Spinal Cord Injury in Wisconsin: 1997

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Wisconsin Department of Health and Family Services
Division of Supportive Living
Bureau of Aging and Long Term Care Resources
Office for Persons with Physical Disabilities

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Introduction

Registry Background

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Introduction to Spinal Cord Injury

Introduction

The establishment of a statewide registry and surveillance program was necessary in order to clearly identify factors and demographics associated with the population of individuals that sustains spinal cord injuries (SCI). Accurate incidence, prevalence and economic information about disabilities caused by traumatic injuries had been lacking in Wisconsin.

This Wisconsin Spinal Cord Injury Report represents an overview of spinal cord injuries in Wisconsin occurring in 1997. The data presented in this report includes hospital discharge data related to spinal cord injuries with ICD-9-CM diagnostic codes 806.00-806.99 (fracture of vertebral column with spinal cord injury) and 952.00-952.99 (spinal cord injury without evidence of spinal bone injury). Within this data it is possible that the same person could be hospitalized more than once during a particular year. In order to avoid counting duplicate hospital visits, only the initial hospital visit data is included in the report, except for the "length of stay" and "cost of stay" data. These exceptions were figured from all hospital visits resulting from the original injury to give the actual length of stay and cost of stay data for each injury. Spinal cord injury codes were chosen based on Center for Disease Control and Prevention Guidelines. The discharge data presented here included all events occurring in Wisconsin during 1997 to Wisconsin residents only. Non-residents of Wisconsin were not included.

Readers are encouraged to review the entire report and tables before drawing any conclusions from one table or graph within the document. Please contact the Office for Persons with Physical Disabilities for further explanation of the data presented in this report or for additional copies.

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Registry Background

Background

The Wisconsin Council on Physical Disabilities state plan and Council on Physical Disabilities 1993-1995 Biennial Budget Initiatives identified the need for the systematic collection and analysis of data. The high cost of treating disabilities, the savings in human suffering, and the cost-effectiveness of prevention are viable reasons for promoting prevention programs.

Physical injury is costly. The National Safety Council (1989) estimated that in the United States:

> drinking is indicated as a factor in at least half of the fatal motor vehicle accidents;
>
> in 40% of motorcycle fatalities, there was a detectable blood alcohol level.
>
> the total lack of crash protection afforded by motorcycles places the motor-cyclist at an 80-90% risk of death or injury in any accident;
>
> in six states where helmet laws were required, head injury in helmeted riders was reduced by at least 60%; and
>
> trauma accidents involving the spinal cord have their highest incidence among adolescents.

Current Concerns

The Council identified the need for information about disability etiology, including spinal cord and brain injury, suggesting that a comprehensive program of public education could serve to educate people about specific precautions and thus reduce the incidence of injury. Specific measures such as driving practices, crash helmets, and seat belts and subsequent public awareness programs that focus on youth could have significant influence on reducing such injuries. Knowledge about the etiology of injuries also suggests that a comprehensive public information program must be coordinated with other public and private agencies that also have a significant responsibility for disabilities prevention and related issues.

In 1994 the Wisconsin Council on Physical Disabilities received a planning grant from the Wisconsin Council on Developmental Disabilities to identify opportunities to establish spinal cord injury and brain trauma surveillance. The Office for Persons with Physical Disabilities staff worked with the Council to identify potential funding opportunities.

Spinal Cord Injury Surveillance

In 1995 the Medical College of Wisconsin received a five-year grant from the National Institute on Disability and Rehabilitation Research, Department of Education to become a federally designated Model Spinal Cord Injury Center. As an integral component of the grant, the Department of Health and Family Services, Office for Persons with Physical Disabilities received a subcontract to establish spinal cord injury surveillance. This surveillance has begun to compile statewide data about persons who have sustained spinal cord injuries. This data will enable other investigators to design and implement prevention projects and service projects, which will assist individuals with spinal cord injuries to live at their maximum levels of independence in their communities.

The objectives of the Spinal Cord Injury Surveillance include:

contribute to and compare Wisconsin data with the national SCI data base;

identify and track the incidence of spinal cord injury in Wisconsin;

provide data which will facilitate the development and implementation of effective preventive programs;

provide data which will facilitate blending the prevention and service aspects of health care for the population with SCI; and

identify and track the expenditure of treatment and service dollars for persons who are spinal cord injured.

Data Sources

Surveillance opportunities in Wisconsin for injuries, illnesses, and other conditions have increased since the creation of the Bureau of Health Information (BHI) hospital discharge data system.

The 1987 Wisconsin Act 399 established an Office of Health Care Information. The Bureau of Health Information's responsibilities include collecting, analyzing, and disseminating information on health care from inpatient hospital medical records. Under the statute and administrative rules, hospitals are required to submit specific data to BHI for the purpose of constructing an inpatient hospital database, using information currently being collected on the Uniform Billing forms (UB-92). Along with a patient's billing information, the diagnosis and treatment of the patient are recorded using standard International Classification of Disease-9th Revision-Clinical Modification (ICD-9-CM) codes. BHI, at present, collects one principal diagnostic code and has the capability of collecting up to eight secondary codes.

Hospitals reporting spinal cord injuries 1997 are shown in **Table 1.7** and the codings used are shown in **Table 1.5**.

The case definition used for this analysis is consistent with current Centers for Disease Control (CDC) guidelines for spinal cord injury surveillance. Included are the hospital discharge records that contain one or more of the following injury codes, which are based on the ICD-9-CM.

Spinal Cord Injury

Code	Description
806	Fracture of vertebral column with spinal cord lesion
952	Spinal cord lesion with evidence of spinal bone injury

[This report does not include persons with spinal cord injuries who died before reaching a hospital.]

When BHI began collecting data in January 1989, external cause codes (E-codes) for injuries were reported on a voluntary basis, as one of the four secondary diagnoses. Regardless of how many diagnostic codes were collected at individual hospitals, BHI only analyzes five diagnostic codes. With recent revisions, the BHI database is able to collect additional secondary diagnoses and provide a field reserved for E-codes. With the national recommendation to change the UB-82 form to the UB-92 form, a designated field is now used for the E-code. The E-codes are shown in **Table 1.8**.

External cause codes for injuries were reported on a voluntary basis until January 1994. Using the voluntary system, only 30 percent of injury diagnoses contained this data element. The

inclusion of E-codes and improvement in their reporting is especially important to the surveillance plan, as these codes classify causative agents and/or activities for disabling injuries. The E-codes provide crucial information to guide, develop and evaluate interventions, as well as initiate preventative activities. Effective January 1994, Wisconsin hospitals were required to report E-codes.

In the early years of hospital data collection, documentation and collection of race codes was not mandatory, therefore the race of some patients is "unknown" or documented as "other".

Data Security

The Spinal Cord Registry maintains confidential data on individuals. This data is only accessible to the individual subject of the data and persons who work directly on the registry. Measures to retain patient confidentiality are outlined in Wisconsin Statues Chapter 153.45 (Release of Data) and 153.50 (Protection of Patient Confidentiality). Only summary data are accessible to the public to protect individual identities.

All data is protected electronically through password measures, and copies of the data on backup diskettes are kept under lock and key. Any additional information collected from persons with spinal cord injuries (in the form of interviews, phone contact, etc.), for the purposes of prevention and services, will be conducted by persons under the direct supervision of the Director of the Office for Persons with Physical Disabilities.

Other Security

In addition to data password protection, an automatic virus-checking program has been installed on the registry computer in order to safeguard against the possibility of any form of virus infecting the data.

Data Quality

As stated in the introduction, while analyzing the data, questions arose relevant to the validity of coding by hospitals of actual spinal cord injuries resulting in permanent neurological deficit necessitating an inpatient rehabilitation stay. In a recent article in the American Journal of Epidemiology, Vol. 146, pp 266-272, 1997, Johnson et al. raised the issue of accuracy in reporting of spinal cord injury to a statewide database in Colorado. They report a positive predictive value of 0.55, which implies that one can be only 55% certain that an identified case of spinal cord injury is, in fact, a spinal cord injury resulting in permanent neurological deficit. This has obvious impact on the surveillance aspects of any registry that is planning on recording only spinal cord injuries with permanent neurological deficit. It is important to remember that the Center for Disease Control only requires a code of 806 or 952 for its registry. While full

medical chart review of all reported cases would not be feasible due to reasons of cost, time and confidentiality, an attempt is underway to screen the data using the available codes by using a process developed by the Medical College of Wisconsin Model Spinal Cord Injury Center. Diagnoses critical to spinal cord injury including acute paraplegia or tetraplegia, bowel and bladder paralysis and systemic problems typically associated with spinal cord injury were reviewed. Also incorporated in the determination of acuity was the performance of surgery for decompression or stabilization of the spine, placement of a halo, and transfer into a rehabilitation environment. Lengths of stay and outcome data were also considered: if patient demonstrated transient quadriparesis, or was discharged home after one day of inpatient hospital care, it was clear that this was not a permanent neurological deficit. In addition there was the need to verify this process by comparing the results with actual medical records. Several of the coding sheets were compared to the medical records of patients who had been discharged from Froedtert Hospital. Eighty-six percent of the determinations at Froedtert were found to be correct, thereby establishing the validity of the coding by that hospital.

