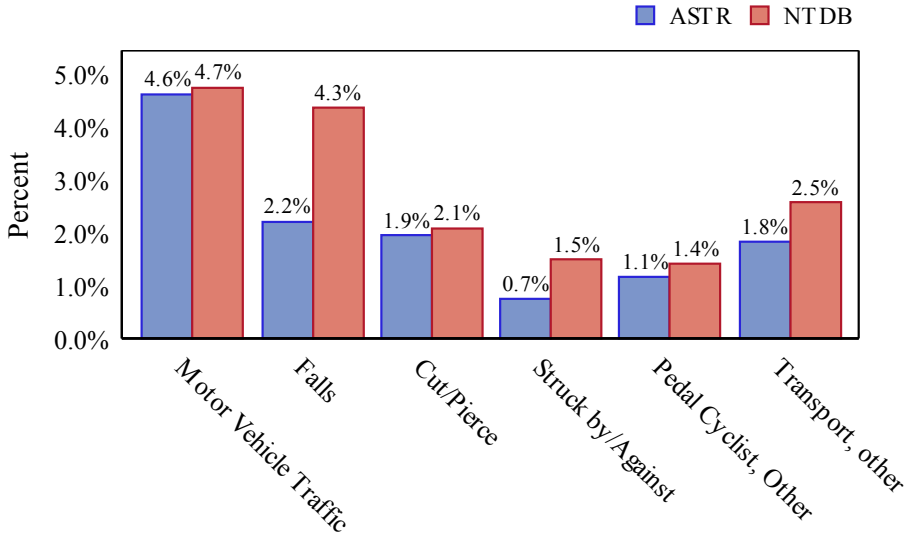



Data source: Arizona State Trauma Registry 2014, Natational Trauma Data Bank: 2013

Arizona had a higher proportion of Struck by/Against, Other Pedal Cyclist, and Other Transport traumas compared to national data.

Although Falls in Arizona appear lower than that of national data, it is important to note that inclusion criteria restrict the types of falls included in ASTR. As a result, Falls may be under-reported in ASTR as compared to NTDB.

**Figure 15: Mortality proportion by Arizona's top six mechanisms of injury, ASTR vs. NTDB**

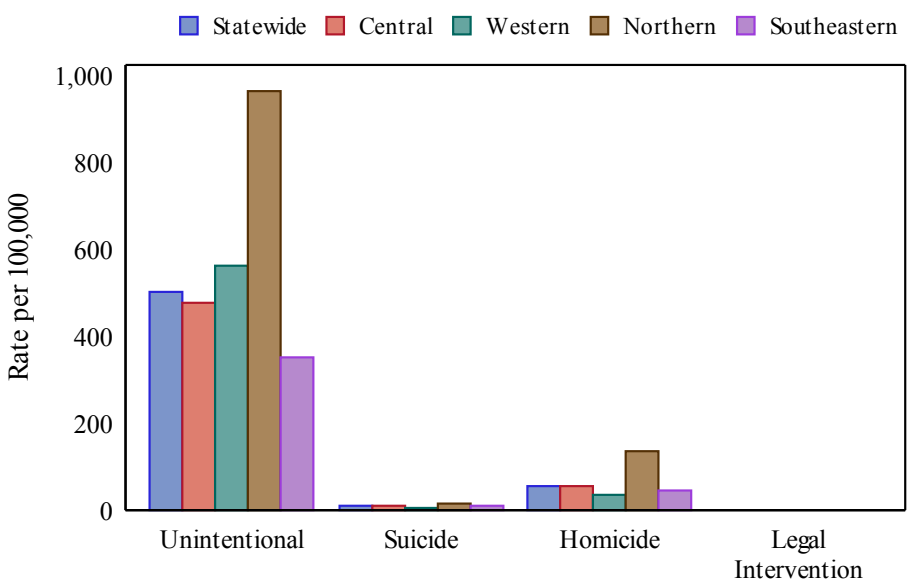



Data source: Arizona State Trauma Registry 2014, Natational Trauma DataBank: 2013

Compared to national trauma data, Arizona has a lower mortality proportion across all six top mechanisms of traumatic injury.

# Injury Characteristics: Intent of Injury

**Figure 16/Table 14: Regional trauma rates per 100,000 Arizona residents by intent**




Data source: Arizona State Trauma Registry 2014, Arizona Vital Statistics 2014

Statewide, in 2014, there were 10 Suicides, 58 Homicides and 500 Unintentional traumas per 100,000 Arizona residents.

| Region | Intent | Total Trauma Cases | Rate per 100,000 (95%CI) |
|---|---|---|---|
| Central | Unintentional | 21,370 | 479 [473, 486] |
| | Suicide | 426 | 10 [9, 10] |
| | Homicide | 2,395 | 54 [52, 56] |
| | Legal Intervention | 70 | 2 [1, 2] |
| Northern | Unintentional | 5,175 | 966 [940, 992] |
| | Suicide | 82 | 15 [12, 19] |
| | Homicide | 736 | 137 [127, 147] |
| | Legal Intervention | 17 | 3 [2, 5] |
| Southeastern | Unintentional | 4,346 | 352 [341, 362] |
| | Suicide | 138 | 11 [9, 13] |
| | Homicide | 595 | 48 [44, 52] |
| | Legal Intervention | 15 | 1 [1, 2] |
| Western | Unintentional | 2,454 | 561 [539, 583] |
| | Suicide | 26 | 6 [4, 8] |
| | Homicide | 150 | 34 [29, 40] |
| | Legal Intervention | 2 | 0 [-0, 1] |
| Statewide | Unintentional | 33,345 | 500 [495, 506] |
| | Suicide | 672 | 10 [9, 11] |
| | Homicide | 3,876 | 58 [56, 60] |
| | Legal Intervention | 104 | 2 [1, 2] |

***CI= Confidence interval***

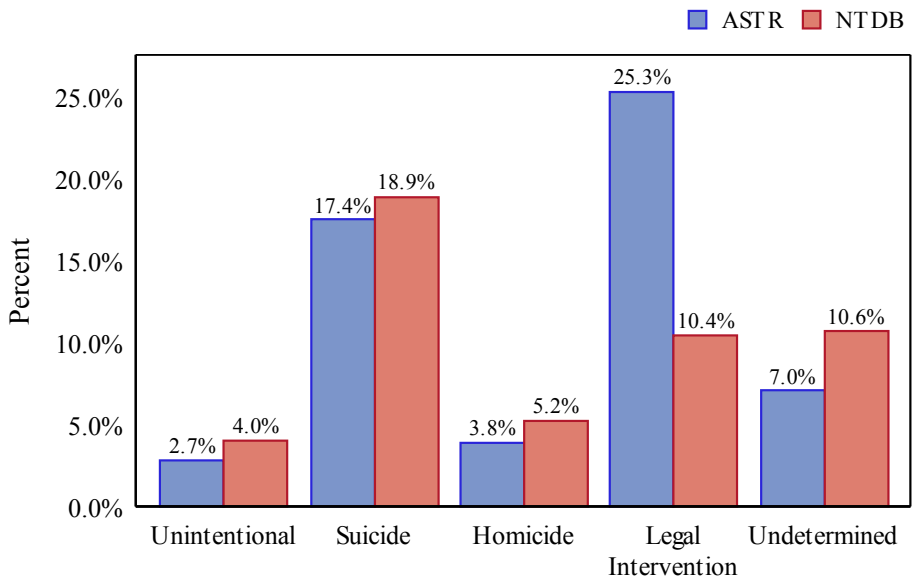
**Table 15: Trauma incidence by gender and intent, and mortality proportion by intent**

| Intent | Total Count | Percent | Male Count | Male % | Female Count | Female % | Deaths | Mortality Proportion |
|---|---|---|---|---|---|---|---|---|
| Unintentional | 34,384 | 87.32% | 19,816 | 83.24% | 14,567 | 93.57% | 628 | 1.82% |
| Homicide attempt | 3,952 | 10.03% | 3,235 | 13.58% | 717 | 4.60% | 109 | 2.75% |
| Suicide attempt | 677 | 1.71% | 485 | 2.03% | 192 | 1.23% | 98 | 14.47% |
| Undetermined | 237 | 0.60% | 163 | 0.68% | 74 | 0.47% | 15 | 6.32% |
| Legal intervention | 107 | 0.27% | 97 | 0.40% | 10 | 0.06% | 21 | 19.62% |
| Missing | 16 | 0.04% | 9 | 0.03% | 7 | 0.04% | 0 | 0.00% |

In 2014, Legal Interventions (19.6%) had the highest mortality proportion, followed by Suicides (14.5%).

Females had a larger proportion of Unintentional trauma, while males had a larger proportion of Homicide, Suicide and Legal Intervention.

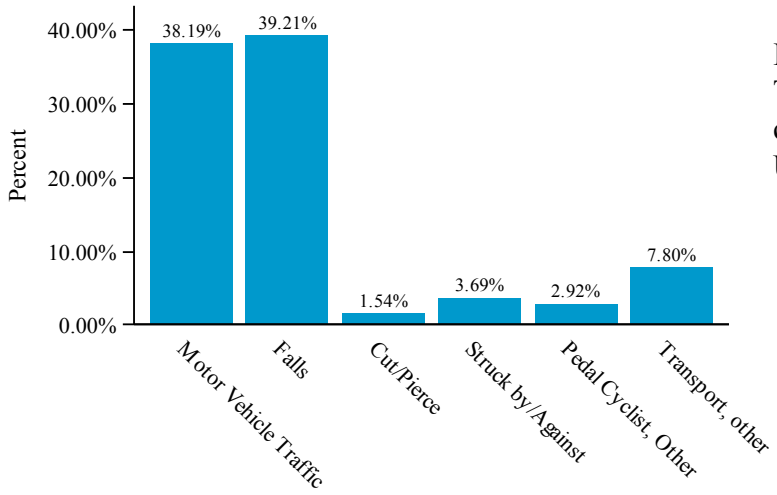
**Figure 17: Trauma mortality proportion by intent, ASTR vs. NTDB**




Data source: Arizona State Trauma Registry 2014, Natational Trauma Data Bank: 2013

The mortality proportion for Legal Intervention in Arizona was two times greater than that of national data. However, the mortality proportions among Unintentional traumas, Suicides and Homicides were lower than national data.

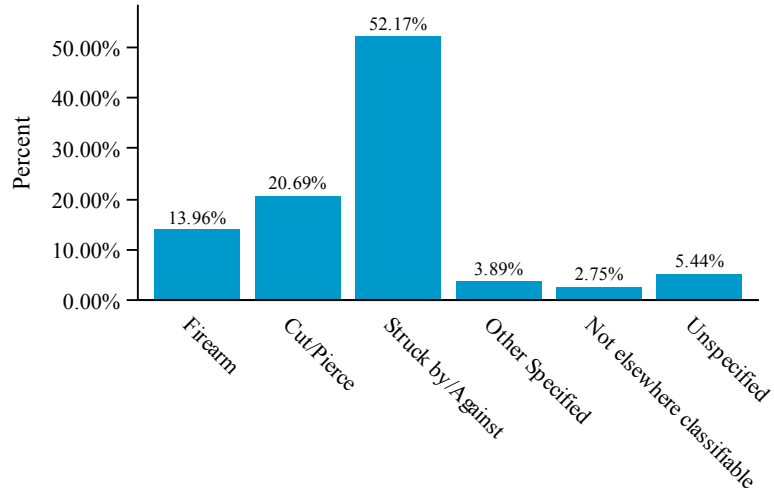
**Figure 18: Top six mechanisms of Unintentional trauma (n=34,384)**




In 2014, Falls and Motor Vehicle Traffic were the two most common mechanisms of Unintentional trauma in Arizona.

