ARIZONA DEPARTMENT OF HEALTH SERVICES

Cara M. Christ, MD, Director

BUREAU OF EMERGENCY MEDICAL SERVICES AND TRAUMA SYSTEM

STATE TRAUMA ADVISORY BOARD

2020 ANNUAL REPORT

This Report is Provided as Required by A.R.S. § 36-2222(E)(4)

Bureau of Emergency Medical Services and Trauma System

Terry Mullins, MBA, MPH, Bureau Chief

Gail Bradley, MD, Medical Director

Benjamin Fisher, MPA, NRP, Services Section Chief

Vatsal Chikani, MPH, BHMS, Epidemiological Data and Quality Assurance Manager

Sri Vidya Mahankali, MS,BDS, Senior Epidemiologist

Mary Benkert, Trauma Data Administrator

Anne Vossbrink, MS, EMS Data Administrator

STATE TRAUMA ADVISORY BOARD MEMBERSHIP

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.

Gail Bradley, MD, Chair
ADHS BEMSTS Medical Director
Phoenix, AZ

Shawn Bowker, RN , BSN
Local Regional EMS Coordinating Council - Northern Region Representative
Flagstaff, AZ

Deputy Chief Sharon McDonough
Fire Department in a County with a Population > 500,000 Representative
Tucson, AZ

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

Vicki Bennett, MSN
Society of Trauma Nurses Representative
Phoenix, AZ

Herman Butler
Tribal Health Organization Representative
Tuba City, AZ

Franco Castro-Marin, MD
National Organization of Emergency Physicians Representative (PMD Liaison) - Scottsdale, AZ

Brent Burgett, NRP
Statewide Ambulance Association Representative
Mesa, AZ

Jeff Farkas, CEP
Statewide Fire District Association Representative
Show Low, AZ

Iman Feiz-Erfan, MD
Statewide Neurosurgical Society Representative
Phoenix, AZ

Garth Gemar, MD
National Association of Retired Persons Representative
Phoenix, AZ

Philip Johnson, MD
Rural ALS Base Hospital that is not a Trauma Center Representative
Show Low, AZ

Debbie Johnston
Statewide Hospital Association Representative
Phoenix, AZ

Tara Johnson, MSN, CCRN
Urban Advanced Life Support Base Hospital that is not a Trauma Center Representative
Chandler, AZ

Neil Williamson, NRP
Department of Public Safety Representative
Phoenix, AZ

David Notrica, MD, FACS, FAAP
Statewide Pediatric Organization Representative
Phoenix, AZ

Nirav Patel, MD, FACS
Statewide Organization Representing a National College of Surgeons for Trauma Services
Phoenix, AZ

Rodney A. Reed, NRP
Local Regional EMS Coordinating Council - Western Region Representative
Yuma, AZ

Sandra Nygaard, EMCT-P
Local Regional Coordinating EMS Council – Central Region Representative
Phoenix, AZ

Chris Salvino, MD, MS, FACS
Trauma Center Representative
Lake Havasu City, AZ

Melissa Anderson, RN, MSN
Local Regional EMS Coordinating Council - Southeastern Region Representative
Tucson, AZ

Clifford Jones, MD
National Association of Orthopedic Trauma Representative
Phoenix, AZ

Andrew Tang, MD, FACS
Trauma Center Representative / Vice Chair
Tucson, AZ

TRAUMA & EMS PERFORMANCE IMPROVEMENT STANDING COMMITTEE MEMBERSHIP

Josh Gaither, MD
EMS Researcher (AEMRC)/Chair
Tucson, AZ

Melissa Moyer, CSTR
Representative of the Trauma Registry Users Group/Vice Chair
Phoenix, AZ

Corbin King, FP-C
Air Ambulance Premier EMS Agency
Quality Improvement Officer
Gilbert, AZ

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

Raymond Proa, NREMT-P
EMS Registry Group Member
Fort Mohave, AZ

Paul Dabrowski, MD
Trauma Surgeon
Phoenix, AZ

Candyce Williams, MD
Rehabilitation Specialist
Phoenix, AZ

Dale Woolridge, MD
Injury Researcher (AEMRC)
Tucson, AZ

Garth Gemar, MD
EMS Medical Director of a Premier EMS Agency
Phoenix, AZ

Pamela Goslar, PhD
IPAC Representative
Phoenix, AZ

Michelle Guadnola, RN
State Designated Level I Trauma Center Trauma Program Representative
Phoenix, AZ

Rebecca Haro, NREMT-P
EMS Council Liaison
Phoenix, AZ

Amber Prince, RN
Prehospital EMS Coordinator (SAEMS/AEMS)
Tucson, AZ

Ralph Zane Kelly, DO
State Designated Level III Trauma Center Program Manager
Tuba City, AZ

Carey Lewis, CPNP-AC/PC
Pediatric Representative (MD or RN)
Phoenix, AZ

Tom Flanagan, NRP
Ground Ambulance or First Responder Premier EMS Agency – Quality Improvement Officer (NAEMS/WACEMS)
Kingman, AZ

Shawn Bowker, RN,
State Trauma Advisory Board Liaison
Flagstaff, AZ

James Cunningham, V, RN, NREMT - P
Ground Ambulance or First Responder Premier EMS Agency, Quality Improvement Officer (SAEMS/AEMS)
Mesa, AZ

Heather Miller, BSN, RN, CEN, TCRN
Western Arizona Council of Emergency Services
Kingman, AZ

Tiffiny Strever, RN
State Designated Level I Trauma Center or Trauma Program Representative
Phoenix, AZ

Pam Noland, RN
State Designated Level IV Trauma Center Program Manager
Willcox, AZ

James Cesolini, CEP, EMT-T, DMT
Law Enforcement Representative with Active Involvement in EMS
Mesa, AZ

Julie Augenstein, MD
Medical Direction Commission Liaison
Phoenix,AZ

Laura Smith, DNP, RN, CEN
State Designated Level I Trauma Center Trauma Program Representative
Glendale, AZ

Director Christ:

No healthcare, public health or public safety sector has gone without significant impact from the COVID-19 pandemic, including Arizona's Trauma System.

In anticipation of the impact of COVID-19, the Bureau recommended, and you approved, a rule waiver that would allow trauma centers to operate with as few non-essential regulatory barriers as possible.

This rule waiver has benefited trauma centers in several ways:

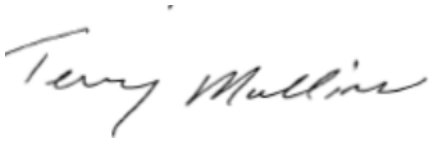
- Due to decreased emergency department and in-patient volumes, many facilities furloughed both clinical and support staff. This impacted trauma center ability to submit trauma registry data to the Arizona Trauma Registry. The Bureau was able to accommodate hospitals while volumes returned to more normal levels and staff were brought back into service. All hospitals are now compliant with data reporting requirements.

- The Stay-Home-Stay Healthy campaign resulted in a dramatic decrease in motor vehicle related trauma and subsequent trauma center case volumes. Normally, this would have resulted in the Bureau requiring corrective action plans, however, the rule waiver made it possible for the facility to focus on other pressing clinical issues.

- Eighteen of Arizona's designated trauma centers use the services of the American College of Surgeons (ACS) to perform the trauma program verification that is accepted by the Department in lieu of a state designation facility inspection. Early in the course of the pandemic, the ACS canceled all scheduled verification site visits, and extended every verification by one year. Again, because of the rule waiver, the Bureau is able to allow hospitals to focus resources on clinical and operational matters while ensuring trauma center designation status remains intact.

Because the COVID-19 pandemic will likely continue through the first and second quarters of 2021, trauma centers will likely continue to be affected. One hospital, a level III, has withdrawn its trauma center designation. The Bureau will continue to focus on supporting Arizona's trauma centers during these difficult times to ensure that Arizona's citizens have access to timely, high quality trauma care.

Sincerely,



Gail Bradley, MD FACEP FAEMS, Medical Director

Terry Mullins, MBA, MPH, Bureau Chief

Traumatic injury is a tremendous health concern in the United States. In the last decade, trauma deaths increased nationally by 22.8%,[1] and are the leading cause of years of potential life lost.[1,2] For those who survive, trauma can lead to lifelong physical suffering and places a substantial economic burden on the health system. In Arizona, the rate of traumatic injury continues to increase. In 2019, Arizona's trauma centers treated 58,604 people (815 per 100,000 Arizona population). In the same year, the Arizona Hospital Discharge Database (HDD) showed 586,130 injury related discharges in Arizona (8,153 per 100,000 Arizona population). According to the Centers for Disease Control and Prevention, in the last 10 years from 2009 to 2018, Arizona's age-adjusted injury mortality rate has increased from 70 to 83 per 100,000 (18.5% increase), while the national rate has increased from 56 to 70 per 100,000 (24% increase).[2]

Traumatic injury exacts a significant financial burden on the state. In Arizona for the year 2019, trauma centers charges totaled $3 billion, with a median charge per patient of $28,931. Falls resulted in over one billion dollars in charges in 2019. Hospital reimbursement has remained consistently low, around 13%.

The top three mechanisms of trauma were Falls (45.02%), Motor Vehicle Traffic, MVT- Occupant (19.88%), and Struck by/Against (6.92%), which made up 72% of all traumas in Arizona.

Firearms and MVT-Pedestrian accounted for less than 2.5% of trauma individually but both had a disproportionately higher mortality of 16.67% and 10.93% respectively as compared to other traumas.

Although trauma affects everyone, males and individuals over the age of 65 years are disproportionately affected, as are American Indian/Alaskan Natives (AI/AN). Males are involved in three times as many assault-related traumas as females, and have a mortality rate over two times higher. Adults 65 years and older had the highest trauma rate as compared to any other age group. AI/AN continue to have the highest rate of trauma and trauma-related deaths when compared to other racial/ethnic groups.

Alcohol and drug use are well known risk factors for trauma. In Arizona, 23% of patients were suspected or confirmed of being under the influence of drugs or alcohol when involved in a trauma. Drug and alcohol use were more prevalent among intentional trauma cases including assaults and self-inflicted injuries. Alcohol and drug involvement varies by age and race. Among the younger population, especially 15-17 year olds, there were more traumas involving drugs than alcohol.

Overall, 72% of motor vehicle occupants were using some form of passenger restraint when involved in a trauma. Although seatbelt use has been shown to save lives, it was least practiced among those between 15 and 17 years of age (64%). In the trauma patient population, 58% of motorcyclists, and less than a third of pedal-cyclists and off-road vehicle occupants were wearing a helmet when involved in a trauma.

Greater than 35% of trauma patients suffered from Traumatic Brain Injury (TBI). Among trauma patients, the incidence of TBI was highest in infants < 1 year of age (60%). TBIs were prevalent among trauma patients whose mechanism of injury was indicated MVT - Other (59%) , Child/Adult abuse (49%), MVT-Pedestrian (46%) and MVT-Pedestrian (45%). One in ten patients with a major head injury died.

Geographically, incident location influences trauma rate and patients' access to care. Arizona's Northern region had the highest rate of traumatic injury, almost double that of the Central region. Importantly, the median injury-to-ED arrival time for patients with Injury Severity Score > 15 was 46 minutes for urban locations vs. 77 minutes for rural locations.

1. Rhee P, Joseph B, Pandit V, et al. Increasing Trauma Deaths in the United States. *Ann Surg*. 2014;00(00):1-9. doi:10.1097/SLA.0000000000000600.
2. Centers for Disease Control and Prevention, National Center for Injury Prevention and Control. Web-based Injury Statistics Query and Reporting System (WISQARS) [online]. (2005) [cited 2017 Sep.]. Available from URL: www.cdc.gov/injury/wisqars
3. State Health Facts: Kaiser Family foundation. Available from URL: http://www.kff.org/other/state-indicator/total-population

BACKGROUND

The Bureau of Emergency Medical Services and Trauma System (BEMSTS) is responsible for collecting, analyzing and reporting on data obtained from designated trauma centers and participating EMS agencies to enhance the EMS and Trauma System in Arizona. In 2019, there were 47 hospitals submitting data to the Arizona State Trauma Registry (ASTR) including twelve (12) Level I trauma centers, seven (7) Level III trauma centers, twenty-seven (27) Level IV trauma centers, and one (1) Level 1 Pediatric trauma center. Appendix A contains a list of trauma centers reporting to ASTR as of 12/30/2019.

All trauma centers are required to report any injuries meeting the ASTR inclusion criteria (Appendix B). Level I , II 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 either the full or reduced data set. The data in the ASTR is validated to meet more than 800 state and national rules. Validation is run at both the hospital and state levels. Any inconsistencies are flagged and returned to the hospitals for review or correction before the data is accepted.

