UTAH'S TRAUMA SYSTEM:

OUTCOMES AND TRENDS

UTAH DEPARTMENT OF
HEALTH

Bureau of Emergency Medical Services and Preparedness

Acknowledgments

This report on the status of traumatic injury outcomes in Utah's Trauma System is produced by the Bureau of Emergency Medical Services and Preparedness, Utah Department of Health. The mission of the Bureau of Emergency Medical Services and Preparedness is to promote a statewide system of emergency medical and trauma care to reduce morbidity and mortality through prevention, awareness, and quality intervention. The Utah Department of Health gratefully acknowledges the participation of Utah hospitals and their staff in reporting trauma registry data as well as the support of the Intermountain Injury Control Research Center and their dedicated staff.

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Executive Summary

Traumatic injury is a leading cause of death and disability in Utah and the nation. The toll among Utahns is a major public health problem, with the injury mortality rate increasing faster in Utah than the rest of the nation. The quality and outcomes of emergency medical treatment for traumatic injuries varies in Utah by geographic location and local emergency medical systems. Hospital charges for the medical treatment of Utah's injured patients tripled since 2000. And, by 2017, charges in Utah are estimated to exceed one billion dollars. Developing functional regional systems to coordinate trauma and emergency medical care is a clear step forward for Utah to improve patient health outcomes and increase system efficiency statewide. Valid trauma data about the care and outcomes of patients provide reliable evidence for regional trauma systems to identify needs and guide decisions about beneficial actions and policies to improve trauma systems coordination.

The current report, "Traumatic Injury Outcomes in Utah's Trauma System: 2001-2013" describes traumatic injury mortality and morbidity trends in Utah with a focus on identifying factors that influence Utah's population health outcomes. Section I introduces a broad state and national perspective to provide an overall picture of the trends in injury mortality rates showing Utah's persistent higher rates compared with the rest of the United States. The steep trend in increasing hospital charges is also presented.

Section II examines Utah's case fatality rate (CFR) trends that mirror trends in the National Trauma Data Bank (NTTB), showing steady declines in the CFR until 2012 and 2013 when the CFR increased abruptly, signaling a new direction change in trauma system population outcomes. Injury severity is a primary risk factor for injury mortality, and in 2013, 35% of trauma patients with very severe injuries did not survive. Higher levels of state-designated trauma centers (SDTC) are generally associated with trauma care expertise and lower CFRs. Among trauma patients with similar injury severity scores, mortality risk was lowest in Utah from 2001-2013 in level I and II trauma centers compared to level III, IV trauma centers , and non-designated hospitals. Taking into account injury severity, the wide variation in mortality risk patterns by level of trauma centers indicates substantial opportunity exists in Utah to develop trauma system networks, communications, and coordination among all trauma-designated and non-designated hospitals that provide critical medical care to patients suffering traumatic injuries.

Section II also addresses traumatic injury patterns among different age groups recognizing age-related associations with traumatic injury risk, resilience, recovery, and susceptibility. Optimal medical care of pediatric trauma injuries requires specialized knowledge, equipment, and techniques distinct from adult trauma care. Children aged 0-14 years who received care in Utah in a level I pediatric trauma center experienced reduced mortality risk than injured children who did not receive care in a pediatric trauma center.

State death certificate data provide a well-established public health data source to corroborate and ground state trauma registry trends about age group differences in injury mortality rates over time. These vital records data show injury mortality is increasing with troubling regularity in Utah's adult population, while simultaneously among Utah's children, the mortality rate shows decline in recent years. In other words, injury morbidity and mortality is high and continues an upward trend in Utah's adults, but an opposite pattern is progressing in Utah's child population. A decrease in the frequency of motor vehicle crashes injuring and killing children between 2001 and 2013 is strongly associated with the decline in mortality rates. This result demonstrates progress in reducing the leading cause of childhood injury death and disability in Utah. Among adults, however, fall-related injuries have shown large increases in recent years, and falls are the leading cause of adult injury reported to the state trauma registry.

Hospital length of stay (LOS) information about traumatic injury medical care in Utah is outlined in Section II. LOS is examined as a limited proxy measure of injury morbidity outcomes. LOS measured in the number of in-patient days is strongly associated with injury severity. The level of SDTC explains part of this association. Depending on injury severity, LOS shows greater variation among level I and II trauma centers than other hospitals: shorter LOS for minor injuries and longer for very severe injuries. Triage and transfer decisions are also linked to these LOS patterns.

Section II concludes with a rationale for improving traumatic injury health outcomes in Utah. When a person suffers a sudden and unexpected traumatic injury, the regionalized trauma and EMS system can rebalance the equation by organizing the provision of local services based upon the regional availability of specialty services and the patient's specific needs.

Section III presents an overview of the general guidance and recommendations for trauma system development provided by federal and professional organizations in the United States. The Health Resources and Services Administration outlined a general model for trauma system development in 2006. The American College of Surgeons (ACS) provides national standards to support states' designation of trauma centers. The National Trauma Data Bank (NTDB), supported by the ACS, coordinates a common data standard for trauma registry data collection and reporting. Utah is one of only a few states mandating the submission of trauma data by all acute care hospitals. Utah's data provide a valuable and unique population-based perspective of trauma care practice and outcomes, unlike many states and the NTDB that rely on voluntary hospital data submissions.

The current report addresses basic questions about the status of Utahns' traumatic injury health outcomes from a population-based and trauma care systems perspective. Findings in the report provide sufficient information to initiate next steps of inquiry to identify specific state and regional trauma system needs and actions. Coordinating state and regional trauma systems including prehospital, hospital, and post-hospital can improve patients' morbidity and mortality outcomes, and increase overall system efficiency.

Section I. Introduction

As the third leading cause of death among Utahns, injuries are a significant public health problem. For children and young-adults in Utah and the rest of the nation, injuries they are the leading cause of death and disability to those younger than age 30. In 2013, for every death in Utah caused by injury, there were 12 hospital admissions from the emergency department resulted from injuries, and 98 emergency department encounters resulted from injuries. In other words, 1,857 Utahns died from injuries in 2013; 23,073 hospital admissions from the emergency department were for injuries in 2012; and 181,175 emergency department encounters resulted from injuries (ED report 2012). These injuries include unintentional, intentional, and undetermined intents. Figure 1 shows Utah's injury mortality rate is higher than the national injury mortality rate. Utah's death rate is also increasing faster than the national rate. Between 2000 and 2013 Utah's injury death rate increased by 23% compared to an 8% increase nationally. In 2013, there were 71 deaths out of 100,000 injuries.
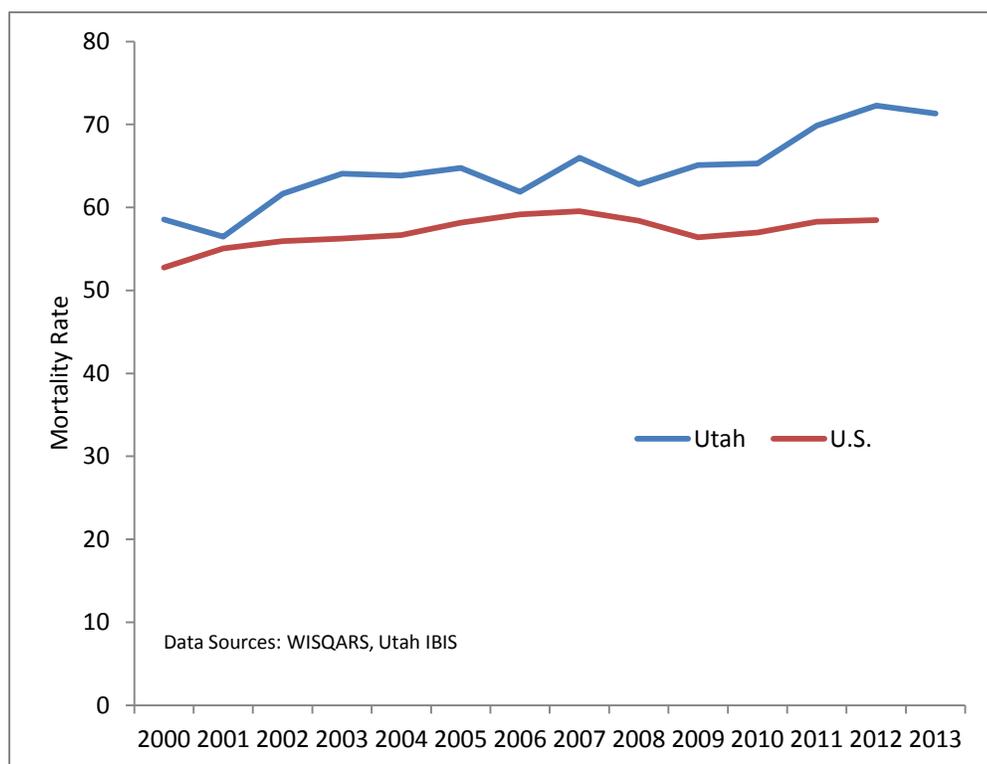
Figure 1. Age-adjusted Annual Injury Mortality Rates in Utah and the United States

The emergency medical system in Utah responds to, and treats acute traumatic injuries as quickly and effectively as circumstances allow. In some situations the traumatic injuries are so severe or complicated that death and disability cannot be prevented. Yet, for many Utahns who suffer traumatic injuries, the consequences of death and disability are prevented every day by emergency medical providers throughout the state. Building a strong system of coordinated emergency medical care centered on saving lives and preventing disability is a leading public health priority in Utah and the United States. The goals of developing a trauma and emergency care system are to improve

patient health outcomes, and to reduce the escalating economic burden placed on individuals, families, and society as a whole. The economic burden of direct injury treatment charges in Utah has more than tripled from 2000 to 2012. Figure 2 shows charges from injuries of patients treated and released, and patients treated and admitted to the hospital. Between 2000 and 2012 the total hospital charges increased from two hundred million to nearly eight hundred million dollars.
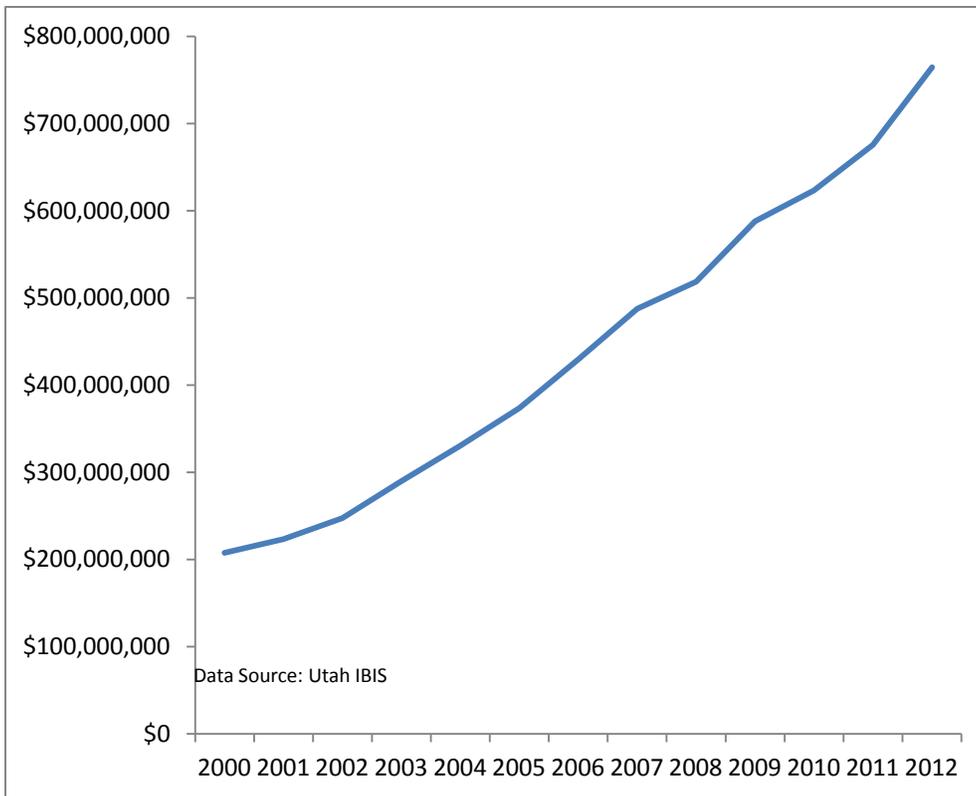
Figure 2. Total Utah Annual Hospital Charges (i.e., Dollars) for Injured Patients Including Treat-and-Release, and Treat-and-Admit

Section II. Factors Affecting Utah's Traumatic Injury Outcomes

Utah's Case Fatality Rate (CFR) of 3.93% for traumatic injury in 2013 is lower than the CFR of 4.47% reported by the National Trauma Data Bank. The CFR for traumatic injury measures the percentage of persons alive, receiving medical care for a traumatic injury, who eventually dies from the injury. It is a measure of trauma mortality versus survival, within a defined trauma care system. Utah death certificate data report 1,857 injury deaths in 2013 (i.e., state residents), and Utah trauma registry data report 381 deaths (i.e., 93% state residents). The difference between the two numbers, other than nonresidents, includes the number of Utahns who died from traumatic injuries outside the hospital. Additionally, the trauma registry excludes patients with injuries caused solely by poisoning, suffocating, drowning, and others not involving mechanical forces that cause blunt, penetrating, or burning injuries often referred to as "major trauma."

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Table 1, and the accompanying Table 1 graph, illustrates the magnitude of mortality prevention provided by Utah's trauma care system. Thousands of lives are saved from traumatic injury death every year. Otherwise, Utah's injury mortality rate would be much higher than what is presented in Figure 1. The top row of Table 1 shows the total number of people each year with a traumatic injury who received medical care at a hospital in Utah and was alive at hospital discharge. The second and third rows of Table 1 show the number of people receiving medical care who survived after suffering severe and very severe traumatic injuries. The fourth row indicates the number of people who received medical care, but still died from traumatic injury. The last row reflects the total number of Utahns who died from injury each year as reported by Utah death certificates. Table 1 provides evidence of the effectiveness of Utah's trauma system to treat traumatic injuries and prevent death.

Table 1. Annual Numbers of Utah Trauma Registry Patients, and Numbers of Total Injury Deaths.

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Alive	5601	6009	6678	7018	6929	8688	8561	8916	9186	9179	9308
Alive (severe injury)	717	818	948	1029	854	791	804	777	1203	1277	1286
Alive (very severe injury)	362	397	480	499	398	335	410	414	284	294	291
Dead (trauma registry)	268	258	289	307	333	332	338	331	329	363	381
Dead (vital records)	1342	1373	1432	1416	1551	1496	1577	1620	1752	1829	1857
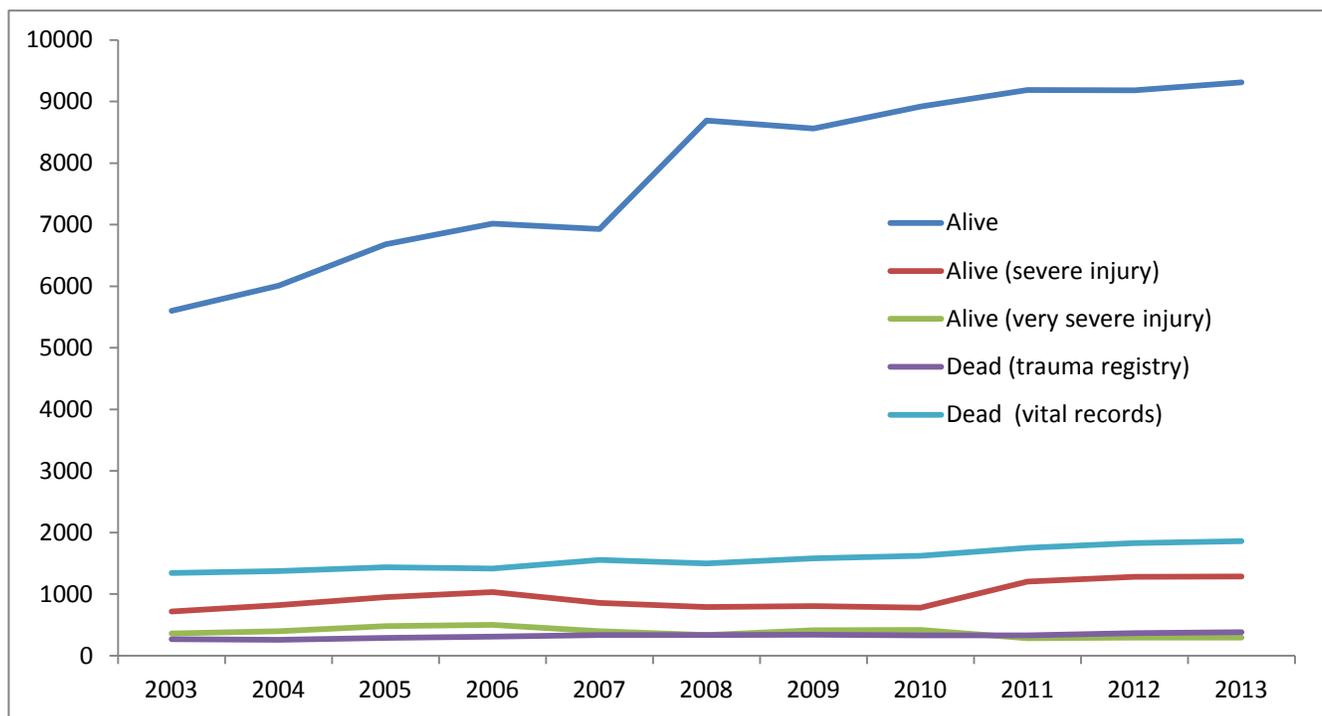
Table 1 in graph