Data source: Arizona State Trauma Registry 2014

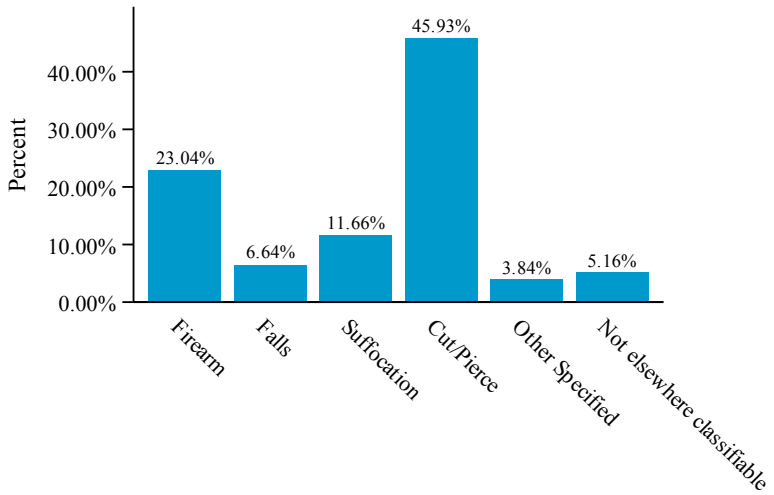
**Figure 19: Top six mechanisms of Homicide/Assault related trauma (n=3,952)**




Struck by/Against, Cut/Pierce and Firearm were the top mechanisms of Homicide/Assault related trauma in Arizona.

Data source: Arizona State Trauma Registry 2014

**Figure 20: The top six mechanisms of Suicide/Self-inflicted trauma (n=677)**




Cut/Pierce, Firearm and Suffocation were the top mechanisms of Suicide/Self-inflicted trauma in Arizona.

Data source: Arizona State Trauma Registry 2014

# Injury Characteristics: Injury Severity

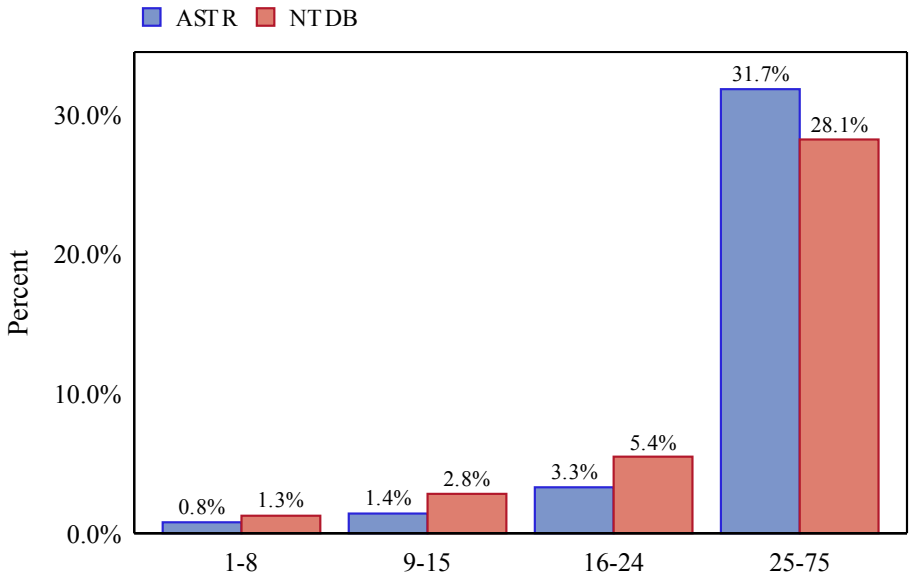
**Table 16: Trauma incidence and mortality proportion by Injury Severity Score, ASTR 2014**

| Injury Severity Score | Count | Percent | Deaths | Mortality Proportion |
|---|---|---|---|---|
| 1-8 | 24,921 | 63.29% | 113 | 0.45% |
| 9-15 | 8,758 | 22.24% | 120 | 1.37% |
| 16-24 | 2,808 | 7.13% | 94 | 3.34% |
| 25-75 | 1,633 | 4.14% | 517 | 31.65% |
| *Missing/NA/ND | 1,253 | 3.18% | 27 | 2.15% |

Injury Severity Score (ISS) is an anatomical scoring system that provides an overall score for patients with multiple injuries. The ISS takes values from 1 to 75:
1-8 = Minor
9-15 = Moderate
16-24 = Serious
25-75 = Severe

In 2014, the majority of trauma patients had an ISS between 1 and 8. The most seriously injured patients experienced the highest mortality.

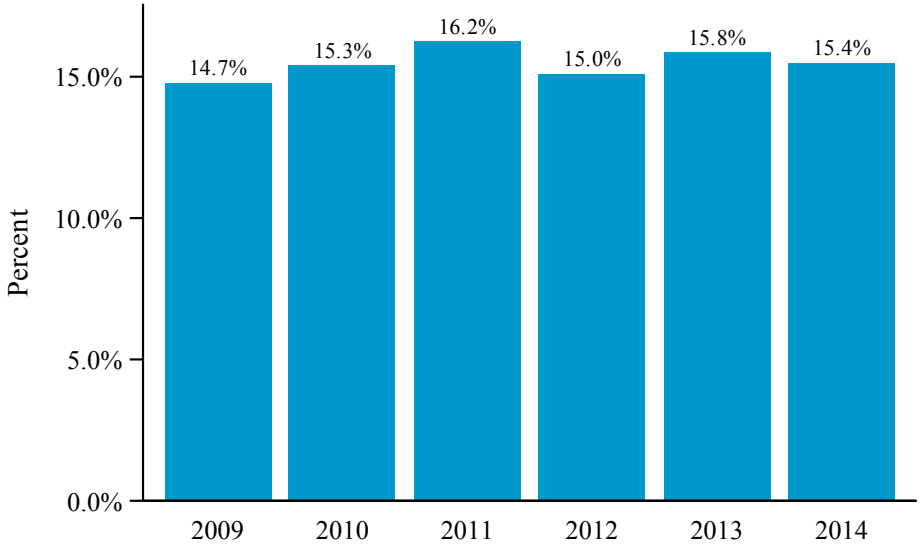
**Figure 21: Trauma mortality proportion by Injury Severity Score, ASTR vs. NTDB**




Data source: Arizona State Trauma Registry 2014, Natational Trauma Data Bank: 2013

Compared to national trauma data, Arizona had a higher mortality proportion for patients with an ISS of 25 or greater. However, Arizona patients with an ISS less than 25 had a lower mortality proportion.

**Figure 22: Overall mortality proportion at Level I Trauma Centers among patients with an ISS > 15, 2009-2014**

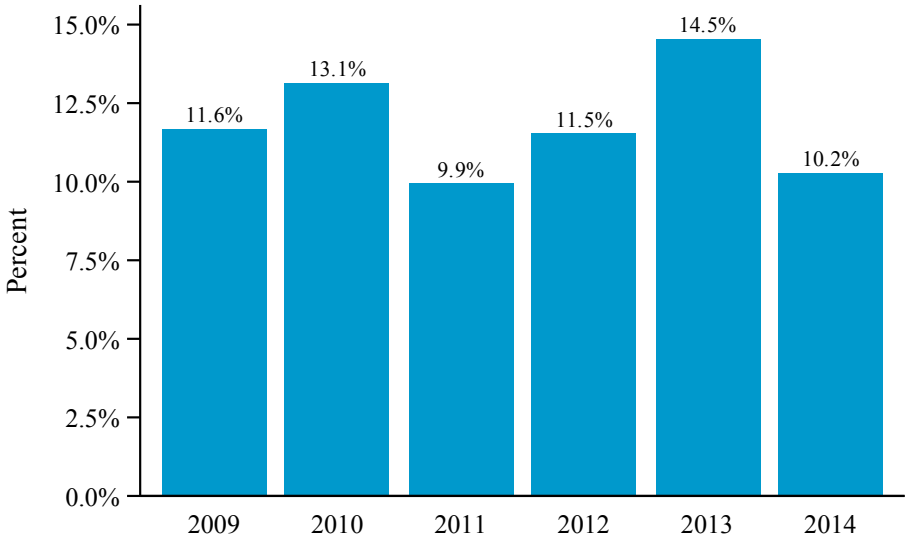



Data source: Arizona State Trauma Registry 2009-2014

The mortality proportion for Level 1 trauma centers among patients with an ISS greater than 15 has been relatively constant from 2009 to 2014. Comparing severely injured patients over time may allow for more insight into the progress and evolution of the trauma system.

Peds

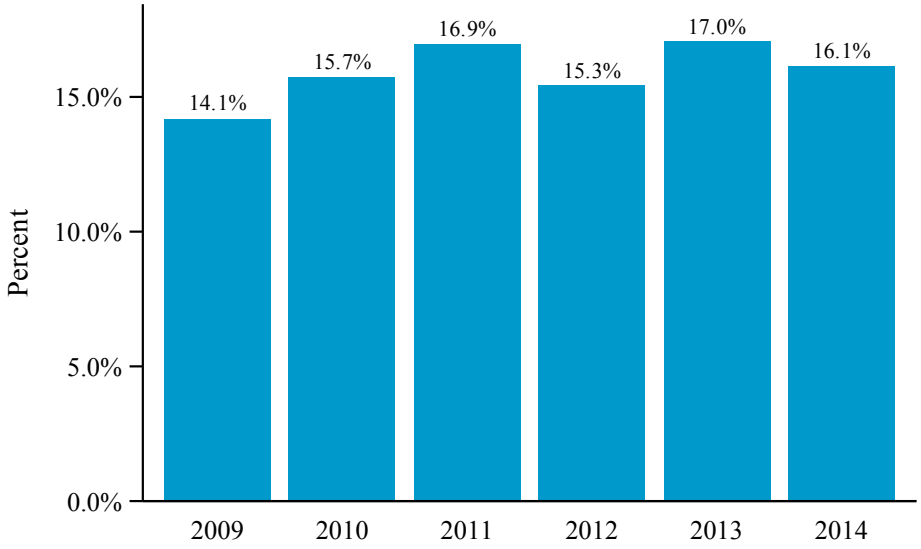
**Figure 23: Pediatric (≤ 14) mortality proportion at Level I Trauma Centers among patients with an ISS > 15, 2009-2014**




Data source: Arizona State Trauma Registry 2009-2014

The Pediatric mortality proportion for Level 1 trauma centers among patients with an ISS greater than 15 has fluctuated over the past six years with a decreased of 4.3 percent from 2013 to 2014.

**Figure 24: Adult (15-64) mortality proportion at Level I Trauma Centers among patients with an ISS > 15, 2009-2014**

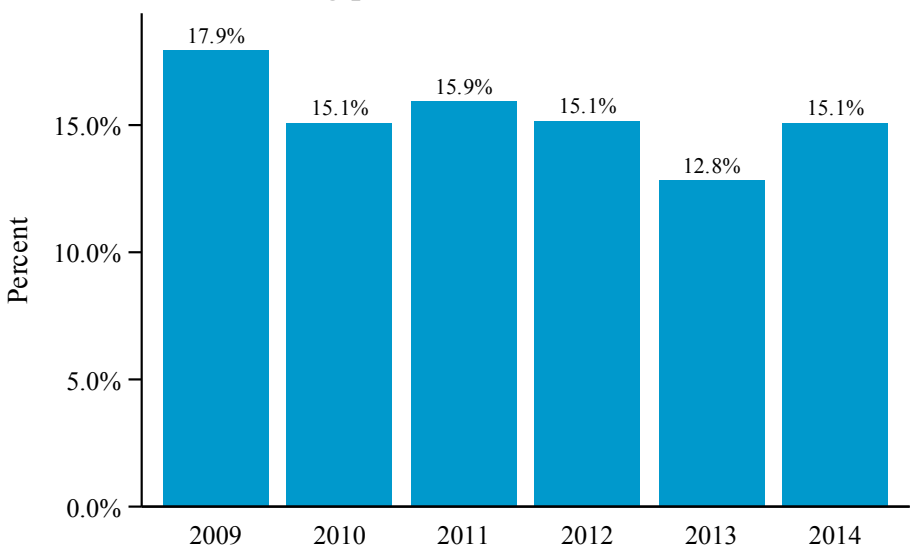



Data source: Arizona State Trauma Registry 2009-2014

The Adult mortality proportion for Level 1 trauma centers among patients with an ISS greater than 15 has been relatively constant over the past six years, with a slight decrease between 2013 and 2014.