All the Level I trauma centers in Arizona are located in urban areas of the state, including 10 in Maricopa County, one in Coconino County and one in Pima County. Due to Arizona's unique geography, the BEMSTS has divided the system into four distinct regions based on Arizona's 15 counties: Western (Mohave, La Paz and Yuma Counties), Northern (Yavapai, Coconino, Navajo and Apache Counties), Southeastern (Pima, Santa Cruz, Graham, Cochise and Greenlee Counties) and Central (Maricopa, Gila and Pinal Counties). Each region has its own community-based, non-profit organization dedicated to improving EMS and trauma care in the state.

Regional EMS Coordinating Systems

- Arizona Emergency Medical Services, Inc. (AEMS) - https://www.aems.org/
- Northern Arizona Emergency Medical Services (NAEMS) - http://www.naems.org/
- Southeastern Arizona EMS Council (SAEMS) - http://saemscouncil.com/
- Western Arizona Council of EMS (WACEMS) - https://wacems.org/

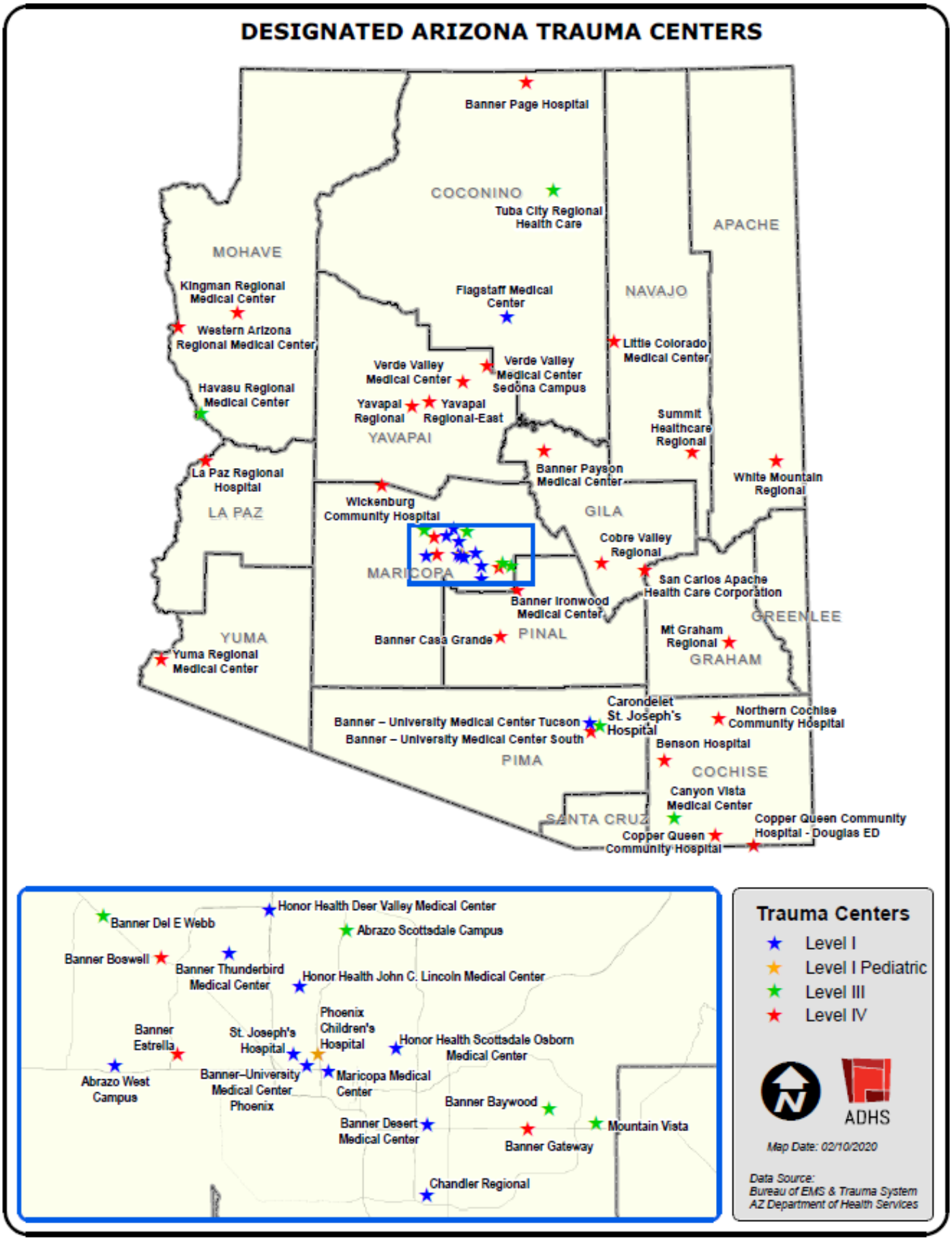
METHODS

This report analyzed incidents of traumatic injury reported to the ASTR with an Emergency Department/ Hospital Arrival Date between January 1, 2019 and December 31, 2019. The report gives an overview of trauma in the state by describing patient demographics, injury characteristics, trauma risk factors, regional differences and comparisons with national trauma data.

Descriptive statistics were used to depict the distribution of traumatic injury in Arizona as well as differences over time. When appropriate, rates and 95% confidence intervals (CIs) were calculated per 100,000 Arizona residents using 2019 population denominators from the Arizona Health Status and Vital Statistics database.[4] If the CIs of two rates do not overlap, the difference between the rates is considered statistically significant (alpha 0.05). The 2019 data was compared with the 2017 and 2018 two-year median. The Vital Statistics Information Management System's Database Applications for Vital Events (DAVE) was used in order to show the complete picture of trauma mortality, including deaths that occurred outside of designated trauma centers.

Note: The 2018 National Trauma Data Bank (NTDB) Annual Report had not been released at the time this report was created; therefore, the section comparing ASTR to NTDB was removed.

4. Arizona Department of Health Services, Population Health and Vital Statistics. Population Denominators: 2019. http://pub.azdhs.gov/health-stats/menu/info/pop/index.php


DESIGNATED ARIZONA TRAUMA CENTERS
Banner Page Hospital
COCONINO
Tuba City Regional Health Care
APACHE
MOHAVE
Kingman Regional Medical Center
Western Arizona Regional Medical Center
Flagstaff Medical Center
NAVAJO
Little Colorado Medical Center
Verde Valley Medical Center
Verde Valley Medical Center Sedona Campus
Havasu Regional Medical Center
Yavapai Regional
Yavapai Regional-East
YAVAPAI
Summit Healthcare Regional
Banner Payson Medical Center
White Mountain Regional
La Paz Regional Hospital
LA PAZ
Wickenburg Community Hospital
GILA
Cobre Valley Regional
MARICOPA
San Carlos Apache Health Care Corporation
Banner Ironwood Medical Center
GREENLEE
YUMA
Banner Casa Grande
PINAL
Mt Graham Regional
GRAHAM
Yuma Regional Medical Center
Carondelet St. Joseph's Hospital
Northern Cochise Community Hospital
Banner – University Medical Center Tucson
Banner – University Medical Center South
Benson Hospital
PIMA
COCHISE
Canyon Vista Medical Center
SANTA CRUZ
Copper Queen Community Hospital - Douglas ED
Copper Queen Community Hospital
Honor Health Deer Valley Medical Center
Banner Del E Webb
Abrazo Scottsdale Campus
Banner Boswell
Banner Thunderbird Medical Center
Honor Health John C. Lincoln Medical Center
Phoenix Children's Hospital
Banner Estrella
St. Joseph's Hospital
Honor Health Scottsdale Osborn Medical Center
Abrazo West Campus
Banner–University Medical Center Phoenix
Maricopa Medical Center
Banner Baywood
Banner Desert Medical Center
Mountain Vista
Banner Gateway
Chandler Regional
Trauma Centers
Level I
Level I Pediatric
Level III
Level IV
ADHS
Map Date: 02/10/2020
Data Source:
Bureau of EMS & Trauma System
AZ Department of Health Services

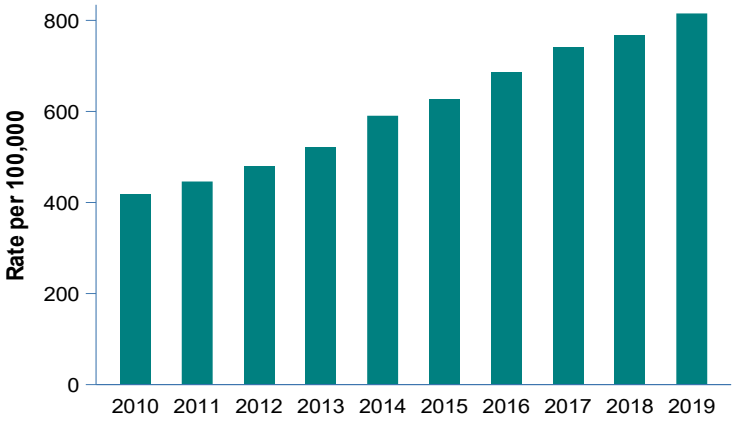
Trauma Demographics **11**
Figure 1/ Table 1: Trauma incidence and rate per 100,000 by year 11
Figure 2/ Table 2: Age and gender-specific trauma rate per 100,000 11
Figure 3/ Table 3: Race-specific trauma rate per 100,000 11
Mechanism of Injury **12**
Table 4: Trauma incidence and mortality proportion by mechanism of injury 12
Table 5: Trauma incidence and mortality proportion by mechanism of injury among severely injured patients (ISS>15) 13
Figure 4/ Table 6: Trauma rate per 100,000 by top six mechanisms and year 14
Figure 5: Gender-specific trauma proportion by top six mechanisms 14
Intent of Injury **15**
Table 7: Trauma incidence and mortality proportion by intent of injury 15
Figure 6/ Table 8: Trauma rate per 100,000 by intent and year 15
Figure 7: Gender-specific trauma proportion by intent 15
Figure 8: Top six mechanisms of unintentional trauma 16
Figure 9: Top six mechanisms of homicide/assault trauma 16
Figure 10: Top six mechanisms of suicide/self-inflicted trauma 16
Injury Severity Score **16**
Figure 11: Trauma proportion by Injury Severity Score 16
Table 9: Trauma incidence and mortality proportion by Injury Severity Score 16
Trauma Mortality **17**
Table 10: Age-specific trauma incidence and mortality proportion 17
Figure 12/ Table 11: Age-specific trauma mortality rate per 100,000 17
Figure 13/ Table 12: Gender-specific trauma mortality rate per 100,000 18
Figure 14/ Table 13: Race-specific trauma mortality rate per 100,000 18
Figure 15/ Table 14: Age-adjusted trauma mortality rate per 100,000 by year: Trauma center vs. Statewide 18
Trauma Charges **19**
Table 15: Total trauma charges and reimbursement by year 19
Figure 16: Primary payment source of traumatic injury by year 19
Table 16: Total trauma charges and reimbursement by primary payer 19
Table 17: Total trauma charges and reimbursement by mechanism of injury 20
Drugs & Alcohol **21**
Figure 17: Age-specific trauma proportion by drug and alcohol use 21
Figure 18: Race-specific trauma proportion by drug and alcohol use 21
Figure 19: Intent-specific trauma proportion by drug and alcohol use 21
Figure 20: Mechanism-specific trauma proportion by drug and alcohol use 21
Protective Devices **22**
Figure 21: Age-specific proportion of restraint use among motor vehicle traffic occupants 22
Figure 22: Age-specific proportion of helmet use among pedal-cyclists 22
Figure 23: Age-specific proportion of helmet use among motorcyclists 22
Figure 24: Age-specific proportion of helmet use among off-road vehicle occupants 22

Access to Care 23
Table 18: Injury to ED arrival time for patient with an Injury Severity Score > 15 by injury location 23
Table 19: Injury to ED arrival time for transferred patients with an Injury Severity Score > 15 by injury location 23
Figure 25: Mode of transport to trauma center by Injury Severity Score 23
Injury Region 24
Figure 26a/ Table 20: Region-specific trauma rate per 100,000 24
Figure 26b/ Table 20: Region-specific severe (ISS>15) trauma rate per 100,000 24
Figure 27/ Table 21: Region-specific trauma mortality rate per 100,000 24
Figure 28: Region-specific trauma proportion by Injury Severity Score 24
Figure 29/ Table 22: Region-specific trauma rate per 100,000 by the top six mechanisms of injury 25
Figure 30/ Table 23: Region-specific trauma rate per 100,000 by intent of injury 26
Trauma Center Designation 27
Table 24: Trauma incidence and mortality proportion by trauma center designation 27
Figure 31: Injury Severity Score by trauma center designation 27
Table 25: Trauma charges and reimbursement by trauma center designation 27
Traumatic Brain Injury 28
Table 26: Traumatic Brain Injury incidence and mortality proportion by age and brain injury severity 28
Figure 38: Proportion of Traumatic Brain Injury by mechanism 28
Table 27: Traumatic Brain Injury incidence and mortality proportion by age and Glasgow Coma Score 29
Rehab 30
Table 28: Discharged to rehab by primary payer and Injury Severity Score 30
Table 29: Discharge to rehab by region of injury 30
Appendix A. List of trauma centers by level of designation 31
Appendix B. Arizona State Trauma Registry inclusion criteria 33