Figure 3 illustrates decreasing CFR trends for injury patients reported to the Utah Trauma Registry and National Trauma Data Bank (NTDB) from 2003-2011, and increasing CFRs between 2012 and 2013. Decreasing CFR trends may indicate improved trauma care practice, and/or changes in trauma patient trends. Each year, on average, from 2003-2011, Utah's CFR decreased twelve-hundredths of one percent (-.12). During the nine-year period, Utah's CFR decreased a total of 1.1 percentage-points. That 1.1% decrease in the CFR translates to an estimated 431 people from 2003-2011 who would not have lived if the CFR had remained constant. Utah CFR calculations are based on reports from all hospitals in the state.. The NTDB relies on voluntary hospital reporting, so NTDB data may not accurately represent the complete picture of trauma care in the United States. The increasing CFR between 2012 and 2013 raises concern and creates a need to understand why, so that steps can be taken to reduce the CFR.
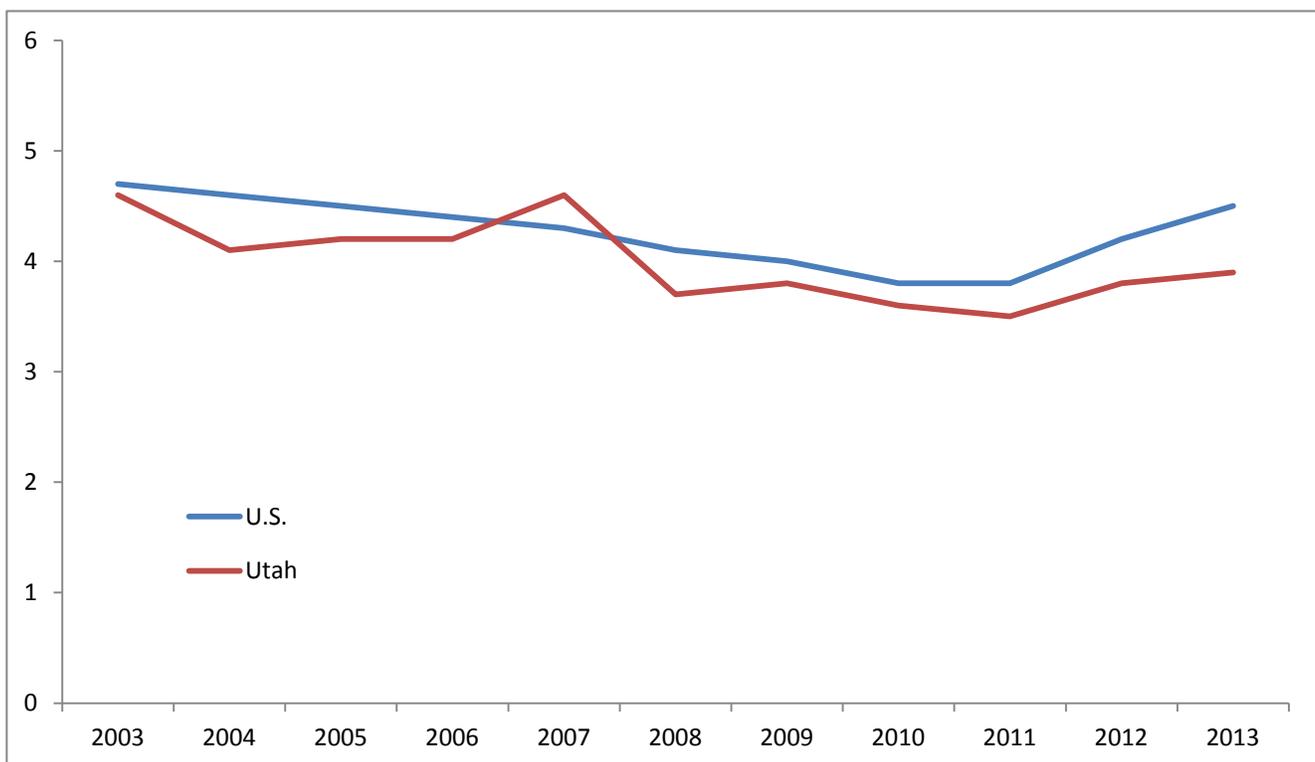
Figure 3. CFR Decreasing Trends in Utah Trauma Registry and NTDB

Mortality, Injury Severity, and State Designated Trauma Centers

Mortality risk increases as Injury Severity Score (ISS) increases. Figure 4 shows the CFR from 2001-2013 grouped into four injury severity categories. Among patients suffering very severe injuries (ISS 25-75), 31% died accounting for 54% of all deaths in the trauma registry over the thirteen-year

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period. That compares with 4.6% of patients dying with severe injuries (ISS 16-24) who accounted for 14% of all deaths. The ISS assigned to each trauma patient is a calculated severity score reflecting the injuries' relative mortality risk to the patient. ISS values range from 0-75 and four groups of injury severity scores are normally reported: minor (0-8), moderate (9-15), severe (16-24), and very severe (25-75). The ISS is a patient-level score and it is a calculated summary score based on the Abbreviated Injury Scale (AIS) which is an injury-level score specific to a body region(s). The AIS was first developed in 1969, and has been updated periodically. The latest version is AIS-2008. Trend reports of ISS-related changes in the population must be based on the same underlying version of the AIS to be valid. CFR trend analyses by injury severity group will be presented after registry data are adjusted for a single methodology.
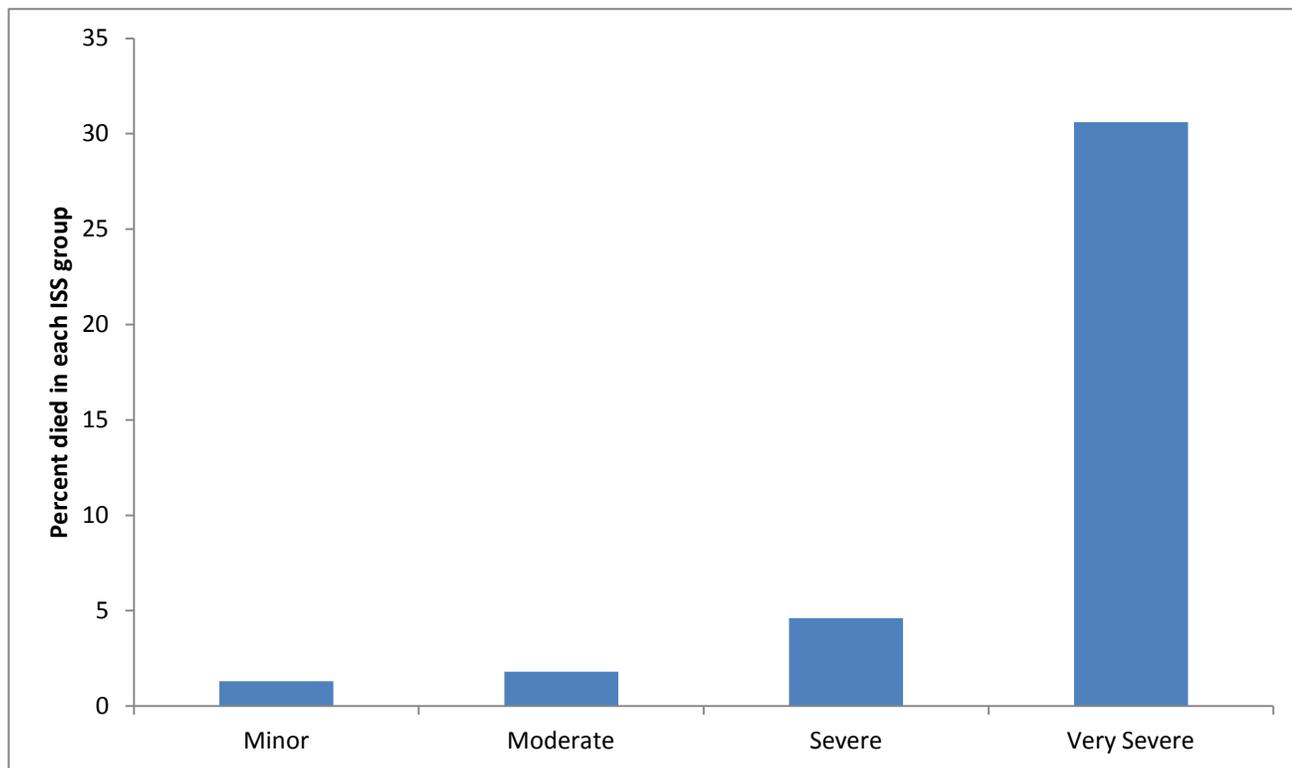
Figure 4. Utah CFR Patterns by Injury Severity Group for 2001-2013

Traumatic injury mortality for patients with very severe injuries also varies by Utah's state-designated trauma centers (SDTC) as shown in Figure 5. The 13-year CFR for Utah's level I trauma centers (including LDS hospital) was 29% for patients with very severe injuries. From 2001 to 2013, 94% of patients with very severe injuries (6,775 of 7,210) received definitive care at level I or level II trauma centers in Utah. This figure (94%) remained relatively constant each year between 2001 and

2013. Hospitals that are not designated (ND) trauma centers in the state cared for 2.5% of these patients; level III trauma centers saw 2.4%; and level IV trauma centers saw 1.2%. Figure 24 on page 38 shows a map of the locations of state-designated trauma centers in Utah.
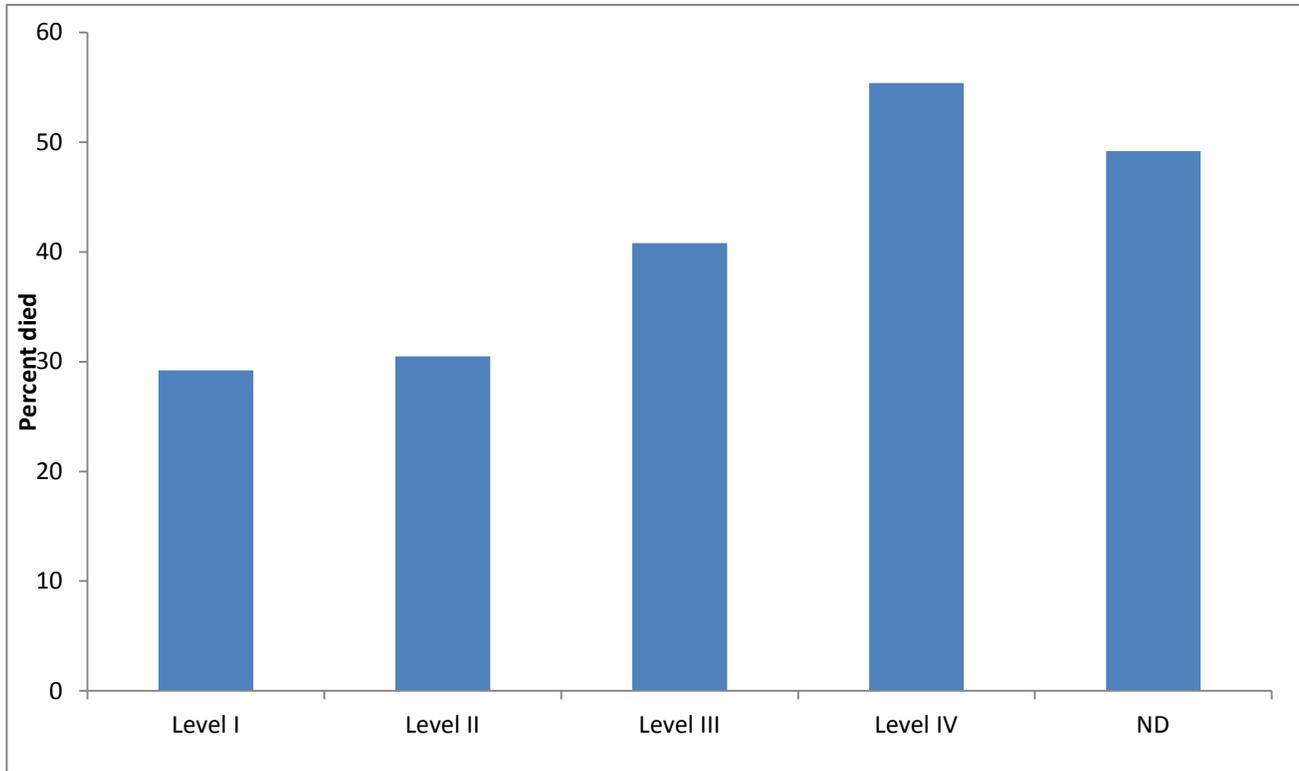
Figure 5. CFRs of Patients with Very Severe Injuries by Utah SDTC, 2001-2013

Figure 6 presents CFRs by SDTC for severe, moderate, and minor injuries. While mortality prevention is more successful for less severe injuries, the number of deaths is still considerable, 576, 685, 536, respectively. Across the 13-year period, level I trauma centers reported 690 deaths among patients with severe, moderate, and minor injuries; level II trauma centers reported 509; level III reported 203; level IV reported 140; ND reported 346. These trauma level totals include 91 patients who died, but did not have an injury score reported.

Figures 5 and 6 show a general pattern of increased injury survivability associated with higher levels of trauma care expertise and resources. These analyses provide support for the continued development of coordinated systems of trauma and emergency medical care, in order to further reduce mortality and morbidity across the state.

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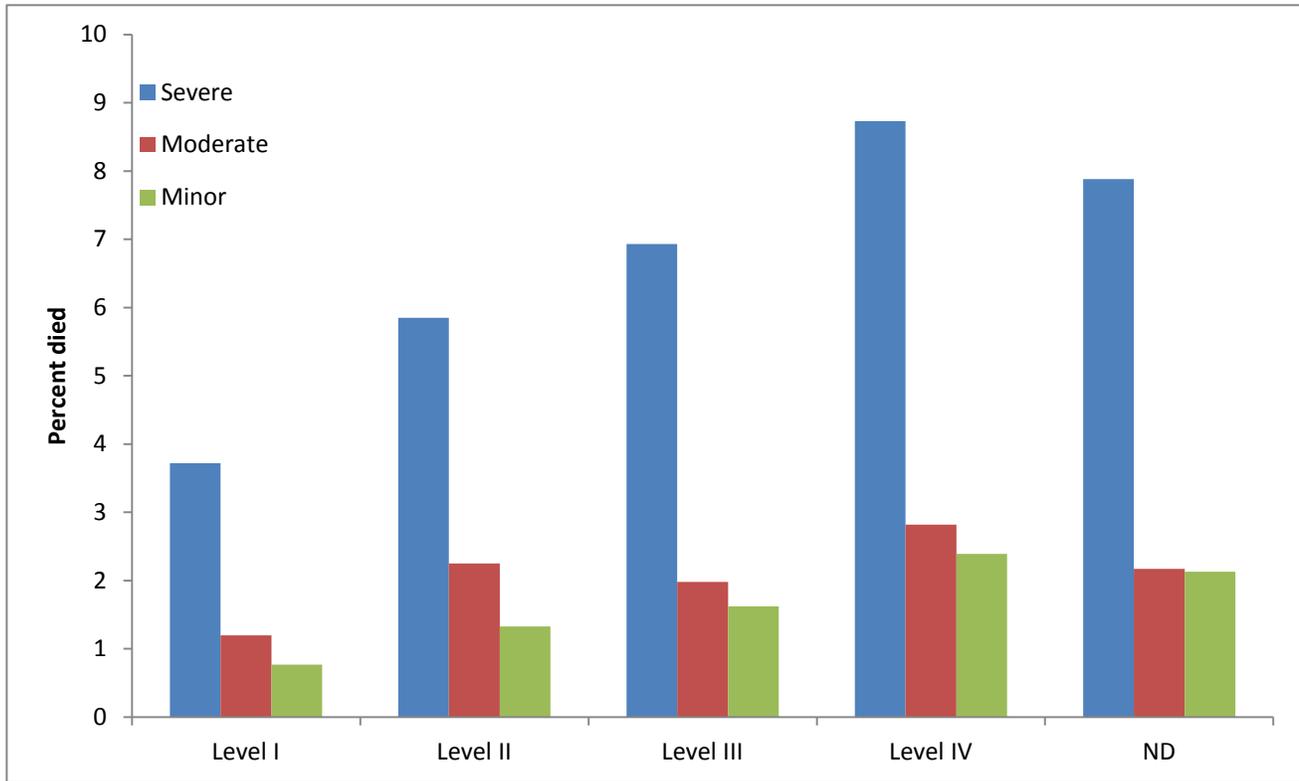
Figure 6. CFRs of Patients by Injury Severity and Utah SDTC Providing Definitive Care, 2001-2013