Ger

**Figure 25: Geriatric (65+) mortality proportion at Level I Trauma Centers among patients with an ISS > 15, 2009-2014**

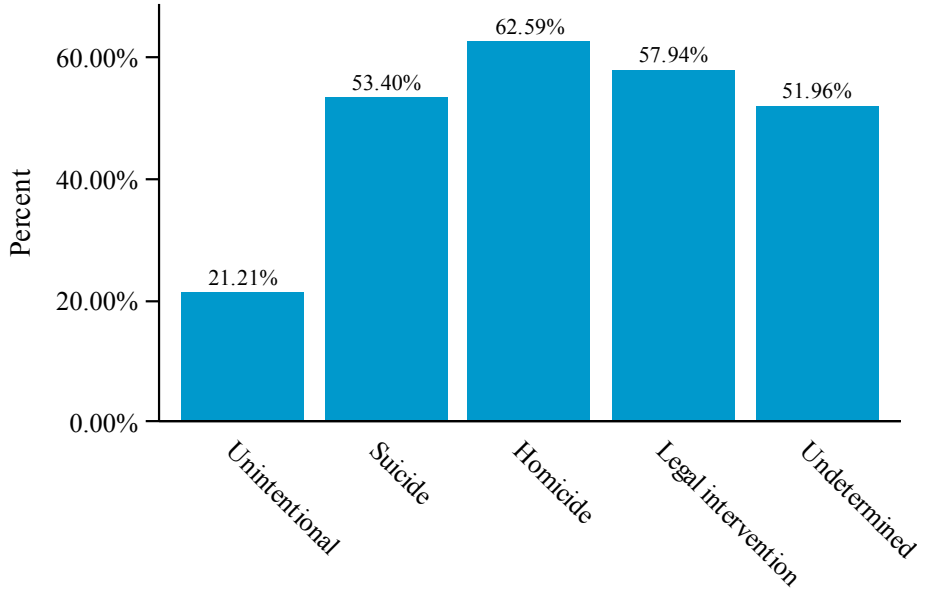



Data source: Arizona State Trauma Registry 2009-2014

The Geriatric mortality proportion for Level 1 trauma centers among patients with an ISS greater than 15 increased from 12.8 percent in 2013, back up to 15.1 percent in 2014.

# Risk Factors: Drug/Alcohol Use

**Figure 26/Table 17: Drug/Alcohol* related trauma by intent**



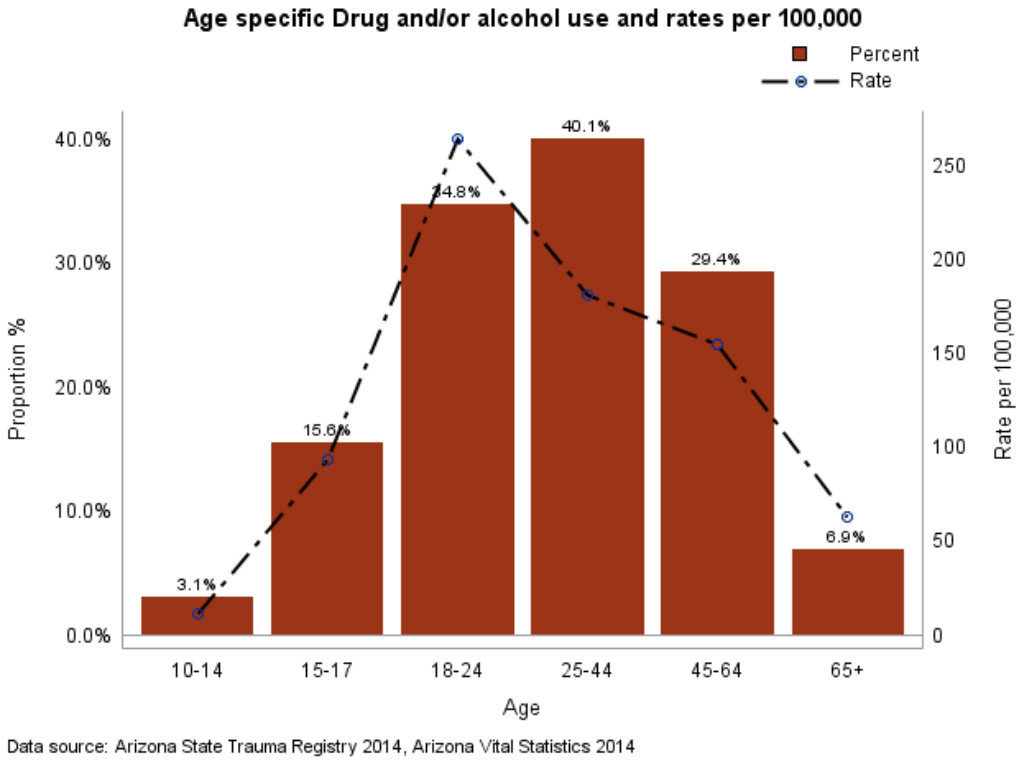

Data source: Arizona State Trauma Registry 2014

Of the 34,589 adult trauma cases in 2014, 26.6 percent involved drug/alcohol use. More than half of Homicides, Legal Interventions, Suicides and Undetermined traumas involved the use of drugs and/or alcohol.

| Injury Intent | Trauma Cases | Percent | Drug/Alcohol Use | Percent Drug/ Alcohol Use |
|---|---|---|---|---|
| Unintentional | 29,878 | 86.38% | 6,338 | 21.21% |
| Homicide | 3,826 | 11.06% | 2,395 | 62.59% |
| Suicide | 661 | 1.91% | 353 | 53.40% |
| Legal intervention | 107 | 0.30% | 62 | 57.94% |
| Undetermined | 102 | 0.29% | 53 | 51.96% |
| Missing | 15 | 0.04% | 1 | 6.66% |

*Drug/alcohol use includes patients who were confirmed, suspected, or reported to have taken either substance.

**Figure 27/Table 18: Drug/Alcohol* related trauma proportion and rates per 100,000 Arizona residents by age**




In 2014, 25 to 44 year olds had the highest proportion of drug/alcohol related trauma (40.1%).

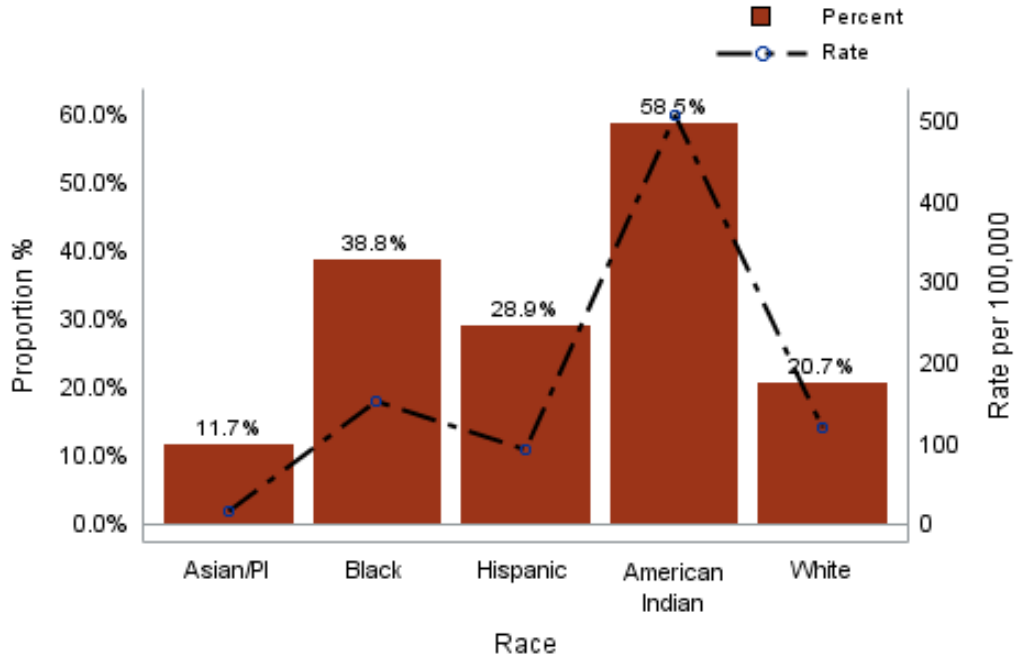
Following standardization by population, the highest rate of drug/alcohol related trauma was in 18 to 24 year olds (264 per 100,000) .

| Age | Drug/Alcohol Use | Rate per 100,000 (95%CI) |
|---|---|---|
| 10-14 | 51 | 11 [8, 14] |
| 15-17 | 255 | 94 [83, 106] |
| 18-24 | 1,773 | 264 [252, 277] |
| 25-44 | 4,005 | 181 [176, 187] |
| 45-64 | 2,522 | 155 [149, 161] |
| 65+ | 647 | 63 [58, 68] |

***CI= Confidence interval***

*Drug/alcohol use includes patients who were confirmed, suspected, or reported to have taken either substance.

**Figure 28/Table 19: Drug/Alcohol* related trauma, proportion and rates per 100,000 Arizona residents by race/ethnicity**




Data source: Arizona State Trauma Registry 2014, Arizona Vital Statistics 2014

In 2014, American Indian/Alaska Natives had the highest proportion (58.5%) and rate (509 per 100,000) of alcohol/drug related trauma in Arizona.

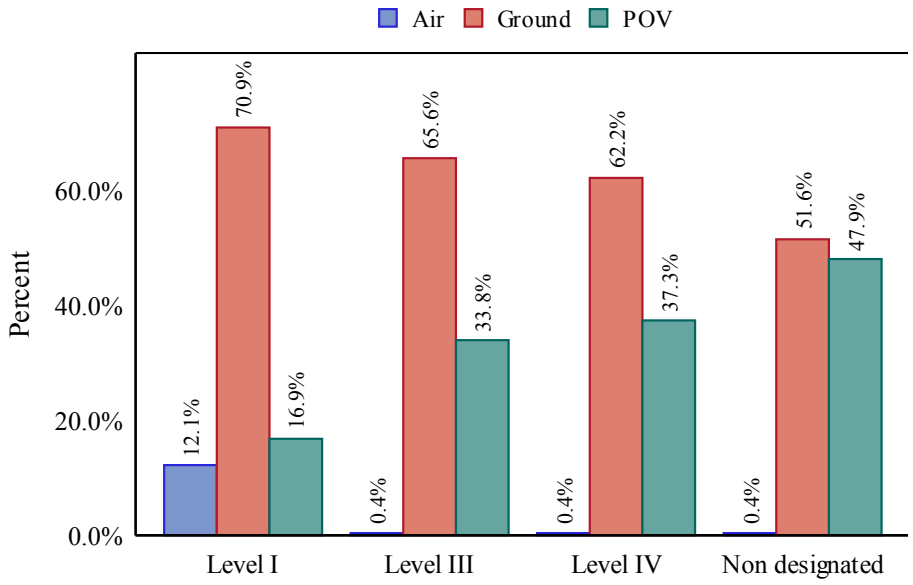
| Race/ethnicity | Drug/Alcohol Use | Rate per 100,000 (95%CI) |
|---|---|---|
| Asian/PI | 46 | 18 [13, 23] |
| Black | 539 | 154 [141, 167] |
| Hispanic | 1,729 | 94 [89, 98] |
| American Indian | 1,933 | 509 [487, 532] |
| White | 4,661 | 121 [118, 125] |

***CI= Confidence interval, PI=Pacific Islander***

*Drug/alcohol use includes patients who were confirmed, suspected, or reported to have taken either substance.