TRAUMA DEMOGRAPHICS (N = 58,604)

INCIDENCE & RATE

Figure 1: Trauma rate per 100,000 by year



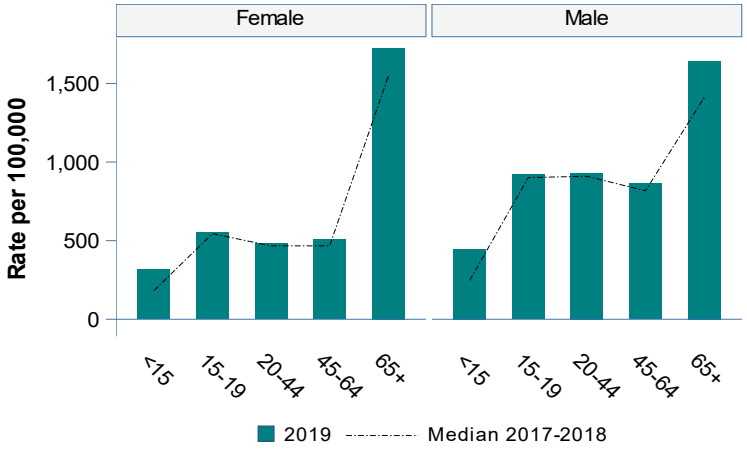
Data source: Arizona State Trauma Registry 2010-2019

Table 1: Trauma incidence and rate per 100,000 by year

Year	Total Trauma cases	Rate per 100,000 (95%CI)
2010	26,688	418 [413, 423]
2011	28,721	446 [441, 451]
2012	31,246	481 [475, 486]
2013	34,275	521 [515, 526]
2014	39,373	591 [585, 596]
2015	42,351	627 [621, 633]
2016	46,842	685 [679, 691]
2017	51,666	742 [735, 748]
2018	54,273	767 [761, 773]
2019	58,604	815 [809, 822]

AGE & GENDER

Figure 2: Age and gender-specific trauma rate per 100,000



Data source: Arizona State Trauma Registry 2017-2019

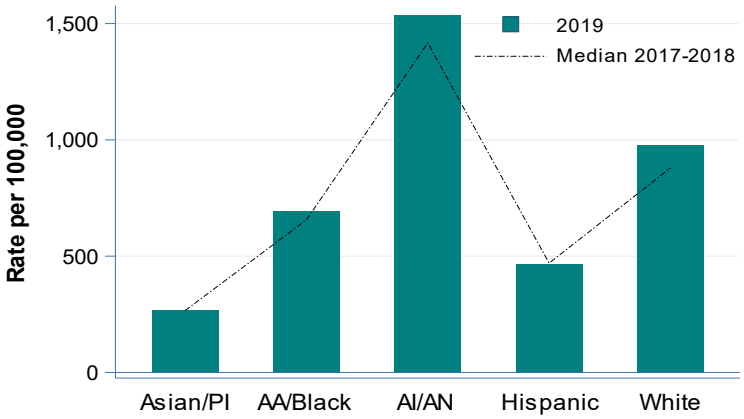
Table 2: Age and gender-specific trauma rate per 100,000

Gender	Age	Total Trauma Cases	Rate per 100,000 (95%CI)
Female	Total	25,152	696 [687, 704]
	<15	2,128	318 [304, 331]
	15-19	1,280	551 [521, 581]
	20-44	5,511	481 [468, 493]
	45-64	4,478	506 [492, 521]
	65+	11,755	1,725 [1,693, 1,756]
Male	Total	33,448	936 [926, 946]
	<15	3,109	446 [430, 461]
	15-19	2,232	919 [881, 958]
	20-44	11,322	931 [914, 949]
	45-64	7,221	864 [844, 883]
	65+	9,564	1,642 [1,609, 1,674]

CI = Confidence interval

RACE & ETHNICITY

Figure 3: Race-specific trauma rate per 100,000



Data source: Arizona State Trauma Registry 2017-2019, PI=Pacific Islander, AI/AN=American Indian/Alaska Native, AA=African American

Table 3: Race-specific trauma rate per 100,000

Race/ethnicity	Total Trauma Cases	Rate per 100,000 (95%CI)
AA/Black	2,444	694 [667, 722]
AI/AN	4,599	1,537 [1,493, 1,582]
Asian/PI	743	268 [249, 287]
Hispanic	10,655	467 [459, 476]
White	38,919	978 [968, 987]

CI= Confidence interval, PI=Pacific Islander, AI/AN=American Indian/Alaska

Table 4: Trauma incidence and mortality proportion by mechanism of injury

Mechanism	Count	Percent	Deaths	Mortality Proportion
Overall	58,604	-	1,335	2.27% (1,335/58,604)
Fall	26,386	45.02%	409	1.55%
MVT-Occupant	11,653	19.88%	191	1.63%
Struck By/Against	4,066	6.93%	17	0.41%
MV Non-Traffic	2,285	3.89%	23	1.00%
MVT-Motorcyclist	2,074	3.53%	108	5.20%
Cut/Pierce	2,066	3.52%	31	1.50%
Firearm	1,499	2.55%	250	16.67%
MVT-Pedestrian	1,198	2.04%	131	10.93%
Other Land Transport	1,006	1.71%	9	0.89%
Pedalcyclist,Other	989	1.68%	3	0.30%
Other Specified,Classifiable	788	1.34%	19	2.41%
Not Documented	598	1.02%	12	2.00%
MVT-Pedalcyclist	588	1.00%	18	3.06%
Bite And Stings-Nonvenomous	469	0.80%	1	0.21%
Other Specified,Not Elsewhere Classifiable	441	0.75%	27	6.12%
Pedestrian,Other	392	0.66%	18	4.59%
Unspecified	382	0.65%	13	3.40%
Other Transport	359	0.61%	7	1.94%
Machinery	270	0.46%	1	0.37%
Natural/Environmental, Other	255	0.43%	2	0.78%
Overexertion	217	0.37%	0	0.00%
Other Specified,Child/Adult Abuse	201	0.34%	6	2.98%
Hot Object/Substance	148	0.25%	1	0.67%
Fire/Flame	97	0.16%	4	4.12%
Suffocation	87	0.14%	25	28.73%
MVT-Other	27	0.04%	3	11.11%
Drowning/Submersion	26	0.04%	5	19.23%
Bite And Stings-Venomous	12	0.02%	0	0.00%
Poisoning:Non-Drug	10	0.01%	1	10.00%
MVT-Unspecified	7	0.01%	0	0.00%
Other Specified,Foreign Body	7	0.01%	0	0.00%
Poisoning:Drug	1	0.00%	0	0.00%

Mechanisms of Injury are classified into various categories based on the tool provided by the Centers for Disease Control and Prevention categorizing injuries using ICD 10 codes . https://www.cdc.gov/nchs/injury/injury_tools.htm . MVT = Motor Vehicle Traffic

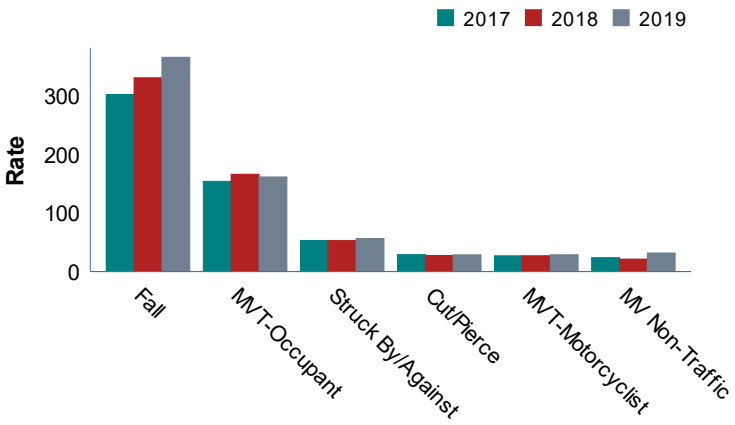
INCIDENCE & MORTALITY: INJURY SEVERITY SCORE (ISS) > 15

Table 5: Trauma incidence and mortality proportion by mechanism of injury among severely injured patients (ISS>15)

Mechanism	Count	Percent	Deaths	Mortality Proportion
Overall	5,873	-	777	13.23% (777/5,873)
Fall	2,682	45.66%	208	7.75%
MVT-Occupant	1,094	18.62%	118	10.78%
MVT-Motorcyclist	379	6.45%	81	21.37%
MVT-Pedestrian	298	5.07%	99	33.22%
Struck By/Against	296	5.04%	11	3.71%
Firearm	275	4.68%	151	54.90%
MV Non-Traffic	147	2.50%	9	6.12%
MVT-Pedalcyclist	92	1.56%	15	16.30%
Pedalcyclist,Other	87	1.48%	1	1.14%
Other Land Transport	74	1.26%	5	6.75%
Other Specified,Child/Adult Abuse	61	1.03%	2	3.27%
Pedestrian,Other	60	1.02%	12	20.00%
Not Documented	57	0.97%	7	12.28%
Unspecified	55	0.93%	9	16.36%
Cut/Pierce	52	0.88%	8	15.38%
Other Specified,Classifiable	49	0.83%	12	24.48%
Other Specified,Not Elsewhere Classifiable	48	0.81%	13	27.08%
Other Transport	17	0.28%	1	5.88%
Natural/Environmental, Other	12	0.20%	0	0.00%
Suffocation	10	0.17%	7	70.00%
MVT-Other	9	0.15%	2	22.22%
Fire/Flame	4	0.06%	1	25.00%
Hot Object/Substance	4	0.06%	0	0.00%
Machinery	4	0.06%	1	25.00%
Drowning/Submersion	3	0.05%	3	100.00%
Bite And Stings-Nonvenomous	2	0.03%	0	0.00%
Overexertion	1	0.01%	0	0.00%
Poisoning:Non-Drug	1	0.01%	1	100.00%

RATE BY YEAR

Figure 4: Trauma rate per 100,000 by top 6 mechanisms of injury



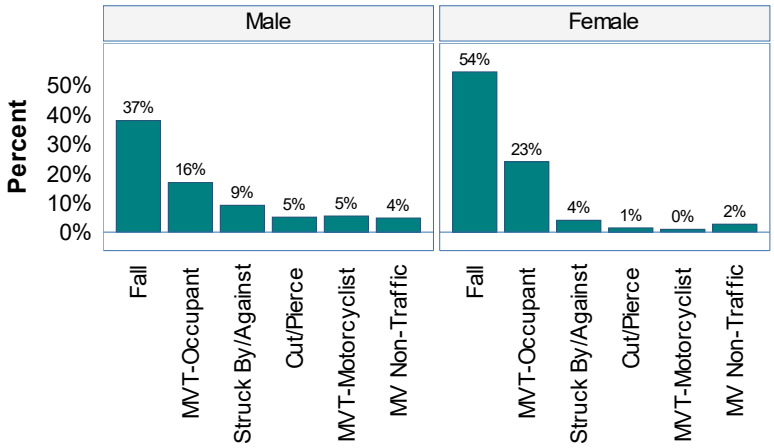
Data source: Arizona State Trauma Registry 2017-2019

Table 6: Trauma rate per 100,000 by top 6 mechanisms and year

Year	Mechanism of injury	Total Trauma Cases	Rate per 100,000 (95%CI)
2017	Fall	21,137	303 [299, 308]
	MVT-Occupant	10,768	155 [152, 158]
	Struck By/Against	3,711	53 [52, 55]
	Cut/Pierce	2,024	29 [28, 30]
	MVT-Motorcyclist	1,884	27 [26, 28]
	MV Non-Traffic	1,657	24 [23, 25]
2018	Fall	23,492	332 [328, 336]
	MVT-Occupant	11,793	167 [164, 170]
	Struck By/Against	3,757	53 [51, 55]
	Cut/Pierce	1,951	28 [26, 29]
	MVT-Motorcyclist	1,921	27 [26, 28]
	MV Non-Traffic	1,510	21 [20, 22]
2019	Fall	26,386	367 [363, 371]
	MVT-Occupant	11,653	162 [159, 165]
	Struck By/Against	4,066	57 [55, 58]
	MV Non-Traffic	2,285	32 [30, 33]
	MVT-Motorcyclist	2,074	29 [28, 30]
	Cut/Pierce	2,066	29 [27, 30]