Level I and II trauma centers provided definitive care for 94% of very severe patients from 2001-2013. They provided definitive care for 70% of minor and moderate injury patients. SDTC levels III and IV hospitals had generally lower death rates for patients than for patients who were treated at nontrauma designated hospitals. This result provides support for the continuing effort by the Utah Department of Health to encourage hospitals to achieve SDTC status.
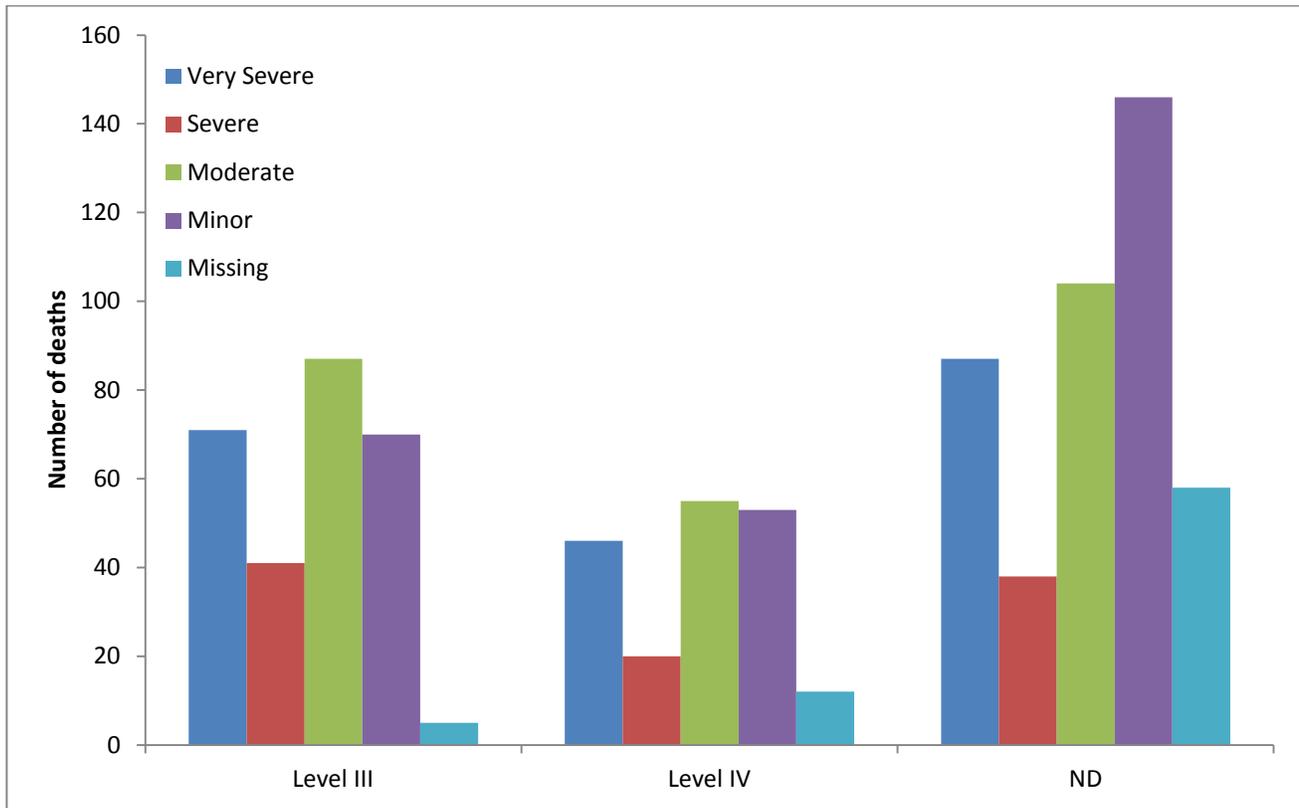
Figure 7. Traumatic Injury Death Totals by SDTC and ISS Group, 2001-2013

Mortality Trends by Age Groups and Leading Causes

Figure 8 distinguishes CFR trends based on age. The CFR for Utah youth (i.e., age 0-19 years) is separated from Utah adults (i.e., age 20 years and older). The age-group trends show that Utah's adult CFR decreased from 2003-2011, and was consistently lower than the CFR reported by the National Trauma Data Bank (NTDB). However, Utah's trend in the youth CFR was relatively flat and consistently higher than national youth trends reported by the NTDB. It must be noted that this national data may not be representative of all hospitals providing care whereas Utah's data include all hospitals providing trauma care in the state.
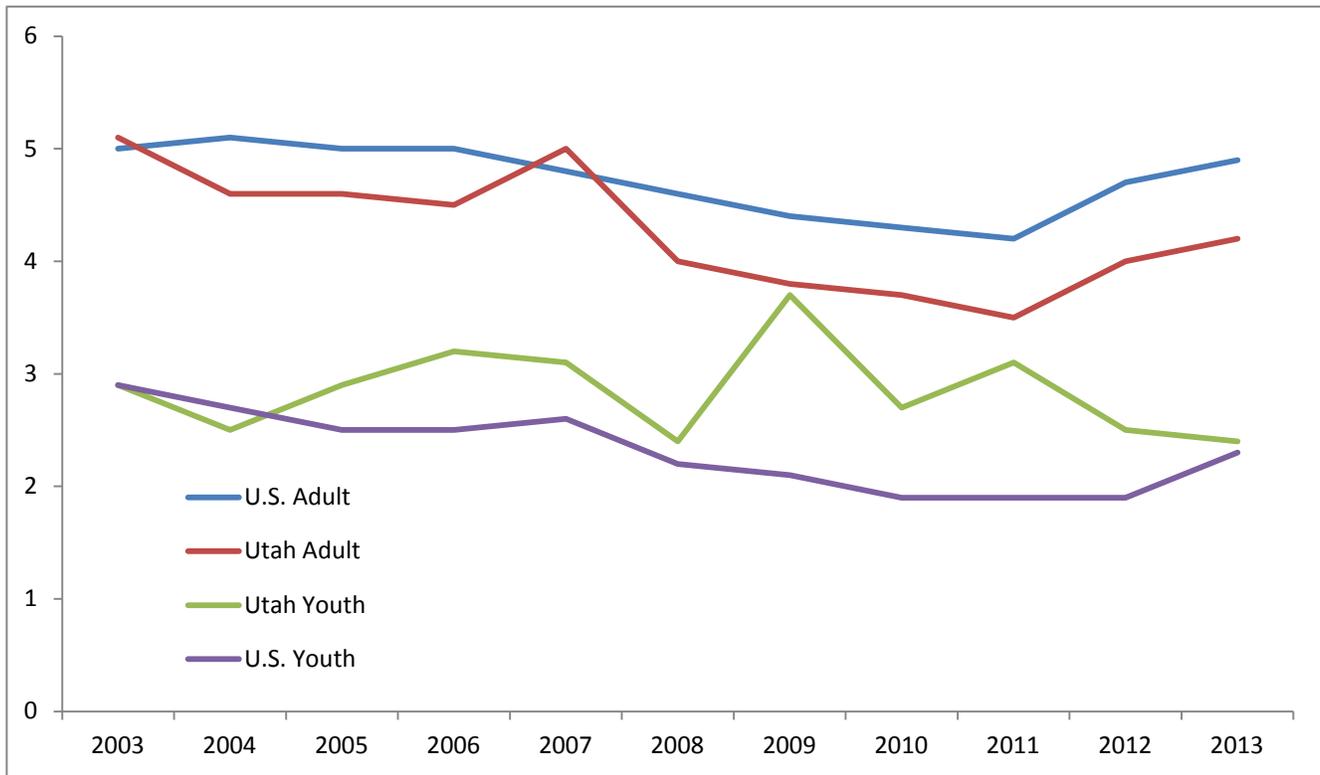
Figure 8. Utah and NTDB CFR Trends by Age Group, 2003-2013

Many factors are associated with changes in CFR trends. One factor is age. From 2003 to 2013 in Utah, 16,724 children aged 0-19 years who experienced traumatic injuries and received hospital medical care, survived the injury, while 493 did not. Primary Children's Hospital (PCH) provided care to 9,488 of the children (207 died), and 7,729 received care from other hospitals (286 died) in the state. As the only pediatric Level 1 trauma center in the state. PCH cared for most Utah children aged 0-14 years with traumatic injuries. Table 2 and Figure 9 present CFR-related results specific to ages 0-14 years, and 15-19 years.

Figure 9 shows that children ages 0-14 years in other hospitals account for a portion of the Utah youth trend in Figure 8. Utah's traumatic injury mortality outcomes varied for children depending partially on the geographic locations of PCH and other hospitals in the state. The mortality trend for 0-14 year-olds outside PCH increased until 2010, but then dropped sharply between 2011-2013. The PCH CFR trend for children ages 0-14 years showed a relatively consistent downward trend.

Table 2. Number of Children by Hospital, Age Group, Mortality, and CFR for Utah, 2003-2013

	N Total	N Alive	N Dead	CFR Average
PCH 0-14	8775	8579	196	2.2
PCH 15-19	713	702	11	1.5
Other 0-14	2187	2093	94	4.3
Other 15-19	5542	5350	192	3.5
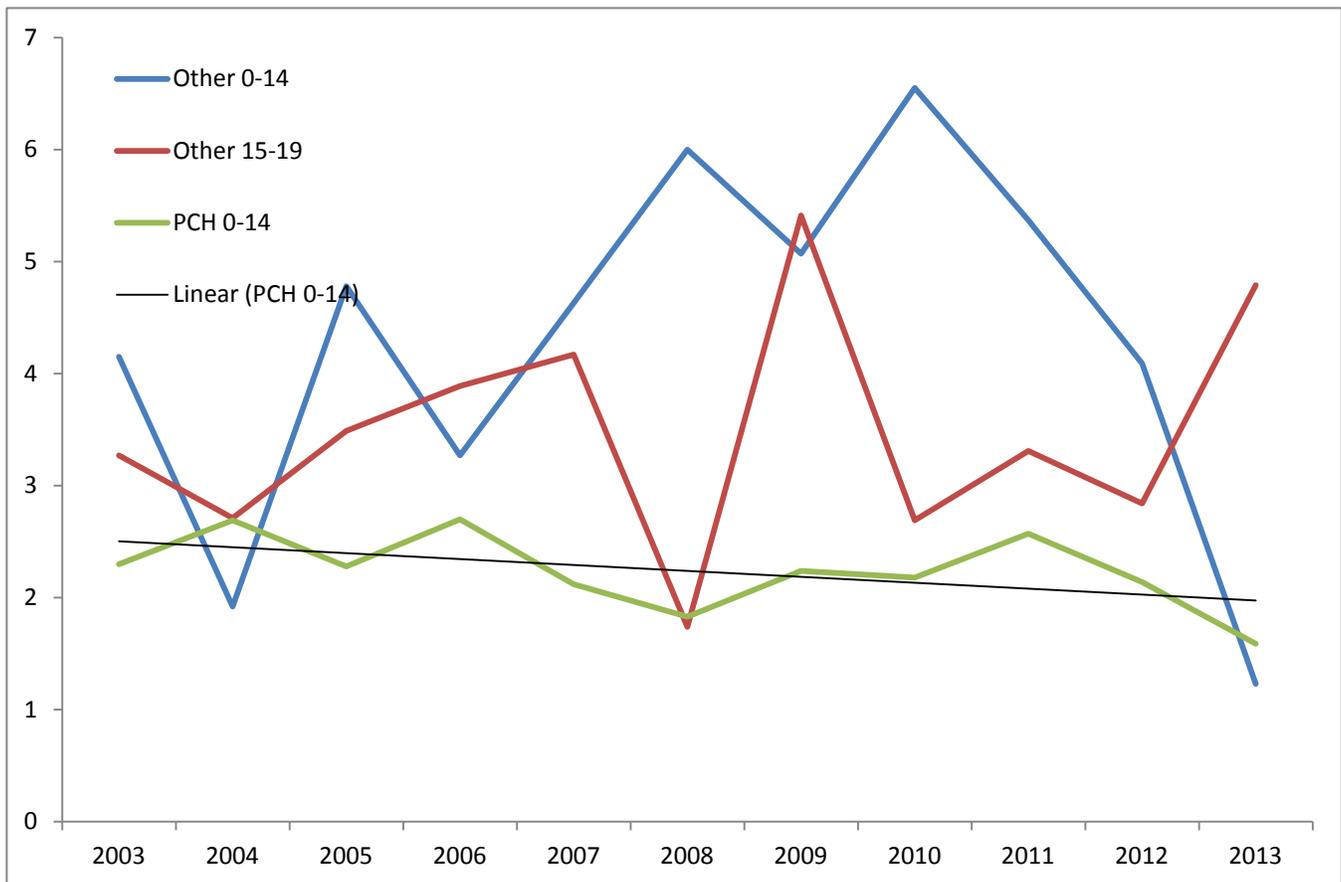
Figure 9. CFR Youth Trends by Age Group and PCH/Other

Figures 10 and 11 present similar injury trends for youth and adults based on two independent public health surveillance systems. Figure 10 presents Utah injury mortality rates based on state death certificate data and Figure 11 presents the Utah patients reported to the state trauma registry.

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Utah's death certificate data show divergent injury mortality trends for youth and adult populations. Figure 10 shows injury mortality trends decreased among youth by 23% between 2000 and 2013; from 28 deaths per 100,000 Utah children and young adults 0-24 years-of-age, to 22 deaths per 100,000. In contrast, these data show a steady increase in adult injury mortality between 2000 and 2013 when the death rate increased 23% and deaths from unintentional injuries and suicides, as reported by state death certificates, increased substantially in Utah.
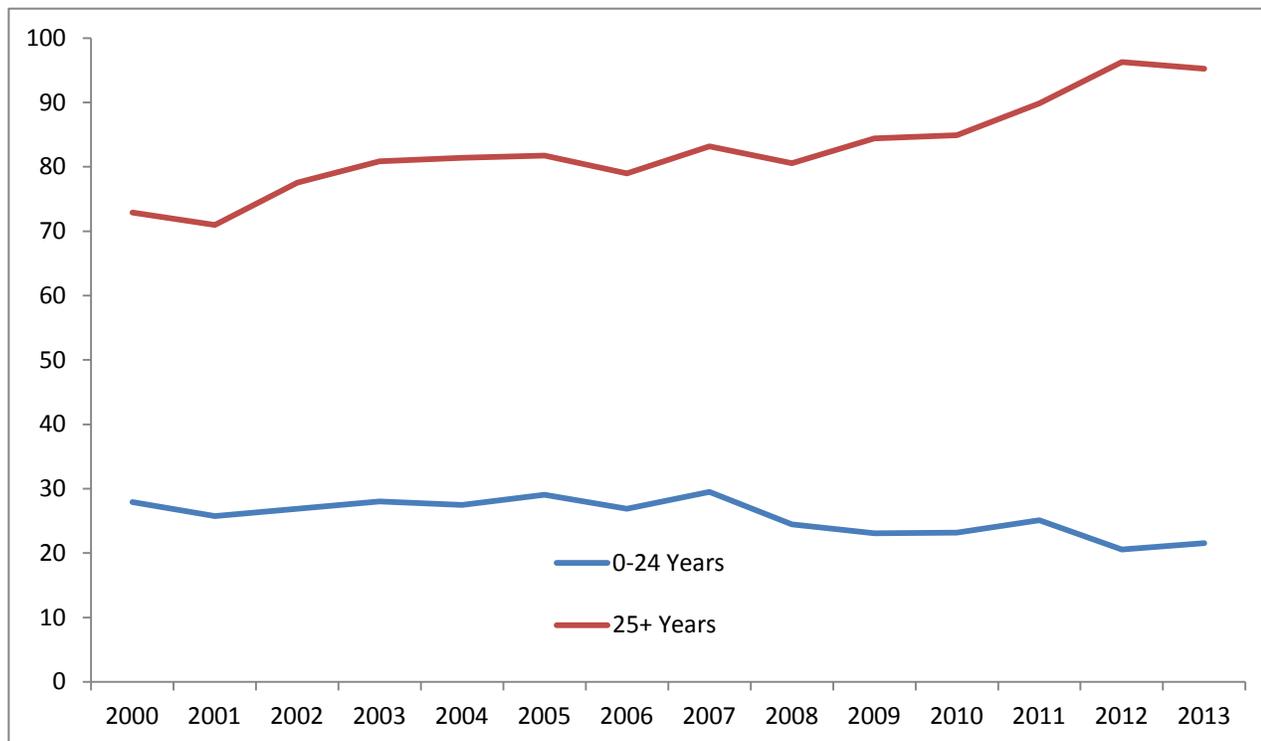
Figure 10. Utah Death Certificate Injury Mortality Crude Rates for Adults and Youth, 2000-2013

Figure 11 presents data from the state trauma registry showing large increases in adult death rates but little overall change in those of youth. Registry data in Figure 11 include about 10-15% out-of-state residents annually, and a substantial increase in death rates in 2008, due to inclusion of ground level falls in the trauma registry for patients aged 65 years and older. Both figures show clear and divergent injury trends between youth and adults: injury morbidity and mortality are increasing among adults in Utah, but not for youth. Even taking into account the change in registry inclusion criteria in Figure 11, the increase in death rates between adults and youth would still be nearly double from 2001 to 2013.

