



# State Trauma Advisory Board 2011 Annual Report



**Arizona Department of Health Services  
Will Humble, Director**

**Published by  
Arizona Department of Health Services  
Division of Public Health Services  
Bureau of Emergency Medical Services & Trauma System  
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Phoenix, Arizona 85007  
Bentley J. Bobrow, MD, Medical Director  
Terry Mullins, Bureau Chief**

**Prepared by:  
The Data and Quality Assurance Section  
Bureau of Emergency Medical Services & Trauma System**

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

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**State Trauma Advisory Board  
2011 Annual Report  
&  
2010 Trauma Registry Report**

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## State Trauma Advisory Board Membership

The following is a list of the talented professionals and citizens who serve the State of Arizona as members of the State Trauma Advisory Board by giving of their time and expertise and providing invaluable guidance for the Arizona trauma system. We thank them for their many contributions to the Arizona Department of Health Services and the citizens of Arizona.

### **Bentley J. Bobrow, M.D., Chairman**

Medical Director  
Bureau of EMS and Trauma System -- Phoenix, AZ

### **Bill Ashland, R.N.**

Regional EMS Council – Northern Region Representative  
Flagstaff Medical Center -- Flagstaff, AZ

### **Jeff Farkas, NREMT-P**

Statewide Fire District Association Representative  
Show Low Fire Department – Show Low, AZ

### **Iman Feiz-Erfan, M.D.**

Statewide Neurosurgical Society Representative  
Maricopa Medical Center – Phoenix, AZ

### **Martyn J. Fink, Aviation & Operations Sgt.**

Department of Public Safety Representative  
Department of Public Safety -- Phoenix, AZ

### **VACANT**

Tribal Health Organization Representative

### **Stewart Hamilton, M.D.**

Regional EMS Council – Western Region Representative  
Yuma Regional Medical Center -- Yuma, AZ

### **Philip Johnson, M.D.**

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

### **Christina Kwasnica, M.D.**

Statewide Rehabilitation Facility Representative  
St. Joseph's Neurorehabilitation, Phoenix, AZ

### **Leonard Kirschner, M.D., M.P.H.**

National Association of Retired Persons Representative  
Litchfield Park, AZ

### **David Notrica, M.D., FACS., FAAP**

Statewide Pediatric Organization Representative  
Phoenix Children's Hospital -- Phoenix, AZ

### **Scott Petersen, M.D., (Vice Chair)**

American College of Surgeons Representative  
St. Joseph's Hospital and Medical Center -- Phoenix, AZ

### **Michael Pflieger, M.D.**

National Organization of Emergency Physicians Representative  
Scottsdale Healthcare/Osborn -- Scottsdale, AZ

### **Dave Ridings, Assistant Chief**

Fire Dept – County with a Population of Five Hundred  
Thousand Persons or More – Representative - City of Tucson Fire  
Department -- Tucson, AZ

### **Peter Rhee, M.D., MPH**

Trauma Center Representative  
University of Arizona -- Tucson, AZ

### **Anthony Rhorer, M.D.**

National Association of Orthopaedic Trauma Representative  
Sonoran Orthopaedic Trauma Surgeons -- Scottsdale, AZ

### **Roy Ryals, Director of EMS**

Regional EMS Council – Central Region Representative  
Southwest Ambulance -- Mesa, AZ

### **Chris Salvino, M.D., M.S., FACS**

Trauma Center Representative  
Banner Good Samaritan Regional Medical Center -- Phoenix, AZ

### **Tanie Sherman, R.N., Director, Regulatory of Advocacy**

Statewide Hospital Association Representative  
Arizona Hospital and Healthcare Assoc. -- Phoenix, AZ

### **Mark Venuti, CEP**

Statewide Ambulance Association Representative  
Guardian Medical Transport -- Flagstaff, AZ

### **Jonathan Walker, D.O.**

Federal Indian Health Services Organization Representative  
Phoenix Indian Medical Center -- Phoenix, AZ

### **Laurie Wood, R.N.**

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

### **Linda Worthy, R.N.**

Society of Trauma Nurses Representative  
John C. Lincoln North Mountain Hospital -- Phoenix, AZ

### **Michelle Ziemba, R.N., MSN**

Regional EMS Council – Southeastern Region Representative  
University Medical Center -- Tucson, AZ

## Trauma and EMS Performance Improvement Standing Committee Membership

The following is a list of the talented professionals and citizens who serve the State of Arizona as members of the Trauma and EMS Performance Improvement Standing Committee by giving of their time and expertise and providing invaluable guidance for the Arizona trauma and EMS system. We thank them for their many contributions to the Arizona Department of Health Services and the citizens of Arizona.

**Michelle Ziemba, R.N., MSN,**

Chair  
University Medical Center, Tucson, AZ

**Bill Ashland, R.N.**

Rural Representative  
Flagstaff Medical Center -- Flagstaff, AZ

**Vicki Bennett, R.N., MSN**

Scottsdale Healthcare/Osborn  
Trauma Services Representative -- Scottsdale, AZ

**Jane Burney, R.N.**

Scottsdale Healthcare/Osborn  
Trauma Quality Analyst -- Scottsdale, AZ

**Jeff Farkas, NREMT-P**

Fire District Representative  
Show Low Fire Department -- Show Low, AZ

**Pam Goslar, Ph.D.**

Expertise in Health Data Analysis Representative  
St. Joseph's Hospital and Medical Center -- Phoenix, AZ

**Michelle Guadnola, R.N.**

St. Joseph's Hospital and Medical Center  
Trauma Services Representative -- Phoenix, AZ

**Philip Johnson, M.D.**

Rural Emergency Department Physician  
Summit Healthcare Regional Medical Center -- Show Low, AZ

**Scott Petersen, M.D.**

Urban Trauma Center Surgeon  
St. Joseph's Hospital and Medical Center -- Phoenix, AZ

**Richard Porter, Bureau Chief**

Epidemiologist, ADHS  
Bureau of Public Health Statistics -- Phoenix, AZ

**Tanie Sherman, R.N., Director, Regulatory of Advocacy**

Statewide Hospital Association Representative  
Arizona Hospital and Healthcare Assoc. -- Phoenix, AZ

**Kelly Silberschlag, CEO**

Accredited Rehab Facility Representative  
Director of Commercial Operations -- Ernest Health  
Mountain Valley Regional Rehab Hospital -- Prescott, AZ

**Charlann Staab, R.N., MSN, CFRN**

Arizona Ambulance Association Representative  
Air Evac Services, Inc. -- Phoenix, AZ

**Tiffany Strever, R.N.**

Maricopa Medical Center's Trauma  
Services Representative -- Phoenix, AZ

**Brenda Sutton, R.N.**

Maricopa Medical Center  
Prehospital Coordinator -- Phoenix, AZ

**Melissa Twomey, R.N., M.S.**

Phoenix Children's Hospital  
Trauma and Forensic Program Director

**Linda Worthy, R.N.**

John C. Lincoln North Mountain Hospital's  
Trauma Services Representative -- Phoenix, AZ

**VACANT**

Urban Non-Trauma Acute Care Facility Representative

**VACANT**

Banner Good Samaritan Regional Medical Center  
Trauma Services Representative -- Phoenix, AZ

**Frank Walter, M.D., FACEP**

**MDC Liaison**  
Division of Emergency Medicine Health Sciences Center --  
Tucson, AZ

**VACANT**

**EMS Council Liaison**

## **Annual Report to the Director**

This annual report, developed by the Bureau of EMS and Trauma System (Bureau) on behalf of the State Trauma Advisory Board (STAB) is a synopsis of the work and achievements during the past year and describes challenges which lie ahead for the Arizona trauma system.

STAB is mandated by statute to: (1) make recommendations on the initial and long-term processes for the verification and designation of trauma center levels, including the evaluation of trauma center criteria; (2) make recommendations on the development and implementation of comprehensive regional emergency medical services and trauma system plans; (3) make recommendations on the state emergency medical services and trauma system quality improvement processes, including the state trauma registry; and (4) submit an annual report to the Director of ADHS on or before October 1 regarding the STAB's accomplishments and recommendations.

### **Mandate 1: Recommendations on Verification and Designation**

This past year, a result of comments received by the Trauma Center site visit experts the Bureau began a revision to the Level IV Trauma Center designation process. Specifically, during their site visits, the trauma experts recognized the limited capabilities of many of these facilities to clearly demonstrate the facility's capability to meet designation requirements. While trauma system statutes and rules are prescriptive, the opportunity for policy changes to require that additional material be completed and submitted as a part of the application process exists. The Bureau of EMS and Trauma System (BEMSTS) is currently in the developing a more extensive and reflective application process which will be used from this point forward. The outcome of this change is that the on-site reviewers will have access to a more extensive application document to review in anticipation of the site visit and therefore will be able to utilize the site visit as an opportunity to ask clarifying questions and reach informed decisions in a more timely fashion and with less ambiguity.

### **Mandate 2: Recommendation on System Development**

Prior to 2006, the Arizona trauma system, was characterized by seven designated Level I Trauma Centers and, while robust, inadvertently excluded the sizable amount of trauma care rendered at non-Level I Trauma Centers. Thus, the pre-2006 Arizona State Trauma Registry (ASTR) was not completely representative of all trauma patient stabilization and care in Arizona. To this end, members of STAB encouraged the Bureau to invite the American College of Surgeons to Arizona to perform a state trauma system assessment. Fortunately, in 2006 there were sufficient funds available to accomplish this goal. A major finding of the state trauma system assessment was that timely access to trauma care was not uniformly available to those individuals residing in many of the rural areas of the State. In response to this report, the BEMSTS and the STAB jointly embarked on intensive efforts to recruit rural hospitals into the State Trauma System as Level IV Trauma Centers. Since 2007, 15 hospitals have become designated as Level IV Trauma Centers and several more are considering upgrading to level III Trauma Centers. As a result, access to timely trauma care is improved in Arizona. In 2010 54% of patients in the Western Region, 38% of patients in the Northern Region and 39% of patients in the Southeastern region arrived at a Level IV Trauma Center within an hour of their injuries. Statewide in 2010, 36% of ALL trauma patients transported to a Level I Trauma Center and 43% of patients transported to a Level IV Trauma Center arrived within an hour of their injury.

In the 2009 annual STAB report Guidelines were promulgated on the mode of transport for injured patients in Arizona. This work advanced the discussion on this topic and contributed to the eventual passage of HB- 2548 "Development of Guidelines on the use of Medical Helicopters." Beginning this fall, the EMS Council and Medical Direction Commission (MDC) will be charged with developing

mode of transport Guidelines for non-trauma patients. While those Guidelines have not yet been established, the intention is to build on the significant and important work completed by STAB on this topic.

### **Mandate 3: Recommendations on EMS and Trauma System Quality Improvement**

In late 2009, the Director of ADHS charged the Bureau with improving the efficiency of the three statutory committees under the purview of the Bureau (STAB, MDC and EMS Council). Previously only Bureau staff was responsible for reporting on activities among the statutory committees. During 2009 formal liaisons were established from each of the statutory committees to each of the standing committees. This change ensures that activities related to the emergency care system as a whole will be reported back to the broader stakeholder community through a formal process. Additionally the Arizona Trauma System Quality Assurance and System Improvement (AZTQ) Committee was repurposed and renamed as the Trauma and EMS Performance Improvement (TEPI) Standing Committee. This change reflects the inter-related performance improvement activities of the emergency care system for all patients (trauma and non-trauma) and builds upon the performance improvement strength and experience of the trauma community.

### **Outreach to Partners**

#### The University of Arizona, Mel & Enid Zuckerman College of Public Health, Center for Rural Health

A Critical Access Hospital is a federal designation for small rural hospitals located at least 35 miles from another hospital and having 25 or fewer inpatient beds. (<https://www.cms.gov/center/cah.asp>, <http://rho.arizona.edu/programs/service/flex>). The University of Arizona, Mel and Enid Zuckerman College of Public Health's Center for Rural Health (CRH), administers the federal Medicare Rural Hospital Flexibility Program. The CRH continues to offer small grants or seed money to those Critical Access Hospitals (CAHs) interested in state designation as a Level IV Trauma Center. Nine state designated Level IV trauma centers were operational by the end of 2010, of which four were CAHs. Each of these four CAHs applied for and received federal Medicare Rural Hospital Flexibility Program grant funds to support their respective needs in the designation process. The CRH is diligently working with the staff at three additional CAHs to assist them in putting into place all of the requirements in preparation for Level IV State Trauma Center designation.

The CRH has also provided financial support to a Level I Trauma Center in the Phoenix area, enabling its professional staff to travel to rural parts of Arizona to provide the American College of Surgeon's Rural Trauma Team Development Course (RTTDC). The RTTDC is specifically designed to teach rural healthcare staff in life-saving trauma care skills such as resuscitation, stabilization, and appropriate transport of trauma patients to a higher level of care.

In 2010, a one-day conference was held in Phoenix entitled "*Medical Direction in Arizona: The Role and Function of the Medical Director and Pre-Hospital Coordinator in a Challenging Environment.*" The event was cosponsored by the Southeast Arizona Emergency Medical Services Council, the Bureau of EMS & Trauma System, and the CRH. More than 80 participants learned about the regulatory requirements for prehospital coordinators and physician medical directors, the impact on local EMS agencies that have Level IV trauma centers in their communities, and ways to improve communication and coordination between EMS medical directors and EMTs/paramedics.

Additionally, this past June, the BEMSTS and the CRH co-sponsored a webinar entitled the "*Rural Hospitals Interested in Level III and IV Designation.*" This Webinar included presentations by the

American College of Surgeons, the Center for Rural Health, the Bureau of EMS and Trauma System, a Level IV Trauma Center site reviewer and a Level IV Trauma Center program manager. The goal of the Webinar was to provide information about the verification and designation requirements for level III and IV trauma centers and to answer questions about the process. Over 50 individuals participated in this well received webinar

Throughout the 2010-2011 year, the CRH has sought our input for other funding opportunities related to trauma system development for rural hospitals and their staff. Examples include trauma coordinator training, trauma data collection, training, quality improvement, and other identified needs. The BEMSTS is appreciative of the CRH's partnership on these key trauma care initiatives.

### **Arizona State Trauma Registry (ASTR)**

Accurate trauma system and patient level data collection remains a priority for measuring and improving Arizona's Trauma System. The 2010 Arizona State Trauma Registry (ASTR) includes trauma data from 19 reporting facilities - eight Level I Trauma Centers, nine Level IV Trauma Centers and two non-designated hospitals. Four new Level IV Trauma Centers were designated at the time of this report, bringing the current number of designated trauma centers to 23. The volume of trauma records continues to increase as additional hospitals apply for designation.

Several important ASTR projects were completed this year that will enhance the accuracy of the data received from reporting hospitals. The ASTR currently includes two datasets, a full dataset of 160 data elements and a reduced dataset of 40 data elements. Levels I – III Trauma Centers submit the full data set and Level IV and non-designated hospitals have the option to submit the full or reduced data set.