GENDER

Figure 5: Gender-specific trauma proportion by top 6 mechanisms of injury



Data source: Arizona State Trauma Registry 2019

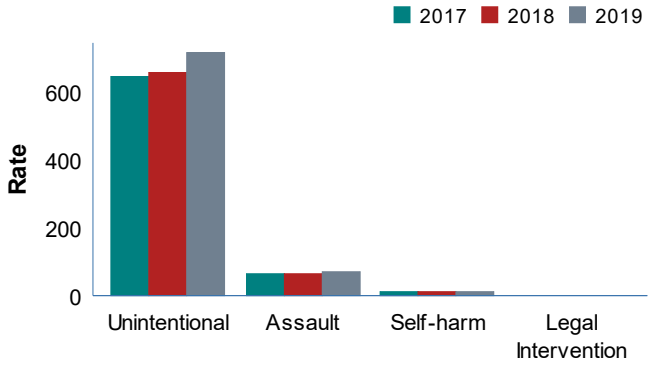
INCIDENCE & MORTALITY

Table 7: Trauma incidence and mortality proportion by intent of injury

Intent	Count	Percent	Deaths	Mortality Proportion
Overall	58,604	100.00%	1,335	2.27%
Unintentional	51,628	88.09%	960	1.85%
Assault	5,004	8.53%	170	3.39%
Self-harm	744	1.26%	131	17.60%
Not documented	598	1.02%	12	2.00%
Undetermined	496	0.84%	46	9.27%
Legal/war	134	0.22%	16	11.94%

INTENT RATE BY YEAR

Figure 6: Trauma rate per 100,000 by intent of injury and year



Data source: Arizona State Trauma Registry 2017-2019

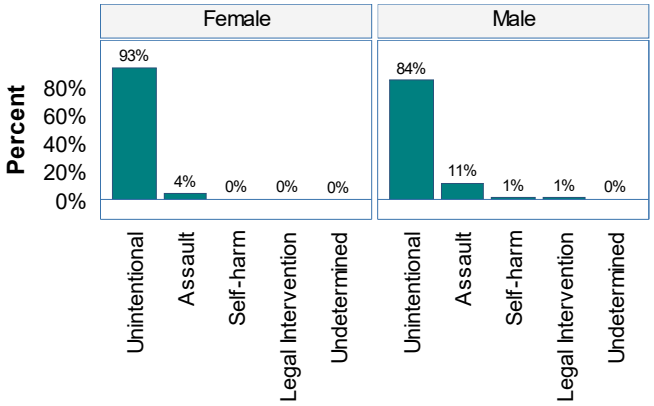
Table 8: Trauma rate per 100,000 by intent and year

Year	Intent of injury	Total Trauma Cases	Rate per 100,000 (95%CI)
2017	Unintentional	44,878	644 [638, 650]
	Assault	4,627	66 [65, 68]
	Self-harm	706	10 [9, 11]
	Legal Intervention	108	2 [1, 2]
2018	Unintentional	46,498	657 [651, 663]
	Assault	4,663	66 [64, 68]
	Self-harm	749	11 [10, 11]
	Legal Intervention	144	2 [2, 2]
2019	Unintentional	51,628	718 [712, 724]
	Assault	5,004	70 [68, 72]
	Self-harm	744	10 [10, 11]
	Legal Intervention	134	2 [2, 2]

CI= Confidence Interval

INTENT RATE BY GENDER

Figure 7: Gender-specific trauma proportion by intent



Data source: Arizona State Trauma Registry 2019

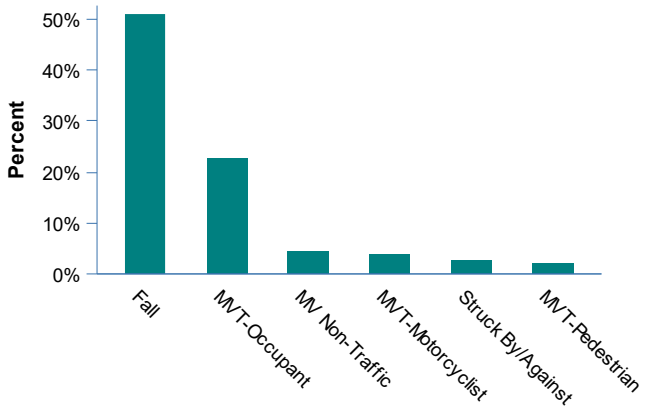
*Intent of Injury: Whether an injury was caused by an act carried out on purpose by oneself (Self-Harm) or by another person(s) (Assault), with the goal of injuring or killing; the injury was not inflicted by deliberate means (Unintentional) or; the injury was inflicted by the police or other legal authorities during law enforcement activities (Legal/War).

Centers for Disease Control and Prevention. Definitions for WISQARS Nonfatal. https://www.cdc.gov/ncipc/wisqars/nonfatal/definitions.htm#nonfatalnjury

INTENT OF INJURY

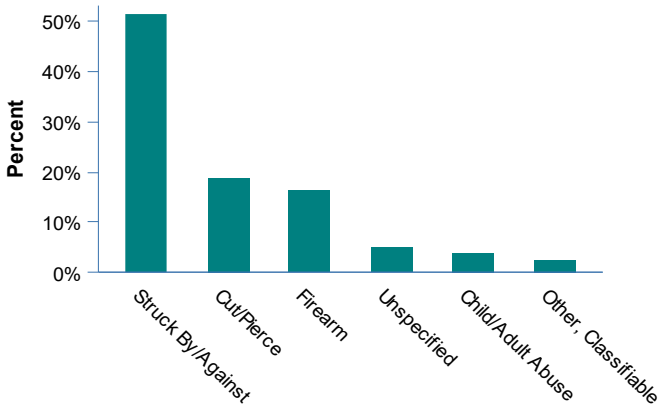
INTENT BY MECHANISM

Figure 8: Top six mechanisms of Unintentional trauma



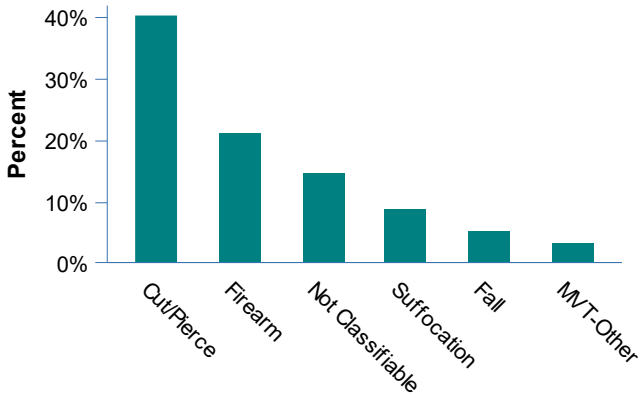
Data source: Arizona State Trauma Registry 2019

Figure 9: Top six mechanisms of Assault trauma



Data source: Arizona State Trauma Registry 2019

Figure 10: Top six mechanisms of Self-harm trauma

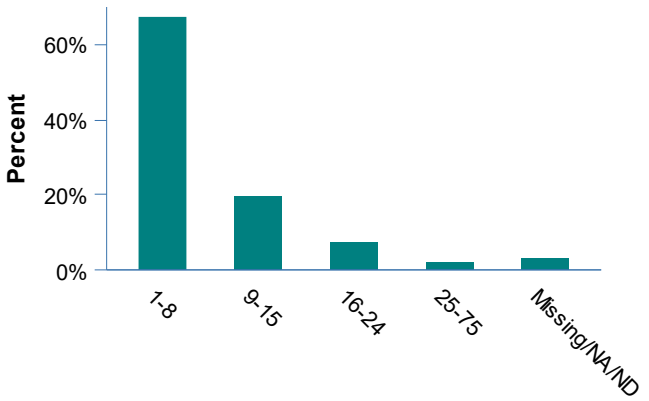


Data source: Arizona State Trauma Registry 2019

INJURY SEVERITY SCORE

INCIDENCE & MORTALITY

Figure 11: Trauma proportion by injury severity score



Data source: Arizona State Trauma Registry 2019

Table 9: Trauma incidence and mortality proportion by injury severity score

Injury Severity Score	Count	Percent	Deaths	Mortality Proportion
1-8	39,379	67.19%	251	0.63%
9-15	11,496	19.61%	261	2.27%
16-24	4,419	7.54%	218	4.93%
25-75	1,454	2.48%	559	38.44%
Missing/NA/ND	1,856	3.16%	46	2.47%

AGE-SPECIFIC MORTALITY

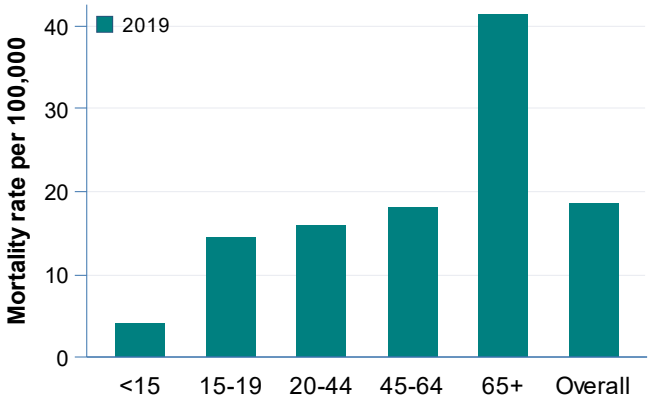
Table 10: Age-specific trauma incidence and mortality proportion

Age	Trauma Count	Trauma Percent	Percent of Arizona Population (n=7,189,020)*	Trauma Deaths	Trauma Mortality Proportion
Total	58,604	100.00%	100.00%	1,335	2.27%
<1	538	0.91%	1.17%	15	2.78%
1-4	1,365	2.32%	4.91%	12	0.87%
5-9	1,479	2.52%	6.29%	8	0.54%
10-14	1,855	3.16%	6.64%	20	1.07%
15-19	3,512	5.99%	6.60%	69	1.96%
20-24	4,051	6.91%	6.86%	88	2.17%
25-34	7,373	12.58%	13.73%	168	2.27%
35-44	5,411	9.23%	12.26%	122	2.25%
45-54	5,355	9.13%	11.84%	143	2.67%
55-64	6,346	10.82%	12.08%	167	2.63%
65-74	7,593	12.95%	10.14%	169	2.22%
75-84	7,940	13.54%	5.45%	199	2.50%
85+	5,786	9.87%	1.98%	155	2.67%

* Source: Arizona Department of Health Services, Population Health and Vital Statistics. Population Denominators: 2019. http://pub.azdhs.gov/health-stats/menu/info/pop/index.php

AGE-SPECIFIC MORTALITY RATE

Figure 12: Age-specific trauma mortality rate per 100,000



Data source: Arizona State Trauma Registry 2017-2019

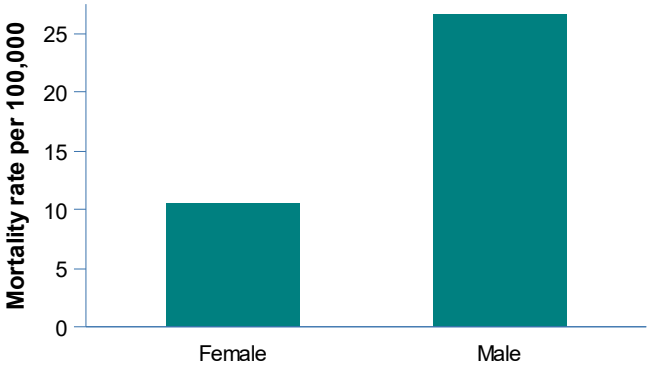
Table 11: Age-specific trauma mortality rate

Age	Total Trauma Deaths	Rate per 100,000 (95%CI)
<15	55	4 [3, 5]
15-19	69	15 [11, 18]
20-44	378	16 [14, 18]
45-64	310	18 [16, 20]
65+	523	41 [38, 45]
Overall	1,335	19 [18, 20]