Figure 11 also includes the total number of injury-caused deaths reported on state death certificates from 2001-2013. In 2001 the difference between ages 0-24 and 25 years and older injury deaths in the state was threefold. In 2013 it was sixfold. Adult injury morbidity and mortality increased steadily from 2001 to 2013.
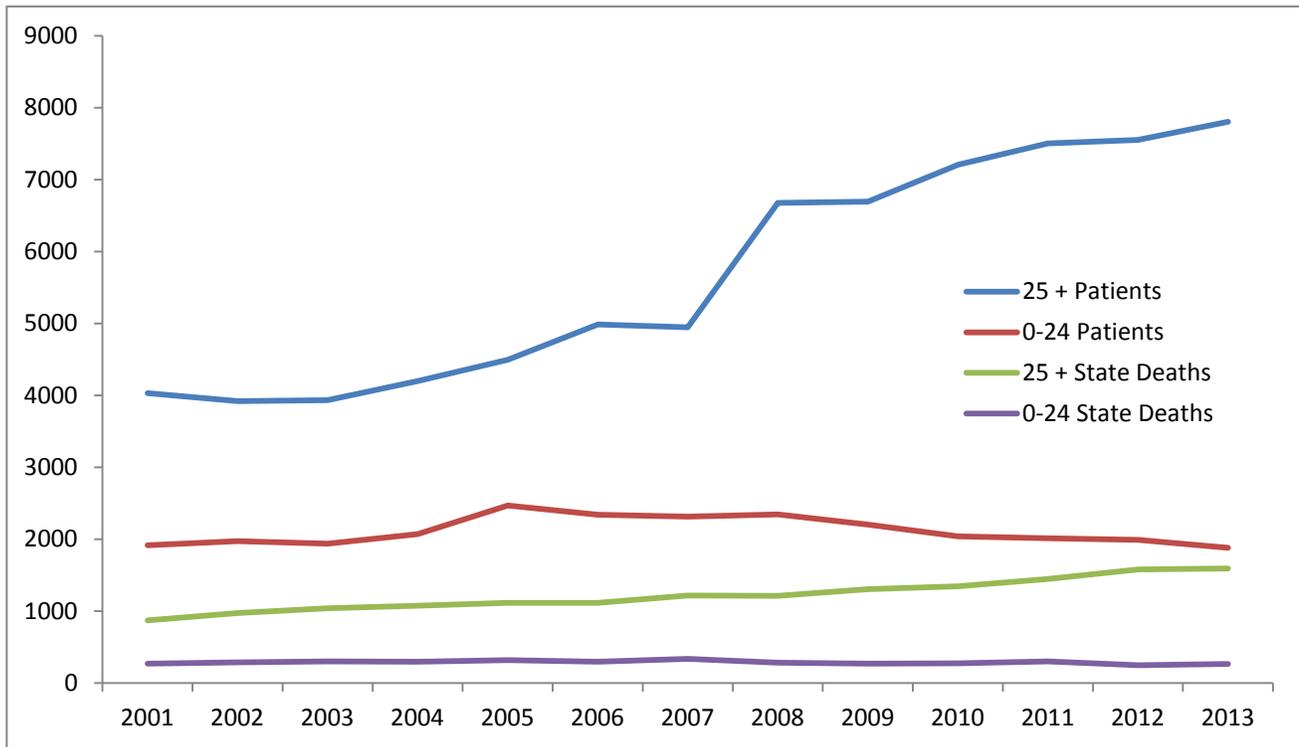
Figure 11. Number of Trauma Patients Reported to the Utah Trauma Registry, and Number of Injury Deaths Reported on Death Certificates by Age and Year

Figure 12 shows the five leading causes of youth injury reported to the Utah Trauma Registry between 2001 and 2013. Injuries from falls, motor vehicle crashes, sports, all-terrain vehicles, and bicycles accounted for 69% of all youth trauma injury patients. Motor vehicle crashes were the leading cause of very severe injuries among youth. However, motor vehicle crashes causing very severe injuries decreased by approximately 50% between 2001 and 2013. The second leading cause of youths' very severe injuries was pedestrian vehicle-related crashes, and this also decreased during the 13 year period. These two vehicle-related causes accounted for 47% of youth very severe injuries 2001-2013. Decreasing injury mortality among Utah youth is associated with decreasing injury severity and injury frequency of motor vehicle crashes. The increasing trends in youth injuries caused by falls and sports shown in Figure 12 were the result of minor and moderate

injuries. Trauma registry data provide significant evidence to demonstrate progress has been made in reducing motor-vehicle-related youth injuries.
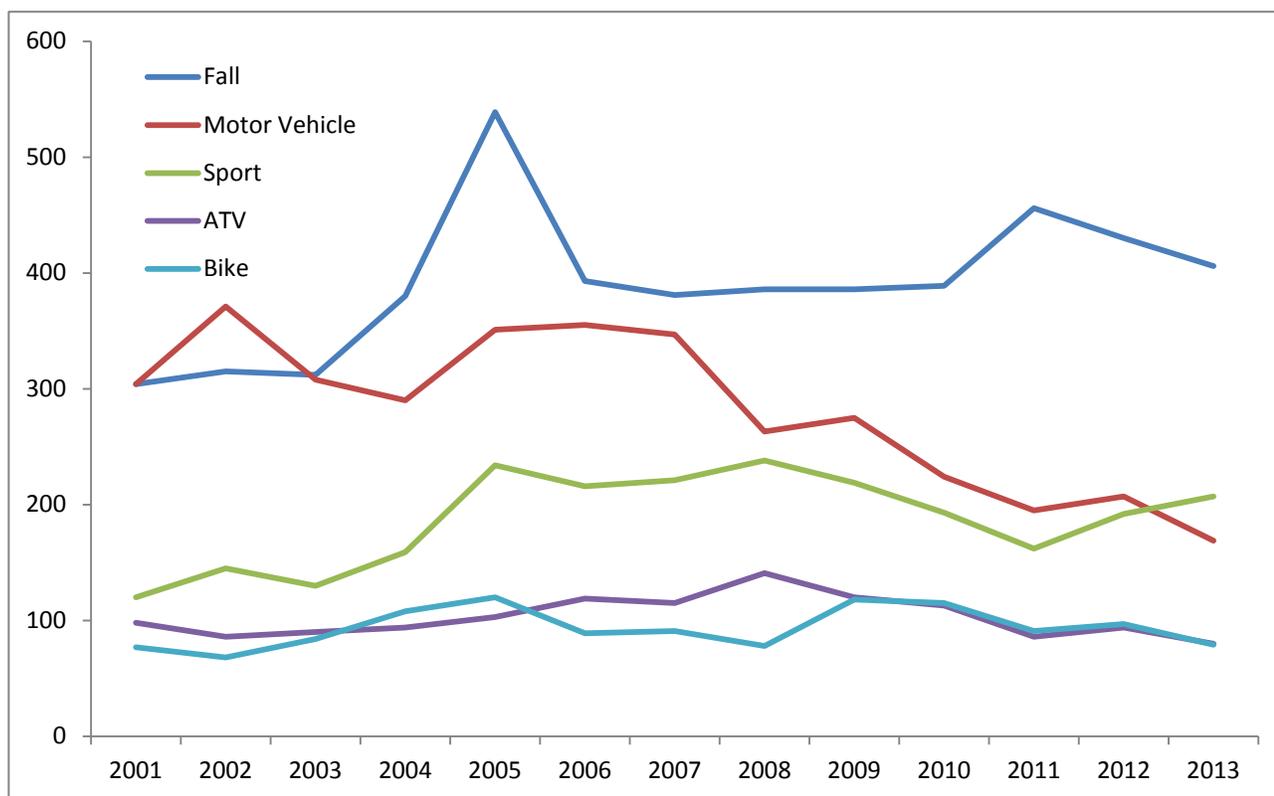
Figure 12. Patient Numbers from the Five Leading Causes of Youth (0-19 years) Injury, 2001-2013

The five leading causes of adult injury in the Utah Trauma Registry are shown in Figure 13. Injuries from falls, motor vehicles, motorcycles, all-terrain vehicles, and sports accounted for 81% of all adult injury patients from 2001-2013. Motor vehicle crashes were the leading cause of very severe injuries among adults between 2001 and 2013, but over the 13-year period motor vehicle crashes caused fewer very severe injuries.. As mentioned above, in 2008 the state trauma registry expanded its inclusion criteria to include ground-level falls among adults aged 65 years and older. Before and after 2008, adult injuries from falls were increasing. In 2013, falls were the primary cause of 62% of all adult injuries reported to the registry. While severe and very severe fall-related injuries increased from 2001-2013, the largest increases were reported among patients with minor and moderate injuries. Injuries from falls are associated with increasing injury mortality rates among older Utah adults.
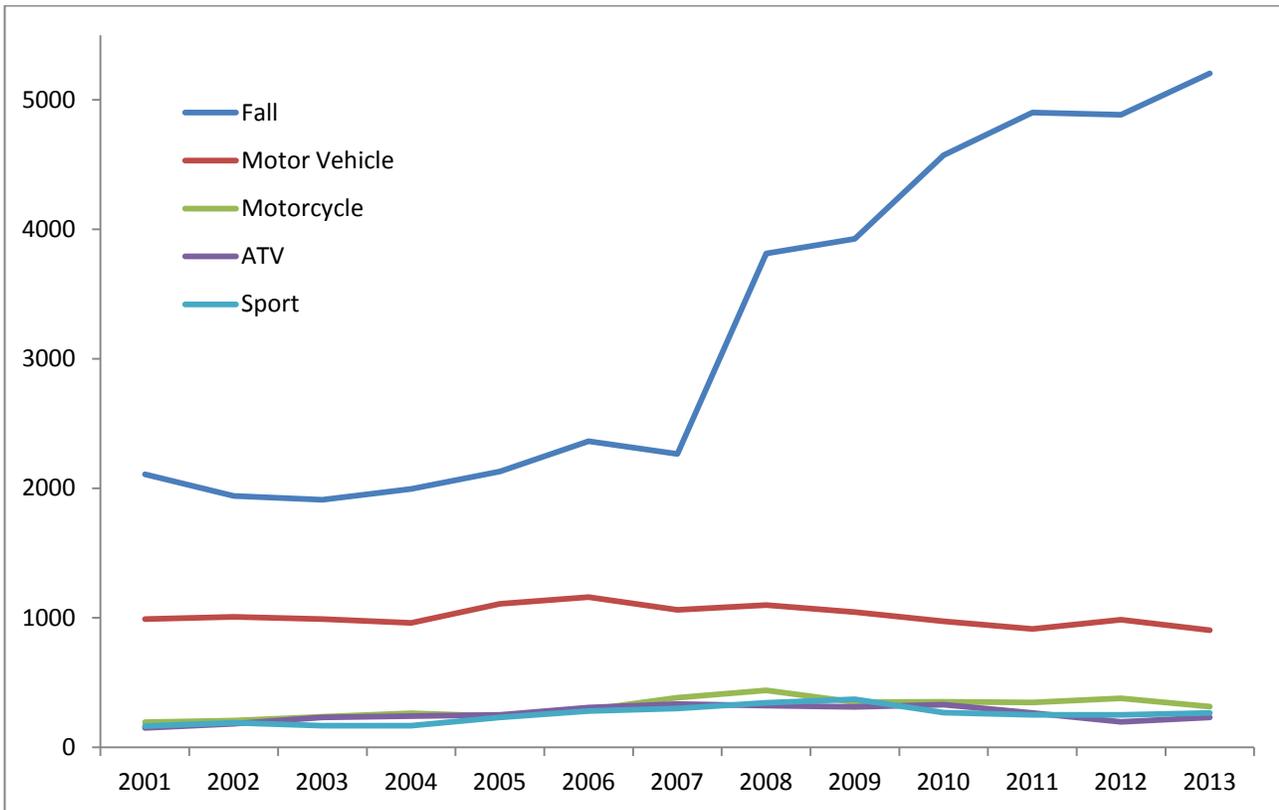
Figure 13. Patient Numbers From the Five Leading Causes of Adult (20+ years) Injury, 2001-2013

Figures 14 and 15 show the four leading causes of injury death reported in the trauma registry. Motor vehicle deaths decreased among youth and fall-related deaths increased among adults. The four leading causes of youth injury death in Figure 14 account for 70% of youth mortality in the registry from 2001 to 2013. For adults, the four leading causes of death in Figure 15 account for 82% of all adult mortality in the registry from 2001-2013.
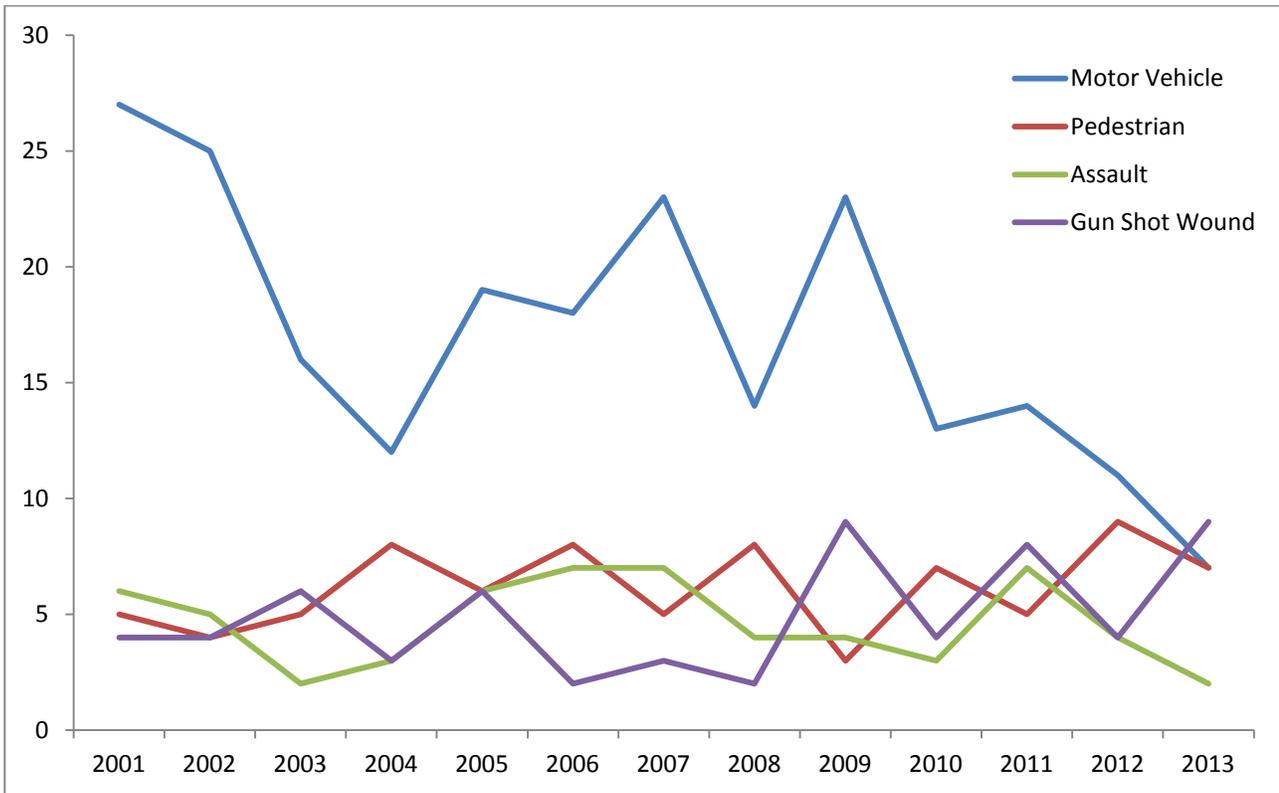
Figure 14. Number of Deaths Each Year by Leading Injury Causes for Youth 0-19 Years of Age
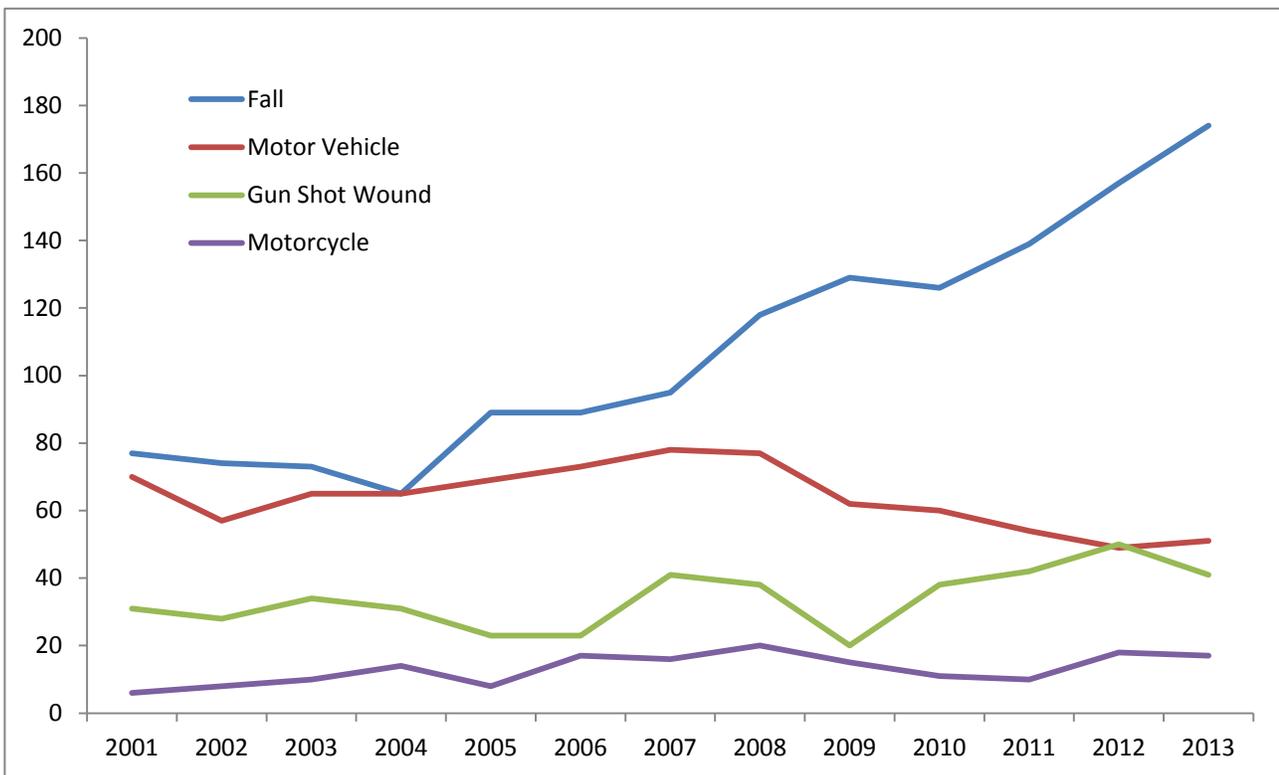
Figure 15. Number of Deaths Each Year by Leading Causes for Adults 20 Years of Age and Above

Figure 16 illustrates the age distribution of patients alive (97,349) and dead (4,091) reported to the trauma registry between 2001 and 2013. Four ages across the lifespan represent the highest numbers of traumatic injury patients reported to the registry: infants in the first year of life; 18 year-olds; 55 year-olds; and 84 year-olds.