Wisconsin's Population

Tables 1.1 and **1.2** summarize Wisconsin's population by county of residence, age and gender. From the 1990 census data, Wisconsin's estimated 1997 population was approximately 49 percent male and 51 percent female. The largest population age groups for both males and females were in the 31-45 age category, comprising 24% of the general population. Ages 0-15 and 16-30 (21%), 46-60 (17%), and 61-75 (11%), followed. Those aged 75 and older made up the smallest age group, comprising 6% of the general population (Wisconsin Department of Health and Family Services, 1999).

In terms of racial diversity in 1997, 92.2 percent of Wisconsin's population was white, 5.5 percent black, 1.4 percent Asian or Pacific Islander, and 0.9 percent Native American.

Table 1.1

Wisconsin Population Projections / County Projections by Total Population

County	County Name	1990 Census	1997 Census
01	Adams	15,682	17,493
02	Ashland	16,307	16,755
03	Barron	40,750	42,399
04	Bayfield	14,008	14,522
05	Brown	195,594	215,692
06	Buffalo	13,584	13,740
07	Burnett	13,084	13,857
08	Calumet	34,291	37,788
09	Chippewa	52,360	54,283
10	Clark	31,647	32,357
11	Columbia	45,088	48,590
12	Crawford	15,940	16,217
13	Dane	367,085	402,988
14	Dodge	76,559	82,147
15	Door	25,690	26,333
16	Douglas	41,758	42,383
17	Dunn	35,909	37,907
18	Eau Claire	85,183	89,682
19	Florence	4,590	4,945
20	Fond du Lac	90,083	95,435
21	Forest	8,776	9,121
22	Grant	49,266	49,567
23	Green	30,339	31,689
24	Green Lake	18,651	19,337
25	Iowa	20,150	21,616
26	Iron	6,153	6,279
27	Jackson	16,588	18,010
28	Jefferson	67,783	72,704
29	Juneau	21,650	23,192
30	Kenosha	128,181	140,133
31	Kewaunee	18,878	19,621
32	LaCrosse	97,904	104,409
33	Lafayette	16,074	16,130
34	Langlade	19,505	20,459
35	Lincoln	26,993	28,682
36	Manitowoc	80,421	83,828
37	Marathon	115,400	124,309
38	Marinette	40,548	42,104
39	Marquette	12,321	13,382
40	Menominee	3,890	4,272

County	County Name	1990 Census	1997 Census
41	Milwaukee	959,275	958,408
42	Monroe	36,633	38,355
43	Oconto	30,226	32,518
44	Oneida	31,679	34,147
45	Outagamie	140,510	153,813
46	Ozaukee	72,831	79,436
47	Pepin	7,107	7,205
48	Pierce	32,765	34,199
49	Polk	34,773	36,698
50	Portage	61,405	66,490
51	Price	15,600	16,181
52	Racine	175,034	186,435
53	Richland	17,521	17,767
54	Rock	139,510	148,766
55	Rusk	15,079	15,310
56	St. Croix	50,251	55,829
57	Sauk	46,975	51,700
58	Sawyer	14,181	15,333
59	Shawano	37,157	38,518
60	Sheboygan	103,877	110,462
61	Taylor	18,901	19,389
62	Trempealeau	25,263	26,116
63	Vernon	25,617	26,344
64	Vilas	17,707	19,232
65	Walworth	75,000	82,906
66	Washburn	13,772	14,619
67	Washington	95,328	110,629
68	Waukesha	304,715	341,338
69	Waupaca	46,104	49,296
70	Waushara	19,385	20,616
71	Winnebago	140,320	152,671
72	Wood	73,605	77,215

State Totals	**4,891,769**	**5,192,298**

Table 1.2
Wisconsin Population Projections By Age Group

Age Group	1990 Census	1997Census
0-15	1,093,891	1,105,602
16-30	1,113,755	1,076,726
31-45	1,143,869	1,247,285
45-60	681,112	864,531
61-75	567,552	568,364
75+	291,590	329,790
Totals	**4,891,769**	**5,192,298**

Glossary of Terms

Central Nervous System (CNS): the brain, spinal cord, and retina.

Cervical Spine: highest level in the spine, the neck region, consisting of seven vertebrae and eight nerve roots.

Clinic Referral: the patient was admitted to a facility upon recommendation of a clinic physician.

Coccyx: the tailbone, with one vertebrae and nerve root.

Complete Injury: injury that leaves no motor function or sensation below the spinal cord injury zone.

Court/Law Enforcement Referral: the patient was admitted to a facility upon direction of a court of law, upon the request of a law enforcement agency representative, or upon referral from a 51.42/51.437 or 46.23 county board.

Elective Admission: an admission that can be delayed without substantial risk to the health of the individual. This means the patient's condition permits adequate time to schedule the availability of a suitable accommodation.

Emergency Admission: the patient requires immediate medical intervention as a result of severe, life threatening or potentially disabling conditions. Usually the patient is admitted through the emergency room.

Emergency Referral: the patient was admitted to a facility upon recommendation of an emergency room physician.

HMO Referral: the patient was referred to a facility upon the recommendation of a health maintenance organization physician.

Incomplete Injury: spinal cord damage leaving some sensation and/or motor control below the injury zone because some nerve pathways remain intact.

Level of Injury: level of injury is determined by which vertebrae of the spinal cord has been injured. The closer the injury is to the brain, the greater the loss of function and feeling will be. C3-T1 will produce tetraplegia. T1 and below will produce paraplegia; C5 and above will produce tetraplegia with reduced respiratory function.

Lumbar Spine: the strongest part of the spine, the lower back, consisting of five vertebrae and nerve roots.

Paraplegia: loss of function below the cervical spinal cord segments, upper body usually retains most function and sensation.

Physician Referral: the patient was admitted to a facility upon the recommendation of his or her physician.

Tetraplegia (formerly quadraplegia): loss of function of any injured or diseased cervical spinal cord segment, affecting all four limbs.

Transfer from Another Health Care Facility: the patient was admitted to a facility as a transfer from a health care facility other than an acute care facility or a skilled nursing facility.

Transfer from a Hospital: the patient was admitted to a facility as a transfer from an acute care facility where he or she was an inpatient.

Transfer from a Skilled Nursing Facility: the patient was admitted to a facility as a transfer from a skilled nursing facility where he or she was and inpatient.

Sacrum Spine: below the lumbar spine, with five vertebrae and nerve roots.

Spinal Cord Injury: any injury of the neural elements within the spinal canal. Can occur from either trauma or disease.

Thoracic Spine: at the level of the chest, has twelve vertebrae and nerve roots.

Urgent Admission: the patient requires immediate attention for the care and treatment of a physical or mental disorder. Generally the patient is admitted to the first available and suitable accommodation.

Ventilator: a mechanical apparatus or machine, which is used for artificially ventilating the lungs.

Introduction to Spinal Cord Injury

The spinal cord is part of the nervous system and is the largest nerve in the body. It is about 18 inches long and extends from the base of the brain, down the middle of the back, to about the waist and is surrounded by protective rings of bone called the vertebral column, or the spinal column. The 33 vertebrae of the spine can be divided into several regions. At the highest level in the spine, the neck region is the cervical spine, consisting of seven vertebrae and eight nerve roots. They are smaller than the other vertebrae, which allows a greater amount of movement. The thoracic spine, at the level of the chest, has twelve vertebrae and nerve roots. The spinal canal in the thoracic region is relatively smaller than the cervical or lumbar areas. This makes the thoracic spinal cord at greater risk if there is a fracture (Maddox, 1993).

