Spinal Cord Injury in Utah

1998-2003

Utah Department of Health • Bureau of Health Promotion • Violence and Injury Prevention Program

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Executive Summary

Nationally, as many as 11,000 Americans sustain a spinal cord injury (SCI) each year. These injuries devastate the victims, their families and friends, and take a $10 billion toll on society through health care costs and lost productivity.[1]

The Utah Department of Health Violence and Injury Prevention Program (VIPP), through a collaborative agreement with the Centers for Disease Control and Prevention, collects SCI information for the state of Utah through a review of hospital discharge data. A medical record review is conducted to collect appropriate information on each case. This report provides a brief overview of SCI in Utah, including:

- Incidence
- Etiology
- Intent
- Drug and alcohol use
- Discharge disposition
- Source of payment

During the six-year period 1998–2003, Utah residents sustained 387 incidents of SCI that were severe enough to result in acute care hospitalization and/or death. Males sustained nearly three times as many total SCIs as females. Among adolescents and young adults, motor vehicle crashes were the leading cause of SCI. Falls were the leading cause among older adults.

This report provides a basic geographical analysis of SCI across the state. Over the period studied, data show that Utahns who either reside in or visit rural counties are at higher risk of sustaining an SCI, particularly related to motor vehicle crashes, than those in urban counties.

Regarding discharge disposition, nearly half (46.3%) of all SCI patients were discharged to a residential facility with skilled services or to an inpatient rehabilitation facility, while 31.7% were transferred to another acute care facility. Thus, most SCI patients undergo extended treatment and/or rehabilitation for their condition. More than one-third (34.4%) of SCI treatment was paid for through private health insurance and 23.3% was paid for through government programs like Medicare and Medicaid.

Introduction

It is estimated that 200,000 Americans currently live day-to-day with the disabling effects of SCI, which include varying degrees of paralysis and loss of feeling. The rate of spinal cord injuries (SCIs) is highest among older Utahns ages 75-84 and second-highest among adolescents and young adults ages 15-24. Because SCI usually occurs in early adulthood, those affected often require costly supportive care for decades.

Noting the tremendous social and financial burdens of SCI, the Centers for Disease Control and Prevention (CDC) in 1988 set a goal of reducing the incidence and severity of SCI and began working with state health departments to conduct spinal cord injury surveillance.[1] The Utah Department of Health (UDOH) began collecting state data the following year. "These data will enable CDC to estimate the magnitude and severity of SCI nationally and to assist states in developing and implementing prevention efforts."[2]

In 1995, the CDC's National Center for Injury Prevention and Control (NCIPC), with assistance from state partners, published "Guidelines for Surveillance of Central Nervous System Injury," a manual that established standards for collecting SCI and traumatic brain injury (TBI) data.

At present, CDC funds four states to conduct SCI surveillance in conjunction with their TBI surveillance.[2] Although UDOH SCI surveillance has not been funded since 2000 (due to a reduction in the number of available SCI grants), the VIPP continues to collect and submit SCI data according to CDC guidelines. The importance of the SCI issue merits its continued surveillance in Utah.

Since SCI surveillance is fundamental to the development, implementation, and evaluation of prevention programs, the health professional is well-advised to become acquainted with the principal causes and contributing factors of SCI in Utah. It is the authors' intent that the following data will aid health professionals in disseminating information that will increase public awareness and bring about successful policies and other preventive measures to reduce the burden of SCI in Utah.

Results and Graphs

Results and Graphs

Incidence

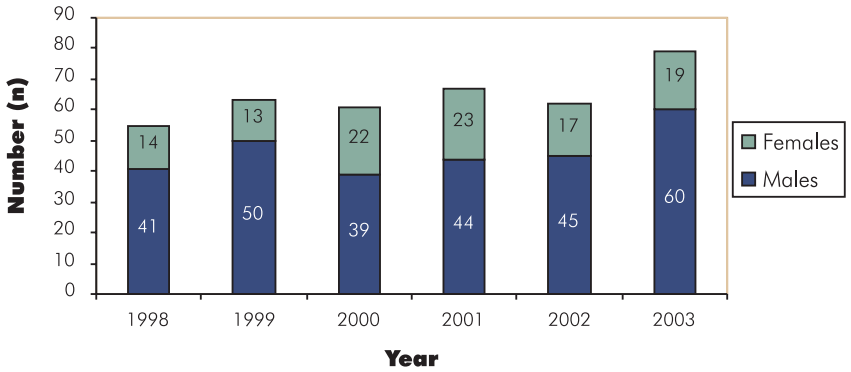
From 1998 to 2003, there were 387 cases of SCI among Utah residents that resulted in either acute care hospitalization or death. The average annual number of cases over the period was 65. This equates to an average of five cases per month that were serious enough to led to hospitalization or death. (Figure 1)

Males sustained 2.6 times as many SCIs (279) as females (108) during the six-year period (72% male, 28% female). Nationally, males sustain 80% of SCIs and females suffer 20%.[3] (Figure 2)

Note that both males and females experience the highest numbers of SCIs between the ages of 15 and 29. (Figure 2)

Figure 1.