**Data Validity Efforts:** The ASTR data validation tool, developed collaboratively by ADHS staff and the trauma registry software vendor was completed this year and significantly increases the ASTR data quality. More than 800 data checks are performed per record for the full data set and more than 240 data checks are performed per record for the reduced data set. Data checks include warning flags for blank fields, invalid entries, date and time errors, and other data logic errors. The validation tool includes both state and national checks, thus assisting reporting hospitals with their data submission to both ASTR and the National Trauma Data Bank. The Data and Quality Assurance (DQA) staff run validation reports and the results are sent to the reporting hospitals so the data can be updated, confirmed, and re-submitted to the ASTR with changes. This data validation is a key step forward for the ASTR.

The Trauma Registry Users Group (TRUG) continues to meet quarterly to review quality assurance practices, provide data entry discussion and education, answer questions, and request feedback from participating hospitals. Data and Quality Assurance (DQA) staff meets with individual trauma registrars from newly designated trauma centers and is continuously available to provide assistance when requested by the registrars.

The Reduced Dataset Trauma Registry Users Group (RD-TRUG) is a sub-group of TRUG comprised of trauma registrars from designated Level IV trauma centers and non-designated hospitals that submit the ASTR reduced dataset. RD-TRUG meetings provide the same opportunity to review trauma registry quality assurance practices, provide data entry discussion and education, and obtain feedback from the trauma registrars. While RD-TRUG members have their own meetings, participation at TRUG meetings is encouraged.

The DQA Section performs statewide Inter-Rater Reliability (IRR) testing as a quality assurance tool to continuously improve on trauma data entry standardization and data reliability. The IRR process includes distributing a redacted sample trauma record to the ASTR participating hospitals. The trauma registrars are instructed to abstract and submit the IRR test record to the ASTR. The submitted IRR test records are individually compared against the master IRR test record on a field-by-field basis, checking for data entry consistency between the individual trauma registrars and with the established ASTR data entry standards. The trauma registrars receive their individual IRR results and the aggregate de-identified IRR results at a Trauma Registry Users Group (TRUG) meeting. Common areas of disagreement are discussed and a consensus is reached on the most suitable values.

The American Trauma Society oversees a national trauma registrar certification process. Eight of Arizona's trauma registrars have passed the testing and training requirements necessary to achieve the designation of Certified Specialist in Trauma Registry (CSTR).

### **Quality Improvement Efforts - Z-statistic and Barel Matrix/Survival Risk Ratio Report:**

The Bureau has a statutory obligation to provide reports to those facilities that submit data to the ASTR. In the past these reports provided relatively static analysis of the Trauma Centers' performance on process measures that were benchmarked against a blinded aggregate of the other Trauma Centers. After one of the Level I Trauma Centers participated in a recent outcomes analysis supported by the American College of Surgeons, the trauma medical director of the facility approached the Bureau to request a related report that is specific to Arizona. The result is a tool that provides specific information about patient outcomes in each Level I Trauma Center against a blinded aggregate of all state trauma centers. In addition, the report goes on to provide survival risk ratios by body regions.

### **Arizona Prehospital Information and EMS Registry System (AZ-PIERS)**

The Bureau received one-time Hospital Preparedness Program funding in 2010 to implement Arizona's first electronic Patient Care Report (ePCR) system. The ePCR system is called Arizona Prehospital Information and EMS Registry System (AZ-PIERS), serving as a prehospital care quality assurance initiative, and will be made available to all EMS agencies free of charge. AZ-PIERS is the final component in the Premier EMS Agency Program (PEAP) that captures all ePCRs generated from EMS agencies, with a special emphasis on ST segment Myocardial Infarction (STEMI), Out of Hospital Cardiac Arrest (OHCA), Trauma, Stroke, and Traumatic Brain Injury (TBI). AZ-PIERS will also facilitate data sharing with the Arizona Department of Transportation (ADOT) Crash Database. An added feature of this system is the Hospital Dashboard which will allow for automatic transmission (and updates) of the ePCR for hospital inclusion in the patient's medical record.

### **Focus Areas for Upcoming Years**

**Performance and Outcome Measures:** As was described above, our efforts to improve access to trauma care has had positive results. Access to care is not the real measure of effectiveness because it says nothing about the patient's clinical experience. Over the next few years the Bureau will be focusing on additional measures that provide a clearer clinical picture of our trauma system enhancements. Under consideration are analyses of patient outcomes, assessment of practitioner trauma education, and assessments of the timeliness of transfers from Level IV Trauma Centers to Level I Trauma Centers.

**Data Validity and Quality Improvements:** With the advent of the AZ-PIERS registry, the Bureau believes that additional trauma data element capture will be facilitated. As demonstrated in the attached ASTR 2010 Report, while significant strides have been made, more work is needed to improve the quality and completeness of the trauma registry data capture. Many of these elements pertain to the prehospital component of care, while others pertain to care provided in the Trauma Centers. The BEMSTS will continue to work with TRUG, RDTRUG and the soon to be developed EMS Registry Users Group (EMSRUG) to improve on the completeness of the data capture and the quality of the data captured to ensure the most accurate evaluation of trauma care in Arizona.

### **Conclusion**

Over the past few years Arizona's trauma system has grown and improved significantly. The outlook for the next few years includes more growth, including the likely introduction of more Level IV Trauma Centers and possibly Level II or III Trauma Centers. The system for caring for injured Arizonans will continue to mature and improve. The steady leadership of the multi-disciplinary State Trauma Advisory Board and the Trauma and EMS Performance Improvement Standing Committee will continue to ensure progress towards the goal of ensuring timely, consistent high-level trauma care for all injured citizens in Arizona. The BEMSTS is grateful to the STAB members for their expertise and dedication to improving the care of trauma patients in Arizona.

## Appendix A

### Arizona Designated Trauma Centers

Health Care Institution	Address	Effective Date	Expiration Date
<b>Level I Trauma Centers</b>			
Banner Good Samaritan Medical Center	925 E. McDowell Rd., Phoenix, AZ 85006	11/17/08	11/17/11
Flagstaff Medical Center	1200 N. Beaver St., Flagstaff, AZ 86001	05/27/11	05/27/14
John C. Lincoln - North Mountain	250 E. Dunlap Ave., Phoenix, AZ 85020	04/23/11	04/23/14
Maricopa Medical Center	2601 E. Roosevelt, Phoenix, AZ 85008	12/19/08	12/19/11
Phoenix Children's Hospital	1919 E. Thomas Rd., Phoenix, AZ 85016	08/31/09	08/31/12
St. Joseph's Hospital & Medical Center	350 W. Thomas Rd., Phoenix, AZ 85013	11/20/10	11/20/13
Scottsdale Healthcare – Osborn	7400 E. Osborn, Scottsdale, AZ 85251	10/26/08	10/25/11
University Medical Center	1501 N. Campbell Ave., Tucson, AZ 85724	11/11/08	11/11/11
<b>Level IV Trauma Centers</b>			
Banner Page Hospital	501 N. Navajo, Page, AZ 86040	11/05/08	11/05/11
Little Colorado Medical Center	1501 N. Williamson Ave., Winslow, AZ 86047	03/10/09	03/10/12
Northern Cochise Community Hospital	901 W. Rex Allen Dr., Willcox, AZ 85643	12/04/08	12/03/11
Summit Healthcare Regional Medical Center	2200 Show Low Lake Rd., Show Low, AZ 85901	08/12/11	08/12/14
Tuba City Regional Health Care Corp.	POB 600, Tuba City, AZ 86045	05/06/09	05/06/12
La Paz Regional Hospital	1200 W. Mohave Rd., Parker, AZ 85344	06/02/09	06/02/12
Kingman Regional Medical Center	3269 Stockton Hill Rd., Kingman, AZ 86409	10/15/09	10/15/12
Copper Queen Community Hospital	101 Cole Ave., Bisbee, AZ 85603	12/01/09	12/01/12
Chinle Comprehensive Health Care Facility	P.O. Drawer PH, Chinle, AZ 86503	09/09/10	09/09/13
Havasu Regional Medical Center	101 Civic Center Ln., Lake Havasu City, AZ 86403	01/20/11	01/20/14
Mountain Vista Medical Center	1301 S. Crismon Rd., Mesa, AZ 85209	02/10/11	02/10/14
Benson Hospital	450 S. Ocotillo Ave., Benson, AZ 85602	03/03/11	03/03/14
Wickenburg Community Hospital	520 Rose Ln., Wickenburg, AZ 85390	08/08/11	08/08/14
Southeast Arizona Medical Center	2174 W. Oak Ave., Douglas, AZ 85607	08/18/11	08/18/14
Verde Valley Medical Center	269 S. Candy Ln., Cottonwood, AZ 86326	08/18/11	08/18/14

# Appendix B

## EMS Regions and Trauma Centers



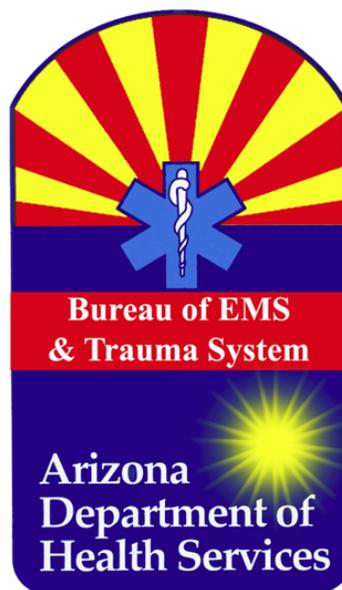
Legend	
Level I Trauma Center	<b>EMS Regions</b>
Level IV Trauma Center	Central
City With Acute Care Hospital	Northern
Interstate Highway	Southeastern
County Boundary	Western





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

**Arizona State Trauma Registry 2010 Data**



**Prepared by:**

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**Anita Ray Ng, BA, Trauma Registry Manager**

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**Terry Mullins, MBA, Bureau Chief**

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

# DESCRIPTION OF THE ARIZONA TRAUMA SYSTEM

**Geo-Population:**

Arizona is 400 miles long and 310 miles wide, totaling an area of 114,006 square miles of which 364 square miles is water. Topographically the state is a heterogeneous blend of deserts, mountains, plateaus, lakes, and the largest stand of Ponderosa pine in the United States. The highest elevation is Humphrey’s Peak at 12,633 feet above sea level, the lowest elevation is the Colorado River at 70 feet above sea level, and the mean elevation is 4,100 feet. Arizona shares contiguous borders with the states of California, Colorado, Nevada, New Mexico, and Utah. The Mexican states of Sonora, Chihuahua, and Baja California Norte share a contiguous international border with Arizona. The state includes 15 counties, with Maricopa County being the largest with a geographic area of 9,204 square miles, a population of 3.8 million, and the seat of state government in Phoenix.

Arizona observed a three percent (3%) decrease in overall population in 2010, with 6,603,122 residents in 2009 and 6,351,646 residents in 2010. All but one of Arizona’s 15 counties observed decreases in population in 2010 – Santa Cruz County with the lowest decrease at -0.1% and Gila County with the highest decrease at -10%. Pinal County, however, observed a 15% increase in population in 2010.

**Indian Reservations:**

Arizona is very fortunate to have within its borders twenty-two (22) federally recognized American Indian tribes, comprising a 2010 collective population of 292,139, of which 178,131 (60%) reside on reservations and tribal lands. The American Indian tribes within Arizona’s borders include: the Ak-Chin Indian Community, Cocopah Indian Tribe, Colorado River Indian Tribes, Fort McDowell Yavapai Nation, Fort Mojave Indian Tribe, Pascua Yaqui Indian Tribe, Quechan Tribe, Salt River Pima-Maricopa Indian Community, San Carlos Apache Tribe, San Juan Southern Paiute Tribe, Gila River Indian Community, Havasupai Tribe, Hopi Tribe, Hualapai Tribe, Kaibab-Paiute Tribe, Navajo Nation, Tohono O’odham Nation, Tonto Apache Tribe, White Mountain Apache Tribe, Yavapai Apache Nation, Yavapai-Prescott Indian Tribe, and the Zuni Tribe.

**Arizona’s Trauma Centers and 2010 Cumulative Data:**

The Arizona EMS and Trauma System includes 23 state-designated trauma centers. There are eight (8) Level-I trauma centers - six located in the central county of Maricopa with 60% of the state’s population; the remaining two Level-I trauma centers are respectively located in the northern-most county of Coconino and the southern county of Pima. There are 15 designated Level-IV trauma centers dispersed primarily in the rural areas the state. Two additional healthcare institutions, Yavapai Regional Medical Center in the north and Yuma Regional Medical Center in the west, treat trauma patients but are not designated trauma centers.

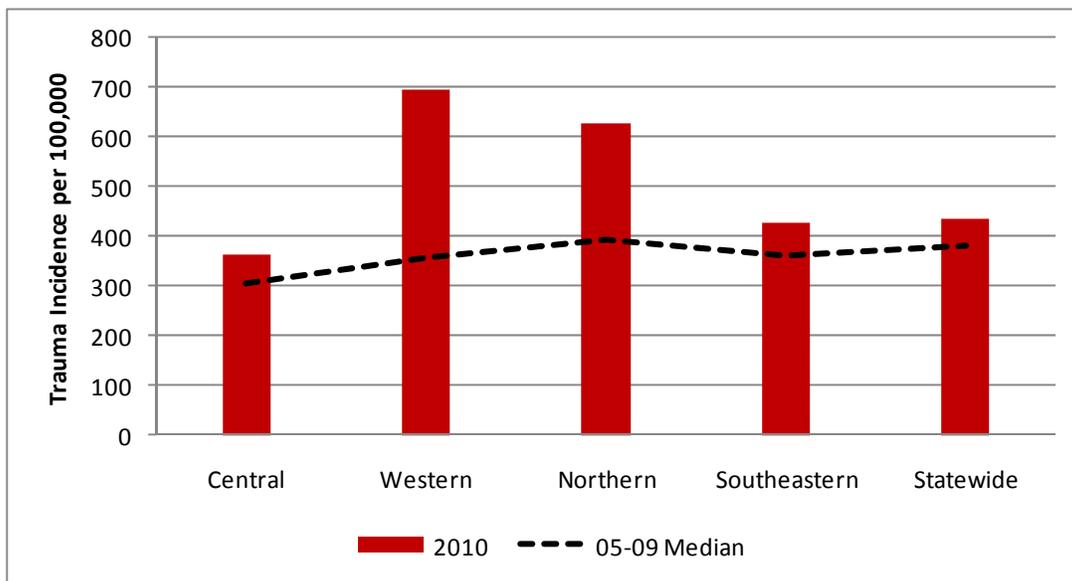
LEVEL I		
Banner Good Samaritan Medical Center	Flagstaff Medical Center	John C. Lincoln Hospital - North Mountain
Maricopa Medical Center	Phoenix Children’s Hospital	Scottsdale Healthcare – Osborn
St. Joseph’s Hospital & Medical Center	University Medical Center – Tucson	
LEVEL IV		
Banner Page Hospital	Benson Hospital	Chinle Comprehensive Healthcare Facility
Copper Queen Community Hospital	Havasupai Regional Medical Center	Kingman Regional Medical Center
La Paz Regional Hospital	Little Colorado Medical Center	Mountain Vista Medical Center
Northern Cochise Community Hospital	Southeast Arizona Medical Center	Summit Healthcare Regional Medical Center
Tuba City Regional Health Care Corp.	Verde Valley Medical Center	Wickenburg Community Hospital

The purpose of this report is to accurately describe the incidence and outcomes of trauma patients across Arizona using the Arizona State Trauma Registry (ASTR). The Arizona State Trauma Registry received 27,831 records from the 19 participating health care institutions in 2010. The various mechanisms of injury, location, and demographics of traumatic injuries are presented and compared with data from the National Trauma Data Bank (NTDB) or the Centers for Disease Control and Prevention (CDC) when available. Additionally, these data presented are derived from the ASTR which has evolved and grown in size since its inception in 2005, but still does not yet capture all traumatic injuries in Arizona.