# Risk Factors: Type of Transport

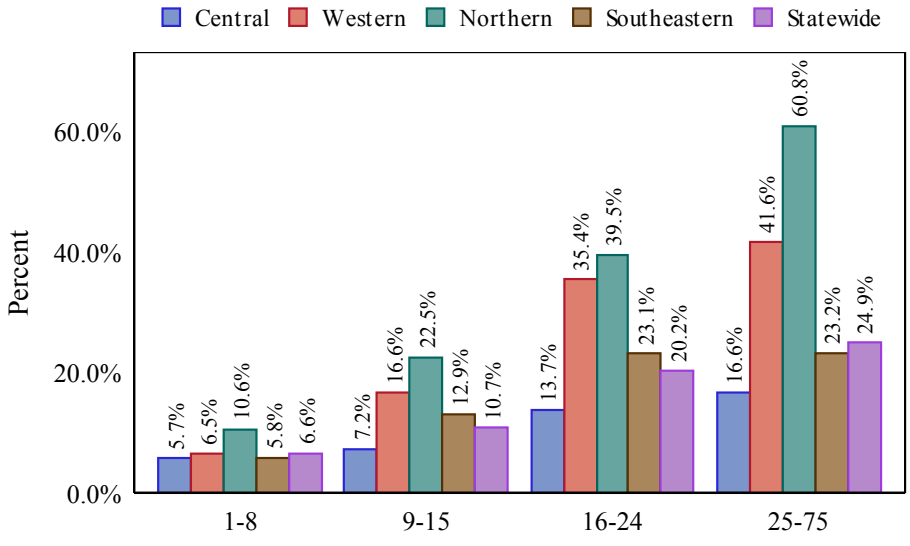
**Figure 29: Mode of transport into reporting hospital by trauma center level (n =33,239)**




Data source: Arizona State Trauma Registry 2014
POV = Privately Owned Vehicle

In 2014, the majority of trauma patients in Arizona were transported to the hospital by ground ambulance regardless of trauma center level. Non-designated hospitals had the largest proportion of Privately Owned Vehicle (POV) transports, while Level I trauma centers had the largest proportion of Air ambulance transports.

**Figure 30: Patients arriving at hospital via EMS air ambulance by region and ISS (n =33,239)**




Data source: Arizona State Trauma Registry 2014

Overall, injury severity was positively correlated with arrival to the hospital via EMS air ambulance.

# Risk Factors: Golden Hour

After the first hour following traumatic injury, often called the "golden hour," a patient's chance of survival begins to decrease dramatically. Care received within this critical time-frame leads to fewer complications and better outcomes for trauma patients.

In 2014, golden hour could not be calculated for 29.5 percent (8,998) of trauma patients due to missing data on injury date/time. These cases were excluded from analysis. Patients transported to non-designated trauma centers and inter-facility transfer patients were also excluded from this analysis.

**Table 20: Proportion of trauma patients arriving within the golden hour by county of injury, ASTR 2014**

| County of Injury | Total Patients Analyzed | ≤ 1 hour | | Patients excluded due to missing data | |
|---|---|---|---|---|---|
| | N | N | % | N | % |
| Apache | 576 | 239 | 41.40% | 241 | 29.40% |
| Cochise | 386 | 160 | 41.40% | 146 | 27.40% |
| Coconino | 1,533 | 764 | 49.80% | 260 | 14.50% |
| Gila | 384 | 75 | 19.50% | 370 | 49.00% |
| Graham | 329 | 182 | 55.30% | 28 | 7.80% |
| Greenlee | 45 | 1 | 2.20% | 2 | 4.20% |
| La Paz | 109 | 37 | 33.90% | 38 | 25.80% |
| Maricopa | 10,934 | 6,959 | 63.60% | 6,603 | 37.60% |
| Mohave | 931 | 374 | 40.10% | 197 | 17.40% |
| Navajo | 709 | 284 | 40.00% | 72 | 9.20% |
| Pima | 2,859 | 1,692 | 59.10% | 456 | 13.70% |
| Pinal | 1,226 | 487 | 39.70% | 392 | 24.20% |
| Santa Cruz | 91 | 10 | 10.90% | 10 | 9.90% |
| Yavapai | 1,290 | 449 | 34.80% | 169 | 11.50% |
| Yuma | 20 | 0 | 0 | 14 | 41.10% |
| Statewide | 21,422 | 11,713 | 54.6% | 8,998 | 29.5% |

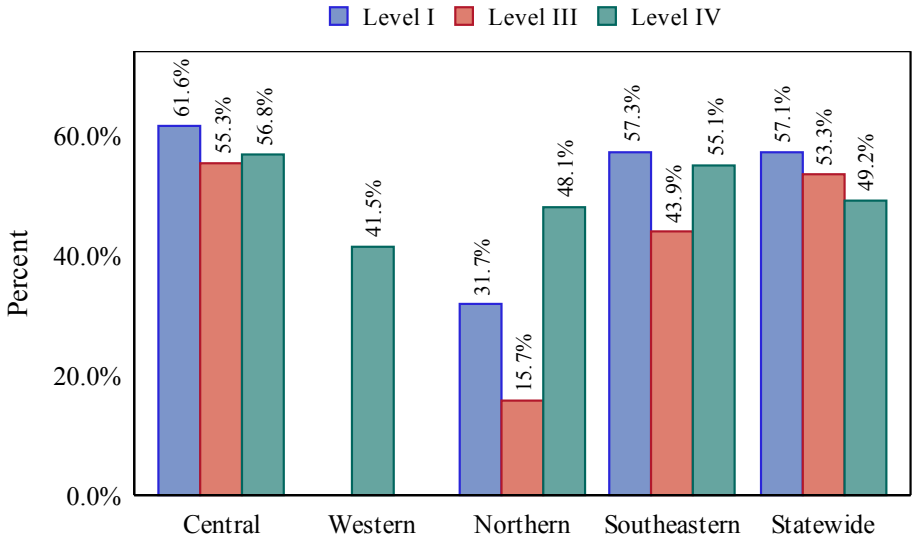
In 2014, at least half of all traumas occurring in urban counties—Maricopa, Pima and Coconino—were transported to the hospital within the golden hour. In rural Arizona, Graham County had the highest proportion of trauma patients transported within the golden hour (55.3%), followed by Cochise and Apache Counties (41.4%).

**Table 21: Proportion of trauma patients arriving within the golden hour by region, ASTR 2014**

| Region | Total | ≤ 1 hour | | 25th Percentile (hours) | Median (hours) | 75th Percentile (hours) | Patients excluded due to missing data | |
|---|---|---|---|---|---|---|---|---|
| | N | N | % | | | | N | % |
| Western | 1,060 | 411 | 38.7% | 0.7 | 1.3 | 2.1 | 249 | 19.0% |
| Southeastern | 3,710 | 2,045 | 55.1% | 0.7 | 0.9 | 1.4 | 642 | 14.7% |
| Northern | 4,108 | 1,736 | 42.2% | 0.7 | 1.2 | 2.0 | 742 | 15.2% |
| Central | 12,544 | 7,521 | 59.9% | 0.7 | 0.9 | 1.4 | 7,365 | 36.9% |
| Statewide | 21,422 | 11,713 | 54.6% | 0.7 | 1.0 | 1.6 | 8,998 | 29.5% |

The proportion of trauma patients transported within the golden hour was highest in the Central Region (59.9%) and lowest in the Western Region (38.7%).

**Figure 31/Table 22: Proportion of trauma patients arriving within the golden hour by level of designation and region**



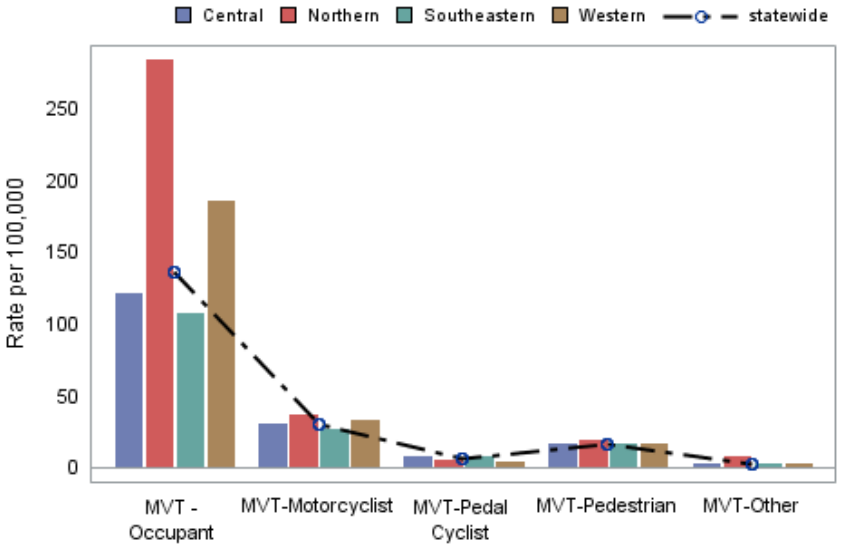

Data source: Arizona State Trauma Registry 2014

In the Central and Southeastern regions, the proportion of trauma patients transferred within the golden hour was highest for Level I trauma centers. In the Western and Northern regions the proportion was highest for Level IV trauma centers. Level IV trauma centers are primarily located in rural counties.

| Region | Level IV | | Level I | | Level III | |
|---|---|---|---|---|---|---|
| | N | % | N | % | N | % |
| Central | 497 | 56.8% | 5,544 | 61.6% | 1,480 | 55.3% |
| Northern | 1,277 | 48.1% | 456 | 31.7% | 3 | 15.7% |
| Southeastern | 351 | 55.1% | 1,472 | 57.3% | 222 | 43.9% |
| Western | 411 | 41.5% | 0 | 0 | 0 | 0 |
| Statewide | 2,536 | 49.2% | 7,472 | 57.1% | 1,705 | 53.3% |

# Motor Vehicle Traffic Related Trauma

**Figure 32/Table 23: Trauma related to Motor Vehicle Traffic rates per 100,000 Arizona residents by region**




Data source: Arizona State Trauma Registry 2014

In 2014, the Northern Region had the highest rates of trauma related to Motor Vehicle Traffic across all mechanisms except Pedal Cyclist, which was highest in the Southeastern Region.