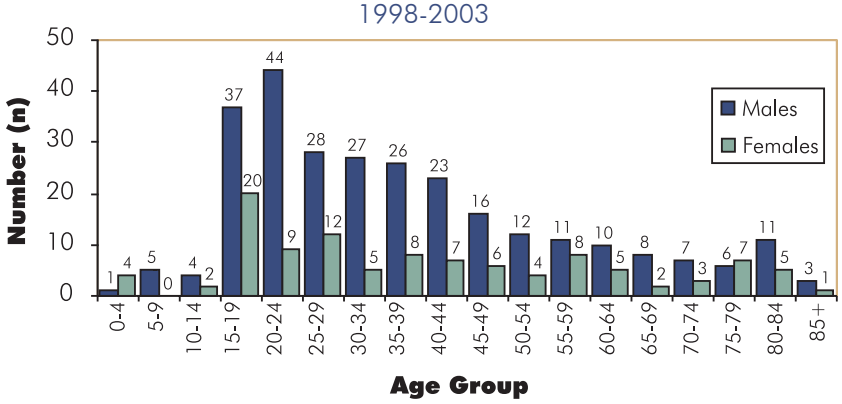
Utah SCI, Number of Cases by Year and Gender, 1998-2003



Source: UDOH TBI/SCI Surveillance Project

Figure 2.

Utah SCI, Number of Cases by Age Group and Gender, 1998-2003

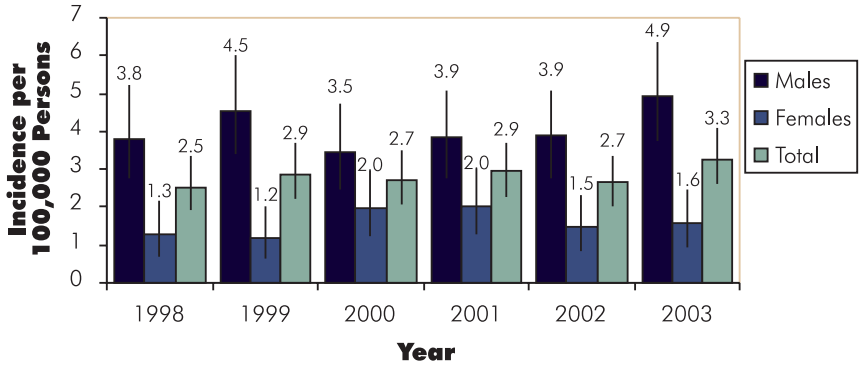


Source: UDOH TBI/SCI Surveillance Project

Results and Graphs

Figure 3.

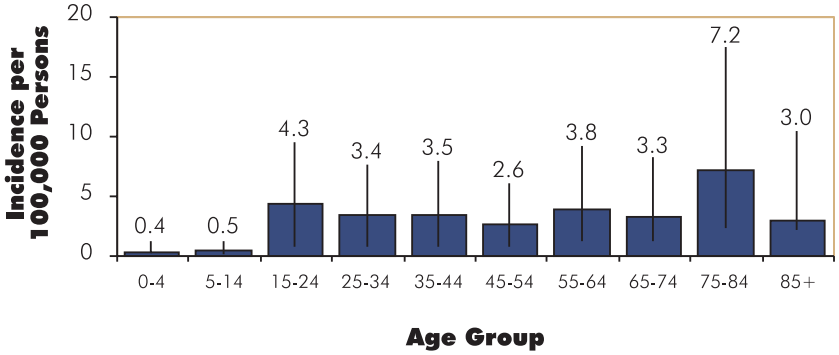
Utah SCI, Age-Adjusted Incidence Rates by Year and Gender, 1998-2003



Source: UDOH TBI/SCI Surveillance Project

Figure 4.

Utah SCI, Incidence Rates by Age Group, 1998-2003



Source: UDOH TBI/SCI Surveillance Project

The overall age-adjusted incidence rate* for SCI in Utah for the period was 3.1 per 100,000 persons, with a rate of 4.4 per 100,000 for males, and 1.7 per 100,000 for females. The 2001-2002 overall U.S. rate for SCI was similar at 3.8 per 100,000.[3]

**Rates are expressed with a 95% confidence interval (C.I.). C.I. quantifies the uncertainty in a measurement and is usually reported at 95%, which is the range of values within which one can be 95% sure that the true value for the whole population lies.*

Older adults ages 75–84 have the highest rate of spinal cord injury at 7.2 per 100,000 persons. Adolescents and young adults ages 15–24 have the second-highest rate at 4.3 per 100,000 persons. (Figure 4)