Below the thoracic spine is the lumbar spine, the low back region, consisting of five vertebrae and nerve roots and then the sacrum, which also has five fused vertebrae and nerve roots. The coccyx, or tailbone, has one vertebrae and nerve root. Vertebrae increase in size as they go down the column, with the cervical as the smallest and the lumbar the largest.

The *central nervous system* consists of the brain and spinal cord. The nerves that lie within the spinal cord are upper motor neurons and their function is to carry the messages back and forth from the brain to the spinal nerves along the spinal tract. The *peripheral nervous system* consists of spinal nerves that branch out from the spinal cord to other parts of the body, that are called lower motor neurons. These spinal nerves exit and enter at each vertebral level and communicate with specific areas of the body. The *sympathetic nervous system* is a system of nerves that controls involuntary functions such as blood pressure and temperature regulation.

The term *spinal cord injury* or SCI refers to any injury of the neural elements within the spinal column. SCI can occur from either trauma or disease to the vertebral column or the spinal cord itself, though most spinal cord injuries are the result of trauma to the vertebral column. The spinal cord does not have to be severed in order for a loss of functioning to occur. In fact, in most people with SCI, the spinal cord is intact, but the damage to it results in loss of functioning due to bruising or loss of blood supply. These injuries can affect the spinal cord's ability to send and receive messages from the brain to the body systems that control the sensory, motor, and autonomic function below the level of injury.

Typically, the nerves above the injury site continue to function as they always have and the nerves below the site do not. A physician describes an individual as having a certain “level” injury by naming the region affected and the level that corresponds with that region. In general, the higher the level of injury, the greater the functional loss. Damage to the cervical region (C1-C8) usually results in a loss of function in the arms and legs, resulting in tetraplegia. Injury to the thoracic region (T1-T12) usually affects the chest and legs and results in paraplegia. Nationally, the most common types of injury are at the mid-to-low cervical vertebrae (C5-C6), followed by the thoracolumbar junction (T2-L1). Both spots are the spine’s areas of greatest flexibility and vulnerability.

Mortality rates are significantly higher during the first year after injury than during subsequent years. The average life expectancy for a person with spinal cord injury continues to increase due to improved technology, but is still somewhat below normal. Spinal cord injuries have profound effects on the public health system because of the young age of those injured, the high cost of acute and rehabilitative care, and the long-term disability.

Executive Summary

Incidence of Spinal Cord Injury

Hospitalization and Cost Information

Circumstances of Spinal Cord Injury

Status at Time of Discharge

Spinal Cord Injury Rates by County of Residence

Executive Summary

In 1997, there were 230 spinal cord injury events in Wisconsin with the predominant causes of hospitalizations being falls, motor vehicle crashes, and other injury events. Males disproportionately represented 76.5% of spinal cord injury events. In 1997, the average age at time of injury was 41.6 (males 41.2 and females 43.0), with the most frequent age at 16 (males 22 and females 13). Males aged 31-45 represented the overall largest group of injury with 55 (24% overall) injuries, followed by men in the 16-30 age group with 52 (23% overall) injuries. Females aged 16-30 represented the largest group for women with 14 (6% overall) injuries, followed by women aged 31-45 with 12 (5% overall) injuries. Overall, 58% of all injuries (both men and women) occurred between the ages of 16-45. It is interesting to note that 22% of all injuries occurred to individuals who were age 61 or over. This is especially significant with women, as over 28% of all injuries occur to women in that combined age group. Although age and gender are significant risk factors for spinal cord injury, there are other risk factors that contribute such as race, time of year and demographic area.

The majority of individuals admitted for spinal cord injuries during 1997 were white (179 or 78%), followed by 26 (or 11%) being black. Although whites sustain the majority of spinal cord injuries, members of minority groups sustain a disproportionate percentage relative to their numbers.

The warmest months (May through July) had the highest number of spinal cord injury events, with May and June being the leading months. Saturday and Sunday had the highest incidence of spinal cord injuries. It is important to remember that Saturday and Sunday would include any incidences that occurred the "night" before (after midnight). For example, Saturday injuries would include any incidence that occurred after midnight on Friday.

The average length of an inpatient hospital stay in 1997 was 26.9 days. In 1997, acute care hospital charges for treatment for spinal cord injuries totaled more than $14 million. The average charge for a non-fatal spinal cord injury was $61,758 per acute inpatient admission.

Spinal cord injuries have profound effects on the public health system because of the young age of those injured, the high cost of acute and rehabilitative care, and the long-term disability. Thus, the findings of this and future reports will identify the cost and cause of spinal cord injury, leading to strategies to prevent the injuries from occurring in the first place.

Spinal Cord Injury Events: 1997

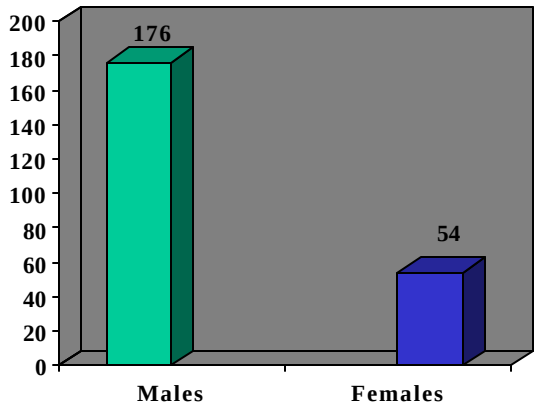
The Incidence of Spinal Cord Injury

From January 1, 1997 to December 31, 1997, a total of 230 Wisconsin residents were hospitalized for a spinal cord injury.

Demographics

Sex—Males sustained 176 injuries (76.5%) and females sustained 54 injuries (23.5%) **(Graph 1.1)**.

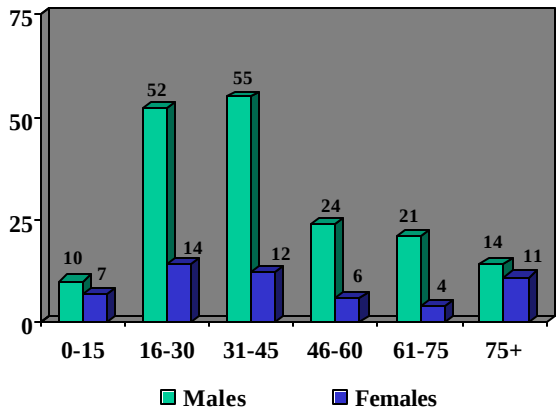
Graph 1.1
Injuries by Gender and Year
1997



Age—The average age at time of injury was 41.6. The most frequent age of injury was 16 overall, with 22 for males and 13 for females. The mean age at injury was slightly higher for females (43.0) than for males (41.2). Ages ranged from 3 to 93. Males aged 31-45 represented the overall largest group of injury with 55 injuries, followed by men in the 16-30 age group with 52 injuries. Females aged 16-30 represented the largest group of women with 14 injuries, followed by women aged 31-45 with 12 injuries **(Graph 1.2)**.

Graph 1.2

Injuries by Age and Gender
1997



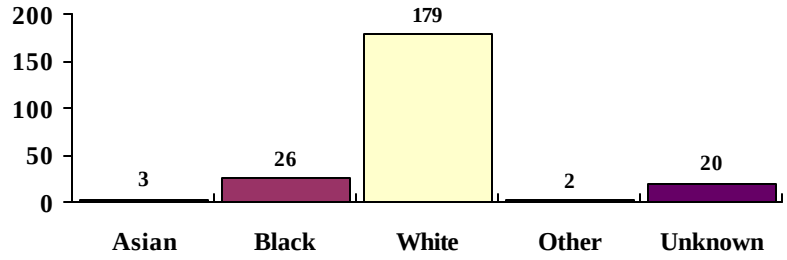
Overall, 29% of all injuries occurred between the ages of 16-30 and 31-45. The next highest age group was 46-60, with 13% of all injuries. Eleven percent occurred between the ages of 46-60 and 75 and older. Finally, 7% of all injuries occurred between the ages of 0-15. The total number of spinal cord injuries for each age group and gender is listed in **Table 1.4**.

Among racial/ethnic groups, whites had the highest mean age at injury (43.1 years), while blacks had the lowest mean age at injury (31.3 years). The mean age at injury for Asians was 33.3 years.

Ethnicity—The race of some patients in 1997 was unknown or documented as "other" (22 or 10%). The majority of individuals admitted for spinal cord injuries during 1997 were white (179 or 78%), followed by 26 or 11% being black and 3 or 1% being Asian and/or Pacific Islander **(Graph 1.3)**.