| Region | Mechanisms | Total Trauma Cases | Rate per 100,000 (95%CI) |
|---|---|---|---|
| Central | Occupant | 5,406 | 121 [118, 124] |
| | Motorcyclist | 1,353 | 30 [29, 32] |
| | Pedal Cyclist | 322 | 7 [6, 8] |
| | Pedestrian | 715 | 16 [15, 17] |
| | Other | 99 | 2 [2, 3] |
| Northern | Occupant | 1,523 | 284 [270, 299] |
| | Motorcyclist | 194 | 36 [31, 41] |
| | Pedal Cyclist | 29 | 5 [3, 7] |
| | Pedestrian | 104 | 19 [16, 23] |
| | Other | 39 | 7 [5, 10] |
| Southeastern | Occupant | 1,320 | 107 [101, 113] |
| | Motorcyclist | 328 | 27 [24, 29] |
| | Pedal Cyclist | 99 | 8 [6, 10] |
| | Pedestrian | 212 | 17 [15, 19] |
| | Other | 34 | 3 [2, 4] |
| Western | Occupant | 810 | 185 [173, 198] |
| | Motorcyclist | 144 | 33 [28, 38] |
| | Pedal Cyclist | 20 | 5 [3, 7] |
| | Pedestrian | 74 | 17 [13, 21] |
| | Other | 13 | 3 [1, 5] |
| Statewide | Occupant | 9,059 | 136 [133, 139] |
| | Motorcyclist | 2,019 | 30 [29, 32] |
| | Pedal Cyclist | 470 | 7 [6, 8] |
| | Pedestrian | 1,105 | 17 [16, 18] |
| | Other | 185 | 3 [2, 3] |

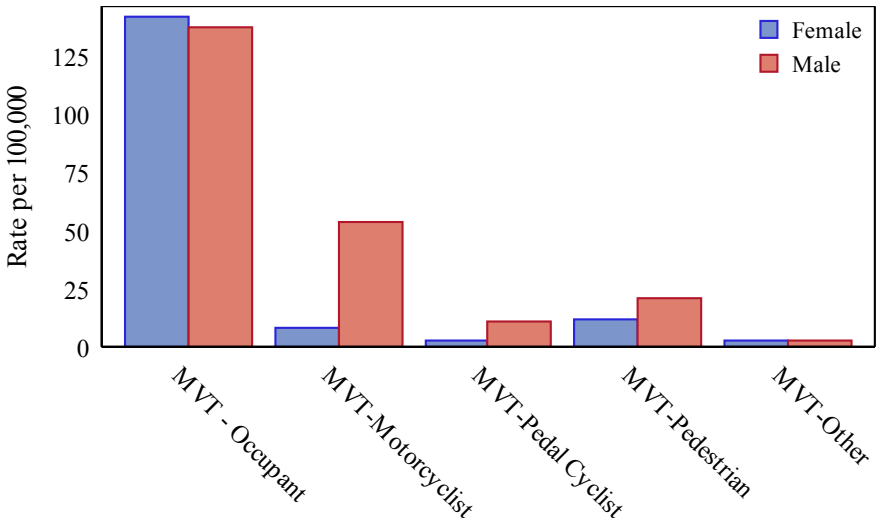
***CI= Confidence interval***

**Table 24: Trauma related to Motor Vehicle Traffic incidence and mortality proportion, ASTR 2014**

| Motor vehicle traffic crashes | Count | Percent | Deaths | Mortality Proportion |
|---|---|---|---|---|
| Occupant | 9,302 | 70.63% | 142 | 1.52% |
| Motorcyclist | 2,068 | 15.70% | 66 | 3.19% |
| Pedestrian | 1,119 | 8.49% | 90 | 8.04% |
| Pedal Cyclist | 480 | 3.64% | 19 | 3.95% |
| Other | 200 | 1.51% | 9 | 4.50% |

Of the 39,373 trauma cases, 34% (13,377) were related to Motor Vehicle Traffic. The majority of these trauma cases (70.6%) were Motor Vehicle Traffic-Occupant. However, the highest mortality proportion was reported for Motor Vehicle Traffic-Pedestrian trauma (8.04%).

**Figure 33/Table 25: Motor vehicle traffic related trauma rates per 100,000 Arizona residents by gender**



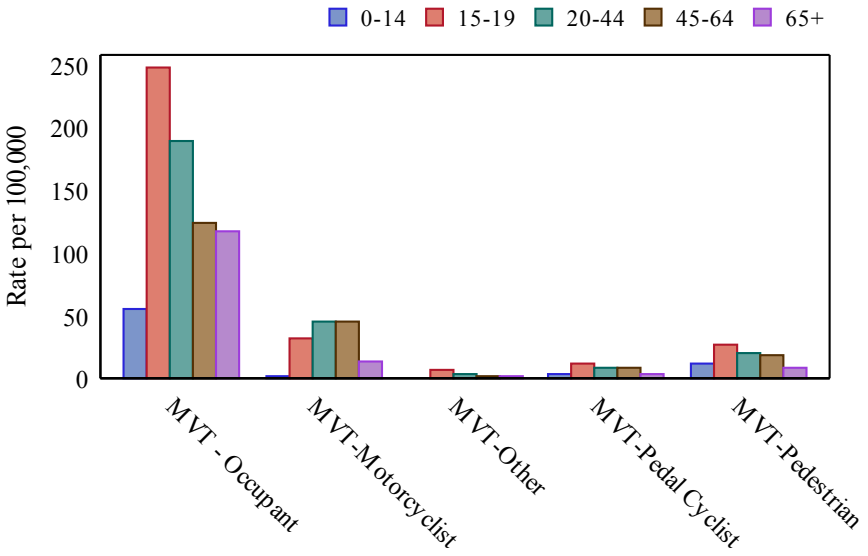

In 2014, Males and Females had a similar rate of Motor Vehicle Traffic-Occupant trauma. Males had higher rates than females for Motor Vehicle-Motorcyclist, Pedal Cyclist and Pedestrian traumas.

Data source: Arizona State Trauma Registry 2014

| Gender | Mechanisms | Total Trauma Cases | Rate per 100,000 (95% CI) |
|---|---|---|---|
| Female | Occupant | 4,756 | 142 [138, 146] |
| | Motorcyclist | 287 | 9 [8, 10] |
| | Pedal Cyclist | 104 | 3 [3, 4] |
| | Pedestrian | 410 | 12 [11, 13] |
| | Other | 87 | 3 [2, 3] |
| Male | Occupant | 4,545 | 137 [133, 141] |
| | Motorcyclist | 1,781 | 54 [51, 56] |
| | Pedal Cyclist | 376 | 11 [10, 12] |
| | Pedestrian | 709 | 21 [20, 23] |
| | Other | 113 | 3 [3, 4] |

***CI= Confidence interval***

**Figure 34/Table 26: Motor vehicle traffic related trauma rates per 100,000 Arizona residents by age**



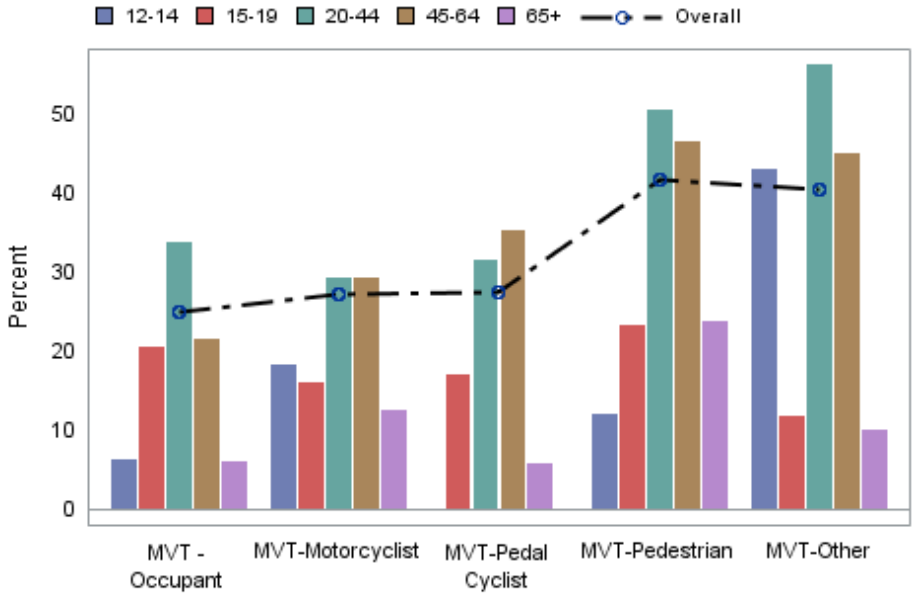

Data source: Arizona State Trauma Registry 2014

In 2014, 15 to 19 year olds had the highest rates of Motor Vehicle Traffic-Occupant, Pedal Cyclist and Pedestrian traumas.

| Age | Mechanisms | Total Trauma Cases | Rate per 100,000 (95%CI) |
|---|---|---|---|
| 0-14 | Occupant | 758 | 56 [52, 60] |
| | Motorcyclist | 25 | 2 [1, 3] |
| | Other | 17 | 1 [1, 2] |
| | Pedal Cyclist | 54 | 4 [3, 5] |
| | Pedestrian | 167 | 12 [10, 14] |
| 15-19 | Occupant | 1,123 | 248 [233, 262] |
| | Motorcyclist | 143 | 32 [26, 37] |
| | Other | 34 | 7 [5, 10] |
| | Pedal Cyclist | 59 | 13 [10, 16] |
| | Pedestrian | 121 | 27 [22, 31] |
| 20-44 | Occupant | 4,204 | 190 [184, 196] |
| | Motorcyclist | 1,022 | 46 [43, 49] |
| | Other | 89 | 4 [3, 5] |
| | Pedal Cyclist | 185 | 8 [7, 10] |
| | Pedestrian | 439 | 20 [18, 22] |
| 45-64 | Occupant | 2,018 | 124 [119, 130] |
| | Motorcyclist | 734 | 45 [42, 48] |
| | Other | 40 | 2 [2, 3] |
| | Pedal Cyclist | 148 | 9 [8, 11] |
| | Pedestrian | 295 | 18 [16, 20] |
| 65+ | Occupant | 1,199 | 117 [110, 124] |
| | Motorcyclist | 144 | 14 [12, 16] |
| | Other | 20 | 2 [1, 3] |
| | Pedal Cyclist | 34 | 3 [2, 4] |
| | Pedestrian | 97 | 9 [8, 11] |

***CI= Confidence interval***

**Figure 35/Table 27: Drug/Alcohol use* by type of Motor Vehicle Traffic collision**




Data source: Arizona State Trauma Registry 2014

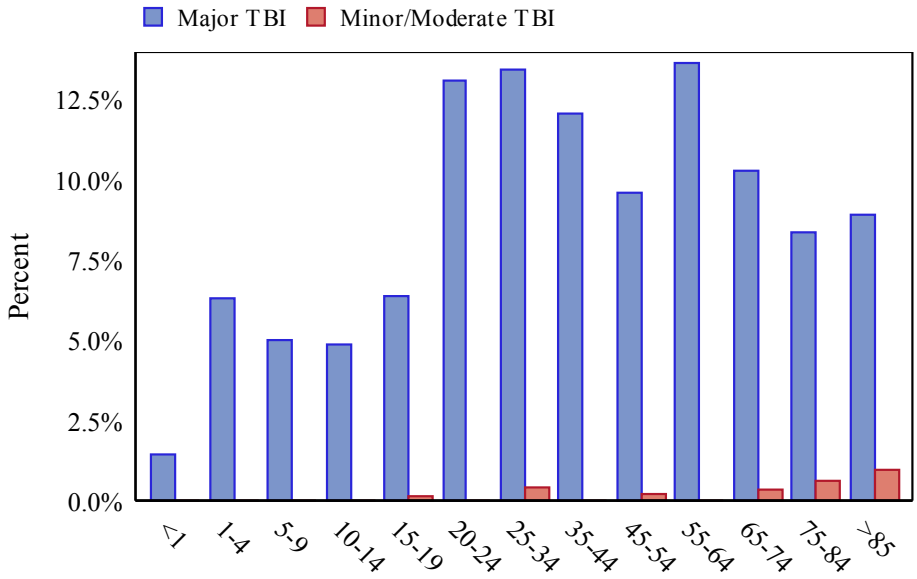
In 2014, patients over the age of 12 had drug/alcohol involvement in 24.8 percent of traumas related to Motor Vehicle Traffic-Occupant. The highest proportion of drug/alcohol use was reported among the 20 to 44 and 45 to 64 age groups.

| Age groups | Occupant | | Motorcyclist | | Pedal Cyclist | | Pedestrian | | Other | |
|---|---|---|---|---|---|---|---|---|---|---|
| | N | % | N | % | N | % | N | % | N | % |
| Overall | 2,169 | 24.8% | 557 | 27.1 | 122 | 27.3% | 414 | 41.6 | 77 | 40.5% |
| 12-14 | 11 | 6.1% | 2 | 18.1 | 0 | 0 | 5 | 11.9 | 3 | 42.8% |
| 15-19 | 230 | 20.4% | 23 | 16.0 | 10 | 16.9% | 28 | 23.1 | 4 | 11.7% |
| 20-44 | 1,419 | 33.7% | 299 | 29.2 | 58 | 31.3% | 221 | 50.3 | 50 | 56.1% |
| 45-64 | 436 | 21.6% | 215 | 29.2 | 52 | 35.1% | 137 | 46.4 | 18 | 45.0% |
| 65+ | 73 | 6.0% | 18 | 12.5 | 2 | 5.8% | 23 | 23.7 | 2 | 10.0% |

*Drug/alcohol use includes patients who were confirmed, suspected, or reported to have taken either substance.