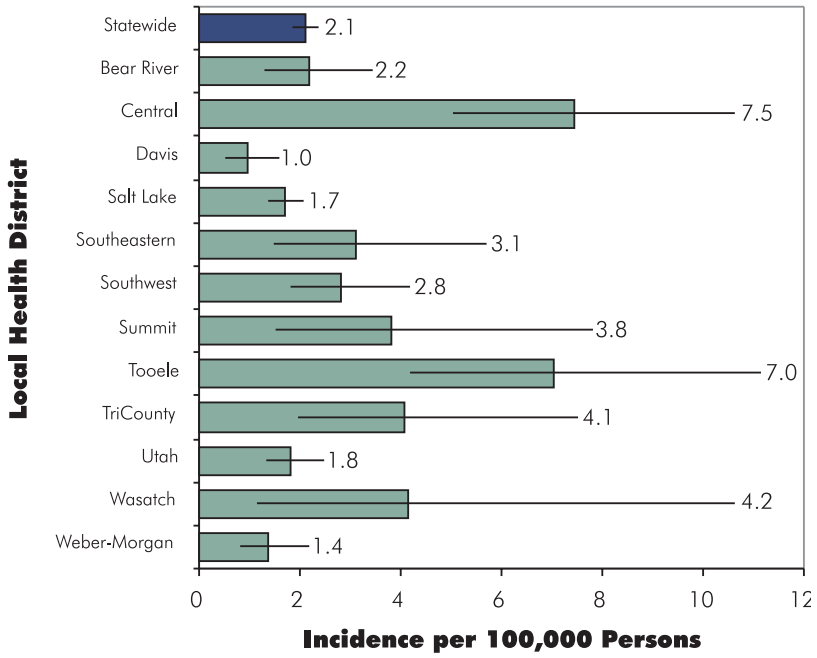
Incidence by Local Health District

The Central Utah and Tooele County Local Health Districts (LHDs) had the highest SCI incidence rates in the state at 7.5 cases and 7.0 per 100,000 persons, respectively. (Figure 5)

Davis County and Weber-Morgan LHDs had the lowest incidence rates at 1.0 and 1.4 per 100,000 persons, respectively. (Figure 6)

Figure 5.

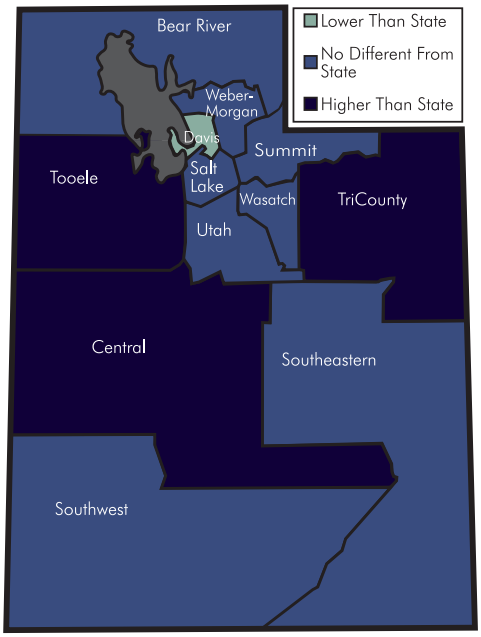
Utah SCI, Incidence Rates by Local Health District of Occurrence, 1998-2003



Source: UDOH TBI/SCI Surveillance Project

Figure 6.

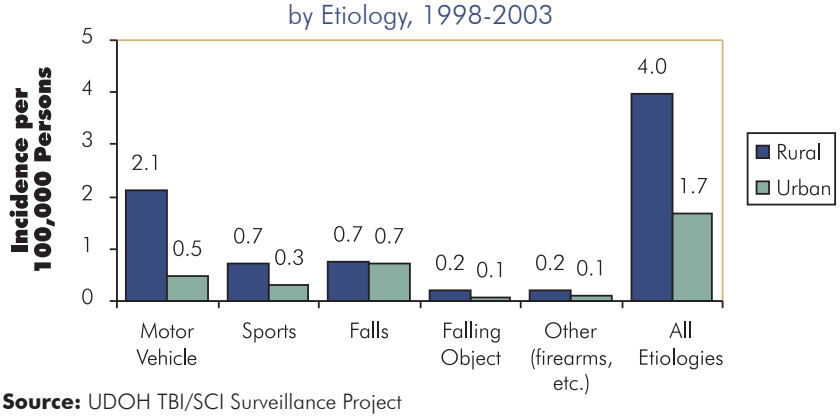
Utah SCI, Risk by Local Health District of Occurrence, 1998-2003



Source: UDOH TBI/SCI Surveillance Project
Percentage for a local health district was considered different from the state percentage if its 95% confidence interval did not include the state percentage.

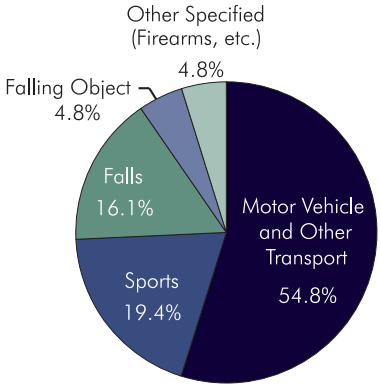
Results and Graphs

Figure 7.
Utah SCI, Incidence Rates, Rural vs. Urban Health Districts of Occurrence, by Etiology, 1998-2003



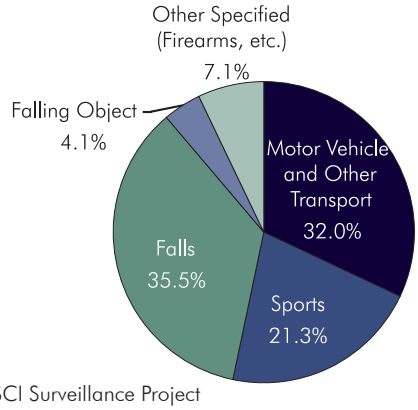
Source: UDOH TBI/SCI Surveillance Project
Note: Cases are based on LHD where injury occurred, not on victim's LHD of residence.