Infants younger than one year of age represent the second highest number of patients alive and dead in the registry. The injuries of these young infants were caused primarily by falls (50%), assaults (20%), burns (9%), and motor vehicles (7%). Young adults 18 years old, but more generally 15-28 years of age, represent the highest number of trauma patients alive and nearly the second highest number of dead (22 year-olds). The injuries of 18-year-olds were caused primarily by motor vehicles (34%), falls (14%), sports (12%), motorcycles (7%), and all-terrain vehicles (6%). Adults 55 years old had injuries caused primarily by falls (49%), motor vehicles (16%), motorcycles (6%), and animals (4%). Adults 84 years of age represented the third highest group of trauma patients discharged alive, but the broader age group of 75-90 years of age had the highest mortality rate. The primary causes of injuries for 84-year-olds were falls (93%), and motor vehicle crashes (4%).

People aged 84 years in the Utah population have the highest risk of traumatic injury and inclusion in the state trauma registry. In 2010, 1.7% of Utah's population was 18 years old, compared to .2% of the population for 84-year-olds. Controlling for age distribution differences in the population shows that 84-year-olds experience six-times higher injury risk leading to inclusion in the trauma registry compared with 18-year-olds.
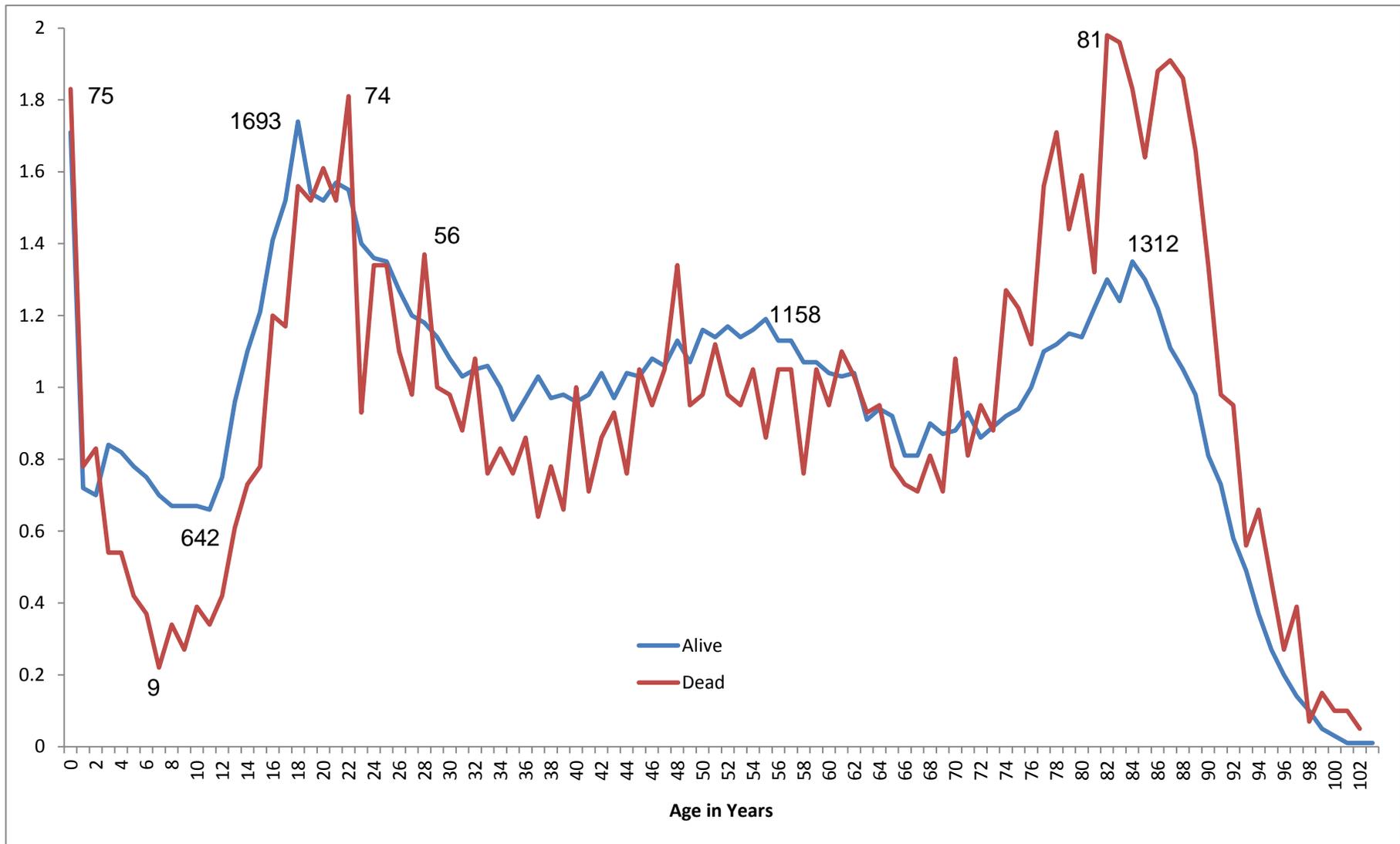
Figure 16. Age Distribution of the Percent of Total Patients Alive and Dead in the Trauma Registry from 2001 to 2013

Length of Stay

Length of hospital stay (LOS) provides an indication of injury severity that may be associated with temporary or permanent disability, reduced quality of life, hospital and EMS charges, and length of recovery. LOS is a limited proxy measure of injury morbidity outcomes because it does not measure injury morbidity outcomes directly, and does not provide any information about injury morbidity experienced after hospital discharge.

Figure 17 presents LOS comparisons for patients who died and injury patients who were discharged from the hospital alive. From 2001 to 2013, 96% of 101,445 patients lived and 4% died. Zero days equates to 18.4% of deaths occurring in the emergency department, and one day shows 42% of deaths occurred on the same day the patients were admitted to the hospital. By comparison, 1.3% of patients listed as alive in the trauma registry were discharged from the emergency department, and 15.4% were discharged the same day they were admitted to the hospital.
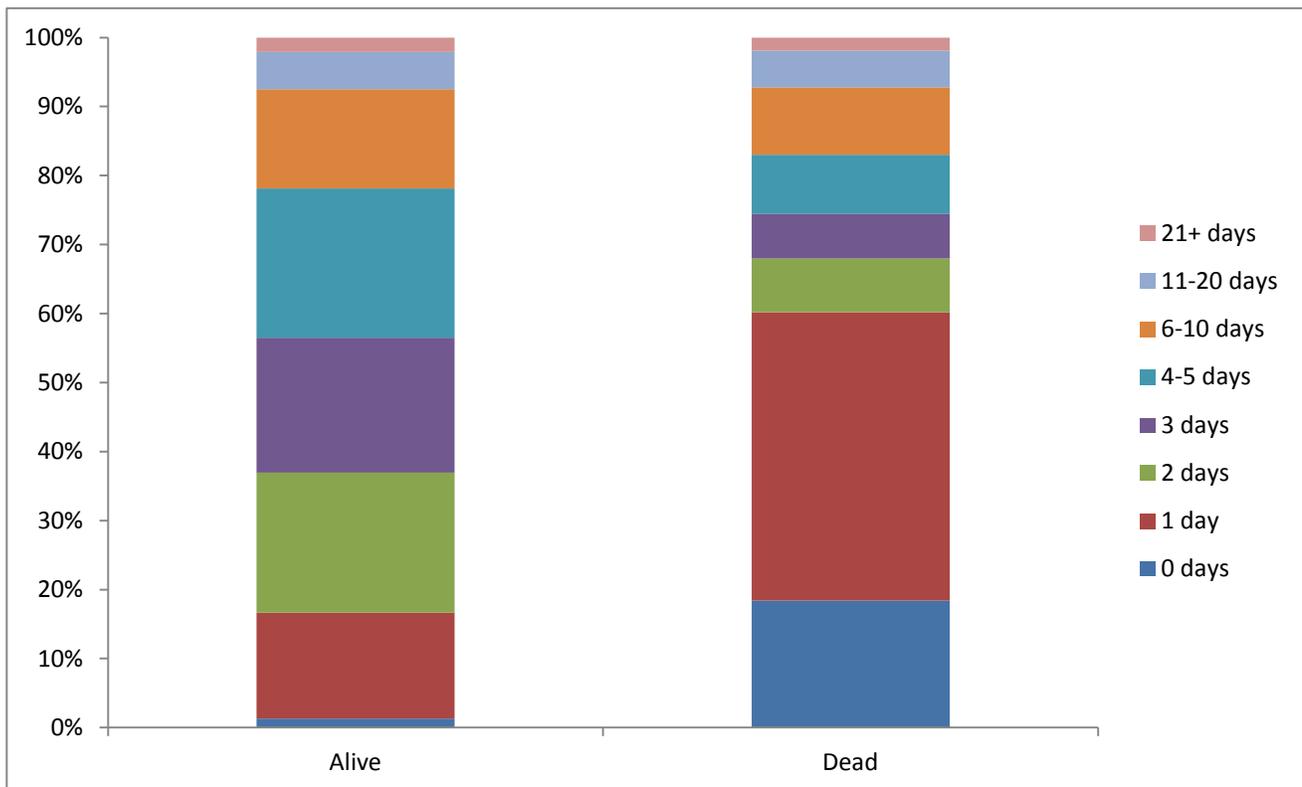
Figure 17. LOS Days by Percent of Trauma Patients Alive and Dead, 2001-2013

Figures 18-23 present LOS as a proxy measure of injury morbidity outcomes among trauma patients who lived. Therefore, patients who died are excluded from these injury morbidity-related analyses. The analyses include 97,282 trauma patients who survived their injuries from 2001-2013, as reported by the hospitals providing definitive care.

Figure 18 shows a strong association between LOS and injury severity. While 72% of patients with minor injuries were discharged from the hospital in three days or less, 87% of patients with very severe injuries were discharged after four or more days.
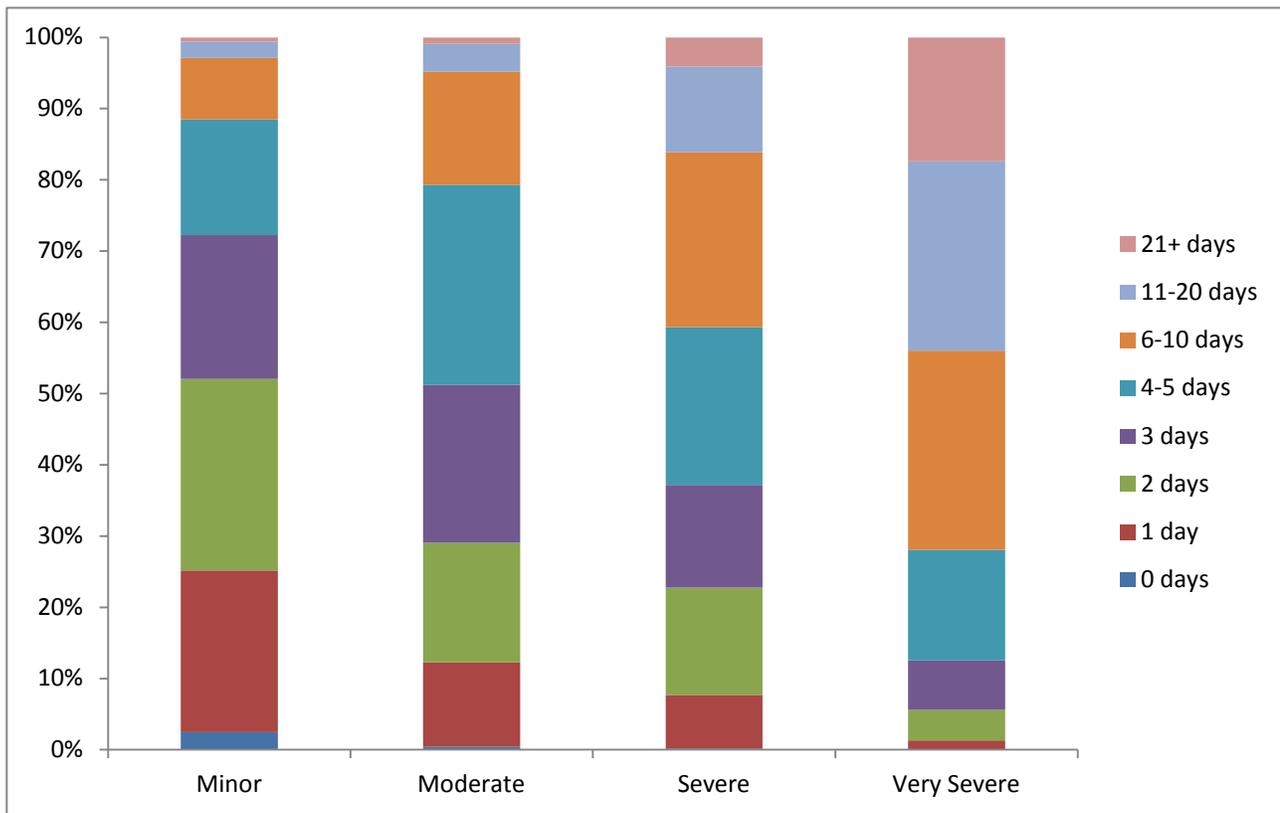
Figure 18. LOS Days by Injury Severity Group, 2001-2013