## ***ACKNOWLEDGEMENT***

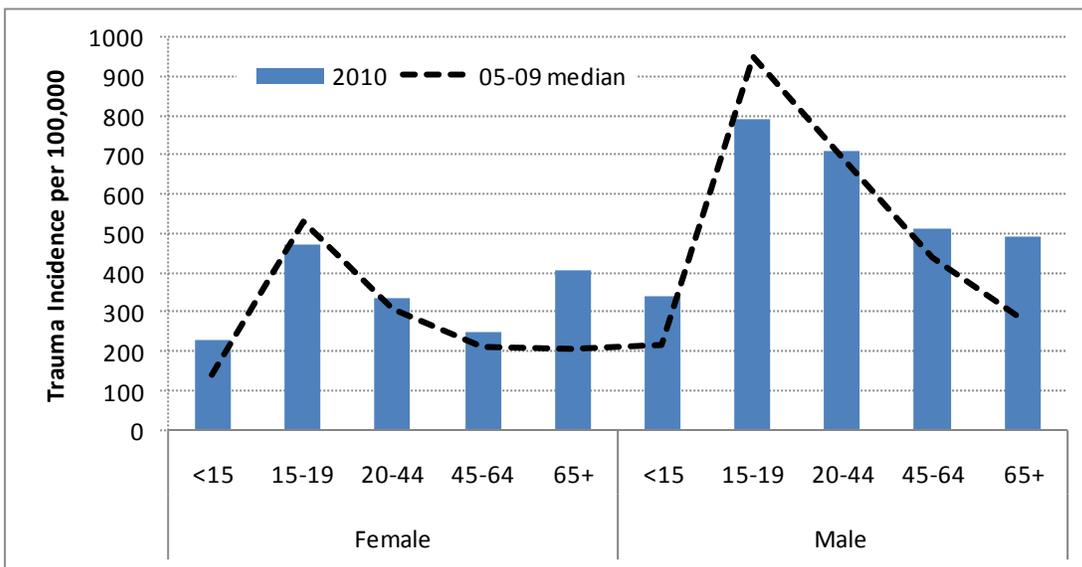
The Arizona Department of Health Services' Bureau of Emergency Medical Services and Trauma System (Bureau) wishes to acknowledge the continued hard work and dedication of the many individuals involved in the Arizona EMS and Trauma System and working to improve patient outcomes. We would especially like to thank all the participating Trauma Centers, Trauma Directors, Trauma Managers and Trauma Registrars for their contribution to continuously improving the data collection processes in order to fully evaluate the trauma system in Arizona.

**Figure 1: Region-specific Trauma Rates per 100,000 Arizona Residents, ASTR 2005-2010**



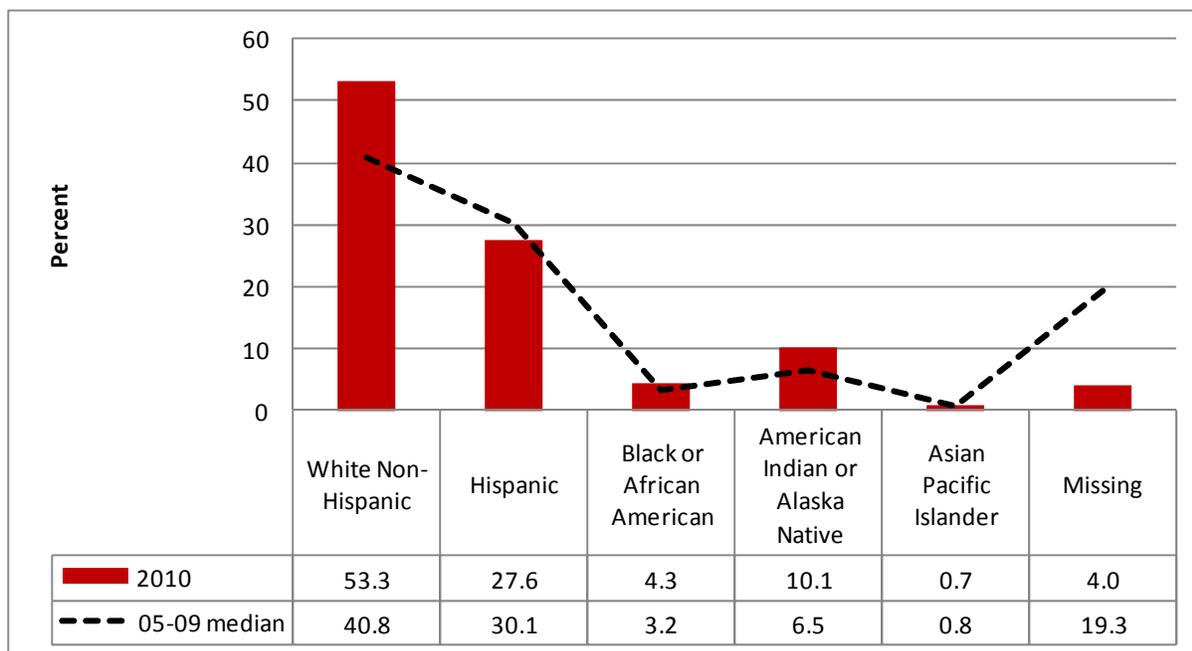
Although the Central region is the most densely populated and has the highest volume of trauma, it has the lowest trauma rate per 100,000 residents as compared to all other regions.

**Figure 2: Gender & Age-specific Trauma Rates per 100,000 Arizona Residents, ASTR 2005-2010**



Across all the age groups, Males have a higher trauma rate than Females. The 15-19 year old age group has the highest trauma rate for Males & Females in both the 2010 and the 2005-2009 five-year median. However, this has been steadily decreasing over the last five years. Increase in trauma rates for pediatric and geriatric population may be due to changes in inclusion criteria or an increase in the number of reporting hospitals.

**Figure 3: Race-specific Trauma Rates, ASTR 2005-2010**



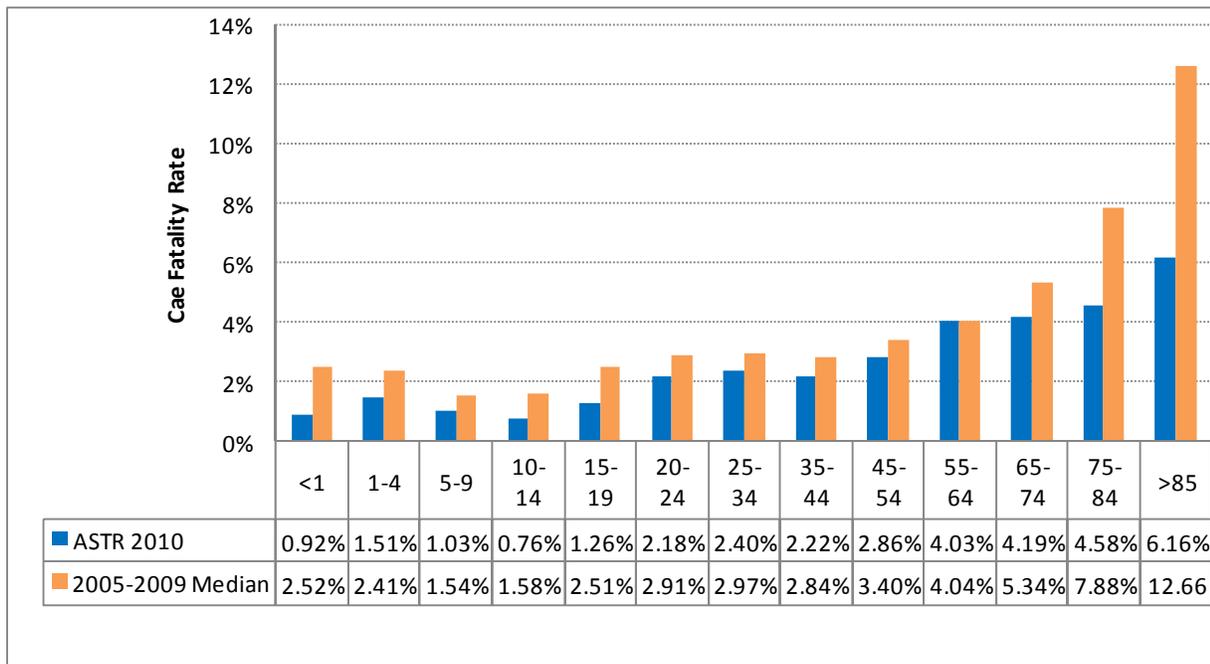
Statewide race and ethnicity data were missing for 20% of trauma records from 2005 to 2009. By 2010, the percent missing has decreased to 4%, highlighting the ongoing efforts of reporting hospitals to submit complete data to ASTR.

**Table 1: Age-specific Trauma Rates and Case Fatality Rates, ASTR 2005-2010**

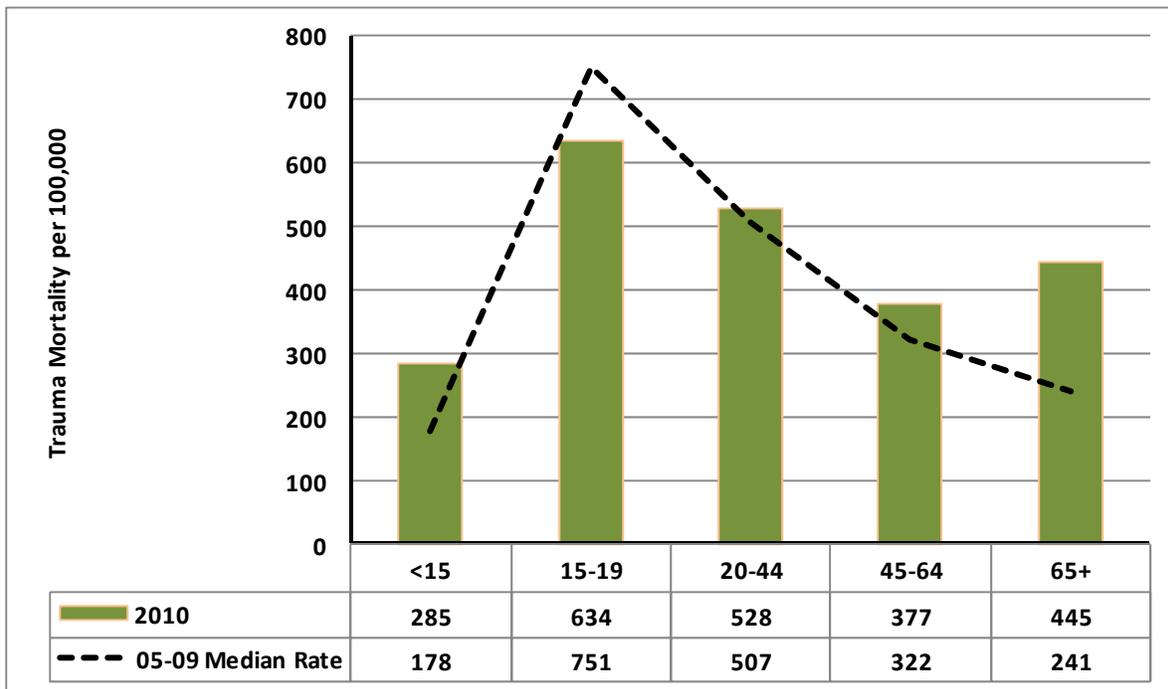
INCIDENTS AND CASE FATALITY RATE BY AGE, ASTR 2010				
Age (Years)	Count	Percent	Deaths	Case Fatality Rate
<1	325	1.16%	3	0.92%
1-4	1,191	4.27%	18	1.51%
5-9	1,058	3.80%	11	1.03%
10-14	1,299	4.66%	10	0.76%
15-19	2,927	10.51%	37	1.26%
20-24	3,156	11.33%	69	2.18%
25-34	4,571	16.42%	110	2.40%
35-44	3,467	12.45%	77	2.22%
45-54	3,386	12.16%	97	2.86%
55-64	2,526	9.07%	102	4.03%
65-74	1,643	5.90%	69	4.19%
75-84	1,438	5.16%	66	4.58%
>85	844	3.03%	52	6.16%
<b>Total</b>	<b>27,831</b>	<b>100.00%</b>	<b>721</b>	<b>2.59%</b>

Trauma affects people of all ages and is the leading cause of death among persons 1-44 years of age according to the Centers for Disease Control and Prevention (Table 1). Of the 27,831 trauma patients, the overall mortality rate was 2.59%. The highest case fatality rate was observed among the geriatric population, especially within the >85 age group (6.16%) (Table 1). The case fatality rate in 2010 has decreased across all age groups as compared to 2005-2009 median (Figure 4). Figure 5 depicts trauma mortality rates per 100,000 Arizona residents by age. Arizona's highest trauma mortality rate per 100,000 was in the 15-19 year age range.