Figure 8.
Utah SCI, Cases by Etiology, Rural Health Districts of Occurrence, 1998-2003



Source: UDOH TBI/SCI Surveillance Project

Figure 9.
Utah SCI, Cases by Etiology, Urban Health Districts of Occurrence, 1998-2003



Source: UDOH TBI/SCI Surveillance Project

Incidence by Local Health District, Rural vs. Urban Utah

Utah's rural areas show a markedly higher per-capita incidence of SCI than urban areas. Urban Utah includes Davis, Salt Lake, Weber-Morgan and Utah County Health Districts. Of the cases where county of injury was known, the overall incidence of SCI in rural Utah was 4.0 per 100,000 population, more than twice as high as urban Utah's rate of 1.7 per 100,000 population. (Figure 7)

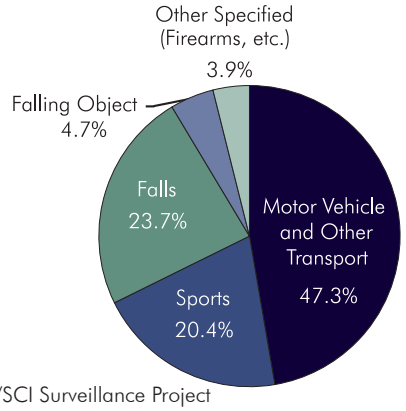
When analyzed by etiology, rural Utah's rate of motor vehicle-related SCI is 4 times that of urban Utah (2.1 vs. 0.5 per 100,000 population). In addition, sports-related SCI rates are twice as high in rural than urban Utah (0.8 vs. 0.3 per 100,000 population). Falls are the most common cause of SCI in urban Utah.

Etiology

In both males and females, the leading causes of SCI were "Motor vehicle and other transport" (males 47.3%, females 50.0%) and "Falls" (males 23.7%, females 30.6%). (Figures 10 and 11)

Figure 10.

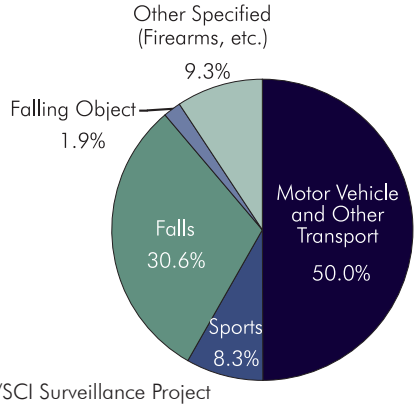
Utah SCI, Percent of Cases by Etiology, Males, 1998-2003



Source: UDOH TBI/SCI Surveillance Project

Figure 11.

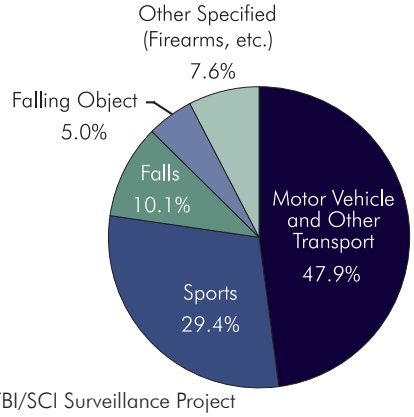
Utah SCI, Percent of Cases by Etiology, Females, 1998-2003



Source: UDOH TBI/SCI Surveillance Project

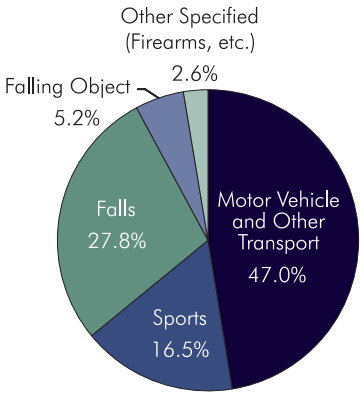
Results and Graphs

Figure 12.
Utah SCI, Percent of Cases by Etiology, Males Ages 0-29, 1998-2003



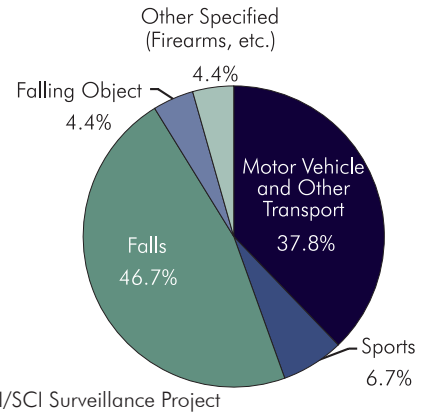
Source: UDOH TBI/SCI Surveillance Project

Figure 13.
Utah SCI, Percent of Cases by Etiology, Males Ages 30-59, 1998-2003



Source: UDOH TBI/SCI Surveillance Project

Figure 14.
Utah SCI, Percent of Cases by Etiology, Males Ages 60 and Older, 1998-2003



Source: UDOH TBI/SCI Surveillance Project

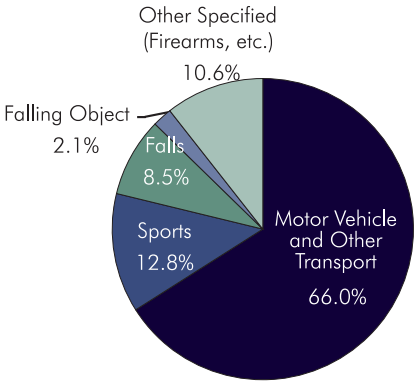
Male Etiology

Among males ages 0-29 and 30-59, "Motor vehicle and other transport" was the leading cause of SCI (47.9% and 47.0%, respectively), while fall-related events were the leading cause (46.7%) among the "60 and over" age group. (Figures 12,13, and 14)