Figures 19 and 20 show LOS patterns by injury severity and SDTC from 2001-2013. Depending on injury severity, level I and II trauma centers report greater variation in LOS than other trauma centers and hospitals. In general, level I and II trauma centers report shorter LOS for minor/moderate injuries, and longer LOS for severe/very severe injuries than other Utah hospitals.
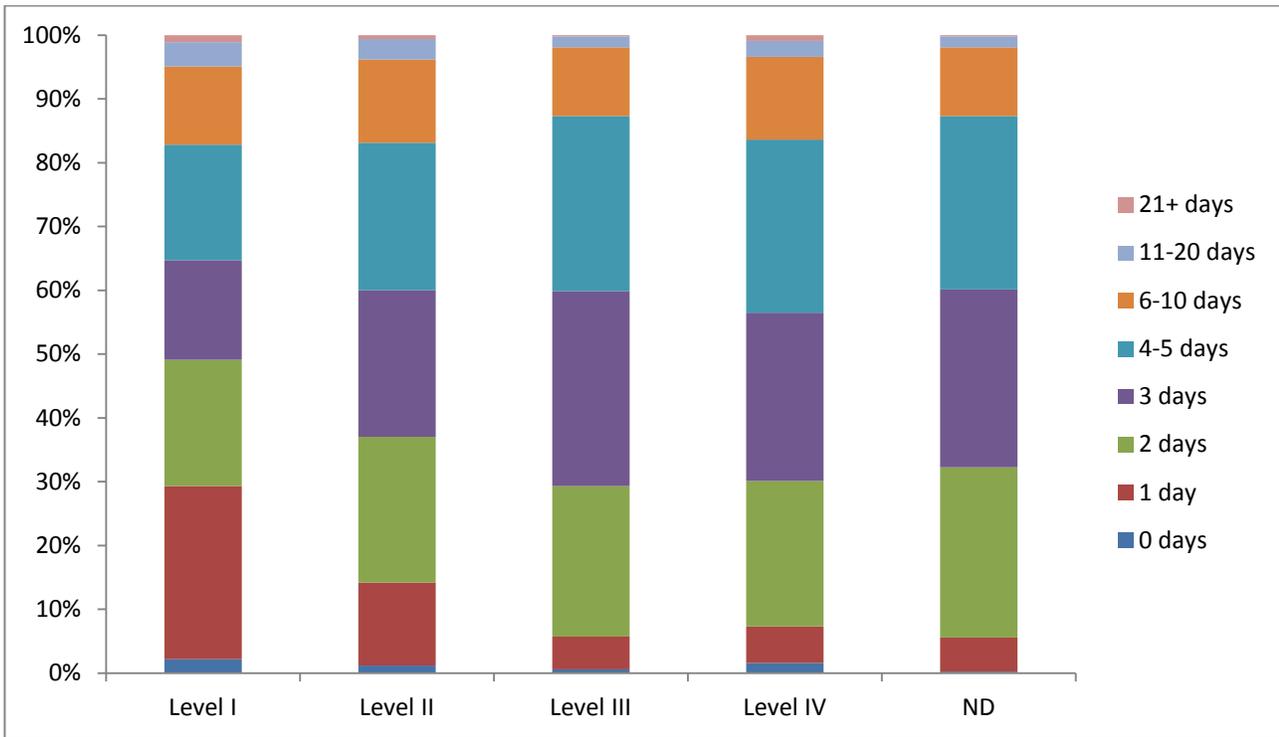
Figure 19. LOS for Minor & Moderate Injuries by State-Designated Trauma Center (SDTC), 2001-2013
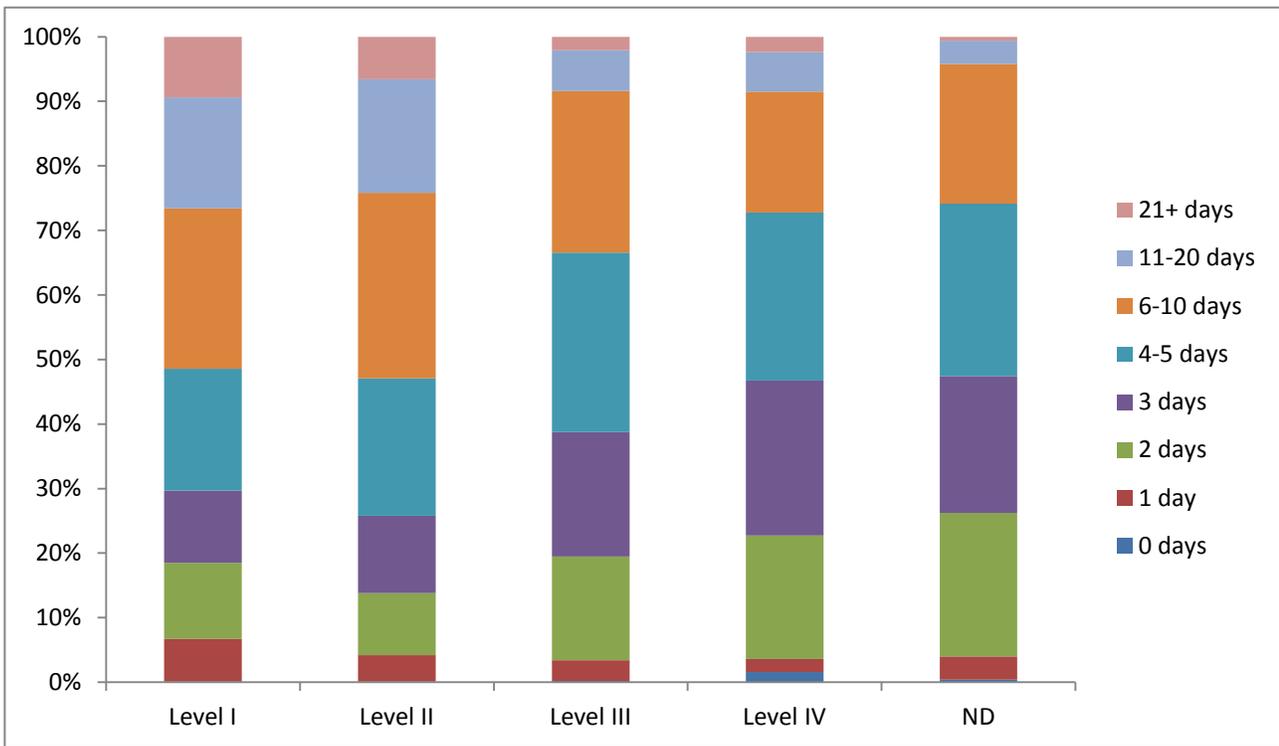
Figure 20. LOS for Severe & Very Severe Injuries by SDTC, 2001-2013

For example, 49% of patients with minor and moderate injuries and 18% of patients with severe and very severe injuries were discharged from level I centers in two days or less, compared to 30% and about 23% respectively, for level III and IV trauma centers and nondesignated hospitals. In Figure 19, 70% of patients received definitive care at level I and II trauma centers, and 91% of patients in Figure 20. From 2001 to 2013, just over 100 patients per year (1,434 patients) with severe and very severe injuries received definitive care outside of level I and II trauma centers.

Trauma patient transfer patterns correlate with the LOS patterns presented in Figures 19 and 20. Figure 21 presents LOS by patient transfer status, and shows that 31% of 97,206 trauma patients were transferred from acute care hospitals between 2001 and 2013. Patients with the shortest LOS were most likely to have been transferred. That is, 54% of patients discharged from the emergency department, and 52% discharged from the hospital the same day they were admitted, were transfer patients. These patients account for 8,426 (28%) of 29,950 transfer patients from 2001 to 2013. Patients with LOS from 2-10 days were least likely to be transferred. Less than half of patients with LOS above 10 days were transfer patients.
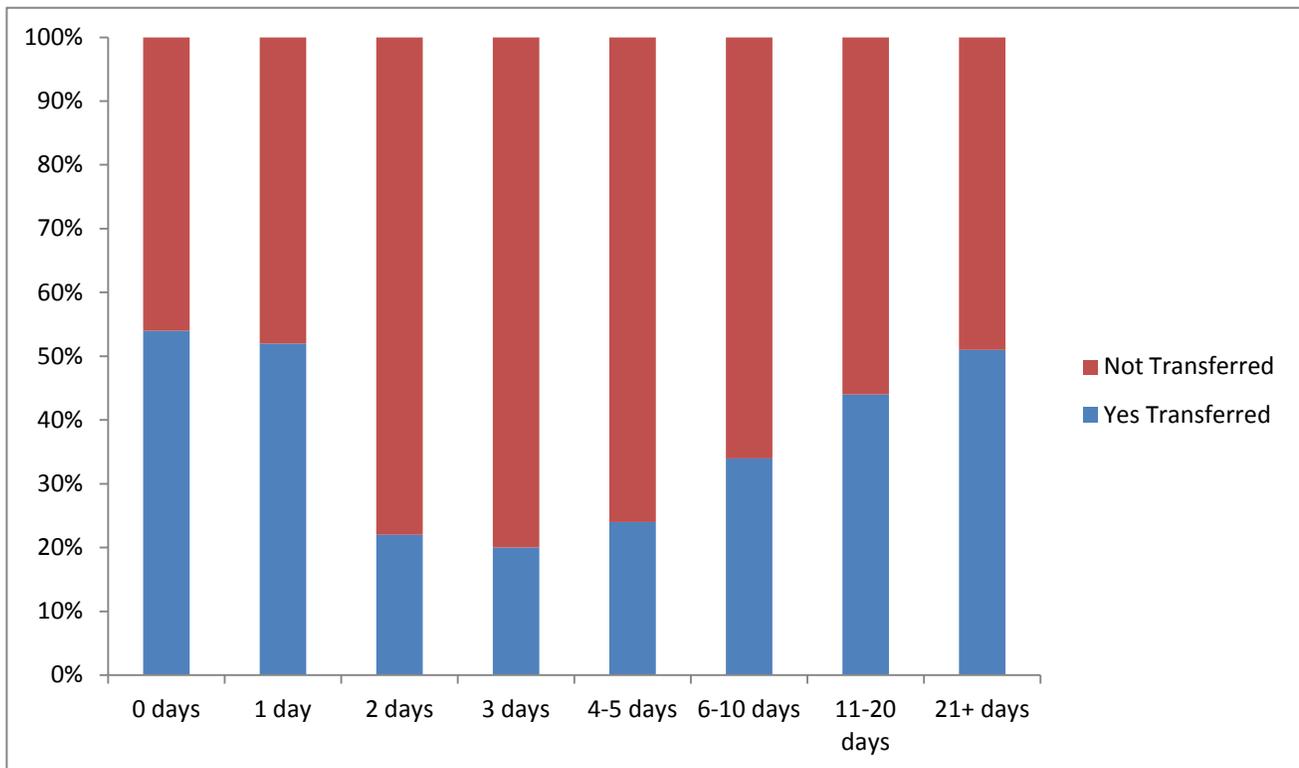
Figure 21. LOS Patterns in Utah by Patient Transfer Status, 2001-2013

Among trauma patients receiving definitive care at Utah's level I trauma centers, shown in Figure 22, 44% of 38,175 minor and moderate (M/M) injured patients were transferred from acute care hospitals, compared to 54% of 11,363 severe and very severe patients (S/V). Transferred trauma patients were more likely to have shorter LOS in level I trauma centers, especially patients with minor and moderate injuries. From 2001-2013 definitive care was provided in level I trauma centers for 77% of all transferred trauma patients.
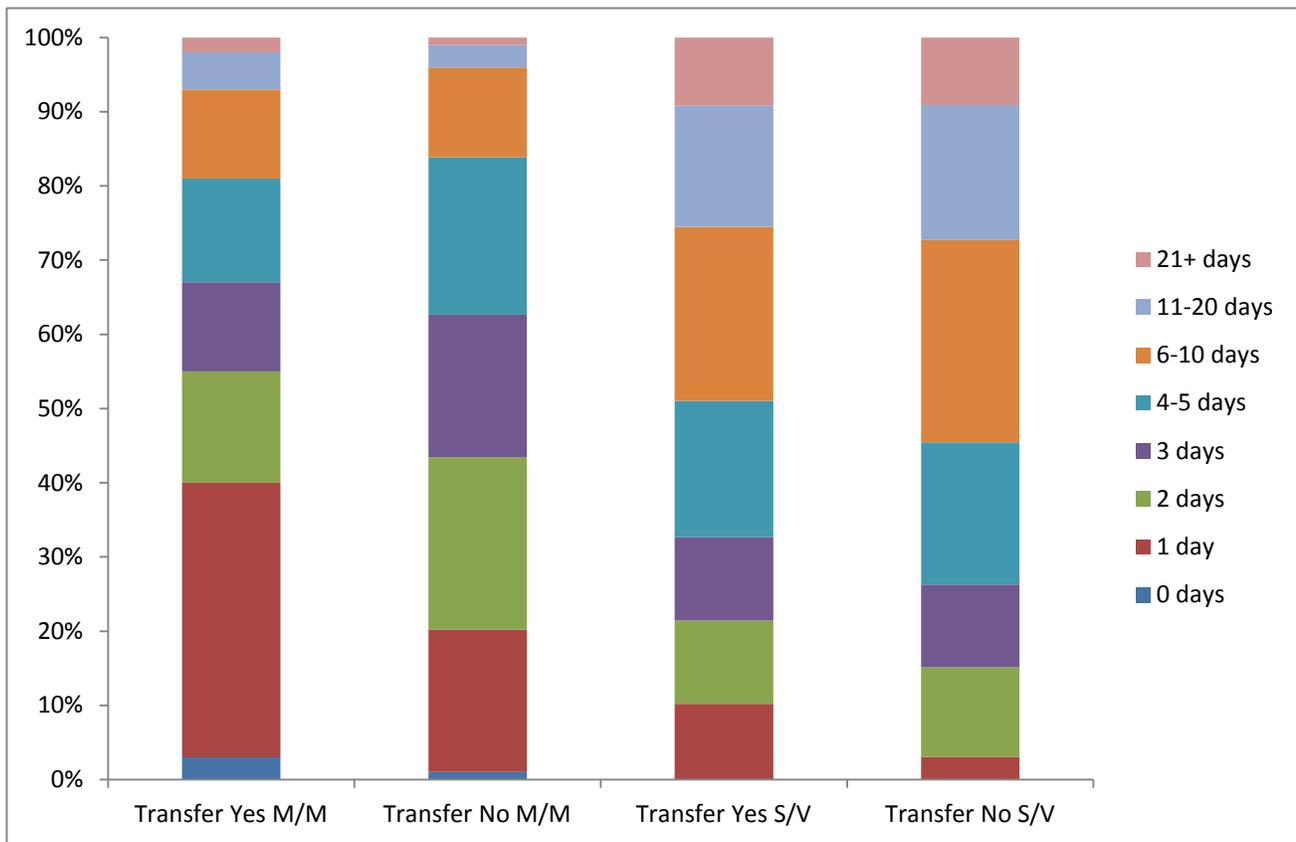
Figure 22. LOS Among Utah Level I Trauma Centers by Patient Transfer Status and ISS, 2001-2013

Figure 23 shows that LOS for trauma care is associated with age. Children from 0-14 years old are more likely to experience shorter LOS than patients in the other age groups. The overall pattern in Figure 23 holds primarily for minor and moderate injuries, and to a lesser extent for severe and very severe injuries. Among surviving patients, minor and moderate injuries combine for 82% of all trauma patients in the registry from 2001-2013. Figure 23 shows statewide patterns for LOS and age.
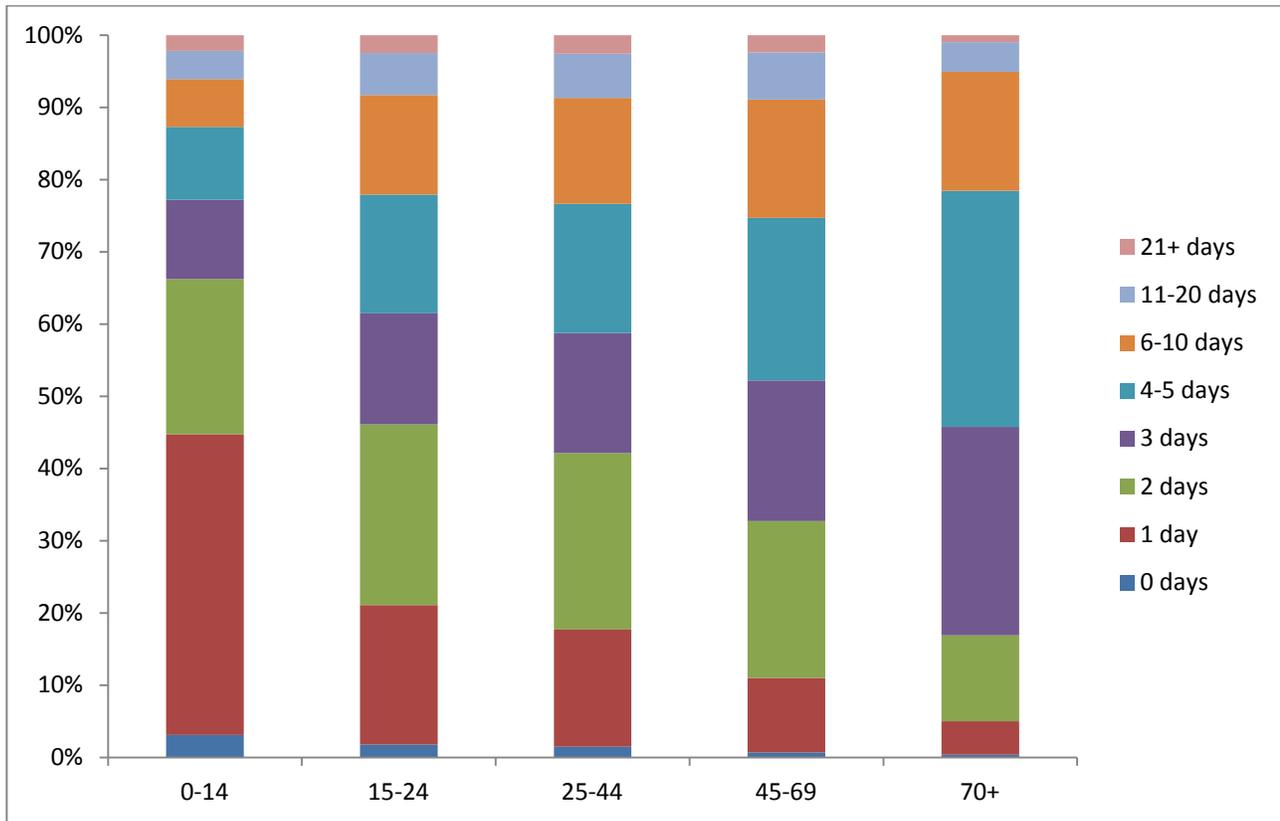
Figure 23. LOS by Age Group, 2001-2013

Using Data Regionally and Locally to Improve Health Outcomes

When a person suffers a traumatic injury, medical care decisions are made for the patient. At this critical time a patient frequently is not able to directly choose what care he or she will receive, or who will provide the care. Organized regional systems of trauma care can establish guidelines of practice with respect to local availability of resources that influence patient care decisions including patient triage, transport destination, transfer, and hospital bypass. Organized regional trauma systems provide a professional forum where EMS agencies, hospitals, and trauma centers can use surveillance-related medical evidence together to develop local destination and practice guidelines to best address medical needs. Regional trauma systems also provide a forum to discuss the local trauma care system and appropriate patient triage and distribution in order to reduce overcrowding in emergency departments. A coordinated local trauma system can ensure that severely injured patients are rapidly transported to the expert care they critically need. A regional trauma system is an inclusive, organized body that develops local and regional system-related practice guidelines to improve patient care by using epidemiological and clinical evidence.