**Figure 4: Age-specific Trauma Related Mortality Rates, ASTR 2005-2010**



**Figure 5: Age-specific Trauma Related Mortality Rates per 100,000 Arizona Residents, ASTR 2005-2010**



# INJURY CHARACTERISTICS: MECHANISM OF INJURY

**Figure 6: Top Mechanisms of Injury by Region**

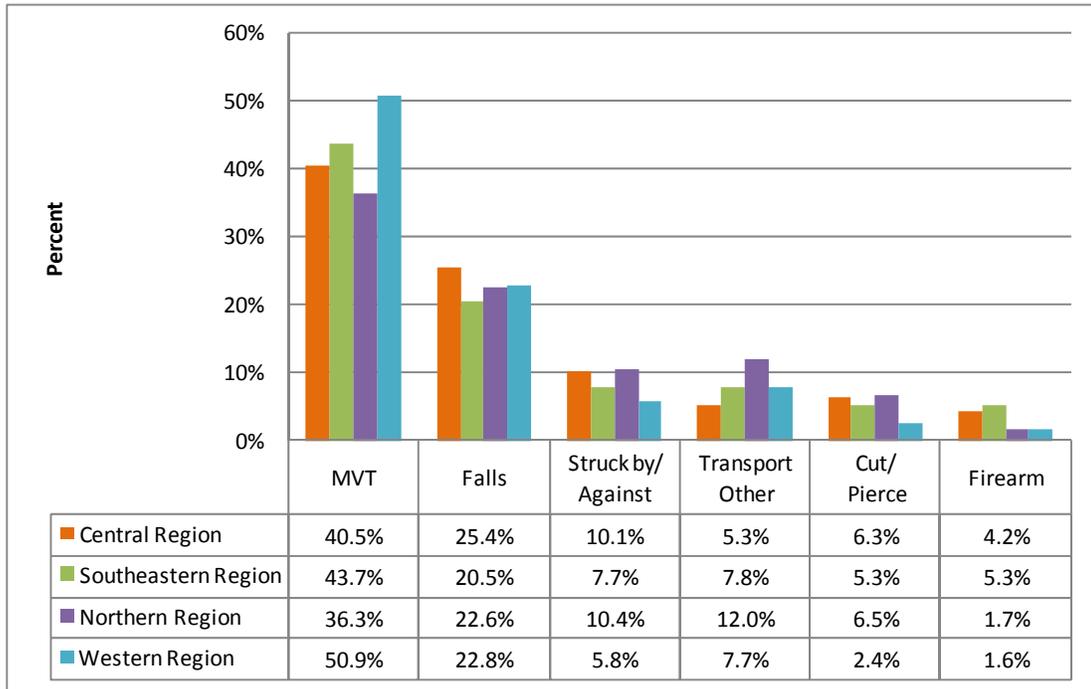


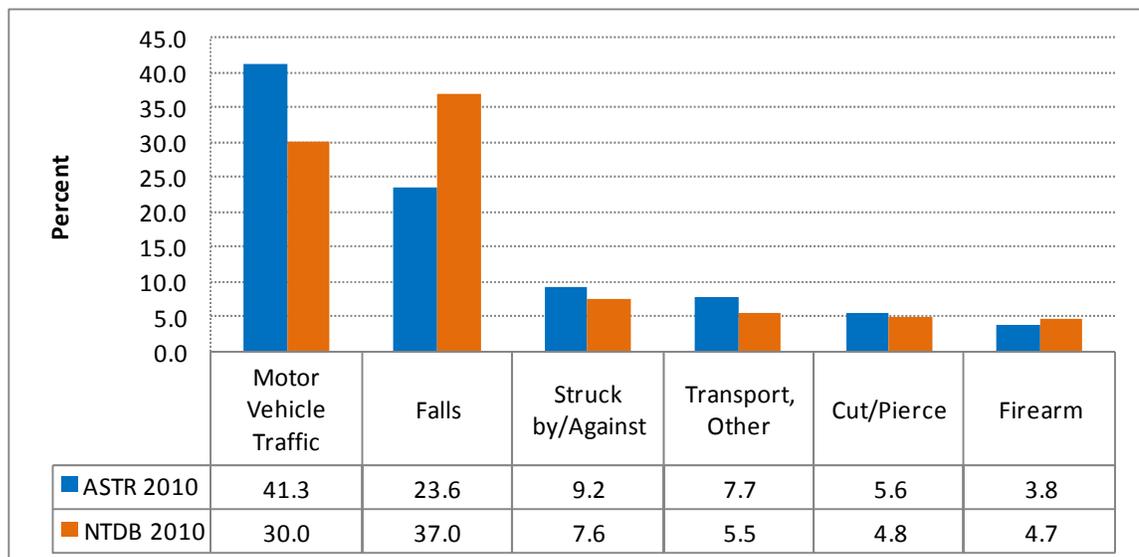
Figure 6 shows Top Mechanisms of Injury by Region. The Western Region had the highest percent of Motor Vehicle Traffic Related Trauma (MVT), as compared to other regions. The Central Region had the highest percent of Falls. The Southeastern Region had the highest percent of Firearm injuries. The Northern Region had the highest percent of Struck by/Against, Transport Other, and Cut-Pierce. The MVT category only includes motor vehicles traveling on a public road or highway. Transport Other includes various other types of vehicles such as railway, off-road, water craft, and air craft. Struck by/Against includes being struck by objects or people, intentionally or unintentionally.

**Table 2: Mechanism of Injury and Case Fatality Rate**

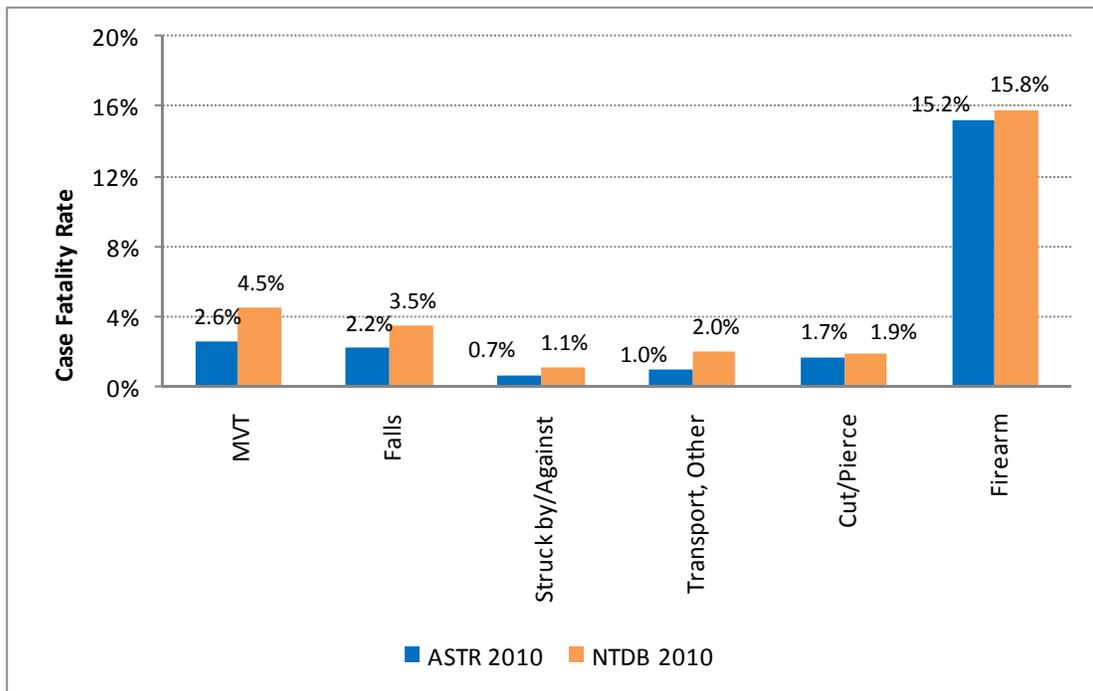
INCIDENTS AND CASE FATALITY RATE BY MECHANISM OF INJURY				
MECHANISM	COUNT	PERCENT	DEATHS	CASE FATALITY RATE
Motor Vehicle Traffic	11,487	41.27%	303	2.63%
Falls	6,576	23.62%	143	2.17%
Struck by/Against	2,548	9.15%	18	0.70%
Transport, other	2,146	7.71%	21	0.97%
Cut/Pierce	1,547	5.55%	26	1.68%
Firearm	1,051	3.77%	160	15.22%
Pedal Cyclist, Other	636	2.28%	4	0.62%
Other Specified	503	1.80%	10	1.98%
unspecified	407	1.46%	15	3.68%
Natural/Environmental	213	0.76%	1	0.46%
Not elsewhere classifiable	192	0.68%	.	.
Machinery	181	0.65%	1	0.55%
Pedestrian, Other	109	0.39%	6	5.50%
Fire/Burn	89	0.31%	.	.
Suffocation	61	0.21%	10	16.39%
Overexertion	43	0.15%	.	.
Drowning	28	0.10%	3	10.71%
Poisoning	8	0.02%	.	.
*Missing	6	0.02%	.	.
<b>Total</b>	<b>27,831</b>	<b>100.00%</b>	<b>721</b>	<b>2.59%</b>

Table 2 describes the trauma incidents and fatality rate by mechanism of injury for 2010 ASTR data. MVT related trauma is the most common mechanism of injury (41.2%), followed by Falls (23.6%), Struck by/Against (9.15%), Transport Other (7.71%), Cut/Pierce (5.55%), and Firearm (3.77%). Nationally, the most common mechanism of injury is Falls (37.0%), followed by Motor Vehicle Traffic related trauma (30.0%) (Figure 7). Of these top six injuries, Firearm has the highest case fatality rate (15.2%), followed by MVT (2.6%) (Figure 8). NTDB inclusion criteria capture more fall-related cases than ASTR.

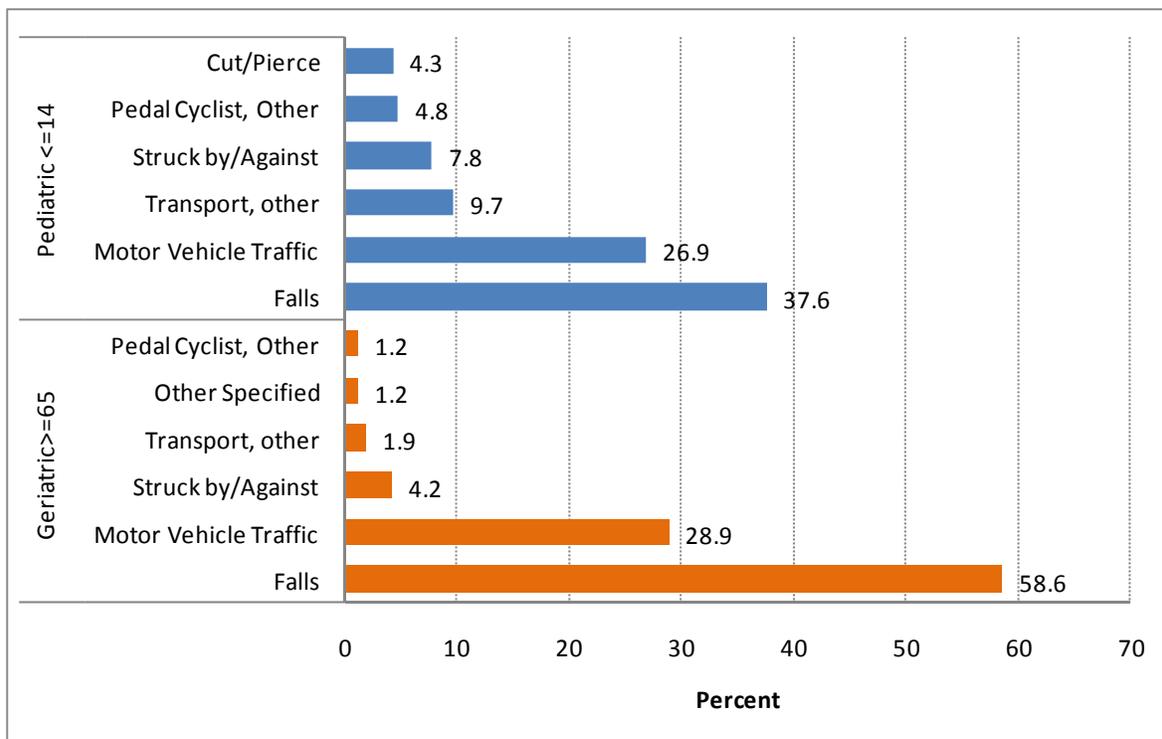
**Figure 7: Top Six Mechanisms of Injury Rate - ASTR vs. NTDB**



**Figure 8: Top Six Mechanisms of Injury Case Fatality Rate - ASTR vs. NTDB**



**Figure 9: Selected Mechanisms of Injury in Pediatric and Geriatric Population**



Falls represent the highest rate of mechanism of injury in both geriatric and pediatric populations, followed by Motor Vehicle Traffic. Pedal Cyclist, Other does not appear as one of the top six mechanisms of injury for aggregate data (Figure 7), but is one of the top six mechanisms of injury for both the pediatric (4.3%) and geriatric (1.2%) populations.

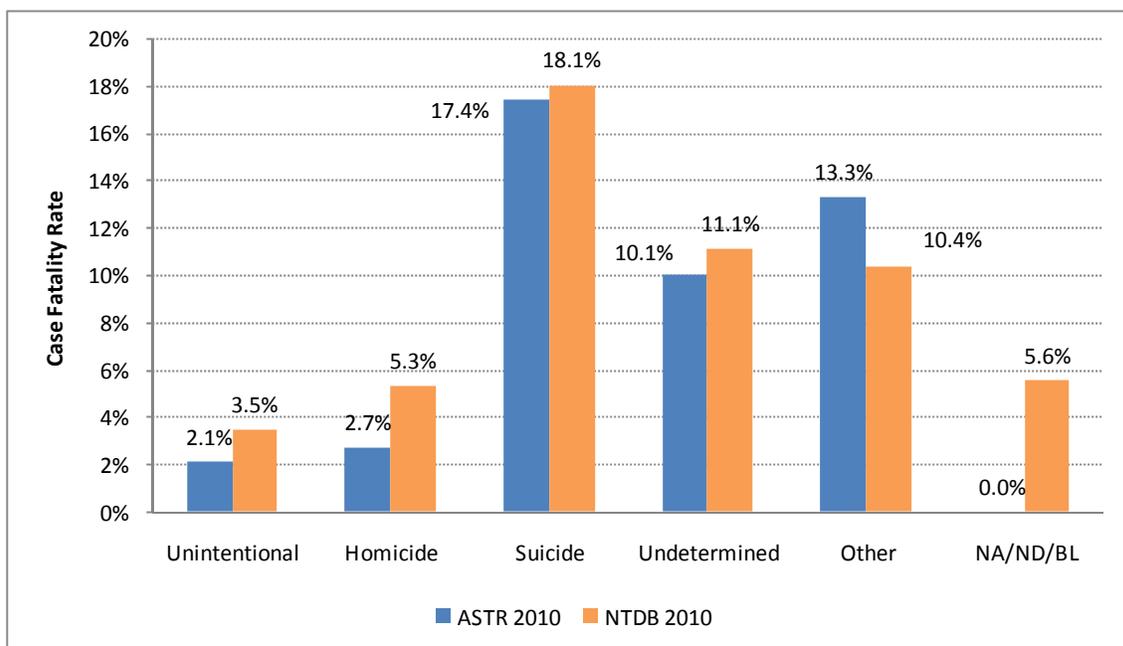
# INJURY CHARACTERISTICS: INTENT OF INJURY

**Table 3: Trauma Incidents and Case Fatality Rate by Intent and Gender**

TRAUMA INCIDENTS AND CASE FATALITY RATE BY INTENT AND GENDER								
	Overall		Deaths		Male		Female	
	Count	Percent	Count	Case Fatality Rate	Count	Percent	Count	Percent
<b>Unintentional</b>	23,401	84.08%	498	2.12%	14,165	50.90%	9,236	33.19%
<b>Homicide</b>	3,615	12.98%	99	2.73%	3,011	10.82%	604	2.17%
<b>Suicide</b>	545	1.95%	95	17.43%	416	1.49%	129	0.46%
<b>Undetermined</b>	189	0.67%	19	10.05%	151	0.54%	38	0.14%
<b>Other</b>	75	0.26%	10	13.33%	71	0.26%	4	0.01%
<b>NA/ND/BL</b>	6	0.02%	0	0	3	0.01%	3	0.01%
<b>Total</b>	27,831	100.00%	721	2.59%	17,817	64.02%	10,014	35.98%

Overall, 84.08% of all 2010 trauma records were unintentional injuries, with a case fatality rate of 2.1%. Suicide (suicide and attempted suicide) accounts for 1.95% of overall traumatic injury, but a case fatality rate of 17.4% (Table 3). Among males, the rate of homicide/assault is five times that of females. Nationally, all the intents of injury have a higher case fatality rate as compared to ASTR 2010, with the exception of “Other” intent. Injury intent of “Other” is defined as injury by legal intervention (Figure 10).