Female Etiology

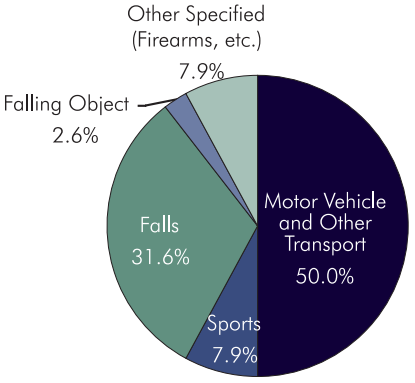
Among females "0 to 29" and "30 to 59" years of age, "Motor vehicle and other transport" was the leading cause of SCI (66.0% and 50.0%, respectively). Among those "60 and over," nearly three-fourths of the SCIs (74.0%) were sustained in fall-related events. (Figures 15, 16, and 17)

Figure 15.
Utah SCI, Percent of Cases by Etiology, Females Ages 0-29, 1998-2003



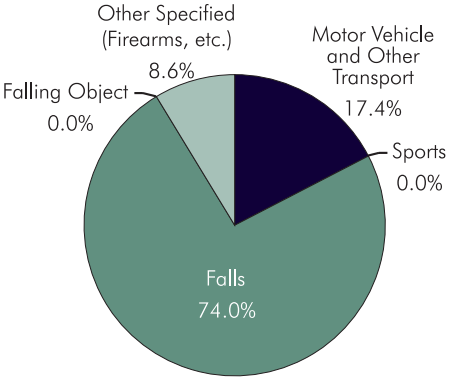
Source: UDOH TBI/SCI Surveillance Project

Figure 16.
Utah SCI, Percent of Cases by Etiology, Females Ages 30-59, 1998-2003



Source: UDOH TBI/SCI Surveillance Project

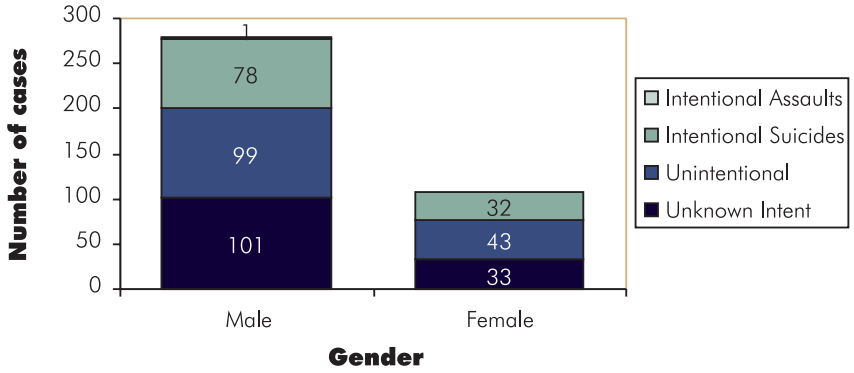
Figure 17.
Utah SCI, Percent of Cases by Etiology, Females Ages 60 and Older, 1998-2003



Source: UDOH TBI/SCI Surveillance Project

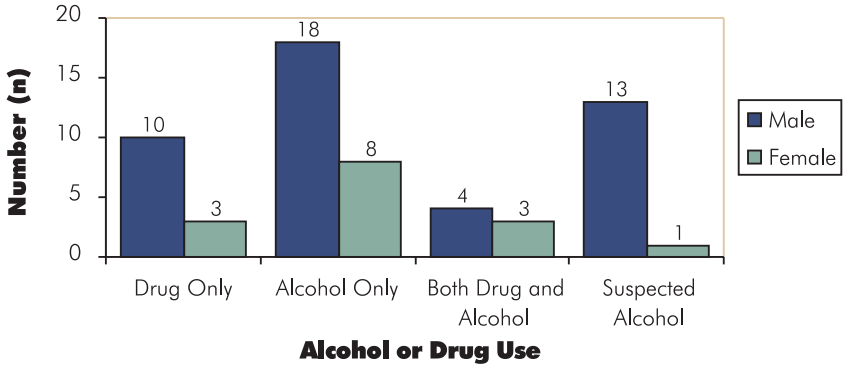
Results and Graphs

Figure 18.
Utah SCI, Number of Cases by Intentionality and Gender, 1998-2003



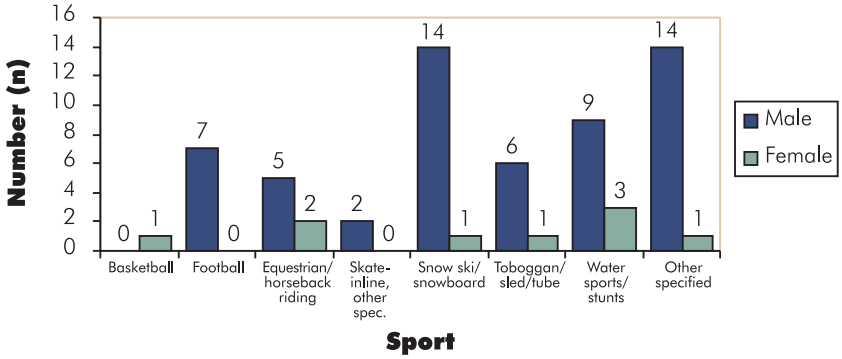
Source: UDOH TBI/SCI Surveillance Project

Figure 19.
Utah SCI, Number of Cases by Alcohol and/or Drug Use, by Gender, 1998-2003



