

**spinal cord injury in wisconsin
2000**

December 2002

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

acknowledgements

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Alternate format versions of this report are available on request.

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preface

Introduction
Introduction to Spinal Cord Injury
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introduction

The establishment of a statewide database and surveillance program was necessary to clearly identify factors and demographics of the population of individuals who sustain spinal cord injuries (SCIs).

This report represents an overview of spinal cord injuries in Wisconsin occurring in 2000 including incidence, prevalence and economic information. Data presented in this report are drawn from hospital discharge data 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). These codes were chosen based on Center for Disease Control and Prevention Guidelines.

With these data it is possible the same person could be hospitalized more than once during 2000. 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.

The discharge data presented here include all events occurring in Wisconsin during 2000 to Wisconsin residents only. Non-residents of Wisconsin were not included. Hospital discharge data were provided by the Wisconsin Bureau of Health Information under a confidentiality agreement with the Office for Persons with Physical Disabilities (OPPD).

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

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background

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 an SCI surveillance database. The database compiles statewide hospital discharge data about persons sustaining SCIs. These data will enable other investigators to design and implement prevention and service projects, to assist individuals with SCIs to live at their maximum levels of independence in their communities.

The objectives of the Spinal Cord Injury Surveillance include:

- identify and track the incidence of spinal cord injury in Wisconsin,
- provide data to facilitate the development and implementation of effective preventive programs, and
- identify and track the expenditure of treatment and service dollars for persons who are spinal cord injured.

The grant that funded the SCI registry expired in 2000. The Office for Persons with Physical Disabilities continues to provide information and assistance to people with SCI and people seeking information about SCI.

data sources

The 1987 Wisconsin Act 399 established the Bureau of Health Information (BHI), formerly known as the Office of Health Care Information (OHCI). BHI'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 to construct 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.

Hospitals reporting spinal cord injuries in 2000 are shown in Table 1.2 and the diagnoses used are shown in Table 1.3, both in Appendix 1.1.

The case definition used for this analysis is consistent with current Centers for Disease Control (CDC) guidelines for SCI surveillance. These are the ICD-9-CM codes 806.0-806.9 (fracture of vertebral column with spinal cord injury) and 952.0-952.9 (spinal cord injury without evidence of spinal bone injury). This report does not include persons with SCI who died before reaching a hospital.

Data collected from BHI also includes external cause codes (E Codes) which classify causative agents and/or activities for disabling injuries. E-codes provide crucial information to guide, develop and evaluate interventions and initiate prevention activities. E-codes are in Table 1.4.

data security

The SCI database maintains confidential data on individuals. These data are only accessible to the subject of the data and to the data analyst. Measures to retain patient confidentiality are outlined in Wisconsin Statutes 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 are protected electronically through password measures. Copies of data on backup diskettes are kept under lock and key by the analyst at OPPD. An automatic virus-checking program safeguards against virus data corruption.

data quality

While analyzing these data, questions arose relevant to the validity of coding by hospitals of SCIs resulting in permanent neurological deficit necessitating an inpatient rehabilitation stay. An SCI with permanent neurological deficit is one in which the individual becomes paralyzed including tetraplegia, paraplegia or has paralysis of bowel and bladder functions.

In the American Journal of Epidemiology, Vol. 146, pp 266-272, 1997, Johnson et al. raised the issue of accuracy in reporting of SCI to a statewide database in Colorado. They report a positive predictive value of 0.55, implying that one can be only 55 percent certain that an identified case of SCI resulted in permanent neurological deficit. This affects the surveillance aspects of any database planning to record only SCIs with permanent neurological deficit.

While full medical chart review of all reported cases is not feasible due to cost, time and confidentiality, an attempt is underway to screen data using available codes via a validity screen developed by Dr. Dennis Maiman, a neurosurgeon at the Medical College of Wisconsin.

A study was recently conducted to test the effectiveness of the validity screen. It found that cases without permanent neurological deficit were identified 82 percent of the time while cases with permanent neurological deficit were identified 74 percent of the time. For a copy of this study, contact the SCI analyst.

wisconsin's population

Table 1.7 in Appendix 1.3 summarizes Wisconsin's population by gender and age. From 2000 census data, Wisconsin's 2000 population was 49.4 percent male and 50.6 percent female. The largest population age group for both males and females was 18 - 44, comprising 39.2 percent of the general population. Ages 0-17 (25.5%), 45-64 (22.2%) and 65+ (13.1%) followed (Wisconsin Department of Health and Family Services, 2000).

Table 1.7 in Appendix 1.3 shows SCI events by county of residence in 2000. These data reflect the county in which the person lives, not necessarily the county in which the SCI occurred. As expected, counties with greater population rates had a higher number of injury events occurring to their residents.

introduction to spinal cord injury

The spinal cord is part of the nervous system and is the largest nerve in the body. It is approximately 18 inches long and extends from the base of the brain, down the middle of the back, to the waist. The spinal cord is surrounded by protective rings of bone called the vertebral column, or spinal column. The 33 vertebrae of the spine are divided into several regions.