Although whites sustained the majority of spinal cord injuries, members of minority groups did sustain a disproportionate percentage relative to their numbers in Wisconsin. In fact, 5.5% of the Wisconsin population is black, yet this group sustained 11% of all spinal cord injuries in Wisconsin.

Graph 1.3
Injuries by Race
1997

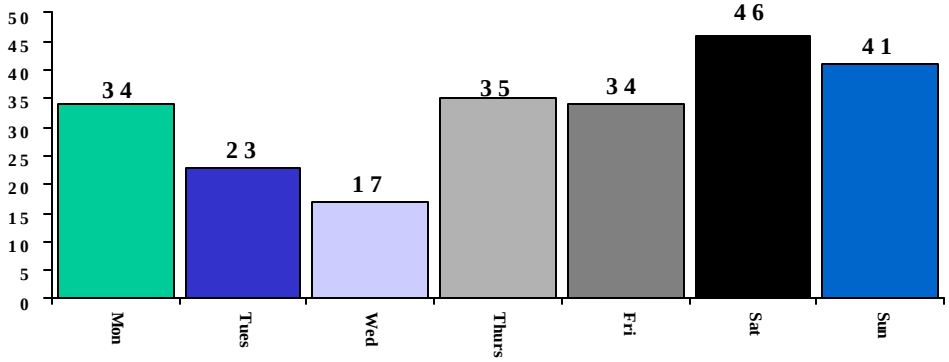


Among whites, men were three times as likely to acquire spinal cord injuries than females, while among blacks, males were seven times as likely to acquire spinal cord injuries than females.

Hospitalization and Cost Information

Admission Day, Month, Type and Source—In 1997, the majority of spinal cord injury events occurred during the weekend. Saturdays had the highest number of events. Wednesdays had the lowest number of injury events **(Graph 1.4)**.

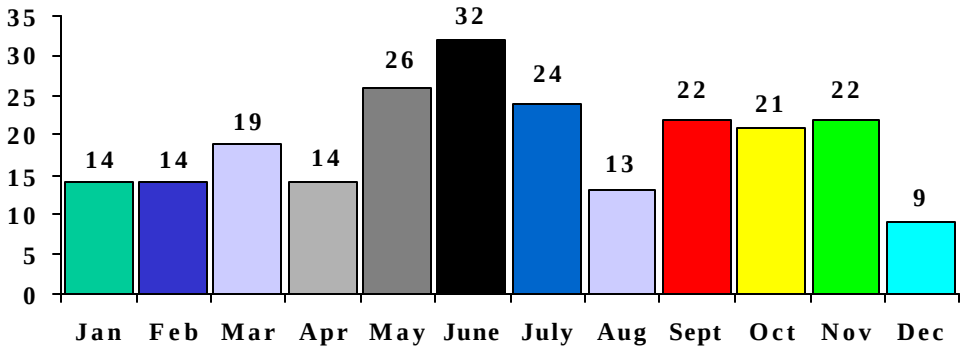
Graph 1.4
Admission by Day of the Week
1997



In terms of the month in which individuals were admitted to hospitals in Wisconsin for spinal cord injuries, the months of May through July had the highest number of injuries. Overall, June had the highest number of admissions with 32, followed by May with 26. December had the

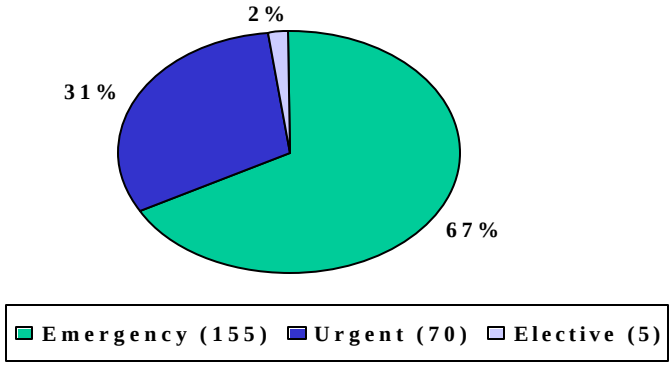
lowest amount with 9 **(Graph 1.5)**. If race becomes a variable, blacks had the highest incidence of injury in May, July and October.

Graph 1.5
Admission by Month
1997



Both the largest type and source of admission to hospitals involving residents with spinal cord injuries occurred during emergency situations, where the patient required immediate medical intervention as a result of severe, life threatening or potentially disabling conditions **(Graph 1.6)**.

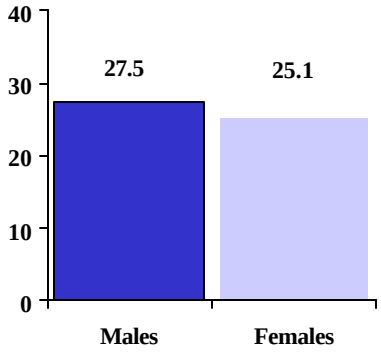
Graph 1.6
Type of Admission
1997



Length of Inpatient Stay—The average length of an acute inpatient hospital stay in 1997 was 26.9 days. The average length of stay for men was 27.5 days, for women 25.1 days **(Graph 1.7)**. The average length of stay for a tetraplegia injury was 31.8 days and for a paraplegia injury, 21.0 days. Above all factors, respiratory complications, including ventilator dependency, were responsible for lengthy hospital stays.

Graph 1.7

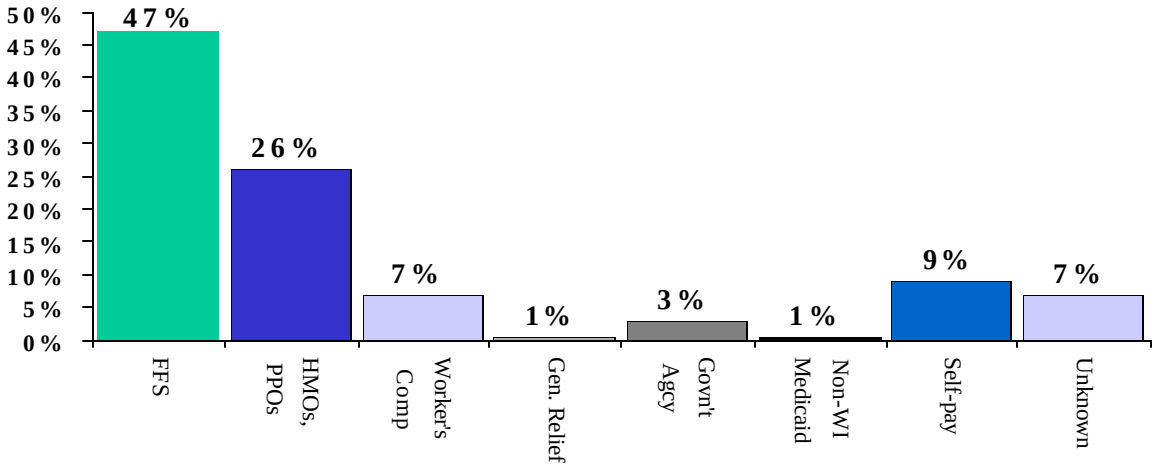
Average Length of Inpatient Stay by Gender 1997



Cost of Inpatient Hospital Care—In 1997, acute care hospital charges for treatment of spinal cord injury totaled more than $14 million. In 1997, the average cost for an acute inpatient hospital stay was $61,758. In terms of gender differences, the cost of hospitalization was greater for males than females. Males averaged $63,006 per year, females averaged $57,693 per year. Men averaged almost two and a half more days of acute care, which may account for the difference in average costs. Fifty-seven percent of all injuries to females resulted in tetraplegia, while just 54% of injuries to males resulted in a tetraplegia diagnosis. It is important to remember that these costs do not reflect the total cost for a spinal cord injury, since medical equipment, ongoing medical care, home and vehicle modifications, and attendant care greatly add to the overall costs of spinal cord injuries.

Payer Type—In 1997, the majority of initial inpatient stays (109 or 47%) were paid for by fee-for service insurance. Sixty (26%) initial inpatient stays were paid for by an Alternative Health Care Insurance Plan (HMO, PPO, PPA, etc.). Other payment types included worker's compensation (16 or 7%), general relief (1 or .5%), non-Wisconsin Medicaid (1 or .5%), other government agency or program (7 or 3%), and self-pay (21 or 9%). For fifteen (7%) inpatient stays, the exact type of payment, either fee-for-service or HMO was unable to be determined **(Graph 1.8)**.