Utah Code Title 26 Chapter 8a Section 250 directs the Bureau of Emergency Medical Services and Preparedness (BEMSP) to establish a statewide trauma system focused on improving patient health outcomes. Utah's Trauma System Advisory Committee (TSAC) includes representatives from urban and rural areas across the state. Based on guidance provided by the TSAC and BEMSP, regional epidemiology evidence and trauma audit filter results will be shared with each of the seven regional trauma systems. In turn, these trauma systems, in partnership with the designated trauma centers and regional EMS agencies, will identify opportunities to refine local practice guidelines in order to improve emergency patient care in the region and in local communities.

As trauma care leaders and EMS providers in each region meet together to identify and address regional trauma care challenges, the statewide system of emergency medical care strengthens. Establishing regional and local emergency care practice guidelines not only allows all personnel and participating organizations to understand their own roles in the regional system, but also the roles and interactions of the other collaborating organizations. The development and implementation of patient-flow guidelines increases coordinated actions both within and across organizations serving in the regional emergency care system. Established communication pathways allow regional and local problems to be quickly identified and addressed as they arise. When traumatic injuries, heart attacks, strokes, and other time-sensitive emergencies occur, well-organized emergency medical systems will save lives and minimize morbidity. This is the ultimate goal of Utah's state, regional, and local systems of emergency medical and trauma care services.

Utah's Ten Trauma System Audit Filters

The Utah TSAC provides recommendations to the BEMSP regarding methods of monitoring the statewide trauma system. One method employs trauma system audit filters. Ten trauma system audit filters have been developed based on work originating with the American College of Surgeons, Committee on Trauma and adapted for Utah. The trauma system audit filters measure specific areas of Utah's trauma care system by observing certain benchmarks of trauma care in the field and in the hospital. Audit filter analyses can be tailored to better inform trauma care decisions at all levels of Utah's trauma care systems

. Ten statements provide brief description of the audit filters:

1. Trauma patients who die greater than one hour and less than 24 hours after ED arrival, stratified by presenting hospital identifier.
2. Trauma patients with more than one inter-hospital transfer prior to definitive care.
3. Ground transport trauma patients (from scene) with an ED RTS less than or equal to 5.5 and scene transport times (scene departure to hospital arrival) greater than 20 minutes.
4. Trauma patients with an ISS greater than 15 (and all penetrating trauma) with EMS scene times (EMS scene arrival to EMS scene departure) greater than 20 minutes.
5. Trauma patients with an ISS greater than 15, and transferred to a higher level of care with referring hospital admit-to-discharge times greater than 90 minutes.
6. Transferred trauma patients with an EMS transport time (hospital discharge to hospital admit) greater than 1-2 hours, taking into account ISS score, state region, and transport mode.
7. Trauma patients who die with a probability of survival (TRISS) > 50% or who live with a probability of survival (TRISS) < 50%. (TRISS score for trauma patients using physiologic measures collected at the hospital providing definitive care).
8. Trauma patients with an ISS greater than 15 who are discharged from nondesignated trauma centers (ND).
9. Trauma patients who die in nondesignated trauma centers.
10. Trauma patients younger than 15 years old (children) who either had an ED GCS less than or equal to 8, intubation, or ISS greater than 15 and not transferred to a regional pediatric trauma center.

Section III. Trauma Care Systems Framework and Guidelines

The Health Resources and Services Administration's (HRSA) "Model Trauma System Planning and Evaluation" provides a framework to guide general development of state and regional trauma care systems. A trauma care system is defined as, "...a pre-planned, comprehensive, and coordinated statewide and local injury response network that includes all facilities with the capability to care for the injured." It is the system's inclusiveness, or range of pre-planned trauma center and nontrauma center resource allocation, that offers the public a cost-effective plan for injury treatment. In such an effective system, trauma care delivery is organized through the entire spectrum of care delivery, from injury prevention to prehospital, hospital, and rehabilitative care delivery for injured people. The system begins with a state's authority to designate various levels of trauma and burn centers and, through data collection and analyses processes, demonstrates its own effectiveness time and time again (HRSA Model Trauma System, 2006).

Level IV and V Trauma Centers / Other Acute Care Facilities	• Definitive care for some minor injuries • High volume of transfers to designated trauma centers
Level III Trauma Centers	• Definitive care for some minor and moderate injuries • High volume of transfers to level I and level II trauma centers
Level II Trauma Centers	• Definitive care for most moderate and severe injuries • Transfer some very severe injuries to level 1 trauma centers
Level I Trauma Centers	• Definitive care for severe and very severe injuries

General Guidance from HRSA about Managing Trauma Patient Distribution and Flow among Hospitals

Trauma Center Designation and Criteria

The Utah Department of Health designates trauma centers based on national standards and best practices. State designation of level I and level II trauma centers requires verification by the America College of Surgeons (ACS). Level III, IV and V trauma centers must meet Utah criteria based on ACS guidelines for designation as outlined in regulatory standards. The level of trauma designation is determined according to medical staff resources, the ability of the trauma center to provide definitive care, and the depth of ancillary resources available for trauma patient care. The following table outlines the resources required for trauma level designation.

Dimension		Level I	Level II	Level III	Level IV	Level V
Trauma System Role		Comprehensive tertiary care. Minimum of 1,200 trauma patients per year.	Comprehensive trauma care. Lead trauma facility to other hospitals in service area.	Community hospital with capabilities to provide some operative intervention to the trauma patient.	Initial resuscitation, stabilization, and transfer to a higher level of care.	Initial resuscitation, stabilization and transfer to a higher level of care.
Care Provided		Definitive comprehensive care for complex multi-system trauma provided within a defined critical care program. Residency program affiliation.	Definitive care for complex and severely injured patients with multi-system abdominal, orthopedic or neurological injury.	Initial resuscitation and immediate operative intervention to control hemorrhage and uncomplicated, multi-system trauma care.	Licensed hospital in rural areas or in close proximity of Llevel I or II trauma center. ATLS and TNCC required.	Licensed hospital, typically a small rural facility or Critical Access Hospital. ATLS and TNCC required.
Leadership		Professional and community education, trauma prevention, research, rehabilitation, and system planning	Professional and community education. Resource for Level III, IV and V trauma centers.	Community resource and collaboration with level IV and V trauma centers. Networks with level I and II trauma centers.	Community resources for education and coordination with EMS agencies. Networks with higher level trauma centers.	Community resources for education and coordination with EMS agencies. Networks with higher level trauma centers.
Staffing	24-hour	Full time ED staffed 24/7 by board certified ED physicians. 24/7 in- house radiology and anesthesia.	Full time ED staffed 24/7 by board certified ED physicians. Staffed ICU.	Full time ED staffed 24/7 by board certified ED physician. Staffed ICU.	24/7 RN coverage of the ED.	24/7 RN coverage of the ED may be shared with other duties in the hospital.
	On-Call	24/7 trauma surgeon in-house. Neurosurgeons, Anesthesiologists. Sub-specialists including plastic surgery and trauma orthopedics.	24/7 trauma surgeon coverage within 15 minutes of notification. Neurosurgery, Anesthesia. Sub-specialists on call.	24/7 general surgeon coverage within 30 minutes of notification. Anesthesia coverage for traumatic airways. Sub-specialists on call.	General surgeon in the community, but not required to have 24/7 surgical coverage.	ED may be staffed by mid-level providers.
	Ancillary	24/7 staffed OR and PACU. 24/7 in-house CT, lab, and blood bank. Full-time trauma program manager.	24/7 in-house CT, staffed OR, and 24/7 lab and blood bank in-house. Full-time trauma program manager.	24/7 in-house CT, OR staff on call. 24/7 lab; blood bank on call; part-time trauma coordinator.	May have on call CT 24/7; lab and blood bank on call; part-time trauma coordinator	May have on call CT 24/7; lab and blood bank on call; part-time trauma coordinator

Trauma Registry Patient Reporting Criteria and Public Health Practice

Operated through the American College of Surgeons, the National Trauma Data Bank (NTDB) contains injury information from patients presenting to hospitals across the nation. Patient care data are reported to the NTDB by ACS verified trauma centers. In conjunction with the NTDB, the National Trauma Data Standard (NTDS) defines required data elements and provides guidance on acceptable data sources, element parameters, and usage. To ensure consistent data collection among hospitals and states, a trauma patient is defined as a patient sustaining a traumatic injury and meeting the following criteria:

- Injuries that fall into diagnostic codes defined in the *International Classification of Diseases, Ninth Revision, Clinical Modification* (ICD-9-CM): 800–959.9 (excluding the following isolated injuries: 905–909.9 (late effects of injury); 910–924.9 (superficial injuries, including blisters, contusions, abrasions, and insect bites) and 930–939.9 (foreign bodies)) AND
- One of the following:
  - Hospital admission of at least 24 hours
  - Patient transfer via EMS transport (including air ambulance) from one hospital to another hospital
  - Any transfer by air ambulance
  - Death resulting from the traumatic injury (independent of hospital admission or hospital transfer status)

National, state, and local public health agencies fulfill three core functions in a trauma system:

- Assessment, including the regular and systematic collection and analysis of injury-related information to determine the status of the system (e.g., related resources, causative factors, and the identification of potential opportunities for intervention).
- Policy development designed to meet the overall goals of the system and improve outcomes.
- Assurance, including the evaluation and monitoring of system components, resources, organization, processes, and adherence to policies and standards to ensure the provision of necessary services.

Utah's Trauma System

The mission of the Bureau of Emergency Medical Services and Preparedness (BEMSP) is to promote a statewide system of emergency and trauma care to reduce morbidity and mortality through prevention, awareness, and quality intervention. To that end, and in response to state statute, the Bureau is responsible for coordinating a statewide trauma system to safeguard and improve the health of all Utahns. The system includes acute care hospitals, emergency medical service agencies, and dispatch centers.

As specified in the Utah Emergency Medical Services System Act (Utah Code Title 26 Chapter 8a Section 250), the purposes of this system include:

- Promote optimal care for trauma patients
- Alleviate unnecessary death and disability from trauma and emergency illness
- Inform health care providers about trauma system capabilities
- Encourage the efficient and effective continuum of patient care, including prevention, prehospital care, hospital care and rehabilitative care
- Minimize the overall cost of trauma care

Of the 45 licensed acute care hospitals in the state in 2014, 22 (49%) are designated trauma centers. Figure 24 shows the geographic locations of Utah's licensed hospitals with designated trauma centers color-coded by level. A complete list of trauma centers can be found in Appendix D. Designated trauma centers provide specialized care for patients who suffer acute traumatic injuries. Level I trauma centers provide the highest level of care to trauma patients. State and national trauma data reinforces that theory that treatment in these centers increases chances of survival for patients suffering severe injuries. The American College of Surgeons verifies the presence of the required resources, staffing, and patient volume so the state of Utah can designate and recognize specific medical facilities capable of providing specialized trauma care. Utah has three level I trauma centers including Intermountain Medical Center, University of Utah Hospital, and Primary Children's Medical Center. Each of these centers provides 24-hour access to a full range of trauma specialists and equipment. They also conduct research, provide education and training, and act as a referral resource for nearby communities and regions. Operating a trauma center is extremely expensive which limits the number of level I and II trauma centers in Utah. There are three level II trauma centers in Utah including, Ogden Regional Medical Center, McKay-Dee Hospital Center, and Utah Valley Regional Medical Center.
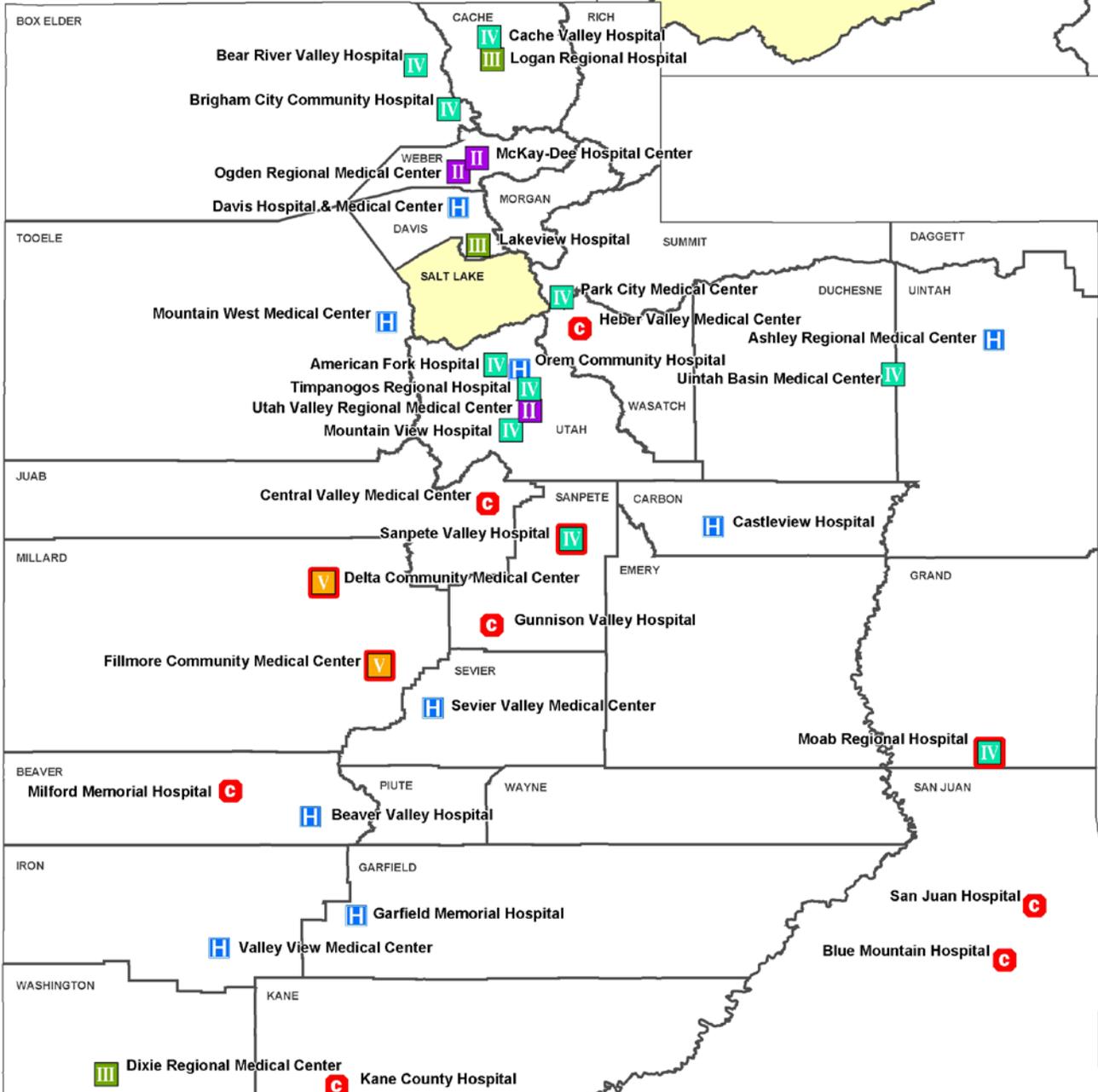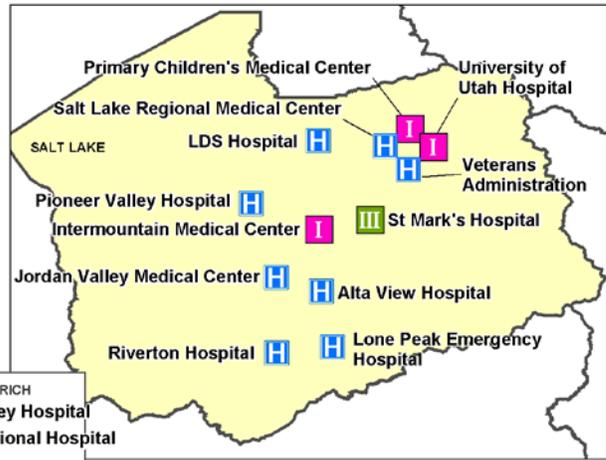
Figure 24. Trauma Centers and Acute Care Hospitals in Utah

The state trauma system is subdivided into geographic regions based on patient referral patterns and health care preparedness regions that coincide with local health department boundaries. Figure 25 shows the seven regions.