CI= Confidence interval

GENDER-SPECIFIC MORTALITY RATE

Figure 13: Gender-specific trauma mortality rate per 100,000



Data source: Arizona State Trauma Registry 2019

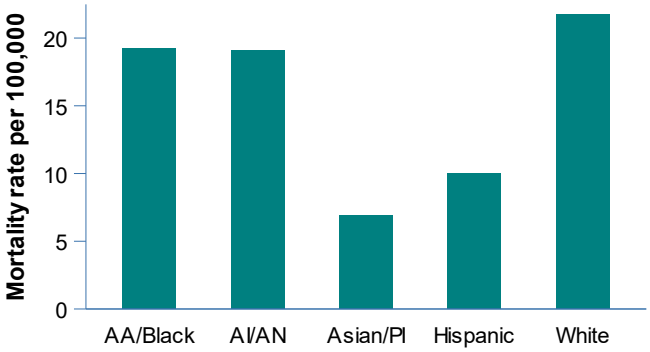
Table 12: Gender-specific trauma mortality rate per 100,000

Gender	Total trauma deaths	Rate per 100,000 (95%CI)
Female	381	11 [9, 12]
Male	953	27 [25, 28]

CI= Confidence interval

RACE-SPECIFIC MORTALITY RATE

Figure 14: Race-specific trauma mortality rate per 100,000



Data source: Arizona State Trauma Registry 2017-2019, PI=Pacific Islander, AI/AN=American Indian/Alaska Native, AA=African American

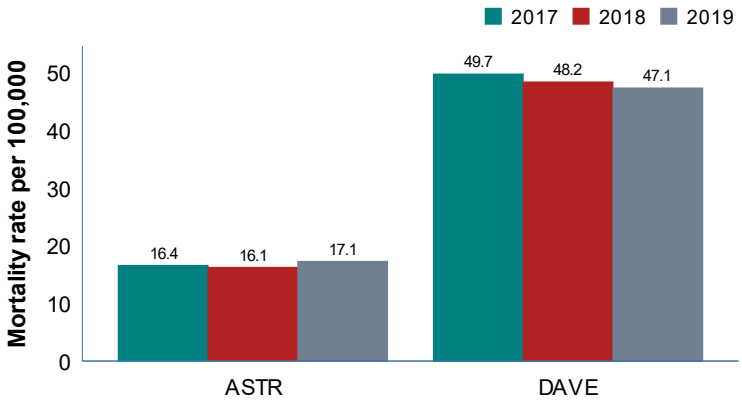
Table 13: Race-specific trauma mortality rate per 100,000

Race/ethnicity	Total trauma deaths	Rate per 100,000 (95%CI)
AA/Black	68	19 [15, 24]
AI/AN	57	19 [14, 24]
Asian/PI	19	7 [4, 10]
Hispanic	229	10 [9, 11]
White	866	22 [20, 23]

CI= Confidence interval

ASTR VS. STATEWIDE

Figure 15: Age-adjusted trauma mortality rate per 100,000: Trauma center deaths vs. Statewide trauma deaths



Data sources: Arizona State Trauma Registry 2017-2019, Database Application for Vital Events, 2017-2019

Table 14: Age-adjusted trauma mortality rate per 100,000 by year: Trauma Center vs. Statewide*

Data source	Year	Total Trauma Deaths	Rate per 100,000 (95%CI)
ASTR	2017	1,220	16.4 [15.5, 17.3]
	2018	1,227	16.1 [15.2, 17.0]
	2019	1,335	17.1 [16.2, 18.0]
DAVE	2017	3,742	49.7 [48.1, 51.3]
	2018	3,723	48.2 [46.7, 49.8]
	2019	3,708	47.1 [45.6, 48.7]

CI= Confidence interval

***Statewide data obtained from the Database Application for Vital Events (DAVE). Includes all trauma deaths including those that occurred outside of trauma centers.**

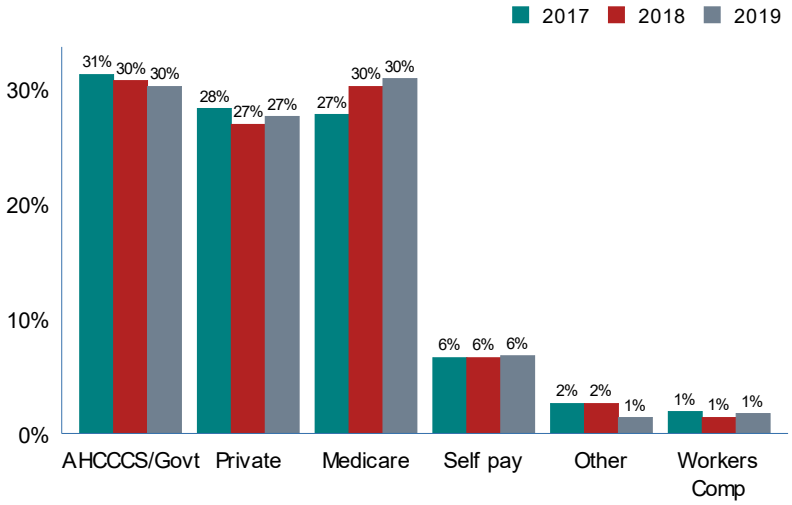
CHARGES & REIMBURSEMENT

Table 15: Total trauma charges and reimbursement by year

Year	Total Charges	Median Charges	Total Reimbursement	Reimbursement Percent
2017	$2,187,732,051	$23,752	$317,620,953	14.5%
2018	$2,611,324,694	$28,068	$375,754,016	14.3%
2019	$3,031,698,529	$28,931	$404,109,995	13.3%

PRIMARY PAYER BY YEAR

Figure 16: Primary payment source of traumatic injuries by year



Data source: Arizona State Trauma Registry 2017-2019, Other includes: No fault auto, Not billed, and Other insurance

CHARGES & REIMBURSEMENT BY PAYER

Table 16: Total trauma charges and reimbursement by primary payer

Primary payer	Total Charges	Median Charges	Total Reimbursement	Reimbursement Percent
AHCCCS/Govt	$1,003,306,654	$28,398	$85,583,955	8.5%
Medicare	$938,446,349	$30,746	$122,708,099	13.0%
Not documented	$191,980	$4,746	$25,295	13.1%
Other	$26,812,523	$17,857	$1,442,264	5.3%
Private	$858,464,576	$29,431	$174,908,880	20.3%
Self pay	$148,479,355	$25,946	$6,130,306	4.1%
Workers Comp	$55,997,092	$29,849	$13,311,197	23.7%
Total	*$3,031,698,529*	*$28,931*	*$404,109,995*	*13.3%*

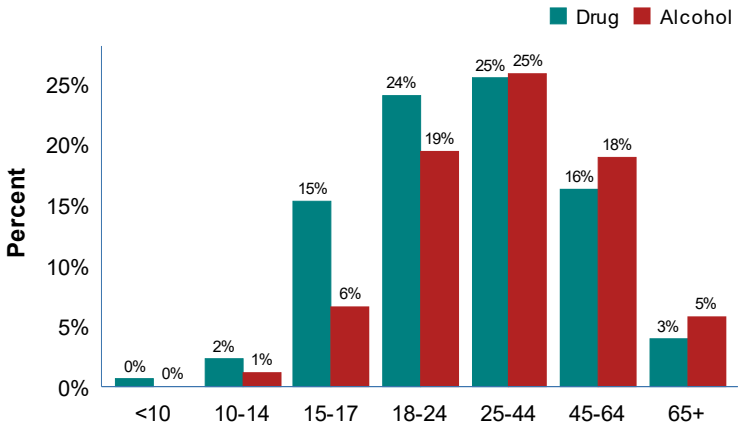
CHARGES & REIMBURSEMENT BY MECHANISM

Table 17: Total trauma charges and reimbursement by mechanism of injury

Mechanism	Total Charges	Median Charges	Total Reimbursement	Reimbursement Percent
Bite And Stings-Nonvenomous	$14,885,425	$26,912	$2,179,246	14.6%
Bite And Stings-Venomous	$824,008	$64,877	$35,501	4.3%
Cut/Pierce	$86,738,474	$28,254	$11,876,900	13.6%
Drowning/Submersion	$2,514,433	$27,621	$520,785	20.7%
Fall	$1,254,915,863	$29,266	$175,015,149	13.9%
Fire/Flame	$7,902,918	$13,062	$524,152	6.6%
Firearm	$127,684,651	$35,501	$15,188,877	11.8%
Hot Object/Substance	$5,270,437	$8,000	$392,143	7.4%
MV Non-Traffic	$109,347,424	$26,487	$14,835,983	13.5%
MVT-Motorcyclist	$216,813,242	$39,811	$27,755,452	12.8%
MVT-Occupant	$609,134,220	$28,273	$76,232,106	12.5%
MVT-Other	$2,226,614	$47,518	$325,577	14.6%
MVT-Pedalcyclist	$39,073,214	$34,599	$5,033,112	12.8%
MVT-Pedestrian	$119,297,144	$41,161	$12,576,273	10.5%
MVT-Unspecified	$91,404	$12,654	$4,728	5.1%
Machinery	$8,997,778	$24,815	$1,367,692	15.2%
Natural/Environmental, Other	$11,509,523	$27,025	$2,110,002	18.3%
Not Documented	$20,731,700	$19,830	$3,445,812	16.6%
Other Land Transport	$44,971,711	$23,864	$7,756,612	17.2%
Other Specified,Child/Adult Abuse	$18,999,147	$32,246	$1,604,794	8.4%
Other Specified,Classifiable	$39,805,732	$26,910	$6,393,189	16.0%
Other Specified,Foreign Body	$361,329	$44,797	$49,990	13.8%
Other Specified,Not Elsewhere Classifiable	$26,117,695	$34,435	$3,528,932	13.5%
Other Transport	$14,717,815	$20,970	$1,706,360	11.5%
Overexertion	$8,160,272	$29,683	$1,426,975	17.4%
Pedalcyclist,Other	$40,706,533	$27,217	$7,386,311	18.1%
Pedestrian,Other	$30,802,185	$36,641	$3,867,010	12.5%
Poisoning:Drug	$34,967	$34,967	$10,736	30.7%
Poisoning:Non-Drug	$278,914	$12,302	$53,080	19.0%
Struck By/Against	$145,286,897	$23,802	$17,982,323	12.3%
Suffocation	$6,232,872	$33,266	$990,150	15.8%
Unspecified	$17,263,989	$26,364	$1,934,043	11.2%
Total	*$3,031,698,529*	*$28,931*	*$404,109,995*	*13.3%*

AGE-SPECIFIC

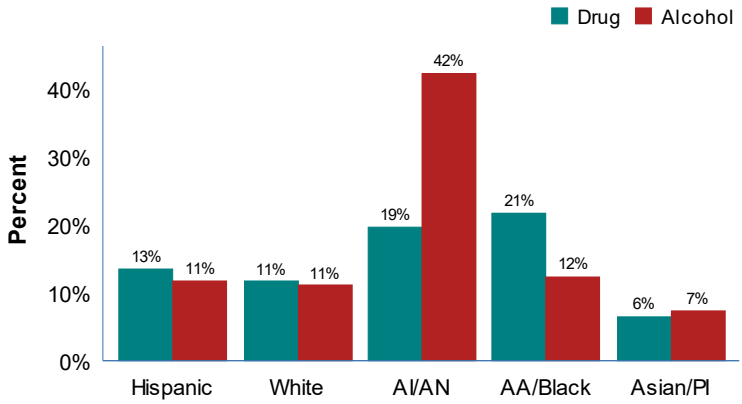
Figure 17: Age-specific trauma proportion by alcohol and drug use



Data source: Arizona State Trauma Registry 2019

RACE-SPECIFIC

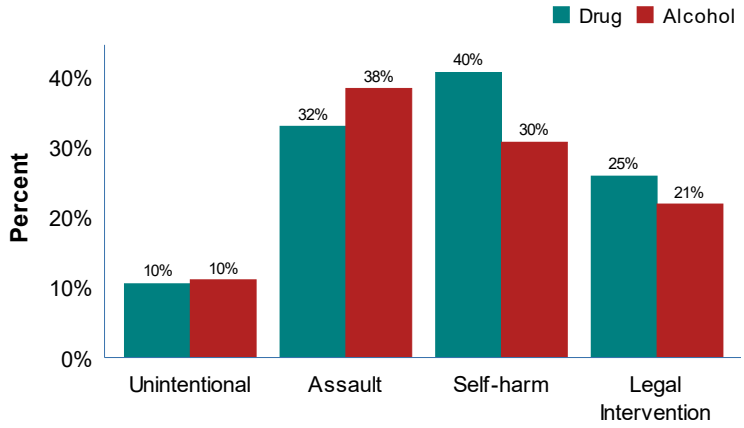
Figure 18: Race-specific trauma proportion by alcohol and drug use