Source: UDOH TBI/SCI Surveillance Project

Figure 20.
Utah SCI, Number of Cases by Sport and Gender, 1998-2003



Source: UDOH TBI/SCI Surveillance Project

Intent

While the majority of SCIs are classified as "unintentional" (commonly called "accidental"), a significant number are the result of self-harm. Of the 387 cases, 110 (78 male, 32 female) were classified as "intentional, suggestive of suicide." These patients sustained the injuries primarily through self-inflicted gunshot wounds and falls. (Figure 18)

Alcohol and Drugs

Of the 243 patients who were tested for the presence of alcohol and/or drugs, 46 (18.9%) tested positive. Medical records indicate another 14 patients were suspected to be under the influence at the time of the injury, but no blood samples were available. (Figure 19)

Sports-related SCI

Sports, especially those considered high-risk, are a significant contributor to SCI, particularly among young males. During the period studied, 57 males (20.4% of all male SCI victims) sustained the injury in sports-related activities. Skiing and snowboarding, water sports and stunts and football were the most common activities resulting in an SCI for males. Among the 9 females (8.3% of all female SCI victims), water sports and horseback riding were the most common causes. (Figure 20)

Discharge Disposition

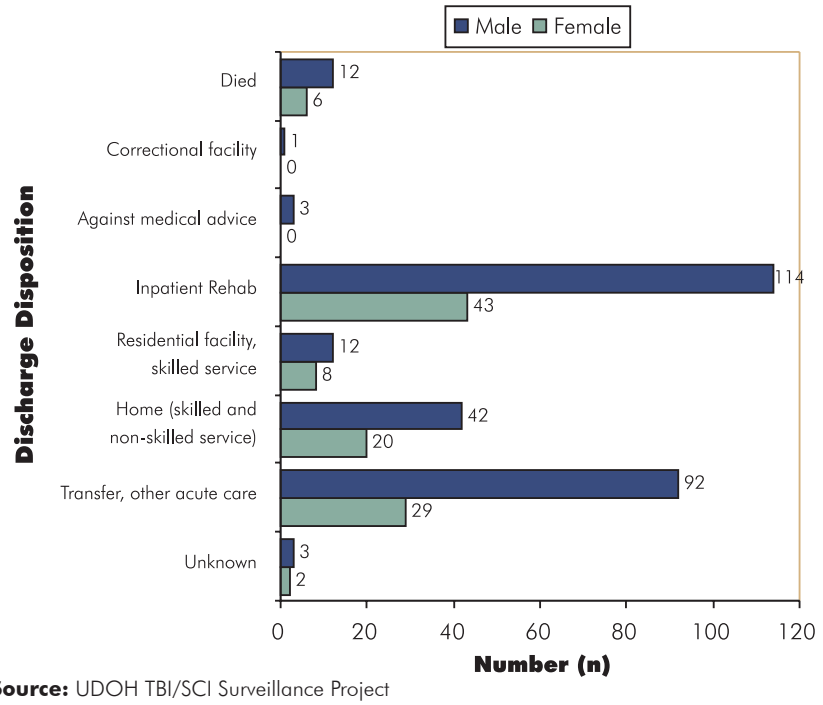
When discharge disposition was known (n=382), 4.7% of those who sustained an SCI died as a result of the SCI, either before being admitted to a hospital or after admission. When categorized by gender, 4.3% of males and 5.7% of females died as a result of SCI before being discharged.

Among the 276 males hospitalized as a result of SCI and for whom hospital discharge disposition was known, 33.3% were transferred to another acute care facility, 15.2% were discharged to a home with or without skilled services, 45.7% were transferred to an inpatient rehabilitation facility or a residential facility with skilled services, 1.1% were discharged against medical advice, 4.3% died, and one person was sent to a correctional facility. (Figure 21)

Among females hospitalized for SCI and for whom hospital discharge disposition was known (n=106), 27.4% were transferred to another acute care facility, 18.9% were discharged to a home with or without skilled services, 48.1% were discharged to an inpatient rehabilitation facility or a residential facility with skilled services and 5.7% died. (Figure 21)

Figure 21.

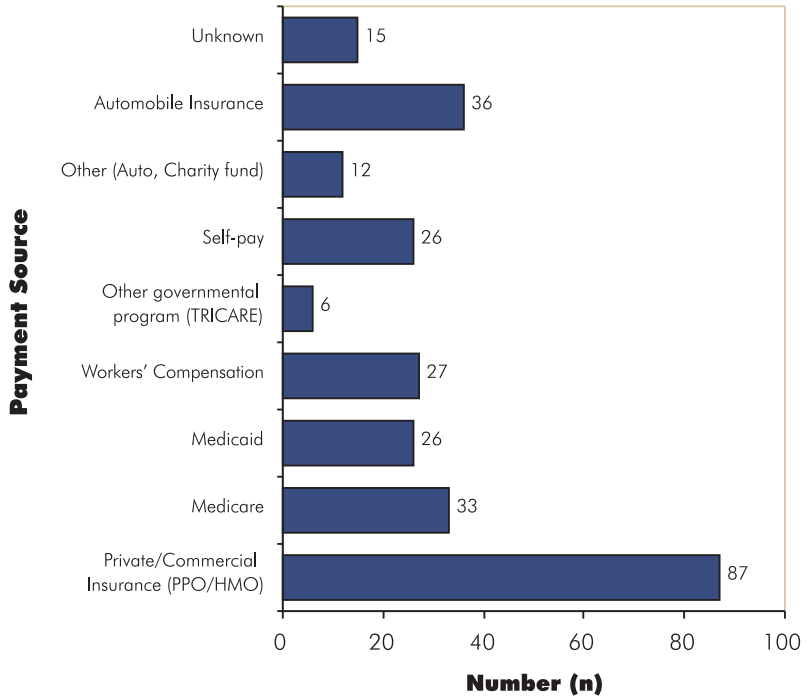
Utah SCI, Discharge Disposition by Gender, 1998-2003



Source: UDOH TBI/SCI Surveillance Project

Figure 22.