The cervical spine in the neck area consists of seven vertebrae and eight nerve roots. They are smaller than other vertebrae, allowing for greater movement. The thoracic spine, at chest level, has 12 vertebrae and nerve roots. The spinal canal in the thoracic region is relatively smaller than the cervical or lumbar areas, putting the thoracic spinal cord at greater risk if there is a fracture (Maddox, 1993). The lumbar spine, in the low back region, has five vertebrae and nerve roots. The sacrum 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.

The central nervous system consists of the brain and spinal cord. The nerves in 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 lower motor neurons, spinal nerves that branch out from the spinal cord to other parts of the body. 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 controlling involuntary functions such as blood pressure and temperature regulation.

Spinal cord injury (SCI) refers to any injury of the neural elements within the spinal column. SCI can occur from trauma or disease to the vertebral column or the spinal cord. Most SCIs result from trauma to the vertebral column. The spinal cord does not have to be severed for a loss of functioning to occur. Most people with SCI have an intact spinal cord, 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 controlling sensory, motor and autonomic function below the level of injury.

Typically, the nerves above the injury site continue to function normally but 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.

report

Executive Summary
Incidence of Spinal Cord Injury
Hospitalization and Cost Information
Causes of Injury
Level and Severity of Injury
Discharge Location
Conclusion
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executive summary

In 2000, there were 263 SCI events in Wisconsin with falls and motor vehicle accidents as the predominant causes of hospitalization. Males disproportionately represent 75.0 percent of SCI events.

- The average age at time of injury was 44.2 (males 42.1 and females 50.5), with the most frequent age at 28.5 for males and 55.5 for females.
- Males ages 18-44 represent the overall largest group of injury with 91 (34.6% overall) injuries, followed by men in the 45-64 age group with 51 (19.4% overall) injuries.
- Females ages 65+ represent the largest group of women with 27 (10.3%) injuries and women 45-64 represent the next largest group with 26 (9.9% overall) injuries.
- Overall, 117 (44.5%) injuries (both men and women) occurred between the ages of 18-44.
- Individuals age 65+ comprised 61(23.2%) of all injuries.

SCI can result in paraplegia or tetraplegia. Eighty (30.4%) resulted in tetraplegia, 54 (20.5%) to men and 26 (9.9%) to women. One hundred eighteen injuries (44.9%) resulted in paraplegia, 91 (34.6%) to men and 27 (10.3%) to women. See Graph 1.10, page 28.

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 SCIs during 2000 were white (205 or 77.9%), followed by African Americans with 23 (8.7%) injuries. Although whites sustain the majority of spinal cord injuries, members of minority groups sustain a disproportionate percentage relative to their numbers. African Americans comprise approximately 5.7% of Wisconsin's population (2000 Census).

Summer and fall had the highest number of spinal cord injury events, with 28 in August and 27 in September. Sunday and Friday had the highest incidence of spinal cord injuries with 55 (20.9%) and 44 (16.7%) respectively.

The average length of an inpatient hospital stay in 2000 was 16.5 days. In 2000, hospital charges for treatment for SCIs totaled more than \$16 million. The average cost for acute inpatient hospital stay is \$56,973.

In 2000, 53.6% (141) of initial inpatient stays were paid by fee for service insurance. Eighty-eight (33.5%) initial inpatient stays were paid for by an Alternative Health Care Insurance Plan (HMO, PPO, PPA, etc.). This represents a 22.4% decrease over 1998, during which fee for service insurance paid 76% of SCI inpatient stays and Alternative Health Care Insurance Plans paid 31% of inpatient SCI stays, an increase of 2.5%.

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.

spinal cord injury events: 2000

The Incidence of Spinal Cord Injury

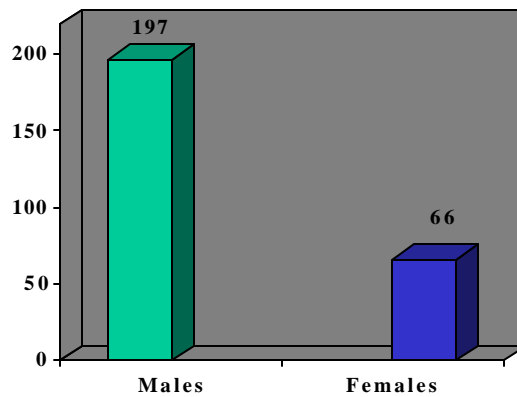
From January 1, 2000 to December 31, 2000, a total of 263 Wisconsin residents were hospitalized for an SCI.

Demographics

Sex

Males sustained 197 injuries (74.9%) and females sustained 66 injuries (25.1%) (Graph 1.1).