# Traumatic Brain Injury (TBI)

**Figure 36/Table 28: Age-specific TBI incidence and mortality proportion (n=8,844)**




Data source: Arizona State Trauma Registry 2014

In 2014, there were a total of 8,844 cases of TBI; 4,581 (52%) of those were Major TBIs. Major TBIs were most common among 75 to 84 year olds (12.8%) and the mortality proportion was highest among 55 to 64 year olds (13.6%). Minor/Moderate TBIs were most common among 25 to 34 year olds (16.2%).

| Age groups | Major TBI* | | | | Minor/Moderate TBI** | | | |
|---|---|---|---|---|---|---|---|---|
| | Count | Percent | Deaths | Mortality proportion | Count | Percent | Deaths | Mortality proportion |
| Total | 4,581 | 100.0% | 463 | 10.1% | 4,263 | 100.0% | 8 | 0.1% |
| <1 | 138 | 3.0% | 2 | 1.4% | 109 | 2.5% | 0 | 0.0% |
| 1-4 | 142 | 3.0% | 9 | 6.3% | 150 | 3.5% | 0 | 0.0% |
| 5-9 | 100 | 2.1% | 5 | 5.0% | 131 | 3.0% | 0 | 0.0% |
| 10-14 | 103 | 2.2% | 5 | 4.8% | 275 | 6.4% | 0 | 0.0% |
| 15-19 | 250 | 5.4% | 16 | 6.4% | 568 | 13.3% | 1 | 0.1% |
| 20-24 | 328 | 7.1% | 43 | 13.1% | 494 | 11.5% | 0 | 0.0% |
| 25-34 | 536 | 11.7% | 72 | 13.4% | 691 | 16.2% | 3 | 0.4% |
| 35-44 | 398 | 8.6% | 48 | 12.0% | 442 | 10.3% | 0 | 0.0% |
| 45-54 | 490 | 10.6% | 47 | 9.5% | 492 | 11.5% | 1 | 0.2% |
| 55-64 | 528 | 11.5% | 72 | 13.6% | 376 | 8.8% | 0 | 0.0% |
| 65-74 | 544 | 11.8% | 56 | 10.2% | 276 | 6.4% | 1 | 0.3% |
| 75-84 | 587 | 12.8% | 49 | 8.3% | 155 | 3.6% | 1 | 0.6% |
| >85 | 437 | 9.5% | 39 | 8.9% | 104 | 2.4% | 1 | 0.9% |

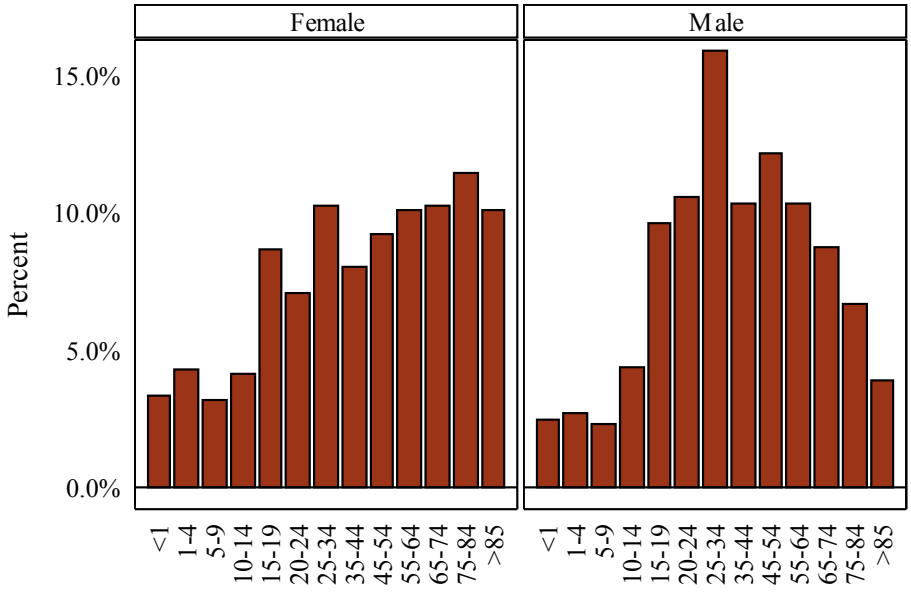
*Major TBI is defined as a Type I TBI on the Barell Matrix or an AIS with a head injury severity greater ≥ 3.
**Minor/Moderate TBI defined as a Type II TBI or a Type III TBI on the Barell Matrix.

**Table 29: Age-specific TBI incidence and mortality proportion by GCS score, ASTR 2014**

| Age groups | GCS<9 | | | | GCS 9-12 | | | | GCS 13-15 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Count | Percent | Deaths | Mortality proportion | Count | Percent | Deaths | Mortality proportion | Count | Percent | Deaths | Mortality proportion |
| **Total** | 970 | 100.0% | 395 | 40.7% | 347 | 100.0% | 15 | 4.3% | 7,383 | 100.0% | 60 | 0.8% |
| **<1** | 10 | 1.0% | 2 | 20.0% | 4 | 1.1% | 0 | 0.0% | 220 | 2.9% | 0 | 0.0% |
| **1-4** | 24 | 2.4% | 9 | 37.5% | 10 | 2.8% | 0 | 0.0% | 250 | 3.3% | 0 | 0.0% |
| **5-9** | 17 | 1.7% | 5 | 29.4% | 9 | 2.5% | 0 | 0.0% | 202 | 2.7% | 0 | 0.0% |
| **10-14** | 13 | 1.3% | 5 | 38.4% | 15 | 4.3% | 0 | 0.0% | 343 | 4.6% | 0 | 0.0% |
| **15-19** | 77 | 7.9% | 17 | 22.0% | 24 | 6.9% | 0 | 0.0% | 708 | 9.5% | 0 | 0.0% |
| **20-24** | 132 | 13.6% | 43 | 32.5% | 33 | 9.5% | 0 | 0.0% | 652 | 8.8% | 0 | 0.0% |
| **25-34** | 176 | 18.1% | 72 | 40.9% | 55 | 15.8% | 1 | 1.8% | 991 | 13.4% | 1 | 0.1% |
| **35-44** | 120 | 12.3% | 47 | 39.1% | 41 | 11.8% | 0 | 0.0% | 671 | 9.0% | 1 | 0.1% |
| **45-54** | 125 | 12.8% | 43 | 34.4% | 42 | 12.1% | 1 | 2.3% | 797 | 10.7% | 4 | 0.5% |
| **55-64** | 107 | 11.0% | 58 | 54.2% | 39 | 11.2% | 3 | 7.6% | 747 | 10.1% | 11 | 1.4% |
| **65-74** | 91 | 9.3% | 50 | 54.9% | 22 | 6.3% | 1 | 4.5% | 688 | 9.3% | 6 | 0.8% |
| **75-84** | 45 | 4.6% | 27 | 60.0% | 32 | 9.2% | 5 | 15.6% | 649 | 8.7% | 18 | 2.7% |
| **>85** | 33 | 3.4% | 17 | 51.5% | 21 | 6.0% | 4 | 19.0% | 465 | 6.2% | 19 | 4.0% |

Among patients with TBI, 970 (11%) had a GCS of less than 9; 347 (3.9%) had a GCS between 9 and 12; and 7,383 (83%) had a GCS between 13 and 15. The mortality proportion for TBI patients with a GCS of less than 9 was 40.7 percent. In general the mortality proportion was highest among Geriatrics.

**Figure 37: TBI incidence by age and gender (n=8,844)**

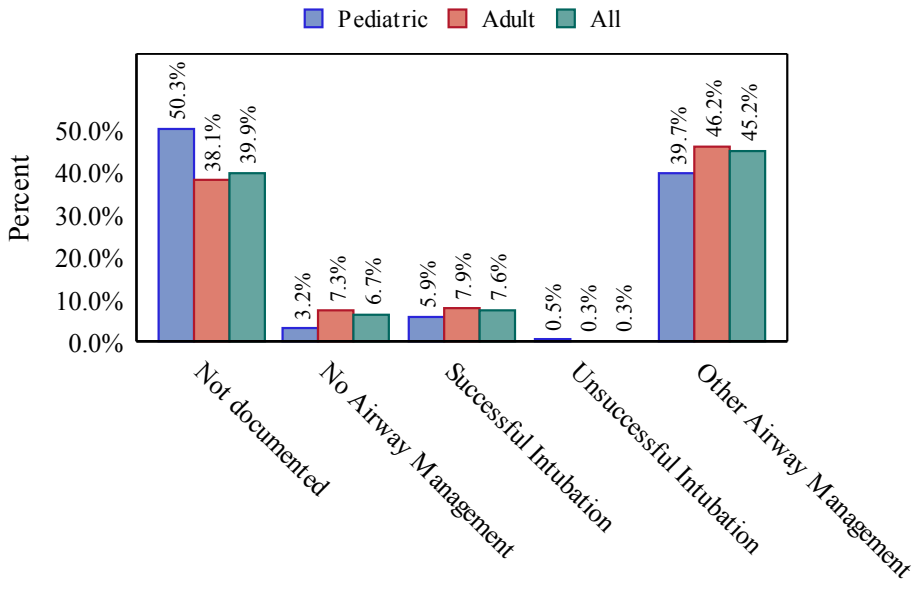



Data source: Arizona State Trauma Registry 2014

Among females the incidence of TBI increases with age while among males the incidence increased until the age of 34 and then decreases after.