Graph 1.8
Payer Type
1997



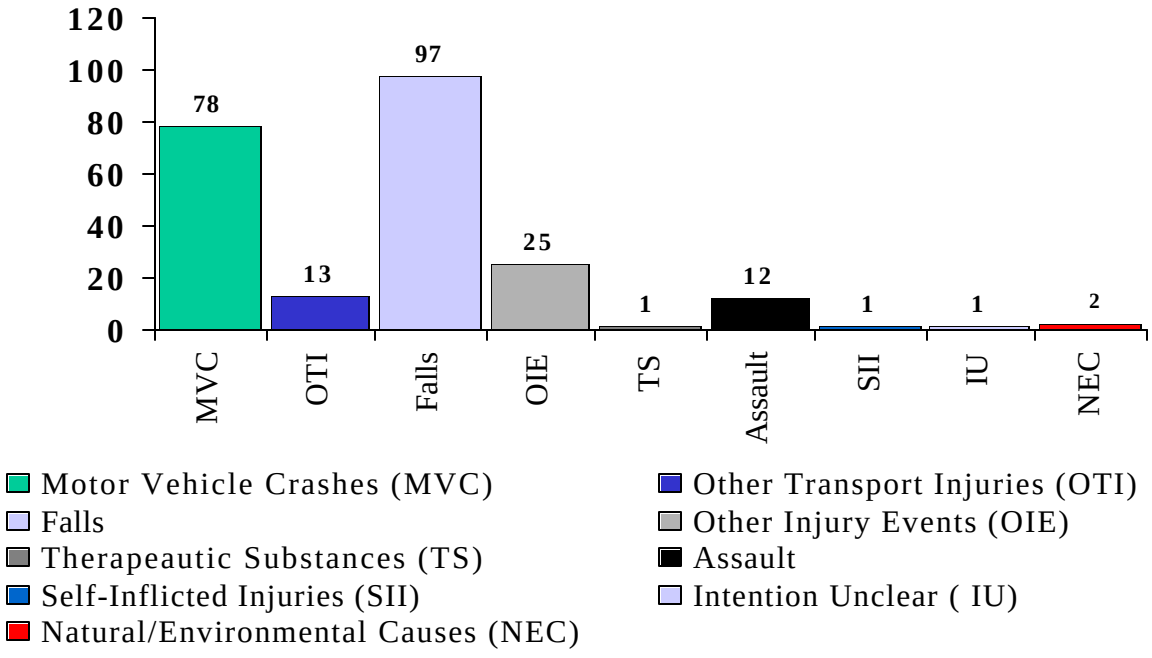
Primary and Secondary Payer— Medicare was the primary payer for 42 initial inpatient stays; Medicaid for 24 stays. Medicare was the secondary payer for 11 initial hospital stays; Medicaid for 12.

Circumstances of Spinal Cord Injury

Causes of Injury—Based on the available information from E-Codes, the leading cause of spinal cord injury during 1997 was falls (97), followed by motor vehicle crashes (78), and then other injury events (25). Motor vehicle crashes were the leading cause of injury to those aged 0-45. After age 46, the leading cause of injury was due to some type of fall **(Graph 1.9)**. Causes of spinal cord injury can vary by race. Accidental falls were the leading cause among whites (84), followed by motor vehicle crashes (61). Intentional injuries (assault and self-inflicted) were the leading cause of spinal cord injury among blacks (10), followed by falls (8). In fact, intentional injuries were the cause of 38% of all spinal cord injuries among blacks.

Graph 1.9

Causes of Injury 1997



- Motor Vehicle Crashes (MVC)
- Other Transport Injuries (OTI)
- Falls
- Other Injury Events (OIE)
- Therapeautic Substances (TS)
- Assault
- Self-Inflicted Injuries (SII)
- Intention Unclear (IU)
- Natural/Environmental Causes (NEC)

The leading causes of injuries of spinal cord injuries from 1997 are listed in **Table 1.3**.

Table 1.3
Causes of SCI, by Gender: 1997

Cause (with E-code)	***Male* #**	*Male %*	***Female* #**	*Female %*	***Total* #**	*Total %*
Unintentional						
Motor Vehicle Crashes *(810-819, 929.0)*	**48**	27	**30**	56	**78**	34
Other Transport Injuries *(820-848, 929.1)*	**13**	7	**0**	0	**13**	6
Falls *(880-888, 929.3)*	**79**	45	**18**	33	**97**	42
Other Injury Events *(870-879, 916-928)*	**20**	11	**5**	9	**25**	11
Natural/Environmental Factors *(900-909)*	**2**	1	**0**	0	**2**	.5
Therapeutic Substances *(930-949)*	**1**	1	**0**	0	**1**	.5
Intentional						
Assault *(960-969)*	**12**	7	**0**	0	**12**	5
Self-inflicted Injuries *(950-959)*	**0**	0	**1**	2	**1**	.5
Unclear						
Intention Unclear *(980-989)*	**1**	1	**0**	0	**1**	.5
Total With Cause Known	**176**	100	**54**	100	**230**	100

Table 1.4
Causes of SCI by Selected Age Groups: 1997

Age Groups & Causes	*Male*		*Female*		*Total*	
	Number of SCI Events	*%*	***Number of SCI Events***	*%*	***Number of SCI Events***	*%*
0-15						
Total All Causes	**10**	100	**7**	100	**17**	100
Motor Vehicle Crashes	**3**	30	**4**	57	**7**	41
Other Transport Injuries	**0**	0	**0**	0	**0**	0
Falls	**2**	20	**1**	14	**3**	18
Other Injury Events	**2**	20	**2**	29	**4**	23
Therapeutic Substances	**0**	0	**0**	0	**0**	0
Assaults	**2**	20	**0**	0	**2**	12
Self-inflicted Injuries	**0**	0	**0**	0	**0**	0
Intention Unclear	**1**	10	**0**	0	**1**	6
16-30						
Total All Causes	**52**	100	**14**	100	**66**	100
Motor Vehicle Crashes	**15**	29	**10**	72	**25**	38
Other Transport Injuries	**4**	8	**0**	0	**4**	6
Falls	**16**	31	**2**	14	**18**	27
Other Injury Events	**10**	19	**1**	7	**11**	17
Therapeutic Substances	**0**	0	**0**	0	**0**	0
Assaults	**7**	13	**0**	0	**7**	11
Self-inflicted Injuries	**0**	0	**1**	7	**1**	1
Intention Unclear	**0**	0	**0**	0	**0**	0
31-45						
Total All Causes	**55**	100	**12**	100	**67**	100
Motor Vehicle Crashes	**16**	29	**10**	84	**26**	39
Other Transport Injuries	**8**	14	**0**	0	**8**	12
Falls	**27**	49	**1**	8	**28**	42
Other Injury Events	**2**	3.5	**1**	8	**3**	4
Therapeutic Substances	**0**	1	**0**	0	**0**	0
Assaults	**2**	3.5	**0**	0	**2**	3
Self-inflicted Injuries	**0**	0	**0**	0	**0**	0
Intention Unclear	**0**	0	**0**	0	**0**	0
46-60						
Total All Causes	**24**	100	**6**	100	**30**	100
Motor Vehicle Crashes	**6**	25	**1**	17	**7**	24
Other Transport Injuries	**1**	4	**0**	0	**1**	3
Falls	**13**	54	**5**	83	**18**	60
Other Injury Events	**3**	13	**0**	0	**3**	10
Therapeutic Substances	**1**	4	**0**	0	**1**	3
Assaults	**0**	0	**0**	0	**0**	0
Self-inflicted Injuries	**0**	0	**0**	0	**0**	0
Intention Unclear	**0**	0	**0**	0	**0**	0

(Table 1.4, Continued)

61-75						
Total All Causes	**21**	100	**4**	100	**25**	100
Motor Vehicle Crashes	**6**	28.5	**2**	50	**8**	32
Other Transport Injuries	**0**	0	**0**	0	**0**	0
Falls	**13**	62	**2**	50	**15**	60
Other Injury Events	**2**	9.5	**0**	0	**2**	8
Therapeutic Substances	**0**	0	**0**	0	**0**	0
Assaults	**0**	0	**0**	0	**0**	0
Self-inflicted Injuries	**0**	0	**0**	0	**0**	0
Intention Unclear	**0**	0	**0**	0	**0**	0
75+						
Total All Causes	**14**	100	**11**	100	**25**	100
Motor Vehicle Crashes	**2**	14.5	**3**	27	**5**	20
Other Transport Injuries	**1**	7	**0**	0	**1**	4
Falls	**8**	57	**7**	64	**15**	60
Other Injury Events	**1**	7	**1**	9	**2**	8
Therapeutic Substances	**0**	0	**0**	0	**0**	0
Assaults	**0**	0	**0**	0	**0**	0
Self-inflicted Injuries	**0**	0	**0**	0	**0**	0
Intention Unclear	**0**	0	**0**	0	**0**	0
Natural/Environmental Factors	**2**	14.5	**0**	0	**2**	8

***Falls*—**Falls were by far the leading cause of spinal cord injury among Wisconsin residents. In 1997, 97 spinal cord injuries (79 or 45% of injuries to males and 18 or 33% of injuries to females) were sustained in a accidental fall. Overall, males sustained approximately 4.4 times as many spinal cord injury events as a result of accidental falls than did females. Falls were the leading cause of spinal cord injury for both genders between 46 and older, and the second leading cause of injury for persons aged 0-45.