**Figure 10: Trauma Mortality Rates by Intent - ASTR vs. NTDB**



## Top Six Mechanisms of Injury by Intent

Figure 11: Unintentional Trauma Injury Rates

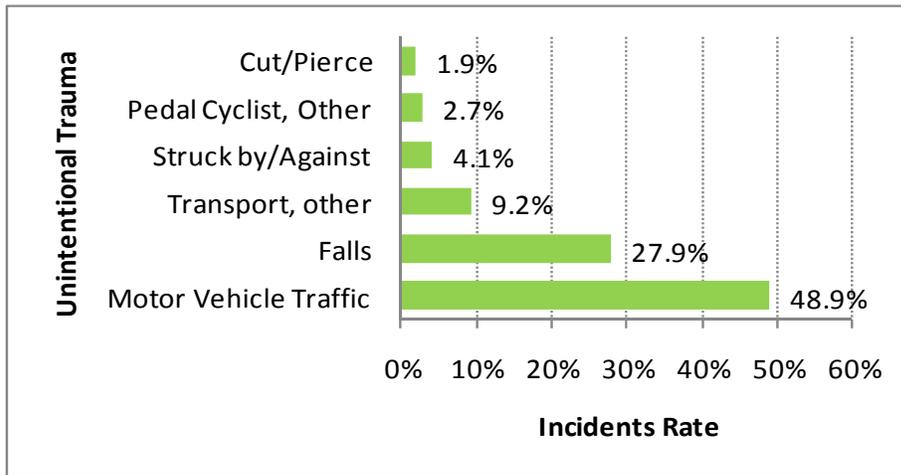


Figure 12: Homicide/Assault Related Trauma Injury Rates

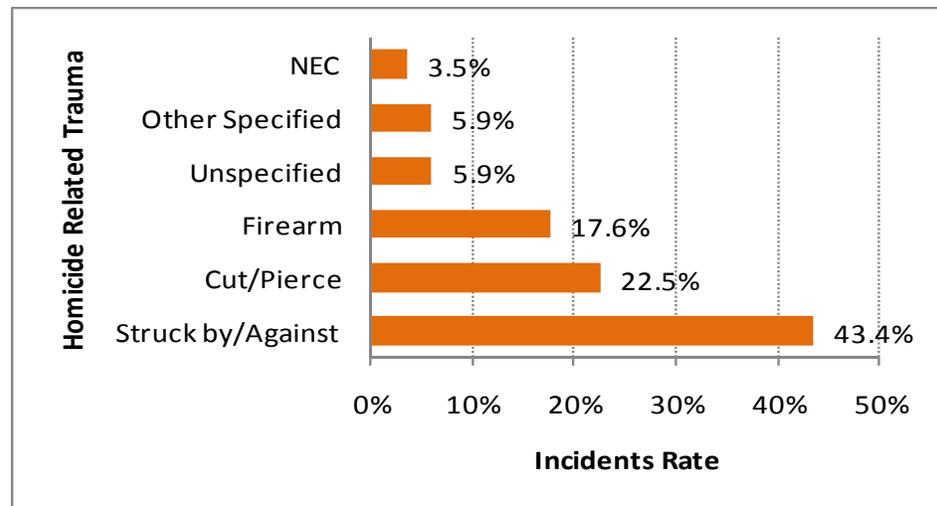
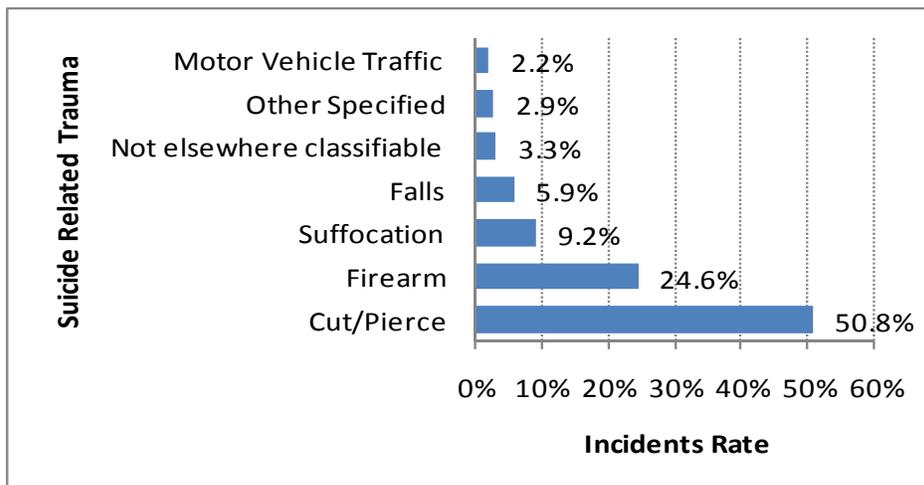


Figure 13: Suicide & Attempted Suicide Related Trauma Injury



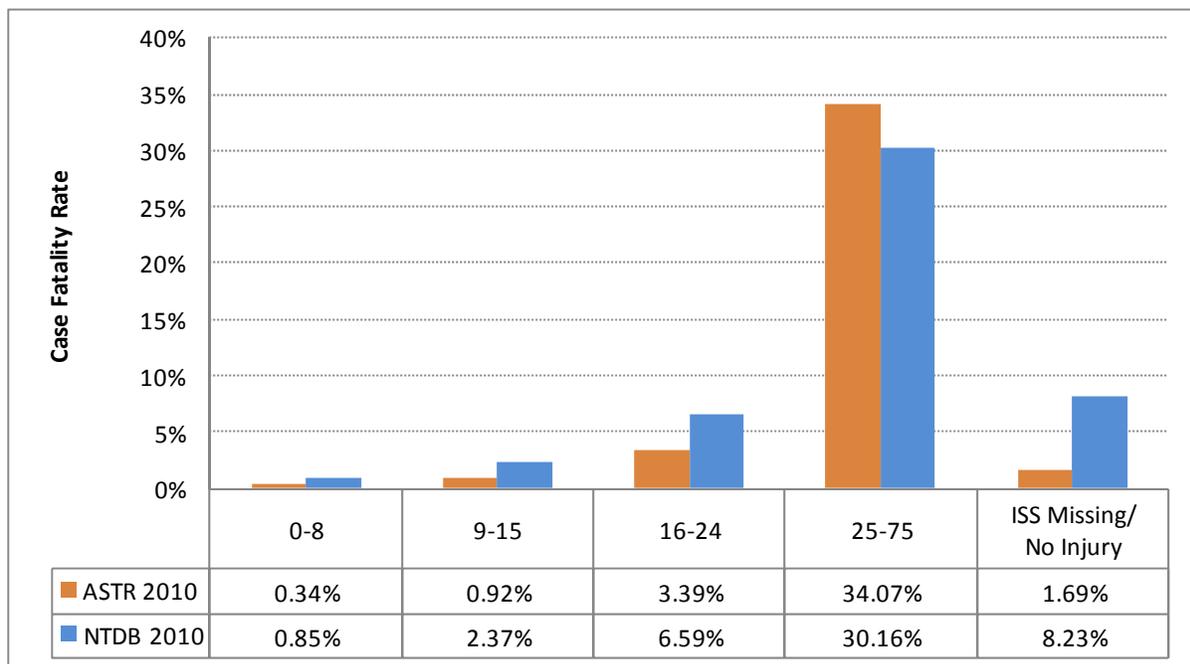
# INJURY CHARACTERISTICS: INJURY SEVERITY

**Table 4: Trauma Incidents and Case Fatality Rates by Injury Severity Score (ISS)**

INCIDENTS AND CASE FATALITY RATE BY INJURY SEVERITY SCORE				
Injury Severity Score - ICD	Count	Percent	Deaths	Case Fatality Rate
<b>0-8</b>	16,930	60.83%	59	0.34%
<b>9-15</b>	5,967	21.44%	55	0.92%
<b>16-24</b>	2,506	9.00%	85	3.39%
<b>25-75</b>	1,485	5.33%	506	34.07%
<b>*Missing</b>	943	3.38%	16	1.69%
<b>Total</b>	27,831	100.00%	721	2.59%

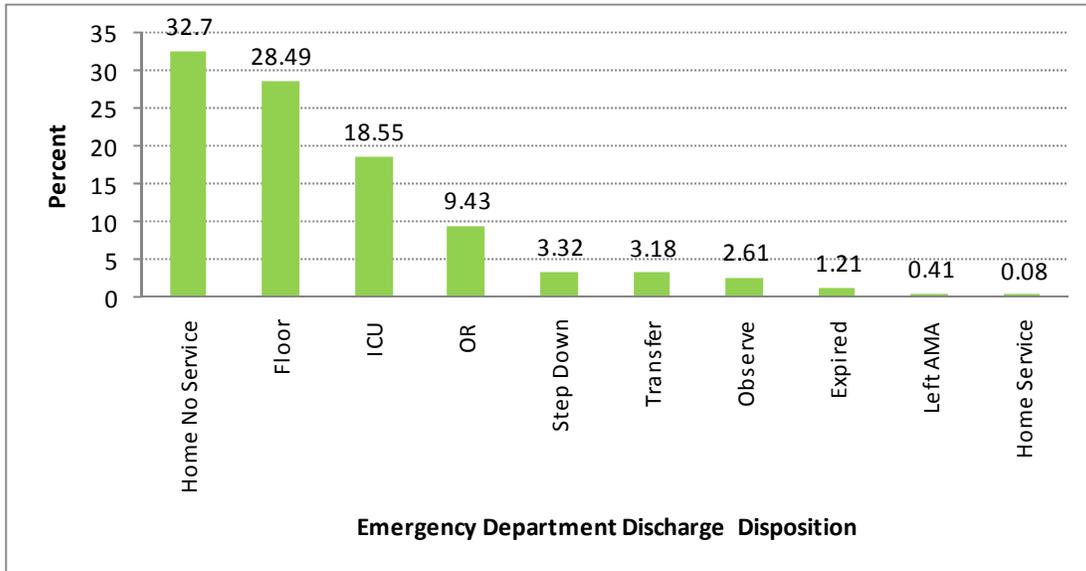
Approximately 5% of trauma patients had an ISS of  $\geq 25$  with a case fatality rate of 34%. Nationally, the case fatality rate of the same population is 30% (Figure 14).

**Figure 14: Trauma Case Fatality Rates by ISS - ASTR vs. NTDB**

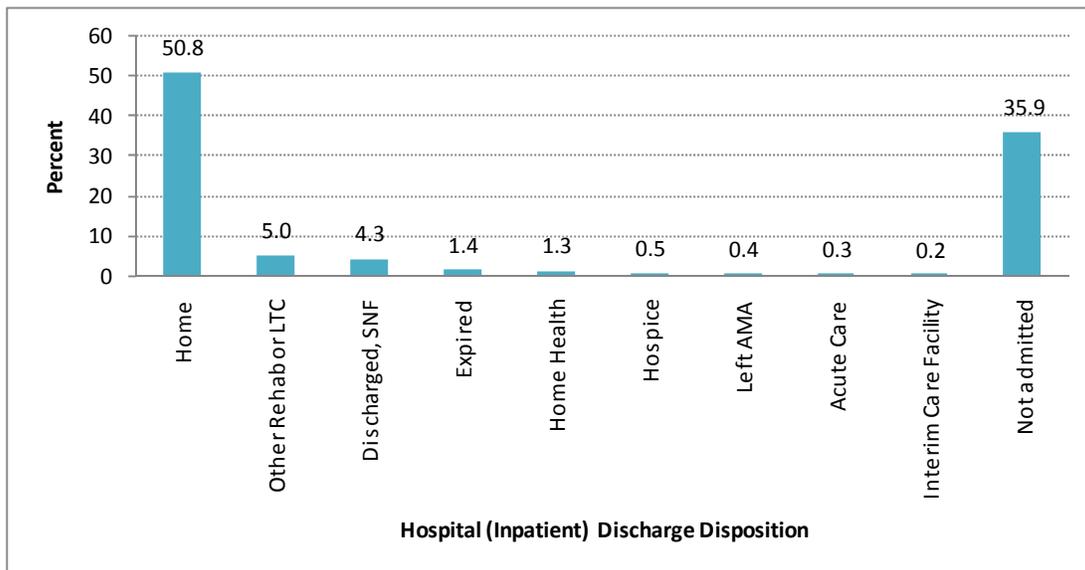


# OUTCOMES

**Figure 15: Rate of ED Discharge by Disposition**



**Figure 16: Rate of Inpatient Discharge by Disposition**



# PRIMARY PAYMENT SOURCE AND TOTAL CHARGES

**Table 5: Primary Payment Source Rate**

PRIMARY PAYMENT SOURCE		
Primary Payment Source	Count	Percent
AHCCCS/Medicaid	9,731	34.96
Private-commercial/BCBS	8,244	29.62
Self pay	3,394	12.2
Medicare	3,384	12.16
Other Government	874	3.14
Other	552	1.98
Workers Comp	500	1.8
No fault auto	159	0.57
Not billed	25	0.09
Not documented	968	3.48

**Table 6: Primary Payment Total Charges and Reimbursements**

Primary Payer	Total Charges	Total Reimbursement
AHCCCS/Medicaid	\$447,182,451	\$73,348,215
Private-commercial/BCBS	\$359,739,675	\$118,770,576
Medicare	\$191,038,548	\$39,333,827
Self pay	\$112,454,368	\$9,180,783
Other	\$32,804,319	\$6,554,187
Other Government	\$28,551,880	\$4,730,193
Workers Comp	\$27,976,970	\$11,877,414
No fault auto	\$2,664,740	\$585,550
Not documented	\$918,913	\$54,763
Not billed	\$493,038	\$3,449
<b>Total Charges</b>	<b>\$1,203,824,903</b>	<b>\$264,438,956</b>

# TOTAL CHARGES BY AGE AND MECHANISM OF INJURY

**Table 7: Age-specific Total Charges and Reimbursements**

Age groups	Total Charges	Total Reimbursement
<15	\$93,686,388	\$21,950,281
15-19	\$105,714,695	\$23,500,263
20-44	\$482,299,872	\$95,792,796
45-64	\$316,218,807	\$77,965,641
65+	\$205,905,141	\$45,229,974
<b>Total Charges</b>	<b>\$1,203,824,903</b>	<b>\$264,438,956</b>