Utah SCI, Source of Payment for Services, 2000-2003



Source: UDOH TBI/SCI Surveillance Project

Note: Due to different coding for payment sources for 1998-1999, these years are not included.

Source of Payment

For cases during 2000-2003 where payment source was collected (n=268), 42.5% of SCI costs were paid by an insurance company (private or employer) or workers' compensation, 24.3% were paid through government programs, and 9.7% were self-pay, and 17.9% includes miscellaneous methods of payment such as auto insurance and charitable funds. (Figure 22)

Conclusions

An analysis of the six years of data included in this report shows spinal cord injuries are sustained most often in motor vehicle crashes, falls and sports. Injury experts have long argued that most injuries, including SCIs, are overwhelmingly preventable occurrences. In particular, spinal cord injuries have profound, lasting effects on Utah victims of all ages. The data show that the majority of SCIs among adolescents and young adults ages 15-24 are due to motor vehicle crashes (40.9%), while those suffered by adults 65 and older are sustained overwhelmingly in falls (66.0%). Additionally, of 5,143 hospitalizations for attempted suicide during the period, 2.1% survived the injury to face a lifetime of paralysis and other physical limitations from an SCI.

Nationally, males sustain 80% and females sustain 20% of spinal cord injuries.[3] Utah differs slightly from the national average, as males sustained 72% of SCIs (n=279) and females sustained 28% (n=108) during the study period.

Historically, males are more prone to SCI than women, in part because they participate more often in higher-risk activities, including contact sports and motorcycle, ATV, snowmobile and personal watercraft riding. Males also tend to work more often in higher-risk professions, like mining, farming and construction.

This study found that alcohol and/or drug use is a notable contributor to spinal cord injury. Many SCI patients were found to be under the influence while driving a motor vehicle, as were many of those who sustained their injuries by diving into shallow pools. Of the 387 SCIs, 46 victims (11.9%) tested positive for alcohol or drugs and another 14 (3.6%) were suspected to have been under the influence, but blood samples were not available.

When combined, high-risk sports and other behaviors led to 92 (23.8%) SCIs. These include: football, diving, snow skiing, snowboarding, and motorcycle, ATV and snowmobile riding. Of 13 diving-related SCIs, the majority (11) were sustained by young males diving from buildings or other structures into shallow pools.

Motor vehicle crashes are consistently the leading cause of SCI among Utahns overall. From 1998-2003, 115 males and 46 females suffered spinal cord injuries in traffic crashes, for an average of one motor vehicle-related SCI every 14 days.

Recommendations

Personal choice and a willingness to take risk play a significant role in SCI. The challenge for the injury-prevention community is to educate Utahns about reducing age- and gender-specific risks.

The Utah Department of Health offers the following recommendations to reduce spinal cord injuries:

- Motor Vehicle Safety
  1. Never drive under the influence of alcohol or drugs.
  2. Never operate a motor vehicle while excessively tired or taking medications that can cause drowsiness.
  3. Follow posted speed limits.
  4. Wear a seatbelt on every ride.
  5. Restrain children properly in car seats and booster seats:
     - Infants should ride in a rear-facing car seat in the back seat until they are at least one year old AND weigh at least 20 lbs.
     - Children ages 1 to 4 should ride in a forward-facing car seat or booster seat until they weigh at least 40 lbs.
     - Children ages 4 and up should ride in a belt-positioning booster until they are at least 4'9" tall and weigh 80 lbs.
- Fall Prevention
  1. When approved by your physician, exercise regularly to strengthen bones and muscles and improve your balance.
  2. Make sure stairs are well lighted, have handrails and are free of clutter.
  3. Keep outside steps cleared of ice and snow.
  4. Use a sturdy step stool to reach items above your head, and always use the correct size ladder for the job.
  5. Place non-slip pads under throw rugs.
  6. Place electrical cords out of the way.
  7. Have your vision checked and use appropriate eyewear.
  8. Install and use grab bars in bathrooms.
  9. Wear shoes that give good support and have non-slip soles.

Recommendations

- ATV and Snowmobile Safety
  1. Ride double only if the machine is designed for more than one rider.
  2. Don't ride ATVs on paved roads. An ATV's balloon tires make them prone to rollovers.
  3. Know the terrain where you ride.
  4. Don't let children ride adult-size machines.
  5. Take an off-road vehicle safety course.
- Firearm Safety
  1. If a firearm is in the home, keep it unloaded and locked up, with ammunition stored separately.
  2. Ask the parents of your children's friends if they have a gun in the home. If guns are present, consider whether your child should be allowed to play at that home.
- Suicide Prevention
  1. Remove guns from the home when someone is at risk.
  2. Get help for mental health problems, substance abuse disorders and suicidal thoughts.
- Sports Safety
  1. Wear a helmet when playing sports like baseball, football, hockey, and softball.
  2. Wear a helmet while downhill skiing and snowboarding.
  3. Avoid head-first moves, such as tackling in football with the top of your head or sliding head-first into a base.
  4. Insist on spotters when performing activities that can put you at risk, like new gymnastic or cheerleading moves.
- Water/Diving Safety
  1. Make sure that the water is deep enough before you dive in head first. If the water is too shallow, you can be seriously injured. Entering feet first is safer than diving.