The majority of identified falls (64%) occurred when the individual fell from one level to another (falling down stairs, off ladders and chairs, etc.). Six (6%) of injuries were sustained from shallow water dives.

Motor Vehicle Crashes—Motor vehicle crashes were the second leading cause of spinal cord injury in Wisconsin. There were 78 motor vehicle crashes resulting in spinal cord injury recorded in Wisconsin in 1997, with sixty-one percent of those events occurring to men. Men sustained 48 spinal cord injuries due to motor vehicle crashes, while females sustained 30 injuries. Motor vehicle crashes were the leading cause of spinal cord injury for both genders age 0 to 45.

In the majority of motor vehicle crashes (51%), the driver was the individual to sustain the spinal cord injury. Based on the available information from E-Codes, 9% of motor vehicle injuries occurred to individuals while operating a motorcycle, all of these injuries to males **(Table 1.8)**.

Other Injury Events—This was the third leading cause of injury, not related to transport vehicles, including machine injuries, sport injuries, and injuries incurred during medical procedures. There were 25 injuries sustained in 1997 due to these events. Males sustained 20 (80%) of these injuries.

***Other Transport Injuries*—**In 1997, other transport injuries were the fourth leading cause of spinal cord injury, with 13 injuries reported. Other transport injuries include injuries from snowmobiles, watercraft, and aircraft, among others. Males sustained all 13 (100%) of these other transport-related events.

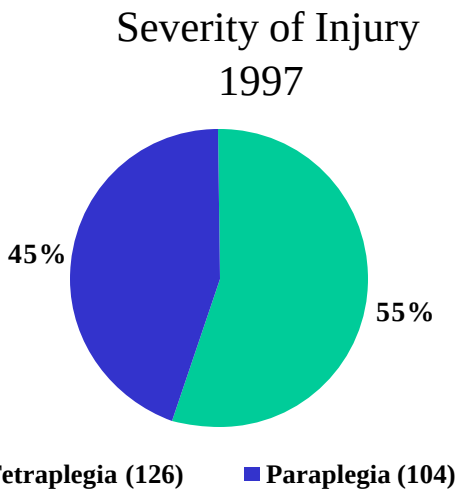
Intentional Injuries—Intentional injuries were the fifth leading cause of spinal cord injury. In 1997, there were 12 intentional events resulting in spinal cord injury. Men sustained all 12 (100%) of these intentional events. This total includes self-inflicted injury as well as those inflicted by other persons.

The question of intention is often considered relevant to causation. An injury is categorized as "intention unknown" when it is unspecified or it cannot be determined whether the injuries are accidental (unintentional), suicide (attempted), or assault.

Whether ruled accidental, intentional, or intention unknown, firearms were a recurring cause of spinal cord injury, especially among males. Fourteen firearm injury events were reported, all fourteen (100%) of these to males.

Level and Severity of Injury—There are two categories of spinal cord injuries: paraplegia and tetraplegia. A person is said to have paraplegia when there is a loss of feeling in the lower portion of the body. Tetraplegia is described as loss of movement in both the upper and lower portions of the body (Maddox, 1993). In the 1997 data, 55% of the individuals sustained spinal cord injuries resulting in tetraplegia, and 45% in paraplegia **(Graph 1.10)**. Men sustained 95 injuries resulting in tetraplegia and 81 injuries resulting in paraplegia. Women sustained 31 injuries resulting in tetraplegia and 23 injuries resulting in paraplegia.

Graph 1.10



The severity of a spinal cord injury is determined by the level of the injury and by the amount of neurological impairment. A spinal cord injury at any level may impair strength, sensation, bowel, bladder, and sexual functioning.

A spinal cord injury can also be described as either complete or incomplete. A complete injury means an individual has no function, sensation, or voluntary movement below the level of injury. In most cases, both sides are equally affected. An incomplete injury means there is some functioning below the primary level of injury. The individual may be able to move one limb more than another, feel parts of the body that cannot be moved, or may have more functioning on one side of the body than the other. Due to advances in medicine, the incomplete injury is more common.

Table 1.5

Principal Diagnosis

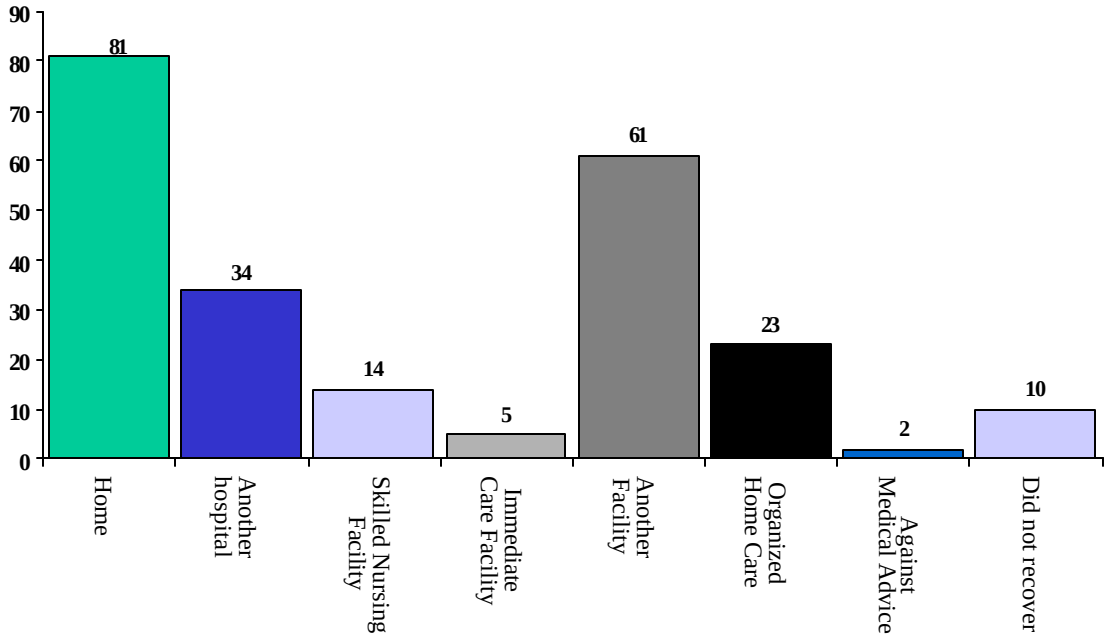
Diagnosis Code	Principal Diagnosis	Male	Female	Total
806	**Fracture of vertebral column with spinal cord injury**			
806.0	***Cervical, closed***			
806.00	C1-C4 level with unspecified spinal cord injury	**3**	**3**	**6**
806.01	C1-C4 level with complete lesion of cord	**4**	**2**	**6**
806.03	C1-C4 level with central cord syndrome	**6**	**2**	**8**
806.04	C1-C4 level with other specified spinal cord injury	**4**	**0**	**4**
806.05	C5-C7 level with unspecified spinal cord injury	**8**	**3**	**11**
806.06	C5-C7 level with complete lesion of cord	**9**	**1**	**10**
806.07	C5-C7 level with anterior cord syndrome	**1**	**2**	**3**
806.08	C5-C7 level with central cord syndrome	**4**	**1**	**5**
806.09	C5-C7 level with other specified spinal cord injury	**11**	**5**	**16**
806.1	***Cervical, open***			
806.11	C1-C4 level with complete lesion of cord	**1**	**0**	**1**
806.14	C1-C4 level with other specified spinal cord injury	**1**	**0**	**1**
806.16	C5-C7 level with complete lesion of cord	**1**	**0**	**1**
806.2	***Dorsal (thoracic), closed***			
806.20	T1-T6 level with unspecified spinal cord injury	**6**	**0**	**6**
806.21	T1-T6 level with complete lesion of cord	**9**	**1**	**10**
806.22	T1-T6 level with anterior cord syndrome	**1**	**0**	**1**
806.24	T1-T6 level with other specified spinal cord injury	**1**	**0**	**1**
806.25	T7-T12 level with unspecified spinal cord injury	**6**	**3**	**9**
806.26	T7-T12 level with complete lesion of cord	**11**	**1**	**12**
806.29	T7-T12 level with other specified spinal cord injury	**10**	**3**	**13**
806.3	***Dorsal (thoracic), open***			
806.36	T7-T12 level with complete lesion of cord	**1**	**0**	**1**
806.39	T7-T12 level with other specified spinal cord injury	**2**	**0**	**2**
806.4	***Lumbar, closed***	**19**	**6**	**25**
806.5	***Lumbar, open***	**1**	**0**	**1**
806.6	***Sacrum and coccyx, closed***			
806.60	With unspecified spinal cord injury	**0**	**1**	**1**
806.7	***Sacrum and coccyx, open***			
806.70	With unspecified spinal cord injur;y	**1**	**0**	**1**
806.8	***Unspecified, closed***	**1**	**0**	**1**