**Table 8: Total Charges, Reimbursements, and Average Charges by Mechanism of Injury**

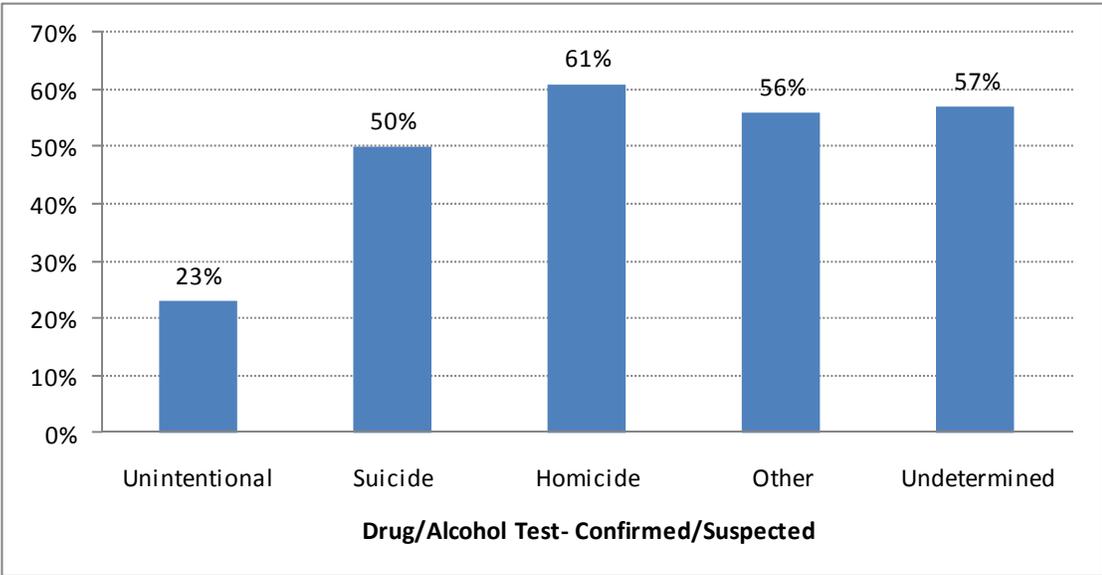
Mechanism of Injury	Total Charges	Average Charges	Total Reimbursement
MVT - Occupant	\$347,121,429	\$20,298	\$71,620,984
Falls	\$269,133,201	\$24,756	\$65,933,703
MVT-Motorcyclist	\$106,931,887	\$31,870	\$24,314,512
Other Transport	\$90,693,097	\$22,245	\$24,276,072
Struck by/Against	\$81,940,382	\$21,359	\$16,714,344
MVT-Pedestrian	\$71,523,346	\$32,240	\$13,039,865
Firearm	\$70,215,650	\$29,417	\$12,167,719
Cut/Pierce	\$51,761,052	\$22,693	\$10,315,977
Other Pedal Cyclist	\$22,058,514	\$20,188	\$6,136,770
MVT-Pedal Cyclist	\$19,965,188	\$24,366	\$4,479,387
Not Specified	\$18,455,881	\$27,333	\$3,131,843
Other Specified	\$15,862,484	\$16,537	\$3,514,298
MVT-Other	\$8,674,458	\$29,486	\$1,415,812
Natural/Environmental	\$6,428,190	\$20,260	\$1,192,985
Machinery	\$6,053,352	\$20,657	\$2,203,011
Other Pedestrian	\$5,957,301	\$26,452	\$1,637,086
Not elsewhere classifiable	\$4,867,184	\$18,890	\$916,817
Suffocation	\$2,739,720	\$32,756	\$592,528
Fire/Burn	\$1,230,544	\$7,971	\$102,923
Overexertion	\$1,170,238	\$29,144	\$414,871
Poisoning	\$466,595	\$73,477	\$134,318
Drowning	\$465,062	\$13,373	\$170,563
Missing	\$110,148	\$22,599	\$12,567
<b>Total</b>	<b>\$1,203,824,903</b>	<b>\$22,663</b>	<b>\$264,438,956</b>

Table 8 describes Total Hospital Charges, Average Charges, and Total Reimbursements by Mechanism of Injury. Average charges = Total Charges for mechanism of injury/number of records that met that mechanism.

# DRUG AND ALCOHOL USE AND TRAUMA

The pediatric ( $\leq 14$  years) population was excluded from the drug and alcohol analysis. Of the 23,958 adult patients, 21.9% of patients (5254) were positive for alcohol (confirmed, suspected, or reported use), and 12.8% of patients (3063) were positive for drugs (confirmed or suspected legal or illegal use). Only 1% of the patients tested positive for legal drug use. More than 29% of trauma patients tested positive for either drug or alcohol use.

**Figure 17: Drug and Alcohol Use by Intent**



Homicide/Assault was the intent of injury that had the highest rate of confirmed or suspected drug or alcohol use. For Undetermined and Other intents, more than half tested positive or were suspected positive for drugs or alcohol.

**Figure 18: Alcohol Use by Mechanism of Injury**

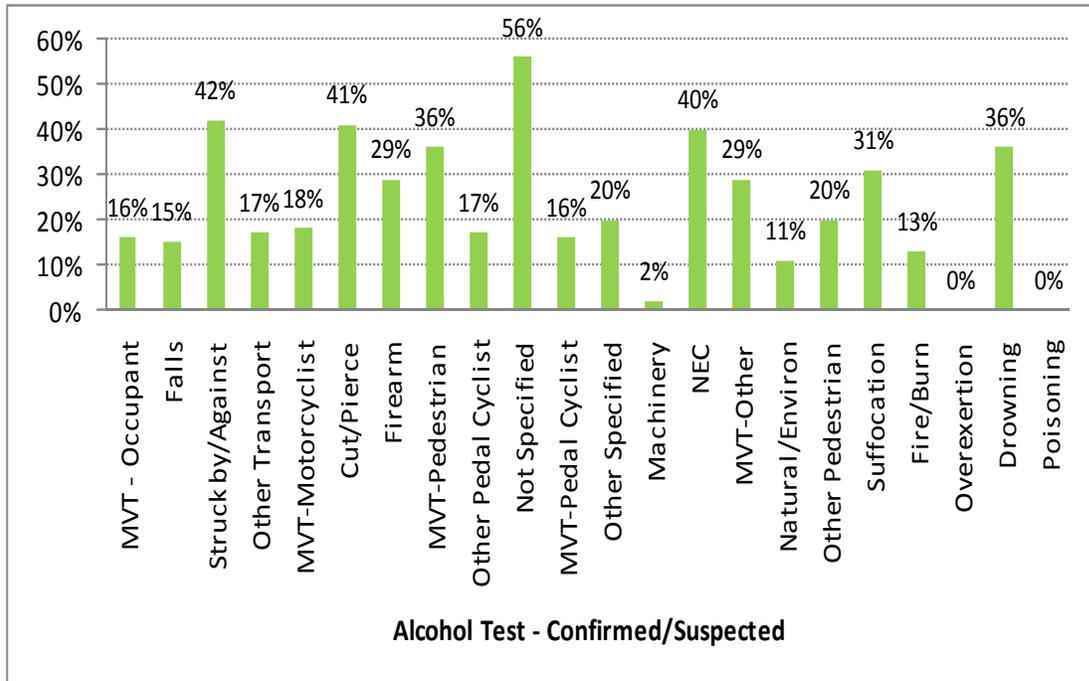
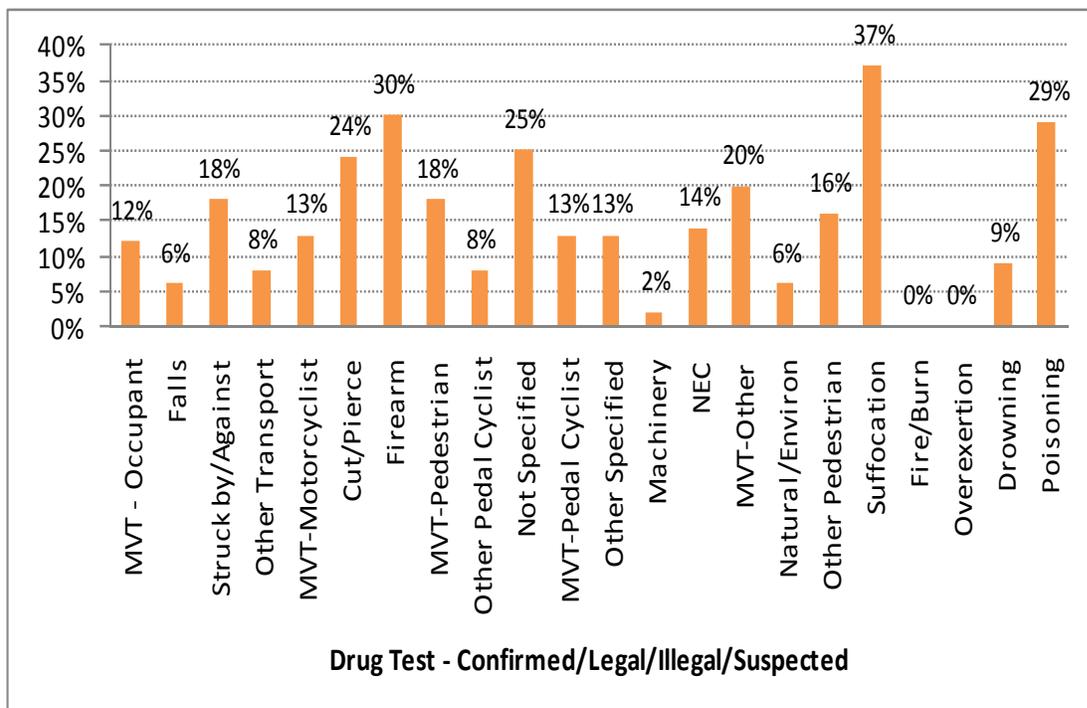


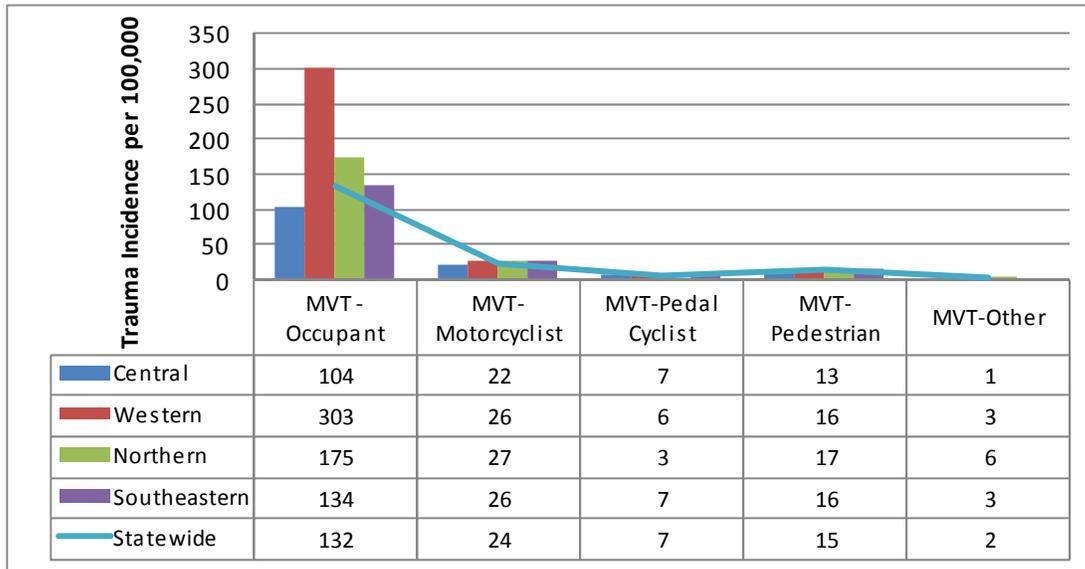
Figure 18 and Figure 19 list mechanism of injury in order of highest to lowest frequency with the percent of patients positive for alcohol or drug use respectively.

**Figure 19: Drug Use by Mechanism of Injury**



# MOTOR VEHICLE TRAFFIC RELATED TRAUMA

**Figure 20: Motor Vehicle Traffic Related Trauma Rate per 100,000 by Region**



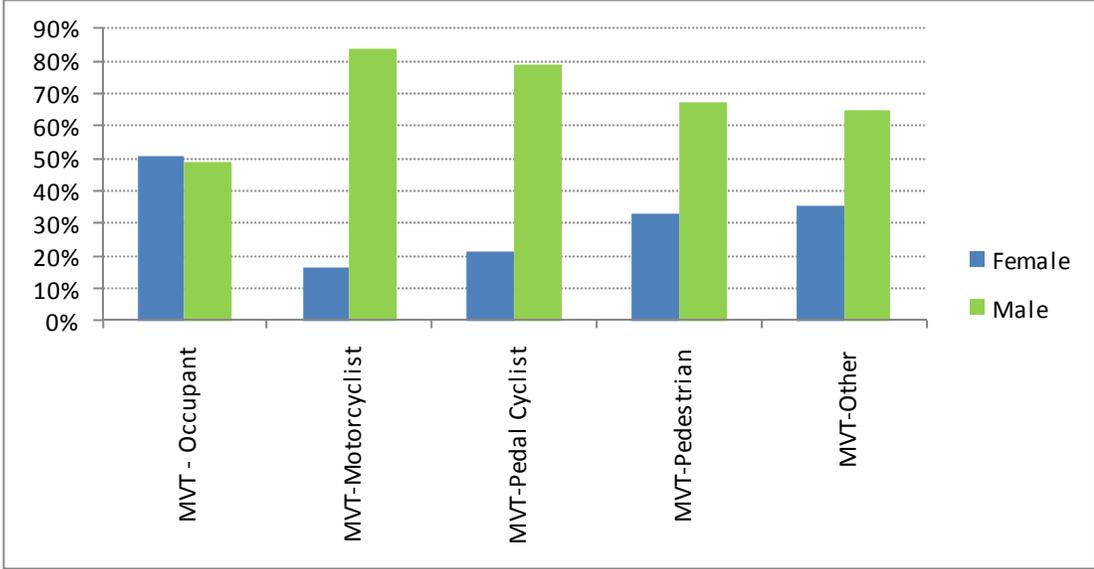
Although the Central Region had the highest volume of injured MVT-Occupants, it had the lowest rate per 100,000 residents, as compared to any other region. The Western Region had the highest rate per 100,000 residents.

**Table 9: Motor Vehicle Traffic Related Trauma Incidents and Case Fatality Rate**

INCIDENTS AND CASE FATALITY RATE BY TYPES OF MVT: 2010				
Motor Vehicle Traffic Accidents	Count	Percent	Deaths	Case Fatality Rate
<b>MVT - Occupant</b>	8,460	73.64%	139	1.64%
<b>MVT-Motorcyclist</b>	1,530	13.31%	49	3.20%
<b>MVT-Pedal Cyclist</b>	417	3.63%	17	4.07%
<b>MVT-Pedestrian</b>	928	8.07%	88	9.48%
<b>MVT-Other</b>	152	1.32%	10	6.57%
<b>Total</b>	11,487	100.00%	303	2.63%

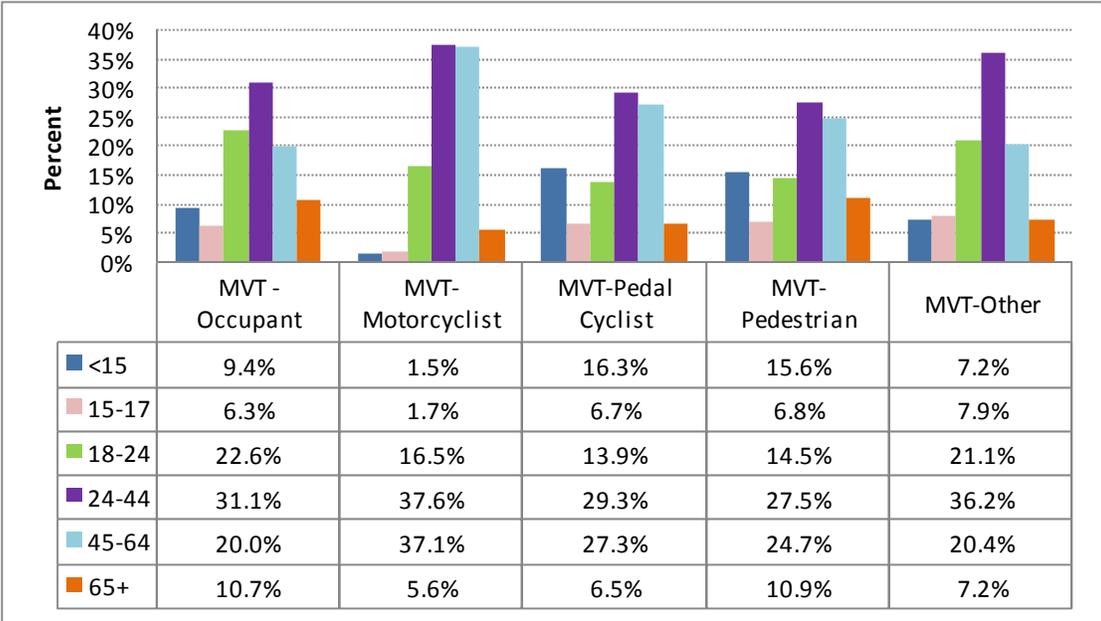
Table 9 describes the types of MVT related trauma and case fatality rate. Of the 27,831 trauma cases, 41.3% (11,487) were motor vehicle traffic related trauma. The highest case fatality rate is among pedestrians involved in MVT related trauma (9.48%).