Data source: Arizona State Trauma Registry 2019, PI=Pacific Islander, AI/AN=American Indian/Alaska Native, AA=African American

INTENT-SPECIFIC

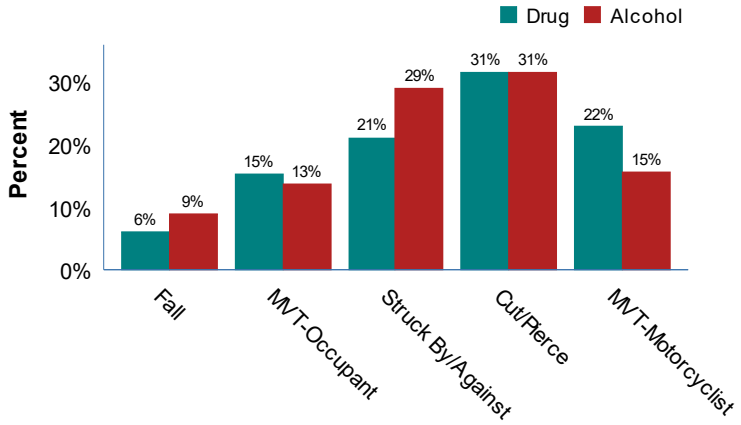
Figure 19: Intent-specific trauma proportion by alcohol and drug use



Data source: Arizona State Trauma Registry 2019

MECHANISM-SPECIFIC

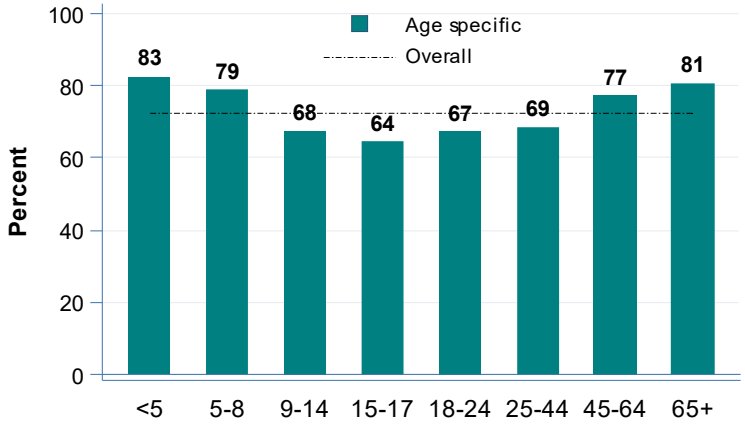
Figure 20: Mechanism-specific trauma proportion by alcohol and drug use



Data source: Arizona State Trauma Registry 2019

MVT-OCCUPANT (N = 11,653)

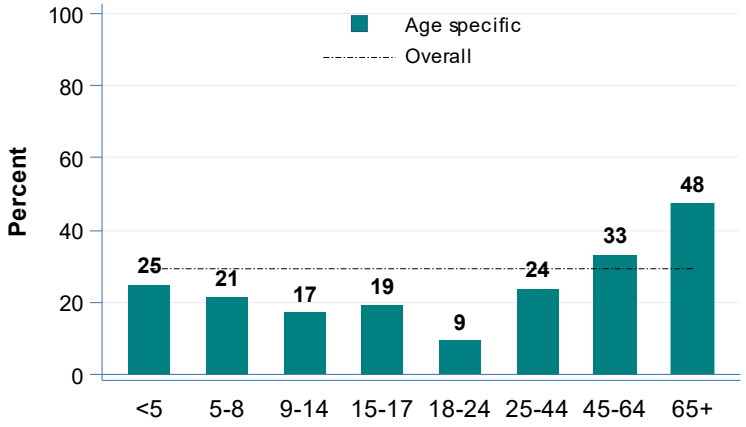
Figure 21: Age-specific proportion of restraint use among Motor Vehicle Traffic occupants



Data source: Arizona State Trauma Registry 2019

PEDAL CYCLIST (N = 1,577)

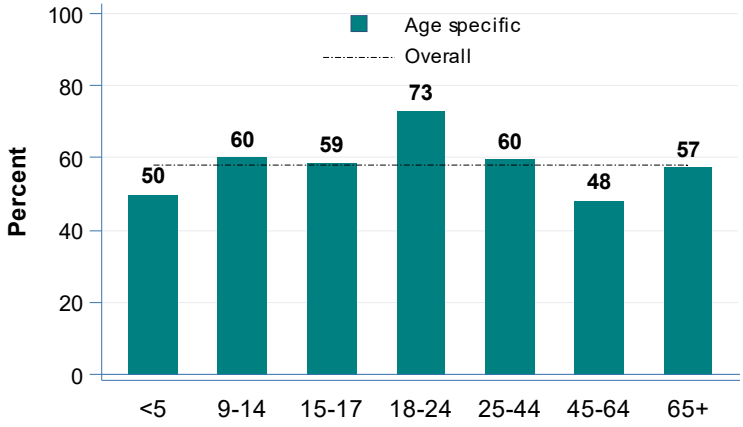
Figure 22: Age-specific proportion of helmet use among pedal-cyclists



Data source: Arizona State Trauma Registry 2019

MOTORCYCLIST (N = 2,074)

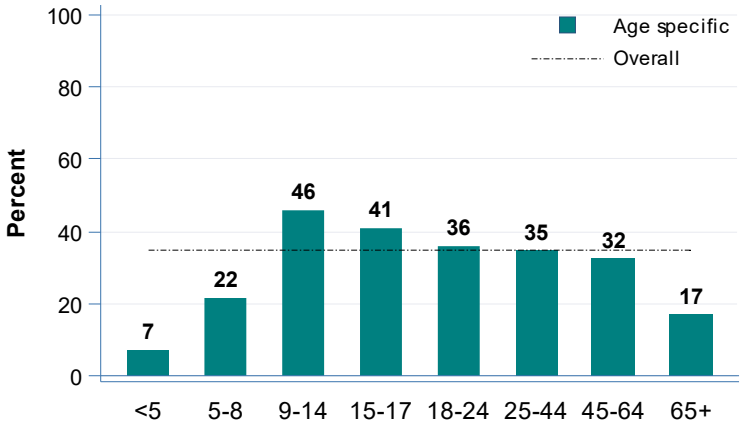
Figure 23: Age-specific proportion of helmet use among Motorcyclists



Data source: Arizona State Trauma Registry 2019

OFF-ROAD VEHICLE OCCUPANT (N = 1,794)

Figure 24: Age-specific proportion of helmet use among off-road vehicle occupants



Data source: Arizona State Trauma Registry 2019

* An age category may be missing in a graph if there are no cases available in that category.

INJURY TO ED ARRIVAL TIME

Table 18: Injury to ED arrival time for patient with an injury severity score > 15 by injury location

Injury location	ISS>15: Injury to ED Arrival Time (Minutes)				
	N	Median time	25th percentile*	75th percentile**	Injury time missing (n)
Rural	574	77	45	125	193
Urban	2,141	46	34	67	1,290
Statewide	2,715	49	35	78	1,483

*25% of the cohort had a median transport time at or below this value
** 75% of the cohort had a median transport time at or below this value

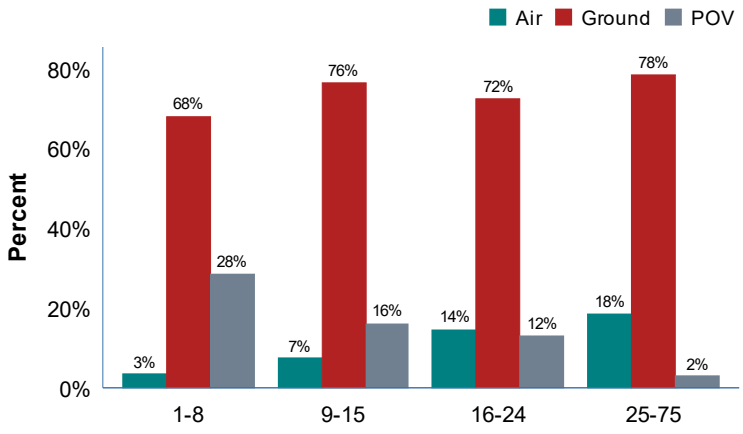
Table 19: Injury to ED arrival time for transferred patients with an injury severity score > 15 by injury location

Injury location	ISS>15 and transferred to Level 1: Injury to Final ED Arrival Time (Minutes)				
	N	Median time	25th percentile*	75th percentile**	Injury time missing (n)
Rural	306	325	229	485	133
Urban	556	327	236	475	473
Statewide	862	326	233	478	606

*25% of the cohort had a median transport time at or below this value
** 75% of the cohort had a median transport time at or below this value

MODE OF TRANSPORT

Figure 25: Mode of transport to trauma center by Injury Severity Score

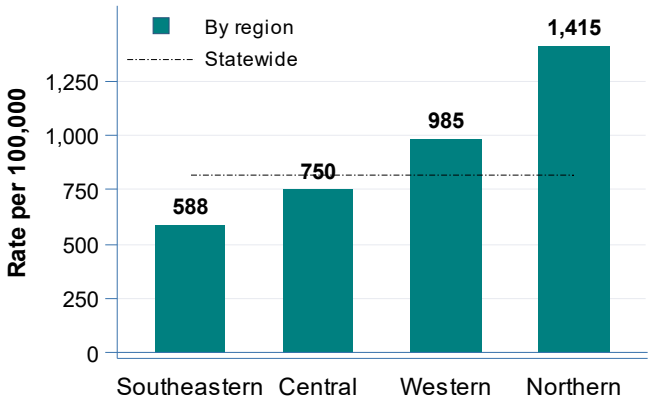


Data source: Arizona State Trauma Registry 2019

POV - Privately owned vehicle

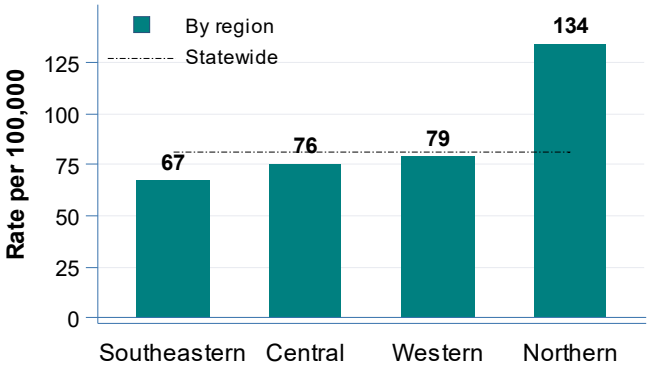
TRAUMA RATE

Figure 26a: Region-specific trauma rate per 100,000



Data source: Arizona State Trauma Registry 2019

Figure 26b: Region-specific severe trauma (ISS>15) rate per 100,000



Data source: Arizona State Trauma Registry 2019

Table 20: Region-specific trauma rate per 100,000

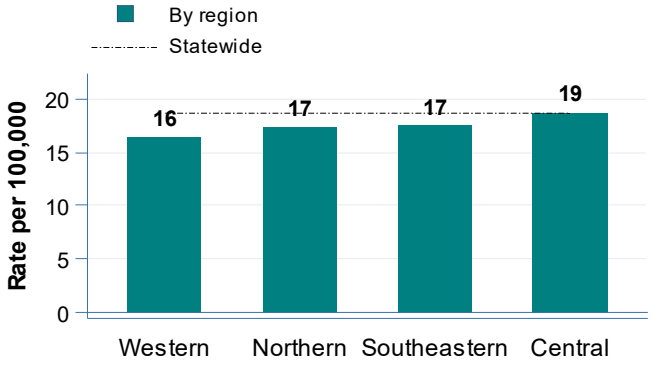
Injury Region	All Trauma Patients		Severe Trauma Patients (ISS >15)		Injury Cases *	
	Total Trauma Cases	Rate per 100,000 (95%CI)	Total Trauma Cases	Rate per 100,000 (95%CI)	Total Injury Cases	Rate per 100,000 (95%CI)
Western	4,621	985 [957, 1,014]	370	79 [71, 87]	39,363	8,392 [8,310, 8,475]
Southeastern	7,512	588 [575, 601]	858	67 [63, 72]	97,001	7,593 [7,545, 7,641]
Northern	7,984	1,415 [1,384, 1,446]	757	134 [125, 144]	46,956	8,321 [8,246, 8,396]
Central	36,594	750 [742, 758]	3,688	76 [73, 78]	370,930	7,604 [7,579, 7,628]

CI= Confidence interval

*The Arizona Hospital Discharge Database (HDD) 2019 was queried to calculate the injury rate by region (In HDD, region is defined based on the county of residence; while in ASTR, region is defined based on the county of injury).