952	**Spinal cord injury without evidence of spinal bone injury**			
952.0	***Cervical***			
952.00	C1-C4 level with unspecified spinal cord injury	**9**	**3**	**12**
952.01	C1-C4 level with complete lesion of spinal cord	**1**	**0**	**1**
952.02	C1-C4 level with anterior cord syndrome	**2**	**0**	**2**
952.03	C1-C4 level with central cord syndrome	**8**	**3**	**11**
952.04	C1-C4 level with other specified spinal cord injury	**2**	**0**	**2**
952.05	C1-C4 level with unspecified spinal cord injury	**5**	**3**	**8**
952.06	C1-C4 level with complete lesion of spinal cord	**2**	**0**	**2**
952.07	C5-C7 level with anterior cord syndrome	**2**	**0**	**2**
952.08	C5-C7 level with central cord syndrome	**8**	**2**	**10**
952.09	C5-C7 level with other specified spinal cord injury	**3**	**1**	**4**
952.1	***Dorsal (thoracic)***			
952.10	T1-T6 level with unspecified spinal cord injury	**1**	**0**	**1**
952.14	T1-T6 level with other specified spinal cord injury	**0**	**1**	**1**
952.15	T7-T12 level with unspecified spinal cord injury	**0**	**1**	**1**
952.2	***Lumbar***	**3**	**2**	**5**
952.4	***Cauda Equina***	**1**	**0**	**1**
952.8	***Multiple sites of spinal cord***	**0**	**1**	**1**
952.9	***Unspecified site of spinal cord***	**7**	**3**	**10**

Discharge Location

In terms of patient discharge, the most common discharge location was to the home or to self-care with 81 (35%) of patients returning to their home or the home of another. Discharges to an institution were the second most common with 61 (26%) discharges **(Graph 1.11)**.

Graph 1.11
Patient Discharge Location
1997



Spinal Cord Injuries by County of Residence

Map 1.1 shows the spinal cord injury events by county of residence in 1997. This data reflects the county in which the person lives, not necessarily the county in which the spinal cord injury occurred. As expected, counties with greater population rates had a higher number of injury events occurring to their residents.


Map 1.1
Spinal Cord Injuries by County of Residence, 1997
Douglas 0
Bayfield 1
Ashland 0
Iron 0
Vilas 3
Washburn 0
Sawyer 1
Burnett 0
Price 2
Oneida 1
Forest 0
Florence 0
Marinette 0
Polk 0
Barron 4
Rusk 2
Lincoln 1
Langlade 0
Oconto
Taylor 3
St. Croix 0
Dunn 0
Chippewa 2
Marathon 5
Menominee 3
Clark 2
Shawano 4
Pierce 0
Eau Claire 5
Door 0
Pepin 0
Wood 3
Portage 1
Waupaca 1
Outagamie 7
Brown 8
Kewaunee 2
Buffalo 1
Tremp-ealeau 3
Jackson 1
Juneau 1
Adams 0
Waushara 2
Winnebago 6
Calu-met 1
Manitowoc 2
Monroe 1
La Crosse 5
Green-Lake 0
Marquette 1
Fond du Lac 2
Sheboygan 3
Vernon 2
Sauk 5
Columbia 1
Dodge 6
Washington 2
Ozaukee 1
Richland 2
Crawford 1
Dane 15
Jefferson 2
Waukesha 16
Milwaukee 44
Iowa 4
Grant 2
Lafayette 1
Green 1
Rock 5
Walworth 2
Racine 13
Kenosha 10

Table 1.6

Injuries by County of Residence

	County	1997		County	1997
01	Adams	**0**	37	Marathon	**5**
02	Ashland	**0**	38	Marinette	**0**
03	Barron	**4**	39	Marquette	**0**
04	Bayfield	**1**	40	Menominee	**2**
05	Brown	**8**	41	Milwaukee	**44**
06	Buffalo	**1**	42	Monroe	**1**
07	Burnett	**0**	43	Oconto	**3**
08	Calumet	**1**	44	Oneida	**1**
09	Chippewa	**2**	45	Outagamie	**7**
10	Clark	**2**	46	Ozaukee	**1**
11	Columbia	**1**	47	Pepin	**0**
12	Crawford	**1**	48	Pierce	**0**
13	Dane	**15**	49	Polk	**0**
14	Dodge	**6**	50	Portage	**1**
15	Door	**0**	51	Price	**2**
16	Douglas	**0**	52	Racine	**13**
17	Dunn	**0**	53	Richland	**2**
18	Eau Claire	**5**	54	Rock	**5**
19	Florence	**0**	55	Rusk	**2**
20	Fond Du Lac	**2**	56	St. Croix	**2**
21	Forest	**1**	57	Sauk	**5**
22	Grant	**2**	58	Sawyer	**1**
23	Green	**1**	59	Shawano	**4**
24	Green Lake	**1**	60	Sheboygan	**3**
25	Iowa	**4**	61	Taylor	**3**
26	Iron	**0**	62	Trempealeau	**3**
27	Jackson	**1**	63	Vernon	**2**
28	Jefferson	**2**	64	Vilas	**3**
29	Juneau	**1**	65	Walworth	**2**
30	Kenosha	**10**	66	Washburn	**0**
31	Kewaunee	**2**	67	Washington	**2**
32	LaCrosse	**5**	68	Waukesha	**16**
33	Lafayette	**1**	69	Waupaca	**1**
34	Langlade	**0**	70	Waushara	**2**
35	Lincoln	**1**	71	Winnebago	**6**
36	Manitowoc	**2**	72	Wood	**3**