**Figure 21: Motor Vehicle Traffic Related Trauma by Gender**

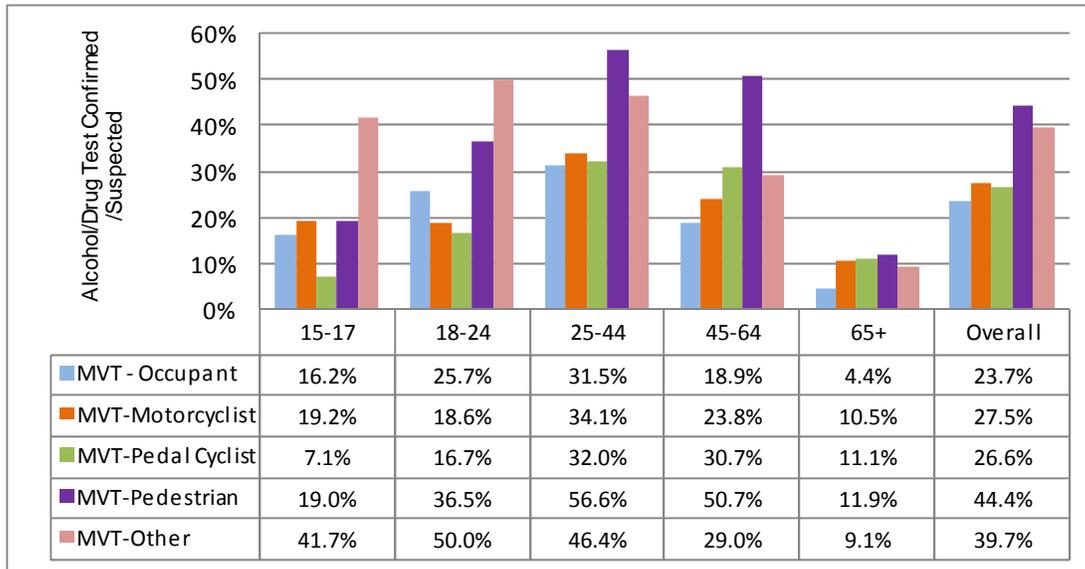


There was no gender difference found for injured MVT-occupants, but for all other types of MVT related trauma, the predominant gender was Male.

**Figure 22: Motor Vehicle Traffic Related Trauma by Age**



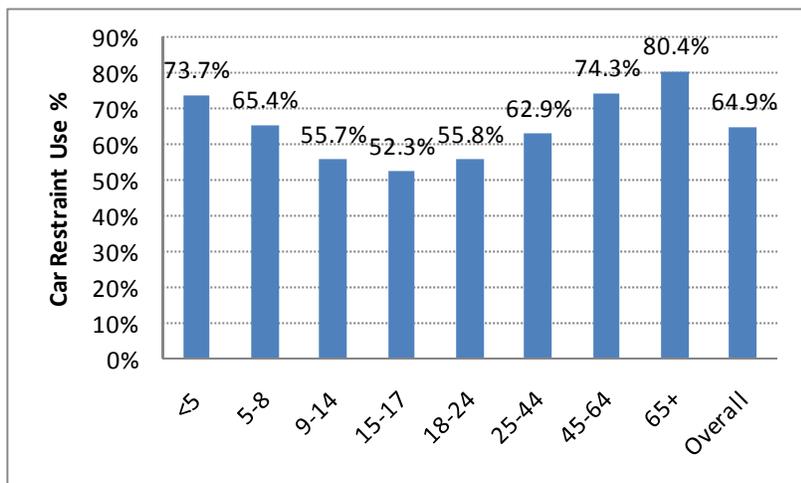
**Figure 23: Alcohol/Drug Use by Types of Motor Vehicle Traffic Accidents**



Alcohol or drug use was confirmed or suspected in more than 30% of any type of MVT accidents involving patients ages 25-44. Of MVT pedestrian traumas, more than 50% of the 25-64 year old pedestrians were positive for alcohol or drugs.

# PROTECTIVE DEVICE USE

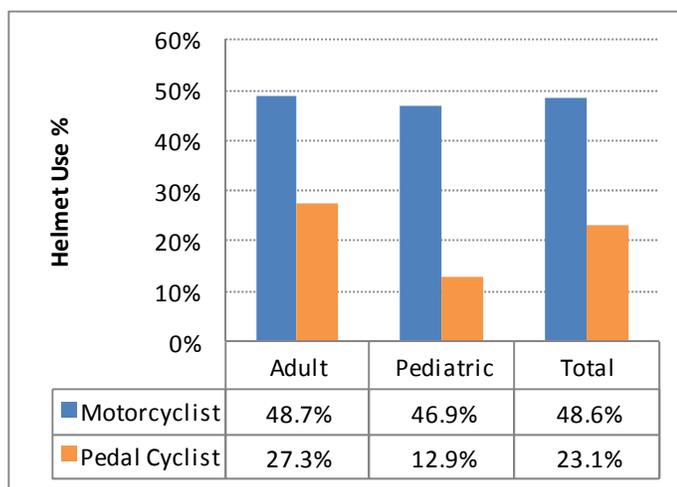
**Figure 24: Age-specific Rates of Car Restraint Use**



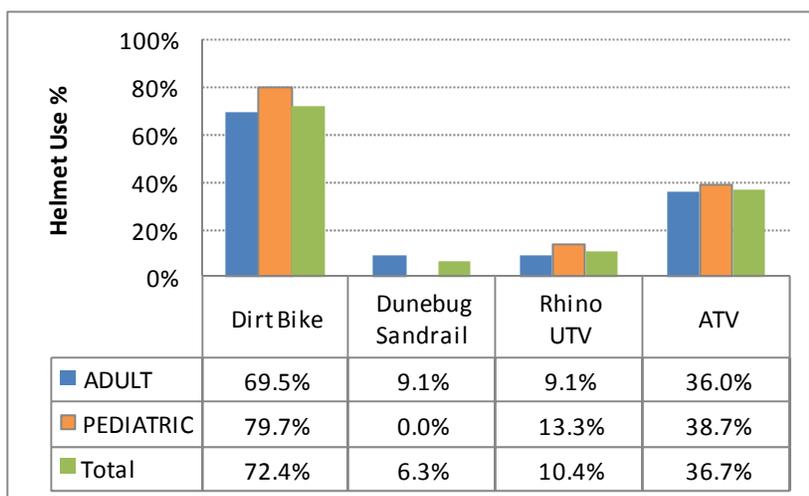
Of the 8,460 MVT injured occupants, 64.9% used a car seat or seat belt (restraint). Motor vehicle occupants ages 9-24 were least likely to use a restraint. The most frequent restraint use was found in adults >65. Over a quarter of the children <5 were not restrained at the time of the MVT collision.

**Figure 25: Rate of Helmet Use for Motorcyclist and Pedal Cyclist for Adult vs. Pediatric**

Of the 1,530 MVT motorcyclists, less than half used a helmet. Of the 1,053 traffic and non-traffic pedal cycle accidents, less than a quarter overall used a helmet. Pediatric helmet use (<18 years) was lower than adult helmet use for both motorcycles and pedal cyclists. Pedal cyclist helmet use in pediatric trauma patients was less than half that of adults.



**Figure 26: Rate of Helmet Use for Select Off Road Vehicles for Adult vs. Pediatric**



Out of the 243 dirt bike injuries, 28.4% (69) were pediatrics (<18 years). Out of the 32 dunebuggy/sandrail injuries, 31.3% (10) were pediatrics. Out of the 48 Rhino/UTV injuries, 31.3% (15) were pediatrics. Out of the 795 ATV injuries, 26.7% (212) were pediatrics. Only 36.7% of patients injured on an ATV were wearing a helmet, whereas 72.4% of injured dirt bike riders were wearing a helmet.

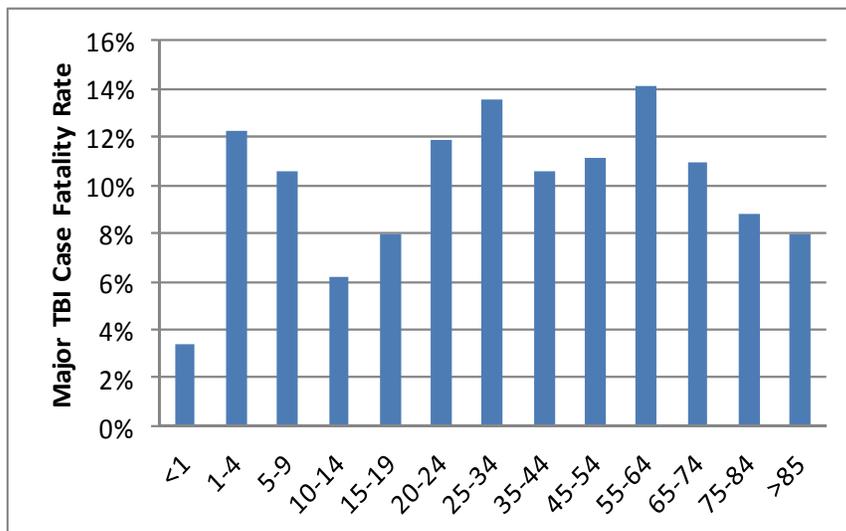
# TRAUMATIC BRAIN INJURY

**Table 10: Age-specific Rates of Incidents and Case Fatality for TBI**

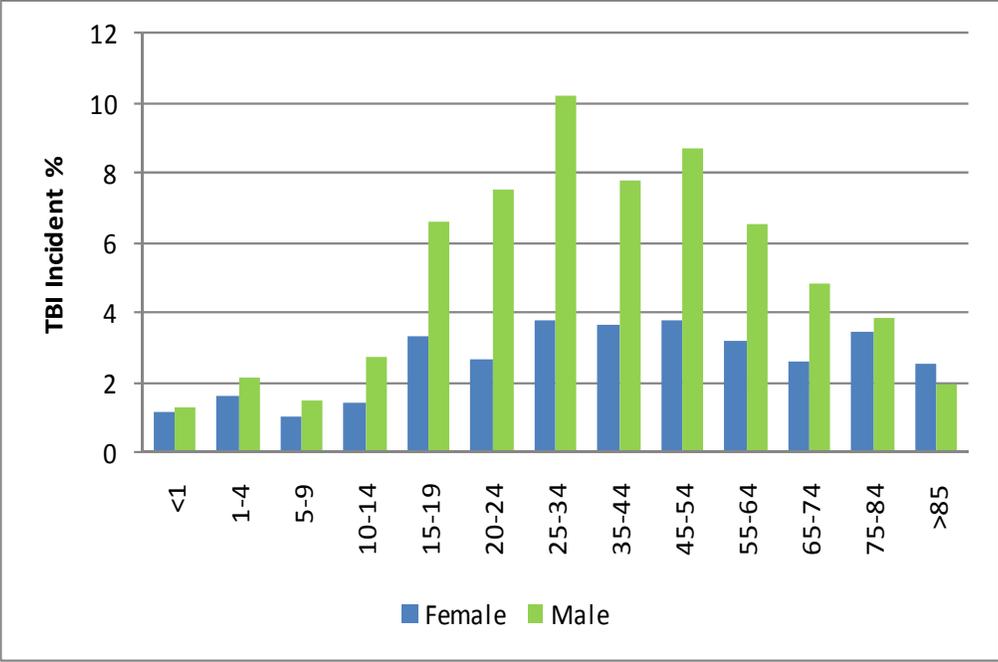
TBI INCIDENTS AND CASE FATALITY RATE BY AGE								
	Major TBI				Minor/Moderate TBI			
	Count	Percent	Deaths	Case Fatality Rate	Count	Percent	Deaths	Case Fatality Rate
<1	88	2.41%	3	3.40%	88	2.54%	0	0
1-4	98	2.68%	12	12.24%	166	4.80%	0	0
5-9	66	1.80%	7	10.60%	116	3.35%	0	0
10-14	97	2.65%	6	6.18%	201	5.81%	0	0
15-19	238	6.52%	19	7.98%	472	13.66%	1	0.21%
20-24	286	7.83%	34	11.88%	437	12.65%	0	0
25-34	450	12.32%	61	13.55%	544	15.74%	1	0.18%
35-44	330	9.04%	35	10.60%	482	13.95%	3	0.62%
45-54	485	13.28%	54	11.13%	401	11.60%	1	0.24%
55-64	412	11.28%	58	14.07%	279	8.07%	1	0.35%
65-74	394	10.79%	43	10.91%	136	3.93%	1	0.73%
75-84	430	11.78%	38	8.83%	88	2.54%	0	0
>85	276	7.56%	22	7.97%	44	1.27%	1	2.27%
<b>Total</b>	<b>3,650</b>		<b>392</b>	<b>10.73%</b>	<b>3,454</b>		<b>9</b>	<b>0.26%</b>

Major, Moderate, and Minor TBI are equivalent to Type I, Type II, and Type III of the Barell Matrix respectively. A total of 3650 Major TBI cases, and 3454 Minor/Moderate TBI cases were treated in an ASTR reporting hospital in 2010. The case fatality rate among Major TBI cases is 10.7% (Table 10). The highest case fatality rate was among 55-64 years for the Major TBI (14.1%), followed by the 25-34 years group (13.6%). Among the pediatric population (< 18 years), ages 1-4 had the highest case fatality rate of 12.2% (Figure 27).