Region	Counties
SST	Salt Lake, Summit, Tooele
Northern	Box Elder, Cache, Davis, Rich, Morgan, Weber
Central	Juab, Millard, Piute, Sanpete, Sevier, Wayne
Southwest	Beaver, Garfield, Iron, Kane, Washington
Southeast	Carbon, Emery, Grand, San Juan
Utah/Wasatch	Utah, Wasatch
Tri-County	Daggett, Duchesne, Uintah

Figure 25. State Trauma Region Boundaries

Utah State Trauma Registry

The Utah Emergency Medical Services System Act authorizes the BEMSP to establish a statewide trauma registry to collect and analyze information on the incidence, severity, causes and outcomes of trauma. The trauma registry is maintained through a contract with the Intermountain Injury Control Research Center (IICRC) at the University of Utah. Administrative Rule R426-5-7 requires all Utah licensed acute care hospitals (regardless of whether they are designated trauma centers) to report information on trauma encounters. The rule also defines the data elements which hospitals are required to submit to the BEMSP for the purpose of constructing a statewide trauma registry.

- Data Submission: Patient data records are to be submitted to the bureau monthly. In general, entries for a given calendar quarter are due no later than the end of the following month.

- System Edits: Data are validated through a process of automated editing and report verification. Each record is subjected to a series of edits for accuracy, consistency, completeness, and conformity with the definitions specified. Records failing any edit are returned to the data supplier for correction and/or comment.

- Inclusion Criteria: As a matter of policy the BEMSP has adopted the inclusion criteria established by the NTDS, however, it is slightly more inclusive in that any patient requiring air transport is automatically included in the trauma registry. While we also adhere to the data element set of the NTDB, the state has identified additional data elements to be collected.

Core Functions

- Assessment: Trauma data are collected from a variety of sources. The trauma registry is the primary data source for hospital-based services, however, other sources are critical in providing data along the continuum of care as well as context for data analysis. Routinely accessed data sources include the following:
  - Utah Trauma Registry
  - Emergency department data
  - Prehospital data

- Policy Development: Under the authority of the Bureau of Emergency Medical Services and Preparedness (BEMSP), and guided by recommendations from the Emergency Medical Services (EMS) Committee and the Trauma System Advisory Committee (TSAC), administrative rules are maintained and implemented within the scope of established

statutes. Administrative Rule R426-5 of the Utah Administrative Code defines the state Trauma Standard and can be accessed through this link: http://www.rules.utah.gov/publicat/code/r426/r426-005.htm.

- Assurance: The BEMSP has been directed by the state legislature to develop and implement a trauma performance improvement system. To that end, audit filters have been identified to measure the quality of trauma care delivered in the state. The results are reviewed at TSAC and regional meetings to serve as one trigger for performance improvement initiatives. A performance improvement team meets monthly to identify, develop, and manage these initiatives.

Utah's trauma system is developing and improving toward an integrated and inclusive statewide trauma system. Included in this report is a summary of the trauma cases treated in Utah hospitals.

Privacy, Confidentiality, and Access

- Privacy: The individual's right to privacy refers to a patient's capacity to control identifiable information about him/her that could be disclosed under certain conditions. Ensuring patient privacy is carefully considered in the management of BEMSP data files.

  Public disclosure of individual hospital data is carefully guarded by use of calculated or aggregated values. Release of identifiable data for legitimate uses occurs only if the hospital is allowed time to verify the accuracy of the information, submit corrections with supporting evidence, and submit comments or alternate interpretations to the release; and the BEMSP has corrected any data records found to be in error.

- Confidentiality: Care is taken to ensure that access to BEMSP raw data files is by authorized personnel only. BEMSP and the Utah Department of Health manage all data files in compliance with statute and protective policies and procedures. All personnel having access to BEMSP data files are required to sign a confidentiality pledge, which outlines responsibilities and possible penalties for breach of the agreement.

- Access: It is the policy of the BEMSP to support legitimate access to trauma data while protecting the patient and the hospital's right to privacy. This policy governs the administration of confidential data in the custody of BEMSP.

Technical Notes and Limitations

Data summarized in this report were collected by the Utah Trauma Registry. This report contains data related to traumatic injury patients transported to a hospital for treatment of that injury. Individuals pronounced dead at the scene are, by definition, not included in the registry. Additionally, it must be noted that in reporting discharge disposition, some actual deaths may have been entered as "unknown." For the purpose of this report, the total reported deaths were derived by a separate data element, "Outcome," which only allows for three values: alive, dead, or unknown. The data dictionary for the Utah Trauma Registry is a living document in that changes are regularly made to reflect national standards. Therefore, values for some data elements may not be collected for every year. Additionally, some data elements are required only by the state, thus limiting national comparisons for those elements.

Section IV. Appendices

Appendix A: Acronyms

Acronym	Definition
ACS	American College of Surgeons
AIS	Abbreviated Injury Scale
ATLS	Advanced Trauma Life Support
BEMSP	Bureau of Emergency Medical Services and Preparedness
CT	Computed Tomography
EMS	Emergency Medical Services
GCS	Glasgow Coma Score
HRSA	Health Resources and Services Administration
IICRC	Intermountain Injury Control Research Center
ISS	Injury Severity Score
NTDB	National Trauma Data Bank
NTDS	National Trauma Data Standard
PACU	Post Anesthesia Care Unit
TNCC	Trauma Nurse Core Course
TSAC	Trauma System Advisory Committee
TSAR	Trauma System Annual Report
UDOH	Utah Department of Health
UTR	Utah Trauma Registry

Appendix B: Excerpt from Utah Emergency Medical Services Act

26-8a-250. Establishment of statewide trauma system.

The department shall establish and actively supervise a statewide trauma system to:

(1) promote optimal care for trauma patients;

(2) alleviate unnecessary death and disability from trauma and emergency illness;

(3) inform health care providers about trauma system capabilities;

(4) encourage the efficient and effective continuum of patient care, including prevention, prehospital care, hospital care, and rehabilitative care; and

(5) minimize the overall cost of trauma care.

26-8a-251. Trauma system advisory committee.

(1) There is created within the department the trauma system advisory committee.

(2) (a) The committee shall be comprised of individuals knowledgeable in adult or pediatric trauma care, including physicians, nurses, hospital administrators, emergency medical services personnel, government officials, consumers, and persons affiliated with professional health care associations.

(b) Representation on the committee shall be broad and balanced among the health care delivery systems in the state with no more than three representatives coming from any single delivery system.

(3) The committee shall:

(a) advise the department regarding trauma system needs throughout the state;

(b) assist the department in evaluating the quality and outcomes of the overall trauma system;

(c) review and comment on proposals and rules governing the statewide trauma system; and

(d) make recommendations for the development of statewide triage, treatment, transportation, and transfer guidelines.

(4) The department shall:

(a) determine, by rule, the term and causes for removal of committee members;

(b) establish committee procedures and administration policies consistent with this chapter and department rule; and

(c) provide administrative support to the committee.

26-8a-252. Department duties.

In connection with the statewide trauma system established in Section 26-8a-250, the department shall:

(1) establish a statewide trauma system plan that:

(a) identifies statewide trauma care needs, objectives, and priorities;

(b) identifies the equipment, facilities, personnel training, and other things necessary to create and maintain a statewide trauma system; and

(c) organizes and coordinates trauma care within defined geographic areas;

(2) support the statewide trauma system by:

(a) facilitating the coordination of prehospital, acute care, and rehabilitation services and providers through state regulation and oversight;

(b) facilitating the ongoing evaluation and refinement of the statewide trauma system;

(c) providing educational programs;

(d) encouraging cooperation between community organizations, health care facilities, public health officials, emergency medical service providers, and rehabilitation facilities for the development of a statewide trauma system;

(e) implementing a quality assurance program using information from the statewide trauma registry established pursuant to Section 26-8a-253;

(f) establishing trauma center designation requirements in accordance with Section 26-8a-254; and

(g) developing standards so that:

(i) trauma centers are categorized according to their capability to provide care;

(ii) trauma victims are triaged at the initial point of patient contact; and

(iii) trauma patients are sent to appropriate health care facilities.

26-8a-253. Statewide trauma registry and quality assurance program.

(1) The department shall:

(a) establish and fund a statewide trauma registry to collect and analyze information on the incidence, severity, causes, and outcomes of trauma;

(b) establish, by rule, the data elements, the medical care providers that shall report, and the time frame and format for reporting;

(c) use the data collected to:

(i) improve the availability and delivery of prehospital and hospital trauma care;

(ii) assess trauma care delivery, patient care outcomes, and compliance with the requirements of this chapter and applicable department rules; and

(iii) regularly produce and disseminate reports to data providers, state government, and the public; and

(d) support data collection and abstraction by providing:

(i) a data collection system and technical assistance to each hospital that submits data; and

(ii) funding or, at the discretion of the department, personnel for collection and abstraction for each hospital not designated as a trauma center under the standards established pursuant to Section 26-8a-254.

(2) (a) Each hospital shall submit trauma data in accordance with rules established under Subsection (1).

(b) A hospital designated as a trauma center shall submit data as part of the ongoing quality assurance program established in Section 26-8a-252.

(3) The department shall assess:

(a) the effectiveness of the data collected pursuant to Subsection (1); and

(b) the impact of the statewide trauma system on the provision of trauma care.

(4) Data collected under this section shall be subject to Chapter 3, Health Statistics.

(5) No person may be held civilly liable for having provided data to the department in accordance with this section.

26-8a-254. Trauma center designations and guidelines.

(1) The department, after seeking the advice of the trauma system advisory committee, shall establish by rule:

(a) trauma center designation requirements; and

(b) model state guidelines for triage, treatment, transportation, and transfer of trauma patients to the most appropriate health care facility.

(2) The department shall designate as a trauma center each hospital that:

(a) voluntarily requests a trauma center designation; and

(b) meets the applicable requirements established pursuant to Subsection (1).

Appendix C: Trauma System Advisory Committee

Committee Chair: Craig Cook, MD

Committee Members: Holly Burke, RN (ED Manager)

Janet Cortez, RN (Trauma Program Manager)

Craig Cook, MD (Level II Trauma Surgeon)

Mark Dalley (UHA member, rural)

Hilary Hewes, MD (Pediatric MD)

Jason Larson, MD (EMS Medical Director)

Grant Barraclough, (ED Manager)

Clay Mann, PhD (Epidemiologist)

Don Vanboerum, MD (Level I Trauma Surgeon)

Marc Sanderson, (Urban Provider)

Mark Thompson, (Rural Provider)

Karen Glauser, RN (Trauma Coordinator)

Meetings are held the third Monday of the third month of each quarter and are open to the public. Links to meeting minutes can be found at http://health.utah.gov/ems/trauma.

Appendix D: Designated Trauma Centers as of 10/8/2014

Hospital	Level	Designation Date	Expiration Date
Intermountain Medical Center 5121 S Cottonwood Dr Murray UT 84157	I	10/25/2007	09/11/2015
Primary Children's Medical Center 100 N Medical Dr Salt Lake City UT 84113		01/01/2004	11/30/2015
University of Utah Hospital 50 N Medical Dr Salt Lake City UT 84132		01/01/2000	02/28/2016
McKay Dee Hospital Center 4401 Harrison Blvd Ogden UT 84405	II	09/01/1995	06/19/2014
Ogden Regional Medical Center 54475 S 500 E Ogden UT 84405		10/26/1983	09/09/2014
Utah Valley Regional Medical Center 1034 N 500 W Provo UT 84604		12/23/2008	11/11/2016
Dixie Regional Medical Center 1380 E Medical Center Dr St George UT 84790	III	12/17/2008	12/14/2016
Lakeview Hospital 630 East Medical Drive Bountiful UT 84010		8/29/2014	9/28/2017
Logan Regional Hospital 1400 N 500 E Logan UT 84341		10/15/2004	12/31/2016
St. Mark's Hospital 3900 S 1200 E Salt Lake City UT 84124		11/26/2012	11/25/2015
American Fork Hospital 170 N 1100 E American Fork UT 84003	IV	01/05/2012	01/04/2015
Bear River Valley Hospital 905 N 1000 W Tremonton UT 84337		08/04/2006	08/31/2015
Brigham City Community Hospital 950 South Medical Drive Brigham City UT 84302		08/19/2010	08/18/2016

Hospital	Level	Designation Date	Expiration Date
Cache Valley Specialty Hospital 2380 N 400 E North Logan UT 84341		05/23/2011	05/22/2014
Moab Regional Hospital 719 W 400 N Moab UT 84532	IV	12/18/2008	12/14/2014
Mountain View Hospital 1000 E 100 N Payson UT 84651		01/01/2012	01/03/2015
Park City Medical Center 900 Round Valley Dr Park City UT 84060		10/23/2010	10/22/2016
Sanpete Valley Hospital 1100 South Medical Drive Mount Pleasant UT 84647		10/1/2014	9/30/2017
Timpanogos Regional Hospital 750 W 800 N Orem UT 84057		09/20/2011	09/19/2014
Uintah Basin Medical Center 250 W 300 N Roosevelt UT 84066		12/15/2007	12/14/2016
Delta Community Medical Center 126 White Sage Ave Delta UT 84624	V	9/24/2014	9/23/2017
Fillmore Community Medical Center 674 S Hwy 99 Fillmore UT 84631		01/26/2012	01/25/2015

Updated 10/8/2014

Appendix E: Trauma Registry Data Elements

For a complete description of these elements, please visit the Utah Trauma Registry's Web site at http://www.utahtrauma.org/.

Category	Data Element
Demographic Data	Database Record Number Institution ID Number Medical Record Number Social Security Number Sex Date of Birth Age Number and Units Patient's Home Country Patient's Home State Patient's Home County Patient's Home City Patient's Home Zip Code Alternate Home Residence Race Ethnicity
Event Data	Date of Injury Time of Injury Trauma Type (Blunt, Penetrating, or Burn Injury) Cause of Injury Code Work Related Patient's Occupational Industry Patient's Occupation Primary E-Code Location E-Code Additional E-Code Incident Location Zip Code Incident State Incident County Incident City Protective Devices Child Specific Restraint Airbag Deployment
Referring Hospital	Hospital Transfer Referring Hospital Referring Hospital Arrival Date Referring Hospital Arrival Time Referring Hospital Discharge Date Referring Hospital Discharge Time Transport Mode into Referring Hospital Referring Hospital Admission Type Referring Hospital Procedures Referring Hospital Pulse Rate Referring Hospital Respiratory Rate Referring Hospital Systolic Blood Pressure Referring Hospital GCS - Eye Movement

Category	Data Element
	Referring Hospital GCS - Verbal Response
	Referring Hospital GCS - Motor Response
	Referring Hospital GCS Assessment Qualifiers
	Referring Hospital GCS - Total
Pre-Hospital Information	Transport Mode into Hospital
	Other Transport Mode
	EMS Agency
	EMS Origin
	EMS Notify Time
	EMS Notify Date
	EMS Respond Time
	EMS Respond Date
	EMS Unit Arrival on Scene Time
	EMS Unit Arrival on Scene Date
	EMS Unit Scene Departure Time
	EMS Unit Scene Departure Date
	EMS Destination Arrival Time
	EMS Destination Arrival Date
	EMS Destination
	EMS Trip Form Received
	Initial Field Pulse Rate
	Initial Field Respiratory Rate
	Initial Field Systolic Blood Pressure
	Initial Field Oxygen Saturation
	Initial Field GCS - Eye Movement
	Initial Field GCS - Verbal Response
	Initial Field GCS - Motor Response
	Initial Field GCS Assessment Qualifiers
	Initial Field GCS - Total
Emergency Department/ Hospital Information	Admit Type
	Admit Service
	ED/Hospital Arrival Date
	ED/Hospital Arrival Time
	ED Admission Time
	ED Admission Date
	ED Discharge Time
	ED Discharge Date
	ED Discharge Disposition
	Transfer Reason
	ED Transferring EMS Agency
	ED Discharge Destination Hospital
	Inpatient Admission Time
	Inpatient Admission Date
	Hospital Discharge Time
	Hospital Discharge Date
	Hospital Discharge Disposition
	Hospital Discharge Destination Hospital
	Hospital Discharge Transferring EMS Agency
	Outcome
	Initial ED/Hospital Pulse Rate

Category	Data Element
	Initial ED/Hospital Temperature
	Initial ED/Hospital Respiratory Rate
	Initial ED/Hospital Respiratory Assistance
	Initial ED/Hospital Oxygen Saturation
	Initial ED/Hospital Supplemental Oxygen
	Initial ED/Hospital Systolic Blood Pressure
	Initial ED/Hospital GCS-Eye
	Initial ED/Hospital GCS-Verbal
	Initial ED/Hospital GCS-Motor
	Initial ED/Hospital GCS Assessment Qualifiers
	Initial ED/Hospital GCS-Total
	Revised Trauma Score Total
	Alcohol Use Indicator
	Drug Use Indicator
	Inpatient Length of Stay
	Total ICU Length of Stay
	Total Ventilator Days
	Primary Method of Payment
	Hospital Complications
Hospital Procedure Information	Hospital Procedures
	Hospital Procedure Start Date
	Hospital Procedure Start Time
Diagnosis Data	ICD9 Diagnosis Codes
	Co-Morbid Conditions
Injury Severity Information	Abbreviated Injury Scale (AIS) Score
	AIS Predot Code
	ISS Body Region
	AIS Version
	Locally Calculated ISS