State Totals	**230**

Appendix 1.1:
Hospitals and E-Codes,
1997

Hospitals Reporting SCI

Table 1.7
Hospitals Reporting SCI

HOSPITAL	CITY	COUNTY
Langlade Memorial Hospital	Antigo	Langlade
Appleton Medical Center	Appleton	Outagamie
St. Elizabeth Hospital	Appleton	Outagamie
Memorial Medical Center	Ashland	Ashland
Beaver Dam Community Hospitals, Inc.	Beaver Dam	Dodge
Memorial Hospital of Iowa County, Inc.	Dodgeville	Iowa
Luther Hospital	Eau Claire	Eau Claire
Sacred Heart Hospital	Eau Claire	Eau Claire
Lakeland Medical Center, Inc	Elkhorn	Walworth
Fort Atkinson Memorial Health Services	Fort Atkinson	Jefferson
St. Vincent Hospital	Green Bay	Brown
Mercy Health System Corporation	Janesville	Rock
Lutheran Hospital – La Crosse	La Crosse	La Crosse
Franciscan Skemp Medical Center, Inc.	La Crosse	La Crosse
Meriter Hospital, Inc.	Madison	Dane
St. Mary's Hospital Medical Center	Madison	Dane
University of Wisconsin Hospital and Clinics	Madison	Dane
Saint Joseph's Hospital	Marshfield	Wood
Hess Memorial Hospital	Mauston	Juneau
Community Memorial Hospital	Menomonee Falls	Waukesha
Children's Hospital of Wisconsin	Milwaukee	Milwaukee
Columbia Hospital, Inc.	Milwaukee	Milwaukee
Froedtert Memorial Lutheran Hospital	Milwaukee	Milwaukee
Sacred Heart Rehabilitation Institute	Milwaukee	Milwaukee
St. Joseph's Hospital – Milwaukee	Milwaukee	Milwaukee
St. Luke's Medical Center	Milwaukee	Milwaukee
St . Michael Hospital	Milwaukee	Milwaukee
Theda Clark Medical Center	Neenah	Winnebago
Mercy Medical Center	Oshkosh	Winnebago
Southwest Health Center, Inc.	Platteville	Grant
Saint Mary's Medical Center	Racine	Racine
Sheboygan Memorial Medical Center	Sheboygan	Sheboygan
Saint Michael's Hospital	Stevens Point	Portage
Watertown Memorial Hospital	Watertown	Jefferson
Waukesha Memorial Hospital, Inc.	Waukesha	Waukesha
Wausau Hospital	Wausau	Marathon
Tri-County Memorial Hospital, Inc.	Whitehall	Trempealeau
Riverview Hospital Association	Wisconsin Rapids	Wood
Sinai Samaritan Medical Center	Milwaukee	Milwaukee

HOSPITAL	CITY	COUNTY
Holy Family Memorial Medical Center	Manitowoc	Manitowoc
THC/Vencor Hospital	Greenfield	Milwaukee
Lakeview NeuroRehab Center, Midwest	Waterford	Racine

Table 1.8

E-Codes

E-code	*Description*	*Total*	*Male*	*Female*
8120	Traffic accidents with motor vehicle, driver	**15**	8	**7**
8121	Traffic accidents with motor vehicle, passenger	**8**	2	**6**
8122	Traffic accidents with motor vehicle, motorcyclist	**1**	1	**0**
8147	Motor vehicle collision with pedestrian, pedestrian	**1**	0	**1**
8160	Motor vehicle-loss of control, driver	**24**	18	**6**
8161	Motor vehicle-loss of control, passenger	**14**	5	**9**
8162	Motor vehicle-loss of control, motorcyclist	**6**	6	**0**
8166	Motor vehicle-loss of control, pedal cyclist	**1**	1	**0**
8167	Motor vehicle-loss of control, pedestrian	**1**	1	**0**
8171	Non-collision motor vehicle, while boarding, passenger	**1**	1	**0**
8190	Unspecified motor vehicle accident, driver	**1**	1	**0**
8191	Unspecified motor vehicle accident, passenger	**1**	1	**0**
8199	Unspecified motor vehicle accident, unspecified person	**3**	2	**1**
8200	Non-traffic accident (snow vehicle), driver	**2**	2	**0**
8210	Off-road motor vehicle, driver	**2**	2	**0**
8212	Off-road motor vehicle, passenger	**2**	2	**0**
8248	Other motor vehicle, while boarding, other specified person	**1**	1	**0**
8250	Other motor vehicle, non-traffic, driver	**1**	1	**0**
8350	Other unspecified fall in water transport, occupant of small unpowered boat	**1**	1	**0**
8353	Other unspecified fall in water transport, occupant of other watercraft	**1**	1	**0**
8447	Other specified air transport accidents, parachutist	**2**	2	**0**
8796	Other procedures, urinary catheterization	**1**	1	**0**
8809	Fall from stairs or steps, other stairs or steps	**13**	11	**2**
8810	Fall from ladder	**4**	4	**0**
8811	Fall from scaffolding	**2**	2	**0**
882	Fall from or out of building	**13**	9	**3**
8830	Accident from diving or jumping into water	**6**	6	**0**
8840	Fall from playground equipment	**1**	1	**0**
8842	Fall from chair	**3**	2	**1**
8845	Fall from other furniture	**1**	1	**0**
8846	Fall from commode	**2**	1	**1**
8849	Fall from one level to another	**24**	23	**1**
885	Fall from same level, slip, trip, or stumble	**15**	10	**5**

888	Other & unspecified fall	**14**	9	**5**
9068	Other specified injury caused by animals	**2**	2	**0**
916	Struck by falling object	**8**	7	**1**
9170	Struck by objects or persons – in sports	**5**	4	**1**
9179	Struck by objects or persons – other	**3**	3	**0**
9190	Accident caused by argicultural machines	**1**	0	**1**
9229	Accident caused by firearm, unspecified firearm	**2**	2	**0**
927	Overexertion and strenuous movements	**4**	3	**1**
9258	Accident caused by electrical current	**1**	0	**1**
9293	Late effects of accidental fall	**1**	0	**1**
9479	Unspecified drugs or medicinal substances	**1**	1	**0**
9571	Suicide/self-inflicted injury, jumping from high place, other man-made structure	**1**	0	**1**
9600	Fight/ brawl/ rape, unarmed fight or brawl	**1**	1	**0**
9650	Assault by firearms, handgun	**2**	2	**0**
9654	Assault by firearms, other & unspecified firearms	**9**	9	**0**
9854	Intention unknown accident, other & unspecified firearm	**1**	1	**0**

Appendix 1.2:
Spinal Cord Injuries 1997

Table 1.9
1997 Data

Category of Data	*Total*	*Male*	*Female*
INCIDENCE			
Incidence (by gender)	230	176	54
AGE			
0-15	17	10	7
16-30	66	52	14
31-45	67	55	12
46-60	30	24	6
61-75	25	21	4
75+	25	14	11
RACE			
American Indian, Native Alaskan	0	0	0
Asian, Pacific Islander	3	1	2
Black	26	23	3
White	179	134	45
Other	2	2	0
Unknown	20	16	4
Not Reported	0	0	0
ADMISSION MONTH			
January	14	9	5
February	14	10	4
March	19	15	4
April	14	11	3
May	26	21	5
June	32	21	11
July	24	19	5
August	13	10	3
September	22	16	6
October	21	17	4
November	22	19	3
December	9	8	1
ADMISSION DAY			
Monday	34	25	9
Tuesday	23	17	6
Wednesday	17	11	6
Thursday	35	29	6
Friday	34	25	9
Saturday	46	39	7
Sunday	41	30	11
ADMISSION TYPE			
Emergency	155	116	39
Urgent	70	56	14
Elective	5	4	1

(1997 Data, Continued)

Category of Data	*Total*	*Male*	*Female*
ADMISSION SOURCE			
Physician referral	18	13	5
Clinic referral	0	0	0
HMO referral	0	0	0
Transfer from hospital	25	20	5
Transfer from skilled nursing facility	0	0	0
Transfer from another health care facility	9	8	1
Emergency room	178	135	43
Court, law enforcement	0	0	0
Information not available	0	0	0
LENGTH OF INPATIENT STAY			
Total number of days	6,196	4,839	1,357
Average number of days	26.9	27.5	25.1
COST OF INPATIENT HOSPITAL DATA			
Total	$14,204,443	$11,089,022	$3,115,421
Average	$61,758	$63,006	$57,693
MOST FREQUENT CAUSES OF INJURY			
1. Falls	97	79	18
2. Motor vehicle crashes	78	48	30
3. Other injury events	25	20	5
4. Other transportation injuries	13	13	0
5. Assault	12	12	0
6. Natural/Environmental factors	2	2	0
7. Intention unclear	1	1	0
8. Therapeutic Substances	1	1	0
9. Self-inflicted injuries	1	0	1
LEVEL OF SEVERITY			
Tetraplegia	126	95	31
Paraplegia	104	81	23
PATIENT DISCHARGE LOCATION			
Discharged to home or self-care	81	63	18
Discharged or transferred to another short-term general hospital	34	24	10
Discharged or transferred to a skilled nursing facility	14	10	4
Discharged or transferred to an intermediate care facility	5	4	1
Discharged or transferred to another type of institution	61	48	13
Discharged or transferred to home under care of organized health service	23	15	8
Left against medical advice	2	2	0
Expired or did not recover	10	10	0

Conclusions

The establishment of this statewide registry and surveillance program was necessary to document factors and demographics associated with the population of individuals that sustains spinal cord injuries. We believe that the data presented in this report clearly indicates the major etiologies of injury, the disproportionate injuries sustained by certain race, age and gender groups, and the cost of these injuries. In the future, we hope to explore the data further to identify the location of injury, the time and the factors surrounding the injuries, and other determinants that are crucial for injury prevention.

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