MORTALITY RATE

Figure 27: Region-specific trauma mortality rate per 100,000



Data source: Arizona State Trauma Registry 2019

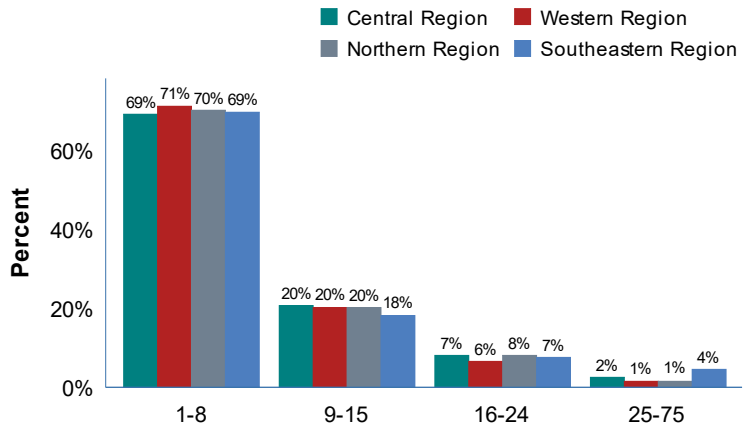
Table 21: Region-specific trauma mortality rate per 100,000

Injury Region	Total Trauma deaths	Rate per 100,000 (95%CI)
Western	77	16 [13, 20]
Northern	98	17 [14, 21]
Southeastern	223	17 [15, 20]
Central	914	19 [18, 20]

CI= Confidence interval

MORTALITY BY ISS

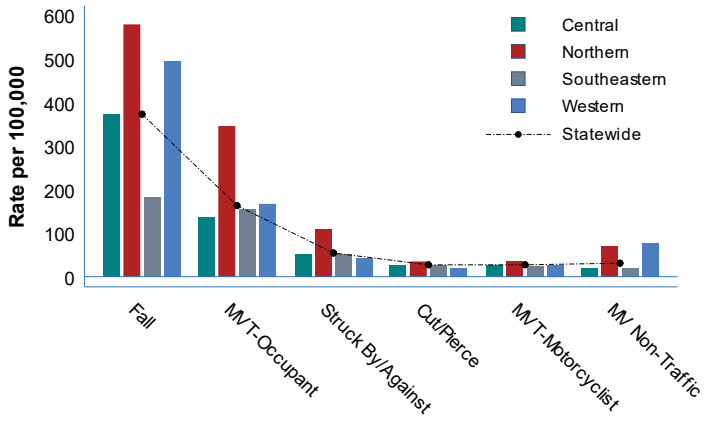
Figure 28: Region-specific trauma proportion by Injury Severity Score



Data source: Arizona State Trauma Registry 2019

MECHANISM OF INJURY

Figure 29: Region-specific trauma rate per 100,000 by top 6 mechanisms

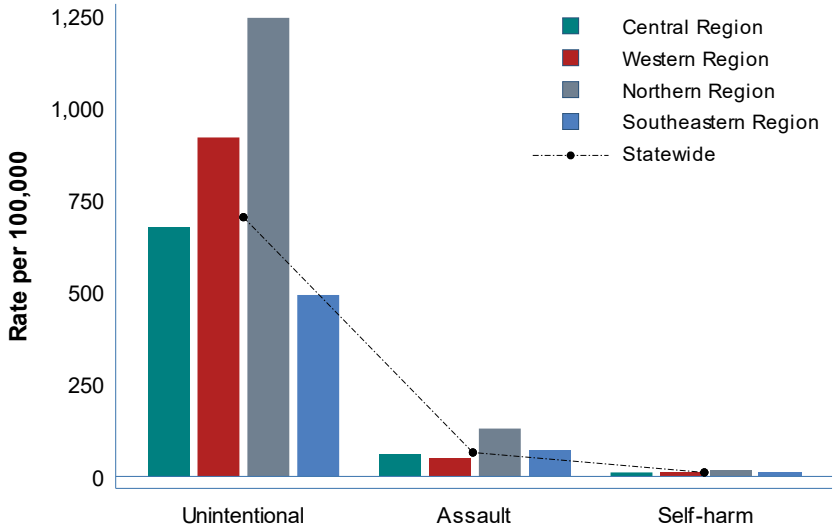


Data source: Arizona State Trauma Registry 2019

Table 22: Region-specific trauma rate per 100,000 by the top 6 mechanism of injury

Region	Mechanisms	Total Trauma Cases	Rate per 100,000 (95%CI)
Central	Fall	17,917	374 [369, 380]
	MVT-Occupant	6,614	138 [135, 141]
	Struck By/Against	2,434	51 [49, 53]
	Cut/Pierce	1,358	28 [27, 30]
	MVT-Motorcyclist	1,361	28 [27, 30]
	MV Non-Traffic	1,077	22 [21, 24]
Northern	Fall	3,264	582 [562, 602]
	MVT-Occupant	1,947	347 [332, 363]
	Struck By/Against	623	111 [102, 120]
	Cut/Pierce	202	36 [31, 41]
	MVT-Motorcyclist	194	35 [30, 39]
	MV Non-Traffic	405	72 [65, 79]
Southeastern	Fall	2,306	182 [175, 190]
	MVT-Occupant	1,963	155 [148, 162]
	Struck By/Against	648	51 [47, 55]
	Cut/Pierce	369	29 [26, 32]
	MVT-Motorcyclist	328	26 [23, 29]
	MV Non-Traffic	241	19 [17, 21]
Western	Fall	2,272	494 [474, 514]
	MVT-Occupant	773	168 [156, 180]
	Struck By/Against	195	42 [36, 48]
	Cut/Pierce	90	20 [16, 24]
	MVT-Motorcyclist	130	28 [23, 33]
	MV Non-Traffic	365	79 [71, 87]
Statewide	Fall	26,386	373 [368, 377]
	MVT-Occupant	11,653	165 [162, 168]
	Struck By/Against	4,066	57 [56, 59]
	Cut/Pierce	2,066	29 [28, 30]
	MVT-Motorcyclist	2,074	29 [28, 31]
	MV Non-Traffic	2,285	32 [31, 34]

Figure 30: Region-specific trauma rate per 100,000 by intent



Data source: Arizona State Trauma Registry 2019

Table 23: Region-specific trauma rate per 100,000 by intent of injury

Region	Intent	Total Trauma Cases	Rate per 100,000 (95%CI)
Central Region	Unintentional	32,535	679 [672, 687]
	Assault	2,964	62 [60, 64]
	Self-harm	463	10 [9, 11]
Northern Region	Unintentional	6,965	1,242 [1,213, 1,272]
	Assault	733	131 [121, 140]
	Self-harm	92	16 [13, 20]
Southeastern Region	Unintentional	6,226	492 [480, 504]
	Assault	899	71 [66, 76]
	Self-harm	133	11 [9, 12]
Western Region	Unintentional	4,229	919 [892, 947]
	Assault	219	48 [41, 54]
	Self-harm	49	11 [8, 14]
Statewide	Unintentional	49,955	706 [700, 712]
	Assault	4,815	68 [66, 70]
	Self-harm	737	10 [10, 11]

CI= Confidence interval

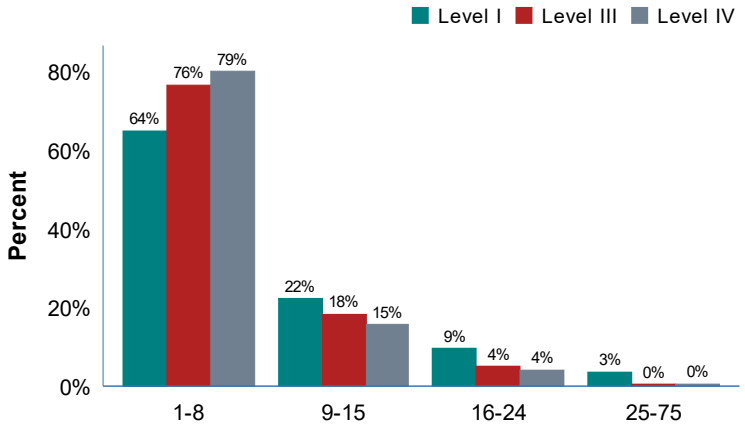
INCIDENCE & MORTALITY

Table 24: Trauma incidence and mortality proportion by trauma center designation

Trauma Center Designation	Count	Percent	Deaths	Mortality Proportion
Level I	38,706	66.24%	1,175	3.03% (1,175/38,706)
Level III	6,838	11.70%	56	0.81% (56/6,838)
Level IV	12,886	22.05%	104	0.80% (104/12,886)

INJURY SEVERITY

Figure 31: Injury Severity Score by trauma center designation



Data source: Arizona State Trauma Registry 2019

CHARGES & REIMBURSEMENT

Table 25: Trauma charges and reimbursement by trauma center designation

Trauma Center Designation	Total Charges	Median Charges	Total Reimbursement	Reimbursement Percent
Level I	$2,534,485,149	$37,037	$355,080,972	14.0%
Level III	$244,589,471	$22,944	$21,337,316	8.7%
Level IV	$251,223,123	$13,591	$27,484,723	10.9%
Total	*$3,030,297,743*	*$29,024*	*$403,903,010*	*13.3%*

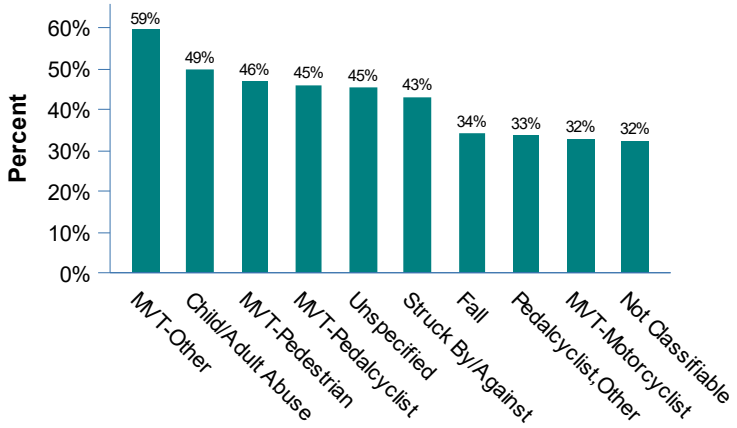
INCIDENCE & MORTALITY

Table 26: Traumatic brain injury incidence and mortality proportion by age and brain injury severity

Age	Total Trauma Cases	Major TBI				Minor TBI			
		N	Percent	Mortality	Mortality Percent	N	Percent	Mortality	Mortality Percent
Total	58,604	6,447	11.00%	652	10.11%	11,901	20.30%	154	1.29%
<1	538	178	33.08%	8	4.49%	133	24.72%	0	.
1-4	1,365	141	10.32%	9	6.38%	234	17.14%	0	.
5-9	1,479	91	6.15%	5	5.49%	225	15.21%	1	0.44%
10-14	1,855	120	6.46%	6	5.00%	370	19.94%	0	.
15-19	3,512	240	6.83%	44	18.33%	803	22.86%	3	0.37%
20-24	4,051	303	7.47%	49	16.17%	902	22.26%	6	0.66%
25-34	7,373	580	7.86%	73	12.58%	1,543	20.92%	17	1.10%
35-44	5,411	489	9.03%	57	11.65%	1,099	20.31%	17	1.54%
45-54	5,355	585	10.92%	73	12.47%	1,125	21.00%	19	1.68%
55-64	6,346	731	11.51%	84	11.49%	1,225	19.30%	27	2.20%
65-74	7,593	948	12.48%	71	7.48%	1,427	18.79%	22	1.54%
75-84	7,940	1,203	15.15%	101	8.39%	1,598	20.12%	24	1.50%
85+	5,786	838	14.48%	72	8.59%	1,217	21.03%	18	1.47%

MECHANISM OF INJURY (TOP 10)

Figure 32: Proportion of Traumatic Brain Injury by mechanism



Data source: Arizona State Trauma Registry 2019

Table 27: Traumatic brain injury incidence and mortality proportion by age and GCS