Continued surveillance of Utah SCI data will enable the Utah Department of Health Violence and Injury Prevention Program to better target prevention measures as more is learned about the populations most at risk for spinal cord injury.

Appendix

Data Sources and Case Definition

Data Sources

The morbidity data set of persons with spinal cord injury discharged from hospitals in Utah was ascertained through the Utah Department of Health Office of Health Care Statistics, Hospital Discharge Database.

Clinical Case Definition

A case of SCI is defined as: An occurrence of an acute traumatic lesion of natural elements in the spinal canal (including spinal cord and cauda equina) resulting in any degree of objective sensory or motor deficit, or deficit of autonomic or motor function of the bowel or bladder. These deficits may be temporary or permanent. Lesions due to degenerative intervertebral disc disease are excluded.

The clinical definition of SCI excludes the following conditions:

- Intervertebral disc disease
- Vertebral injuries in the absence of spinal injury
- Nerve root avulsions and injuries to nerve roots and peripheral nerves outside the spinal canal
- Birth trauma
- Cancer, spinal cord vascular disease, and other nontraumatic spinal cord diseases[4]

International Classification of Diseases Codes, Ninth Edition - Morbidity

806.0 – 806.9 Fracture of vertebral column with spinal cord injury
952.0 – 952.9 Spinal cord injury without evidence of spinal bone injury

*Note: Mortality data have not been shown to be a reliable source for identifying new cases of fatal spinal cord injury.

Population Denominators

Population Data: Figures were taken from the Utah Department of Health Indicator-Based Information System (IBIS); general Utah population estimated.

IBIS NOTE: "This module produces mid-year (July 1) estimates from the Governor's Office of Planning and Budget (GOPB), generated by the Utah Process Economic and Demographic (UPED) model. These population estimates and projections are typically released each January with the Economic Report to the Governor. The data currently available in IBIS incorporate information from the 1990 and 2000 U.S. Census.

For more information, see the Census Bureau Web site: www.census.gov, or the site for the Governor's Office of Planning and Budget: www.governor.utah.gov/dea."

Rate Calculations

Incidence Rate per 100,000 persons:

$$\frac{\text{Number of Events of SCI x (100,000)}}{\text{Population at risk}}$$

Age-adjusted Incidence Rate:

SUM [(Age-group incidence rate) x (Population Standard Weight)[5]]

Data Limitations

- Federal hospital data (Veterans Administration Hospital, Hill Air Force Base Hospital, etc.), Indian Health Services (IHS) data, and emergency department data are not included in the data surveillance.
- Individual etiology categories were condensed to illustrate large category groups for the purpose of creating easy-to-read graphs and may not show the true etiology of every injury.
- ICD-9 and E-coding of cases may vary among Utah health care facilities.
- Data graphs for Intent, Etiology, Discharge, Type of Care, and Payment Source are compiled only for cases where these variables were known. Unknown cases were not included.
- Population figures are estimated based on 1990 and 2000 census data and may not represent the true population at the time the data were collected.

Table 1.
Local Health District by County

Local Health District	Counties
Bear River	Box Elder
	Cache
	Rich
Central	Beaver
	Juab
	Millard
	Piute
	Sanpete
	Sevier
	Wayne
Davis	Davis
Salt Lake Valley	Salt Lake
Southeastern	Carbon
	Emery
	Grand
	San Juan
Southwest	Garfield
	Iron
	Kane
	Washington
Summit	Summit
Tooele	Tooele
TriCounty	Daggett
	Duchesne
	Uintah
Utah	Utah
Wasatch	Wasatch
Weber-Morgan	Weber
	Morgan

Table 2.
Utah SCI, Incidence Rate by Local Health District of Occurrence, 1998-2003

Local Health District	Incidence Rate per 100,000	Lower 95% CI	Upper 95% CI
Bear River	2.2	1.3	3.4
Central	7.5	5.0	10.6
Davis	1.0	0.5	1.6
Salt Lake Valley	1.7	1.4	2.1
Southeastern	3.1	1.5	5.7
Southwest	2.8	1.8	4.2
Summit	3.8	1.5	7.8
Tooele	7.0	4.2	11.1
TriCounty	4.1	2.0	7.5
Utah	1.8	1.3	2.5
Wasatch	4.2	1.1	10.6
Weber-Morgan	1.4	0.8	2.2
Statewide	2.1	1.9	2.4

References

1. *Injury Fact Book 2001–2002*. Atlanta, GA: Centers for Disease Control and Prevention; 2001, pp. 96-99.
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4. Thurman, DJ, Sniezek, JE, Johnson, D, et al. *Guidelines for Surveillance of Central Nervous System Injury*. Atlanta. Centers for Disease Control and Prevention, 1995.
5. Centers for Disease Control and Prevention, *National Center for Health Statistics. National Vital Statistics Reports, Age Standardization of Death Rates: Implementation of the Year 2000 Standard*. Vol. 47, No. 3. Atlanta (GA): CDC; 1998.