Peds
Ger

**Figure 38: Field airway management among major TBI patients, (n=4,581)**

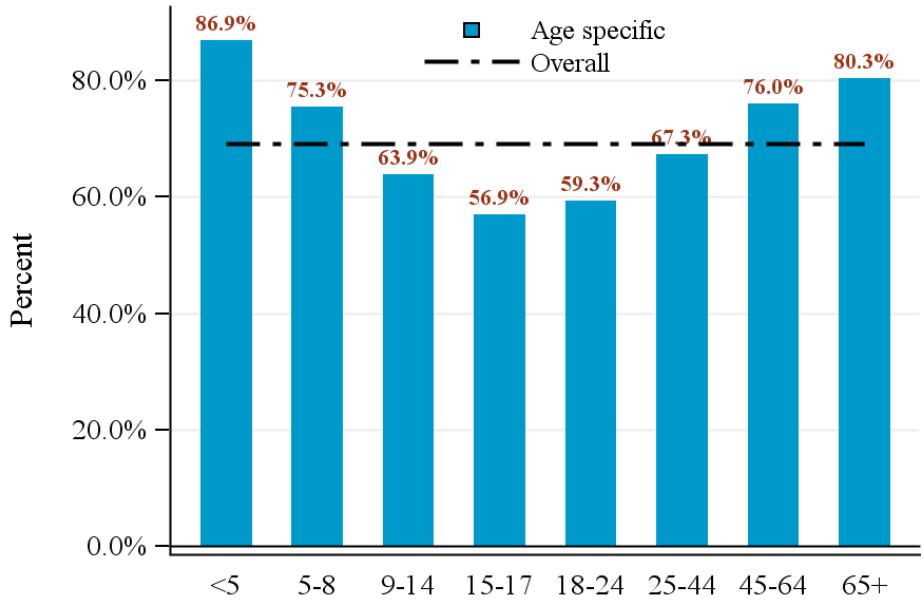



Data source: Arizona State Trauma Registry 2014

In 2014, 52.8 percent of major TBI patients received some airway management, while 7 percent had no or unsuccessful airway management. Field airway management was not documented for about 40 percent of major TBI patients.

# Safety Equipment

**Figure 39: Age-specific proportion of car restraint use (n=9,302)**

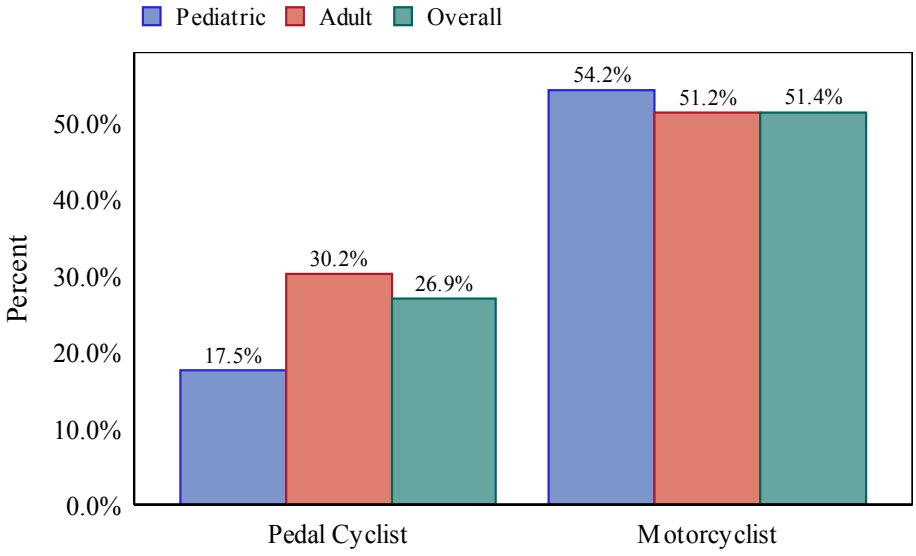



Data source: Arizona State Trauma Registry 2014

In 2014, car restraints were used in about 69 percent of all traumas related to Motor Vehicle Traffic. Restraint use was lowest among teens/young adults.

**Figure 40: Proportion of helmet use among Motorcyclist (n=2,068) and *Pedal Cyclist traumas (n=1,486), Adult vs. Pediatric**

Peds



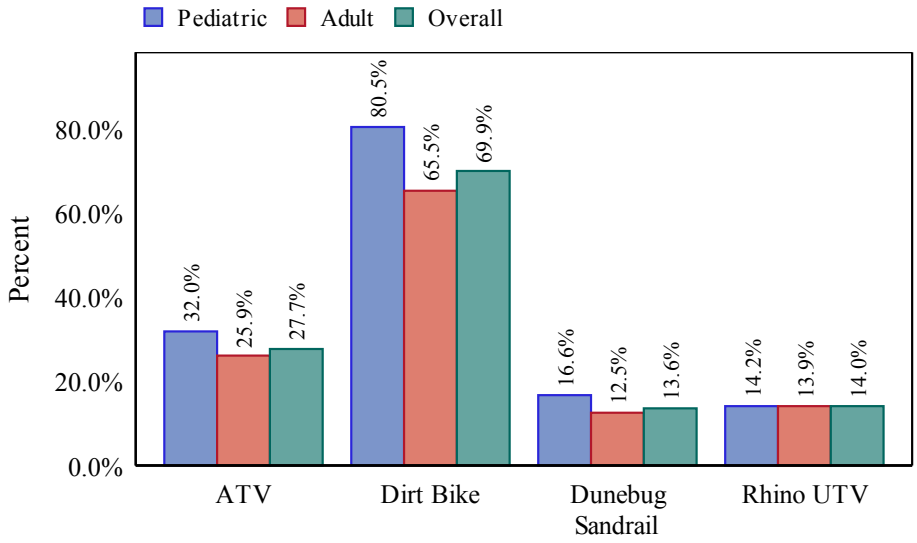

Data source: Arizona State Trauma Registry 2014

About half of the Motorcyclists involved in traumas related to Motor Vehicle Traffic were wearing helmets.

Five out of every 6 Pediatric Pedal Cyclists were **not** wearing helmets when involved in traumas related to Motor Vehicle Traffic.

*Pedal Cyclist includes MVT and non-MVT related traumas

**Figure 41: Proportion of helmet use for select off-road vehicles, Adult vs. Pediatric (n=1,186)**

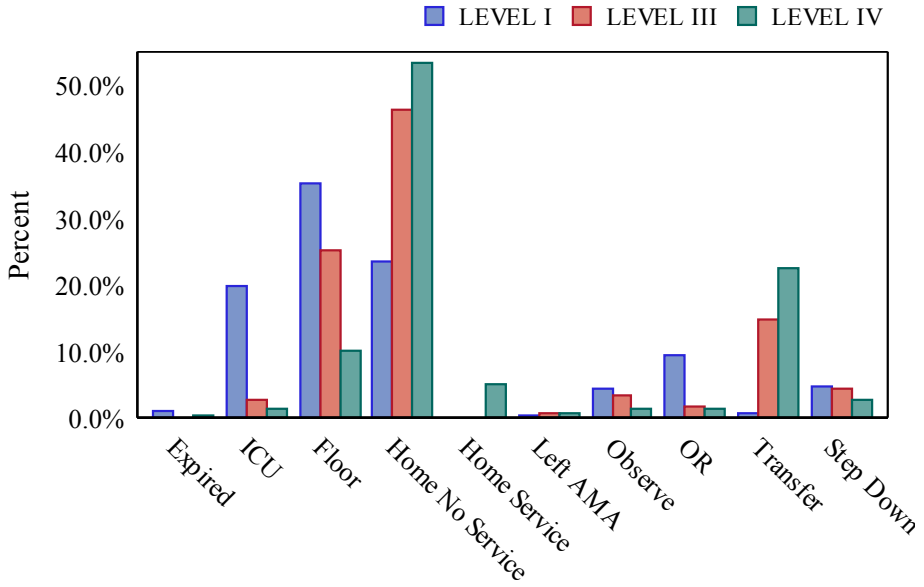



Data source: Arizona State Trauma Registry 2014

The proportion of helmet use low for all select off-road vehicles. Overall, Adults had a lower proportion of helmet use than Pediatrics.

# Outcomes: ED Discharge

**Figure 42/Table 30: Proportion of Emergency Department discharges by designation (n =37,853)**



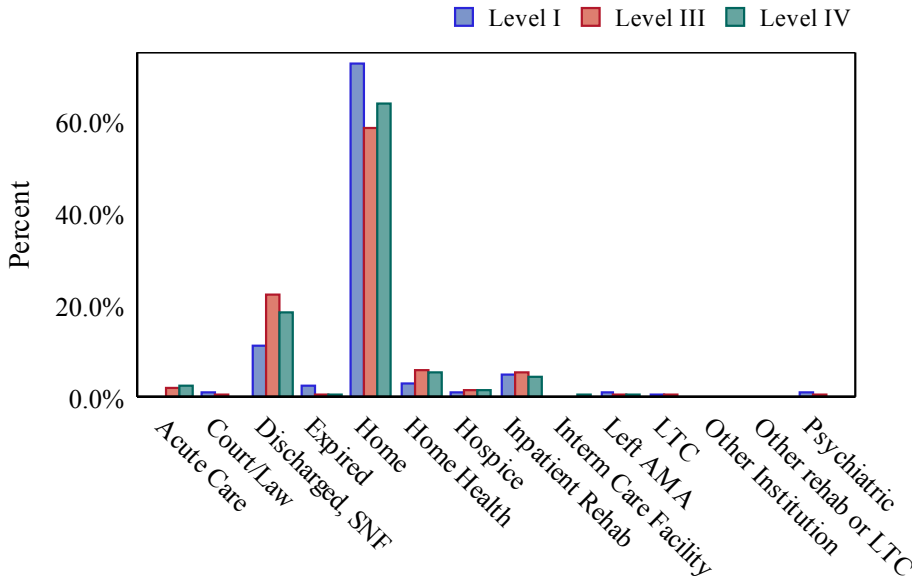

Data source: Arizona State Trauma Registry 2014, LTC= Long term care
AMA=Against Medical Advice, ICU=Intensive Care Unit, OR=Operating Room

The majority of trauma patients treated at Level I trauma centers were admitted to the floor (35%), admitted to the ICU (19.9%) or discharged home with no service (23.4%).

The majority of patients treated at Level III & Level IV trauma centers were discharged home with no service (46.4% & 53.4%, respectively), admitted to the floor (25.1% & 10.2%, respectively) or were transferred to other healthcare facilities (14.7% & 22.6%, respectively).

| ED discharge | Level I | Level III | Level IV |
|---|---|---|---|
| | % | % | % |
| Expired | 1.1% | 0.0% | 0.5% |
| ICU | 19.9% | 2.7% | 1.4% |
| Floor | 35.3% | 25.1% | 10.2% |
| Home No Service | 23.4% | 46.4% | 53.4% |
| Home Service | 0.0% | 0.2% | 5.2% |
| Left AMA | 0.3% | 0.8% | 0.6% |
| Observe | 4.5% | 3.5% | 1.3% |
| OR | 9.4% | 1.6% | 1.5% |
| Transfer | 0.8% | 14.7% | 22.6% |
| Step Down | 4.8% | 4.5% | 2.8% |

**Figure 43/Table 31: Proportion of inpatient discharges by designation (n=22,961)**




Data source: Arizona State Trauma Registry 2014, LTC= Long term care
AMA=Against Medical Advice, SNF=Skilled Nursing Facility

The majority of trauma inpatients in Arizona were discharged Home or to a Skilled Nursing Facility (SNF), regardless of trauma center level. Transfer to acute care after admission was reported for 2.4 percent of Level IV patients and 1.8 percent of Level III patients.

| Inpatient discharge | Level I | Level III | Level IV |
|---|---|---|---|
| Acute Care | 0.3% | 1.8% | 2.4% |
| Court/Law | 0.9% | 0.5% | 0.3% |
| Discharged, SNF | 11.0% | 22.3% | 18.5% |
| Expired | 2.4% | 0.6% | 0.8% |
| Home | 72.8% | 58.9% | 64.1% |
| Home Health | 3.1% | 5.8% | 5.4% |
| Hospice | 0.9% | 1.5% | 1.7% |
| Inpatient Rehab | 5.1% | 5.7% | 4.3% |
| Interim Care Facility | 0.2% | 0.0% | 0.4% |
| LTC | 0.5% | 0.6% | 0.3% |
| Left AMA | 0.8% | 0.5% | 0.4% |
| Other Institution | 0.2% | 0.3% | 0.3% |
| Other rehab or LTC | 0 | 0 | 0.3% |
| Psychiatric | 1.2% | 0.6% | 0.2% |

# Outcomes: Admission to Rehabilitation Centers

A missing component in trauma outcomes are the physical, social, and mental functionality of patients upon discharge. These morbidity and quality of life measures may allow for additional system evaluation. The ASTR recently added Functional Independence Measure (FIM) scores as optional elements. Trauma centers are encouraged to collect these for their trauma patients.