Age	Total Trauma Cases	TBI- GCS<9				TBI- GCS 9-12				TBI- GCS 12-15			
		N	Percent	Mortality	Mortality Percent	N	Percent	Mortality	Mortality Percent	N	Percent	Mortality	Mortality Percent
Total	58,604	1,277	2.17%	605	47.37%	512	0.87%	44	8.59%	16,174	27.59%	141	0.87%
<1	538	15	2.78%	7	46.66%	6	1.11%	1	16.66%	277	51.48%	0	.
1-4	1,365	22	1.61%	9	40.90%	15	1.09%	0	.	332	24.32%	0	.
5-9	1,479	17	1.14%	6	35.29%	11	0.74%	0	.	286	19.33%	0	.
10-14	1,855	19	1.02%	6	31.57%	6	0.32%	0	.	454	24.47%	0	.
15-19	3,512	107	3.04%	46	42.99%	26	0.74%	0	.	894	25.45%	0	.
20-24	4,051	119	2.93%	52	43.69%	37	0.91%	1	2.70%	1,039	25.64%	2	0.19%
25-34	7,373	230	3.11%	81	35.21%	80	1.08%	4	5.00%	1,790	24.27%	3	0.16%
35-44	5,411	165	3.04%	67	40.60%	41	0.75%	0	.	1,360	25.13%	5	0.36%
45-54	5,355	145	2.70%	80	55.17%	47	0.87%	3	6.38%	1,485	27.73%	7	0.47%
55-64	6,346	156	2.45%	82	52.56%	60	0.94%	9	15.00%	1,702	26.82%	16	0.94%
65-74	7,593	109	1.43%	62	56.88%	64	0.84%	9	14.06%	2,146	28.26%	22	1.02%
75-84	7,940	110	1.38%	67	60.90%	71	0.89%	9	12.67%	2,528	31.83%	46	1.81%
85+	5,786	63	1.08%	40	63.49%	48	0.82%	8	16.66%	1,881	32.50%	40	2.12%

DISCHARGED TO REHAB BY PAYER

Table 28: Discharged to rehab by primary payer and Injury Severity Score

Primary Payer	Total Patient admitted		Discharged to Rehab		ISS <=15 and Discharged to Rehab		ISS >15 and Discharged to Rehab	
	N	%	N	%	N	%	N	%
AHCCCS	9,927	29.68%	534	5.37%	263	3.26%	265	16.97%
Medicare	11,597	34.67%	1,305	11.25%	1,037	10.59%	255	15.98%
Other	271	0.81%	4	1.47%	3	1.32%	1	2.77%
Private	9,836	29.41%	787	8.00%	475	5.72%	309	22.50%
Self pay	1,674	5.00%	12	0.71%	6	0.41%	6	2.79%
Not Documented	138	0.41%	6	4.34%	6	4.80%	0	.
Total	33,443	100.00%	2,648	7.91%	1,790	6.41%	836	17.46%

DISCHARGED TO REHAB BY REGION

Table 29: Discharged to rehab by region of injury

Region	Total Patient Admitted		Discharged to Rehab	
	N	%	N	%
Missing Region	918	2.7%	59	6.4%
Central Region	23,984	71.7%	1,728	7.2%
Western Region	1,869	5.5%	184	9.8%
Northern Region	3,388	10.1%	326	9.6%
Southeastern Region	3,284	9.8%	351	10.6%
Statewide	33,443	100.0%	2,648	7.9%

Health Care Institution	Address	Effective Date	Expiration Date
Level I Trauma Centers			
Abrazo West Campus	13677 W. McDowell Road, Goodyear, AZ 85395	06/30/18	06/30/21
Banner - University Medical Center Phoenix	1111 E. McDowell Rd., Phoenix, AZ 85006	11/18/17	11/18/21
Banner Desert Medical Center	1400 South Dobson Rd., Meza, AZ 85202	04/23/19	04/23/22
Banner Thunderbird Medical Center	5555 W. Thunderbird Rd, Glendale, AZ 85306	09/30/19	09/30/22
Banner University Medical Center – Tucson Campus	1625 N. Campbell Ave, Tucson, AZ 85719	11/11/18	11/11/21
Dignity Health, dba Chandler Regional Medical Center	1955 W. Frye Rd., Chandler, AZ 85224	07/01/18	07/01/22
Flagstaff Medical Center	1200 N. Beaver St., Flagstaff, AZ 86001	05/27/20	05/27/21
HonorHealth Deer Valley Medical Center	19829 N. 27th Ave., Phoenix, AZ 85027	06/01/19	06/01/22
HonorHealth John C. Lincoln Medical Center	250 E. Dunlap Ave., Phoenix, AZ 85020	04/24/20	04/24/21
HonorHealth Scottsdale Osborn Medical Center	7400 E. Osborn, Scottsdale, AZ 85251	10/27/18	10/27/21
Maricopa County Special Health Care District, dba Valleywise Health Medical Center	2601 E. Roosevelt, Phoenix, AZ 85008	12/19/17	12/19/21
St. Joseph's Hospital & Medical Center	350 W. Thomas Rd., Phoenix, AZ 85013	11/20/19	11/20/23
Level I Pediatric Trauma Centers **			
Phoenix Children's Hospital	1919 E. Thomas Rd., Phoenix, AZ 85016	08/31/18	08/31/22
Level III Trauma Centers			
Banner Baywood Medical Center	6644 E. Baywood Ave., Mesa, AZ 85206	02/25/20	02/25/24
Banner Del E. Webb Medical Center	14502 W. Meeker Blvd, Sun City West, AZ 85375	01/25/19	01/25/22
Canyon Vista Medical Center	5700 E. Highway 90, Sierra Vista, AZ 85635	04/03/20	04/03/23
Carondelet St. Joseph's Hospital	350 N. Wilmot Rd., Tucson, AZ 85718	02/04/20	*02/04/23
Havasu Regional Medical Center	101 Civic Center Ln., Lake Havasu City, AZ 86403	02/28/20	02/28/23
Mountain Vista Medical Center	1301 S. Crismon Rd., Mesa, AZ 85209	07/26/20	07/26/21
Tuba City Regional Health Care Corp.	P.O. Box 600, 167 Main St., Tuba City, AZ 86045	12/10/18	12/10/21

***Application Pending:** **In accordance with R9-25-1307D – If an owner submits for renewal of designation, the designation does not expire until the Department has made a final determination.**

****Pediatric Level I Trauma Centers:** All Arizona Designated Trauma Centers are required to have the capabilities necessary to resuscitate, stabilize, and transfer pediatric patients. Pediatric Trauma Centers have a trauma service specifically intended to meet the needs of children requiring trauma care.

Level IV Trauma Centers			
Banner Boswell Medical Center	10401 W. Thunderbird Blvd., Sun City, AZ 85351	12/17/18	12/17/21
Banner Casa Grande Medical Center	1800 E. Florence Blvd., Casa Grande, AZ 85122	10/01/19	10/01/21
Banner Estrella Medical Center	9201 W. Thomas Road, Phoenix, AZ 85037	08/30/18	08/30/21
Banner Gateway Medical Center	1900 N. Higley Road, Gilbert, AZ 85234	01/02/19	01/02/22
Banner Ironwood Medical Center	37000 N. Gantzel Rd., San Tan Valley, AZ 85140	10/11/18	10/11/21
Banner Page Hospital	501 N. Navajo, Page, AZ 86040	11/05/17	*11/05/20
Banner Payson Medical Center	807 S. Ponderosa Street, Payson, AZ 85541	11/22/19	11/22/22
Banner University Medical Center – South Campus	2800 E. Ajo Way, Tucson, AZ 85713	08/13/20	08/13/22
Benson Hospital	450 S. Ocotillo Ave., Benson, AZ 85602	09/18/19	09/18/21
Cobre Valley Regional Medical Center	5880 S. Hospital Dr., Globe, AZ 85501	11/26/18	11/26/21
Copper Queen Community Hospital	101 Cole Ave., Bisbee, AZ 85603	12/01/19	12/01/21
Copper Queen Community Hospital – Douglas Emergency Department	100 E. 5th Street, Douglas, AZ 85607	06/25/19	06/25/22
Kingman Regional Medical Center	3269 Stockton Hill Rd., Kingman, AZ 86409	10/15/18	10/15/21
La Paz Regional Hospital	1200 W. Mohave Rd., Parker, AZ 85344	06/02/18	06/02/21
Little Colorado Medical Center	1501 N. Williamson Ave, Winslow, AZ 86047	06/22/18	06/22/21
Mt. Graham Regional Medical Center	1600 S. 20th Ave., Safford, AZ 85546	03/20/20	03/20/23
Northern Cochise Community Hospital	901 W. Rex Allen Dr., Willcox, AZ 85643	12/04/17	12/04/20
San Carlos Apache Health Care Corporation	103 Medicine Way Road, Peridot, AZ 85542	05/09/18	05/09/21
Summit Healthcare Regional Medical Center	2200 Show Low Lake Rd., Show Low, AZ 85901	08/12/20	08/12/23
Verde Valley Medical Center	269 S. Candy Ln., Cottonwood, AZ 86326	08/18/20	08/18/23
Verde Valley Medical Center – Sedona Campus	3700 W. Hwy 89A, Sedona, AZ 86336	05/08/19	05/08/22
Western Arizona Regional Medical Center	2735 Silver Creek Road, Bullhead City, AZ 86442	10/28/19	10/28/22
White Mountain Regional Medical Center	118 S. Mountain Ave., Springerville, AZ 85938	06/18/18	06/18/21
Wickenburg Community Hospital	520 Rose Ln., Wickenburg, AZ 85390	08/08/17	*08/08/20
Yavapai Regional Medical Center – West Campus	1003 Willow Creek Road, Prescott, AZ 86301	01/10/20	01/10/23
Yavapai Regional Medical Center – East Campus	7700 E. Florentine, Prescott Valley, AZ 86314	06/24/20	06/24/23
Yuma Regional Medical Center	2400 South Avenue A, Yuma, AZ 85364	10/28/19	*10/28/20

***Application Pending:** **In accordance with R9-25-1303E – If an owner submits for renewal of designation, the designation does not expire until the Department has made a final determination.**

****Pediatric Level I Trauma Centers:** All Arizona Designated Trauma Centers are required to have the capabilities necessary to resuscitate, stabilize, and transfer pediatric patients. Pediatric Trauma Centers have a trauma service specifically intended to meet the needs of children requiring trauma care.

TRAUMA PATIENT INCLUSION DEFINITION

ARIZONA STATE TRAUMA REGISTRY (ASTR)

Effective for records with ED/Hospital Arrival Dates January 1, 2018 – Current**

The owner of a trauma center shall ensure that:

1. The trauma registry, established according to subsection (B)(1), includes the information required in R9- 25-1309 for each patient with whom the trauma center had contact who meets one or more of the following criteria:
   a. A patient with injury or suspected injury who is:
      i. Transported from a scene to a trauma center or an emergency department based on the responding emergency medical services provider's or ambulance service's triage protocol required in R9-25- 201(E)(2)(b), or
      ii. Transferred from one health care institution to another health care institution by an emergency medical services provider or ambulance service;
   b. A patient with injury or suspected injury for whom a trauma team activation occurs; or
   c. A patient with injury, who is admitted as a result of the injury or who dies as a result of the injury, and whose medical record includes one or more of specific ICD-codes indicating that:
      i. At the initial encounter with the patient, the patient had:
      (1) An injury or injuries to specific body parts - S00-S99 with 7th character modifiers of A, B, or C ONLY. (Injuries to specific body parts –initial encounter)

      (2) Unspecified multiple injuries - T07 (unspecified multiple injuries)

      (3) Injury of an unspecified body region - T14 (injury of unspecified body region)

      (4) A burn or burns to specific body parts - T20-T28 with 7th character modifier of A ONLY (burns by specific body parts – initial encounter)

      (5) Burns assessed through Total Body Surface Area percentages - T30-T32 (burn by TBSA percentages) or

      (6) Traumatic Compartment Syndrome - T79.A1-T79.A9 with 7th character modifier of A ONLY (Traumatic Compartment Syndrome – initial encounter);

and

ii. The patient's injuries or burns were not only:

(1) An isolated distal extremity fracture from a same-level fall,

(2) An isolated femoral neck fracture from a same-level fall,

(3) Effects resulting from an injury or burn that developed after the initial encounter – (Late effect codes, which are represented using the same range of injury diagnosis codes but with the 7th digit modifier code of D through S),

(4) A superficial injury or contusion –

S00 (Superficial injuries of the head)
S10 (Superficial injuries of the neck)
S20 (Superficial injuries of the thorax)
S30 (Superficial injuries of the abdomen, pelvis, lower back and external genitals)
S40 (Superficial injuries of shoulder and upper arm)
S50 (Superficial injuries of elbow and forearm)
S60 (Superficial injuries of wrist, hand and fingers)
S70 (Superficial injuries of hip and thigh)
S80 (Superficial injuries of knee and lower leg) S90 (Superficial injuries of ankle, foot and toes)), or

(5) A foreign body entering through an orifice;

(6) *The inclusion criteria are in the trauma rules. This document is a guide and does not supercede the rules.