**Figure 27: TBI Case Fatality Rate by Age**

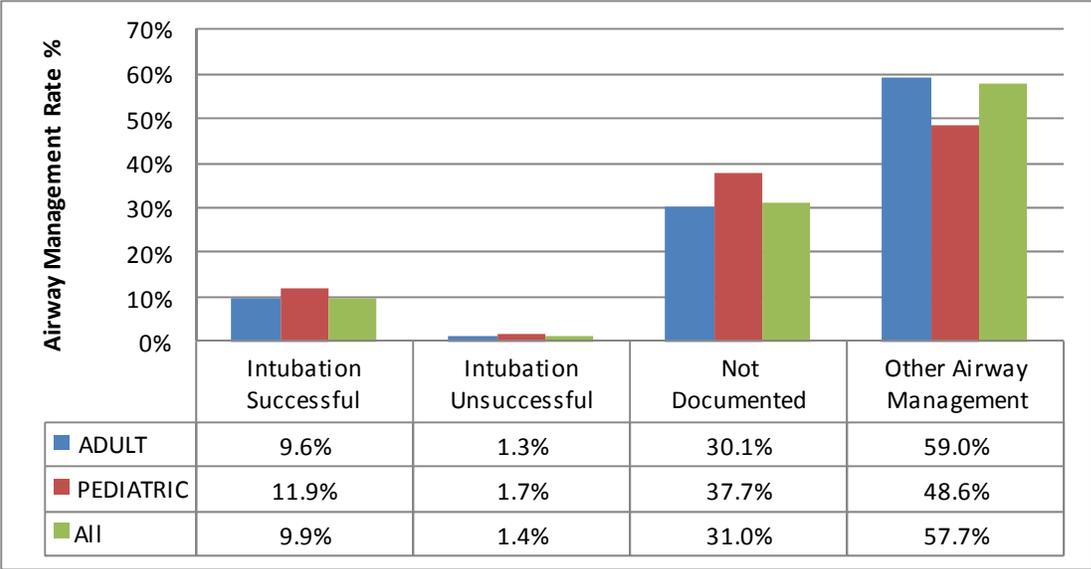


**Figure 28: TBI Incidents by Age and Gender**



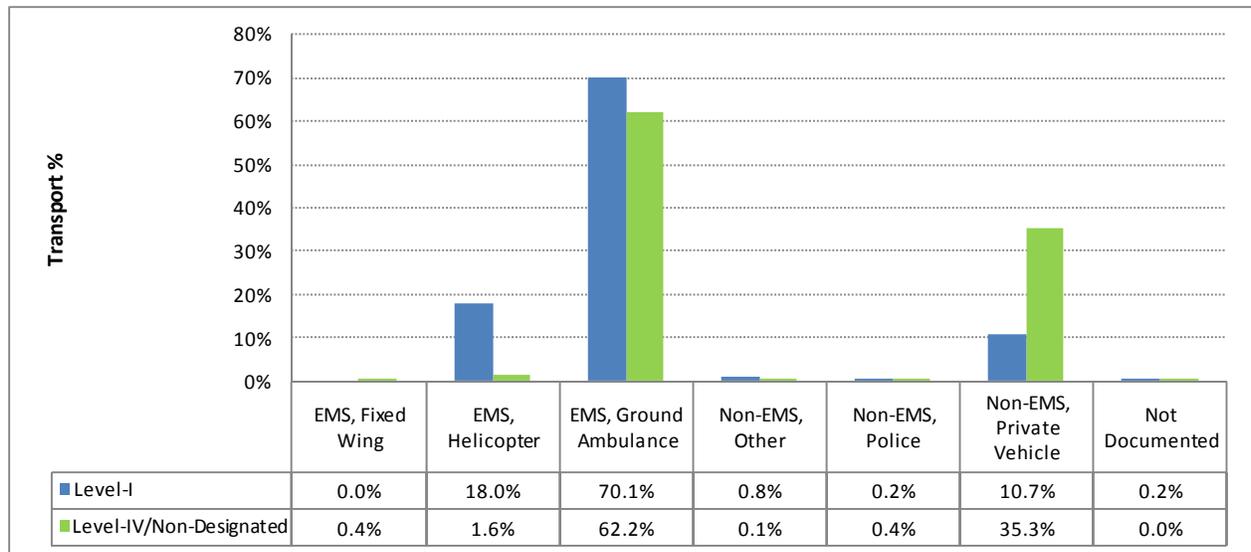
In the pediatric and geriatric population, the ratio of male to female TBI cases is similar. However, in the age group of 15-74, males are more likely than females to sustain a TBI (Figure 28).

**Figure 29: Field Airway Management Among Major TBI Patients**



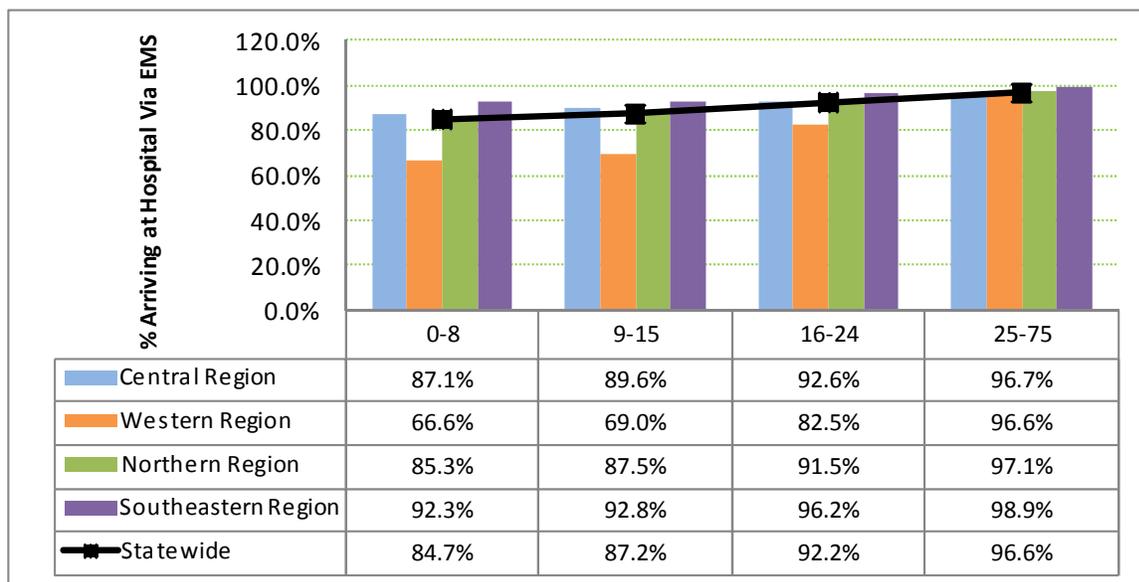
Of the 469 pediatric (< 18 years) Major TBI cases, 11.9% (56) received successful intubation. Overall 10% of the Major TBI cases received successful intubation, 57.7% received other types of Airway Management (ex: Auto-ventilator, Bag Mask Valve, etc.), and in 31% of the cases, Airway Management was not documented.

**Figure 30: Mode of Transport into Reporting Hospital**



The percent of EMS ground transports into a Level I trauma center is fairly consistent with what is seen in a Level IV/Non-Designated hospital. However, EMS helicopter transports were more likely to be the mode of transport into a Level I Trauma Center, and private vehicles were more likely to be the mode into a Level IV/Non-Designated hospital.

**Figure 31: Patients Arriving at Hospital Via EMS by Region and ISS**



The percent of patients arriving via EMS is highest when the Injury Severity Score (ISS) was >15. The Western Region had a lower rate of arrival by EMS for all ISS categories except ISS ≥ 25.

# GOLDEN HOUR

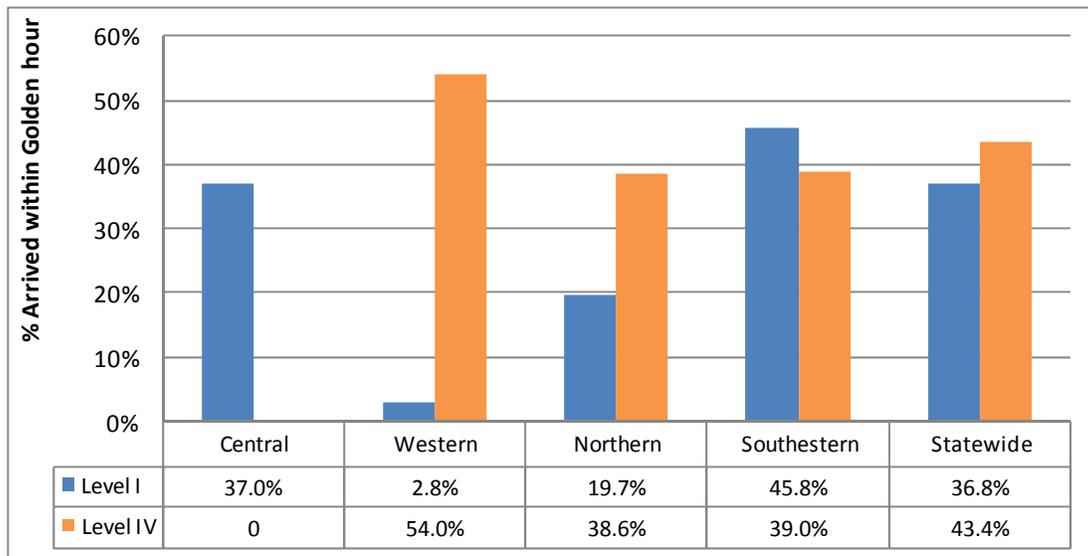
The Golden Hour report examines if a patient arrives at a designated trauma center within one hour from injury time. Non-designated Trauma Centers and inter-facility transfers into the reporting trauma center were not included in this analysis. Golden Hour cannot be calculated for patients with a missing injury time. Injury date/time was missing for approximately 32% of patients transported to a Level I Trauma Center and 21% of patients transported to a Level IV Trauma Center.

Of the 18,335 patients who arrived at a Level I Trauma Center, 36.8% arrived within the Golden Hour, whereas of the 1,508 who arrived at a Level IV Trauma Center, 43.4% arrived within the Golden Hour. More patients injured in the Southeastern region arrived at a Level I Trauma Center within the Golden Hour as compared to the other regions. Improved pre-hospital data completeness for Injury date/time might alter the Golden Hour results (Table 11).

**Table 11: Rates of Patients Arriving Within or Outside of the Golden Hour by Region and Designation Level**

PATIENTS ARRIVING AT LEVEL I OR LEVEL IV TRAUMA CENTERS WITHIN GOLDEN HOUR							
Level I							
Region	Golden Hour						Total Patients
	*Missing Injury Date/Time		<= 1 Hour		>1 Hour		
	N	%	N	%	N	%	
Central	4,960	39.76%	4,609	37.0%	2,904	23.28%	12,473
Western	54	50.46%	3	2.8%	50	46.72%	107
Northern	322	22.43%	283	19.7%	830	57.83%	1,435
Southeastern	387	9.70%	1,826	45.8%	1,776	44.52%	3,989
Missing Region	160	48.33%	35	10.57%	136	41.08%	331
Statewide	5,883	32.08%	6,756	36.8%	5,696	31.06%	18,335
Level IV							
Central	0	0	0	0.0%	0	0	0
Western	37	7.42%	269	54.0%	192	38.55%	498
Northern	135	19.67%	265	38.6%	286	41.69%	686
Southeastern	132	45.51%	113	39.0%	45	15.51%	290
Missing Region	20	58.82%	7	20.6%	7	20.58%	34
Statewide	324	21.48%	654	43.4%	530	35.14%	1,508

**Figure 32: Rates of Patients Arriving within the Golden Hour by Region**



As more Level IV Trauma Centers have become designated, more patients are able to reach a Level IV designated Trauma Center within the Golden Hour compared to a Level I Trauma Center, as is especially notable in the Western and Northern regions (Figure 32). The benefit of Level IV designation is also reflected in Table 12 where a county level Golden Hour analysis is shown by designation level.

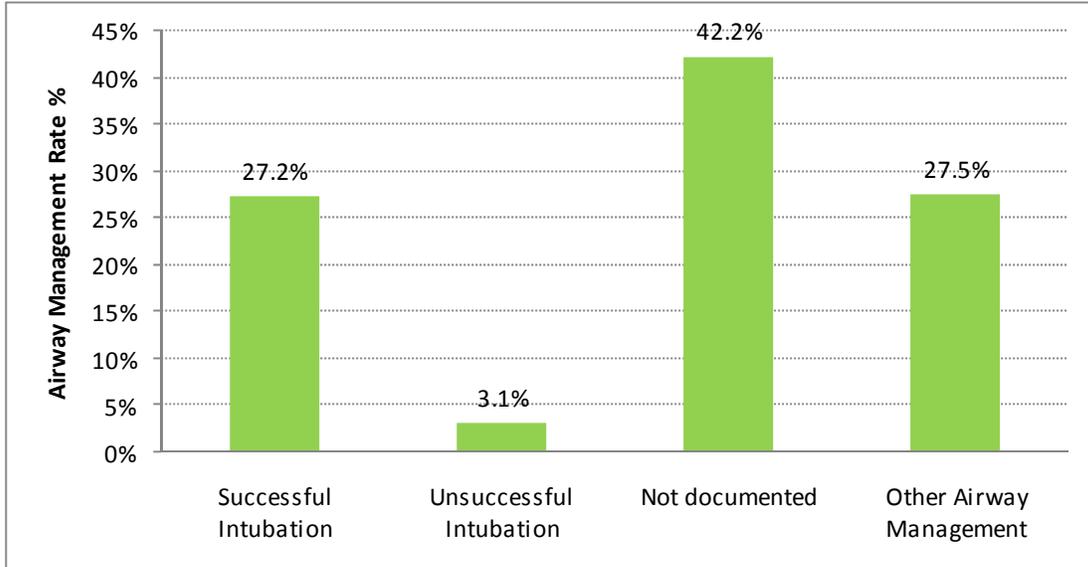
The Golden Hour is not the only important measure. Ensuring that patients make it into the organized trauma system is vital, even if it takes more than 60 minutes.

**Table 12: Golden Hour by County and Designation Level**

GOLDEN HOUR BY COUNTY OF INJURY					
County of Injury	Total Patients	Level I		Level IV	
		<= 1 Hour		<= 1 Hour	
		N	%	N	%
Apache	260	0	0	10	9.09%
Cochise	155	13	5.70%	113	38.96%
Coconino	518	270	33.96%	134	54.91%
Gila	1,039	3	0.97%	0	0
Graham	309	0	0	0	0
Greenlee	49	0	0	0	0
La Paz	29	2	3.38%	42	50.00%
Maricopa	143	4,485	40.58%	0	0
Mohave	11,052	1	5.00%	227	54.83%
Navajo	434	1	0.56%	121	36.44%
Pima	508	1,803	50.88%	0	0
Pinal	105	121	10.88%	0	0
Santa Cruz	3,543	10	7.14%	0	0
Yavapai	1,112	12	2.86%	0	0
Yuma	140	0	0	0	0
Other	419	3	3.12%	3	33.33%
Missing	28	32	13.61%	4	16.00%
All	19,843	6,756	36.84%	654	43.36%

# DATA QUALITY

**Figure 33: Field Airway Management Among Severely Injured Trauma Patients**



Although the data completeness continues to improve each year, hospitals do report difficulty in obtaining pre-hospital data. A large percent (42.2%) of field airway management data was not documented for severe trauma patients (GCS <9 and ISS >15) (Figure 33). Thirty six percent of Injury Time was missing which impacts vital measurements like Golden Hour (Figure 34).

**Figure 34: Percent Not Documented for Select Injury 2010 Data**