**Table 32: Proportion of patients admitted to rehab by primary payer and ISS, ASTR 2014**

| Primary Payer | Total Patient admitted | % | Discharged to Rehab | % | ISS ≤ 15 and Discharged to Rehab | % | ISS >15 and Discharged to Rehab | % |
|---|---|---|---|---|---|---|---|---|
| AHCCCS | 6,672 | 29.05% | 184 | 2.75% | 64 | 1.20% | 118 | 10.43% |
| Medicare | 5,451 | 23.74% | 487 | 8.93% | 357 | 8.07% | 125 | 13.22% |
| Not Documented | 172 | 0.74% | 1 | 0.58% | 1 | 0.59% | . | . |
| Other | 435 | 1.89% | 14 | 3.21% | 6 | 1.72% | 8 | 9.75% |
| Private | 7,991 | 34.80% | 501 | 6.26% | 271 | 4.10% | 227 | 18.08% |
| Self pay | 2,240 | 9.75% | 28 | 1.25% | 15 | 0.81% | 13 | 3.75% |
| Total | 22,961 | 100.00% | 1,215 | 5.29% | 714 | 3.81% | 491 | 13.05% |

AHCCCS=Arizona Health Care Cost Containment System

Of the 22,961 patients admitted to a trauma center, 5 percent were discharged to a rehabilitation center. In 2014, 13% of moderate to sever patients (ISS≥15) were discharged to rehabilitation centers. Patients with private insurance were more likely to discharge to these centers than self-pay patients.

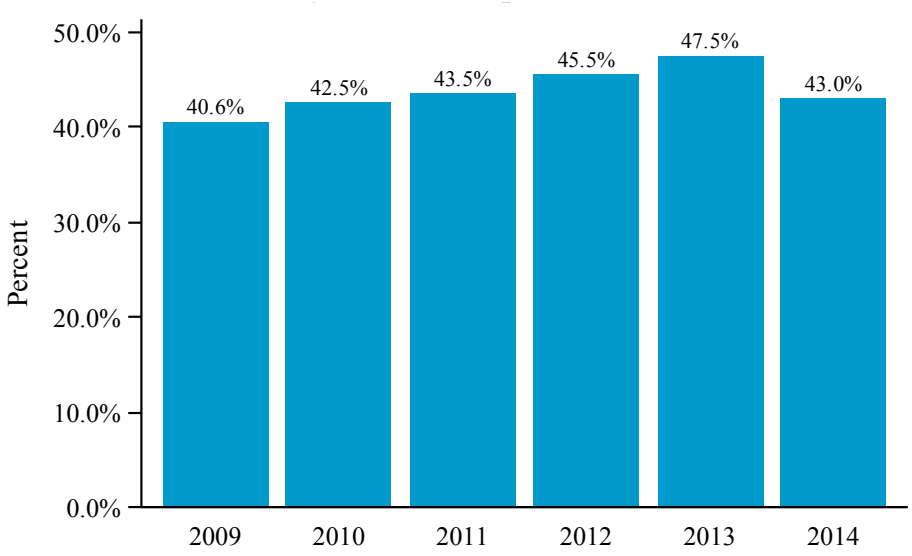
**Table 33: Proportion of patients admitted to Rehab by Injury Region, ASTR 2014**

| Region | Total Patients | | Discharged to Rehab | |
|---|---|---|---|---|
| | N | % | N | % |
| Missing Region | 613 | 2.6% | 33 | 5.3% |
| Central Region | 16,698 | 72.7% | 788 | 4.7% |
| Western Region | 885 | 3.8% | 80 | 9.0% |
| Northern Region | 2,537 | 11.0% | 148 | 5.8% |
| Southeastern Region | 2,228 | 9.7% | 166 | 7.4% |
| All | 22,961 | 100.0% | 1,215 | 5.2% |

In 2014, the Western Region had the largest proportion of trauma patients discharged to a rehabilitation center, while the central region had the lowest proportion.

# Data Quality

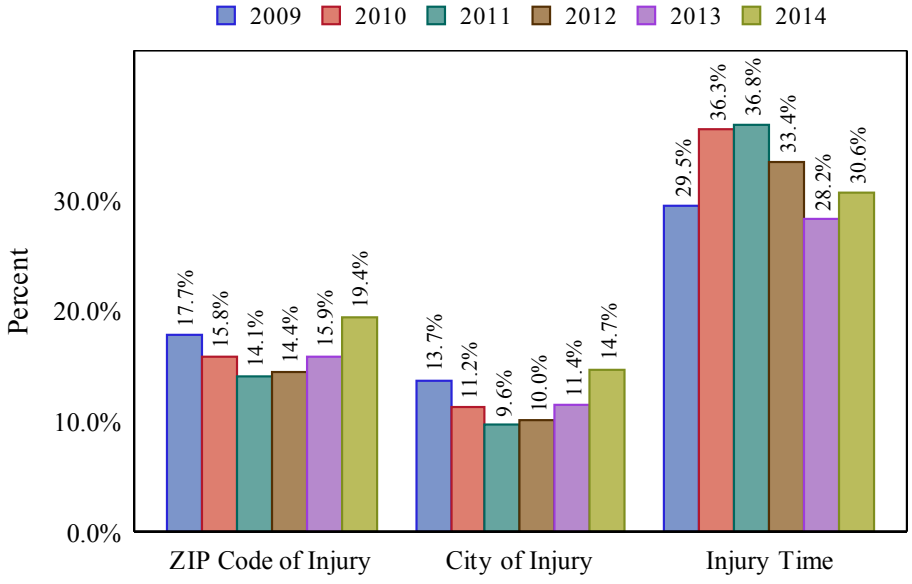
**Figure 44: Field airway management not documented among severely injured trauma patients, 2009-2014**




Data source: Arizona State Trauma Registry 2009-2014

Obtaining complete pre-hospital data is an ongoing challenge. In 2014, a large percentage (43.0%) of field airway management data were not documented for severely injured trauma patients (GCS <9 and ISS >15).

**Figure 45: Proportion of injury elements without documentation, 2009-2014**




Data source: Arizona State Trauma Registry 2009-2014

EMS agencies and trauma centers should collaborate in the exchange of data through the Arizona Prehospital Information and EMS Registry System (AZ-PIERS) in order to increase documentation of prehospital elements.

# Appendix A

## Arizona State Trauma Registry
## 2014 Trauma Data Submission

| Level I Trauma Centers (Full Data Set) |
|---|
| Abrazo West Campus |
| Banner - University Medical Center Phoenix |
| Banner University Medical Center – Tucson Campus |
| Dignity Health, dba Chandler Regional Medical Center |
| Flagstaff Medical Center |
| HonorHealth John C. Lincoln Medical Center |
| HonorHealth Scottsdale Osborn Medical Center |
| Maricopa Medical Center |
| Phoenix Children's Hospital |
| St. Joseph's Hospital & Medical Center |

| Level III Trauma Centers (Full Data Set) |
|---|
| Banner Baywood Medical Center |
| HonorHealth Deer Valley Medical Center |
| Mountain Vista Medical Center |
| Tuba City Regional Health Care Corp. |

| Level IV Trauma Centers (Full Data Set) |
|---|
| Banner Boswell Medical Center |
| Banner Del E. Webb Medical Center |
| Banner Estrella Medical Center |
| Banner Gateway Medical Center |
| Banner Ironwood Medical Center |
| Banner University Medical Center –South Campus |
| Kingman Regional Medical Center |
| Summit Healthcare Regional Medical Center |
| Verde Valley Medical Center |
| Yavapai Regional Medical Center –West Campus |
| Yavapai Regional Medical Center – East Campus |

| Level IV Trauma Centers (Reduced Data Set) |
|---|
| Banner Page Hospital |
| Banner Payson Medical Center |
| Benson Hospital |
| Chinle Comprehensive Health Care Facility |
| Cobre Valley Regional Medical Center |
| Copper Queen Community Hospital |
| Havasu Regional Medical Center |
| La Paz Regional Hospital |
| Mt. Graham Regional Medical Center |
| Northern Cochise Community Hospital |
| Oro Valley Hospital |
| White Mountain Regional Medical Center |
| Wickenburg Community Hospital |

| Non-designated Trauma Centers (Full Data Set) |
| --- |
| Yuma Regional Medical Center |
| Banner Desert Medical Center |

# Appendix B

## TRAUMA PATIENT INCLUSION DEFINITION

### ARIZONA STATE TRAUMA REGISTRY (ASTR)

**Effective for records with ED/Hospital Arrival Dates Jan. 1, 2008 – Dec. 31, 2013**

- **EMS TRAUMA TRIAGE PROTOCOL**

  A patient with injury or suspected injury who is triaged from a scene to a trauma center or ED based upon the responding EMS provider's trauma triage protocol; **OR**

- **INTER-FACILITY INJURY TRANSFERS BY EMS**

  A patient with injury who is transported via EMS transport from one acute care hospital to another acute care hospital; **OR**

  ***Note: For 2012 trauma data, only Level III and IV Trauma Centers were required to report inter-facility injury transfers. For 2008-2011 and 2013 forward, all designation levels are required to report inter-facility injury transfers.**

- **HOSPITAL TRAUMA TEAM ACTIVATIONS**

  A patient with injury or suspected injury for whom a trauma team activation occurs; **OR**

- **ADMITTED OR DIED BECAUSE OF INJURY & MEETS ASTR DIAGNOSIS CODES**

  A patient with injury who:

  Is admitted as a result of the injury **OR** who dies as a result of the injury

  **AND**

  Has an ICD-9-CM N-code (injury diagnosis code) within categories 800 through 959 (except exclusions below):

  **EXCLUSIONS for admitted or died ICD-9-CM 800-959 patients:**

  - Only has late effects of injury or another external cause:
    (ICD-9-CM N-code within categories 905 through 909)
  - Only has a superficial injury or contusion:
    (ICD-9-CM N-code within categories 910 through 924)
  - Only has effects of a foreign body entering through an orifice:
    (ICD-9-CM N-code within categories 930 through 939)
  - Only has an isolated femoral neck fracture from a same-level fall:

(ICD-9-CM N-code within category 820 **AND** ICD-9-CM E-code within category E885 or E886)

- Only has an isolated distal extremity fracture from a same-level fall:
  (ICD-9-CM N-code within categories 813 through 817 or 823 through 826 **AND** ICD-9-CM E-code within category E885 or E886)
- Only has an isolated burn:
  (ICD-9-CM N-code within categories 940 through 949)

*Inter-facility transfer item 1-B was added to the ASTR Inclusion Criteria, per the Bureau of EMS & Trauma System in November 2008. This item was then revised by the TEPI advisory committee for 2012, requiring only Level III and IV trauma centers to submit inter-facility transfers. For 2013 data forward, the advisory committee reinstated the original 2008-2011 inter-facility transfer criteria.

Note: New ASTR inclusion criteria went into effect for trauma records with ED/Hospital Arrival Dates Jan. 1, 2008 forward. Changes to inclusion criteria affect the numbers and types of records submitted to ASTR. Inclusion changes should be taken into consideration when comparing multiple years of trauma data.

# 2013 Arizona Trauma Registry Inclusion Criteria