Graph 1.1
Injuries by Gender and Year
2000

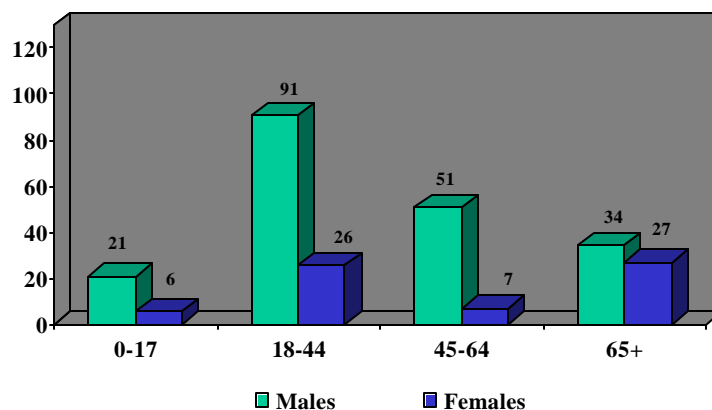


Age

The average age at time of injury was 44.2. The mean age at injury was higher for females (55.5) than for males (28.5). Ages range from 2 to 94.

- Males aged 18-44 represent the overall largest group of injury with 91 (34.6%) injuries, followed by men in the 45-64 age group with 51 (19.4%) injuries.
- Females aged 65+ represent the largest group of women with 27 (10.3%) injuries, followed by women 45-64 with 51 injuries (19.4%) (Graph 1.2).

Graph 1.2
 Injuries by Age and Gender
 2000



Overall, 44.5% of all injuries occurred to individuals between the ages of 18-44. The next highest age group was 65+, with 61(23.2%) injuries. Fifty-eight (22.1%) injuries occurred to individuals aged 45 to 64 and 27 (10.3%) injuries occurred between the ages of 0-17. The total number of spinal cord injuries for each age group and gender is listed in Table 1.5.

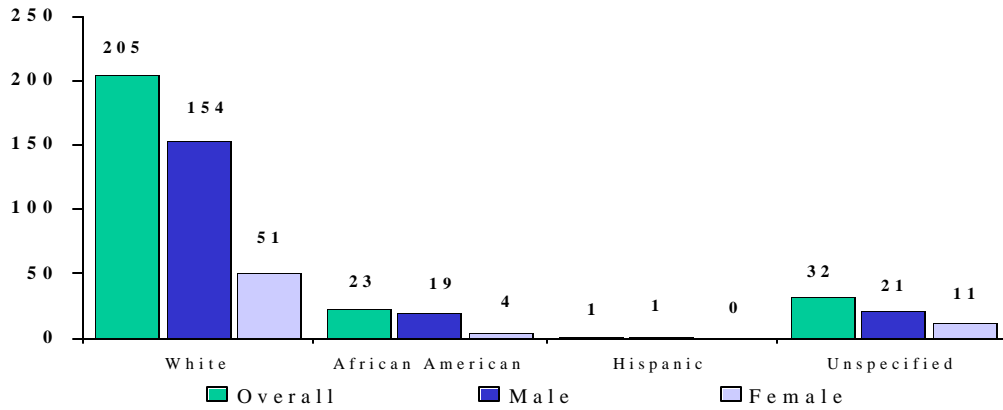
Among racial/ethnic groups, whites had the highest mean age at injury (46 years), while Hispanics have the lowest mean age at injury (20 years). The mean age at injury for African Americans is 36 years and 25.5 years for Asian/Pacific Islanders.

Ethnicity

The race of some patients in 2000 was unknown or documented as “other” or was otherwise unspecified (32 or 12.2%). The majority of individuals admitted for SCIs during 2000 were white (205 or 77.9%), followed by 23 (8.7%) for African Americans, and 1 (.4%) for Hispanics (Graph 1.3).

Although whites sustained the majority of spinal cord injuries, members of minority groups sustained a disproportionate percentage relative to their numbers in Wisconsin. In fact, 5.7% of Wisconsin’s population is African American (2000 Census), yet this group sustained 8.7% of all spinal cord injuries in Wisconsin.

Graph 1.3
Injuries by Race
2000

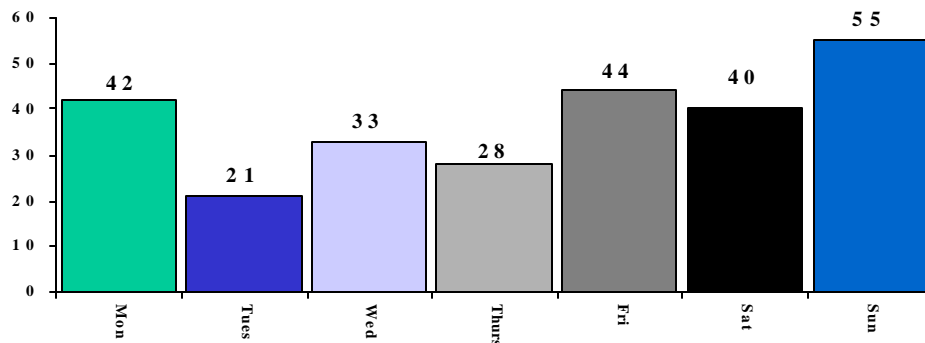


Hospitalization and Cost Information

Admission Day, Month, Type and Source

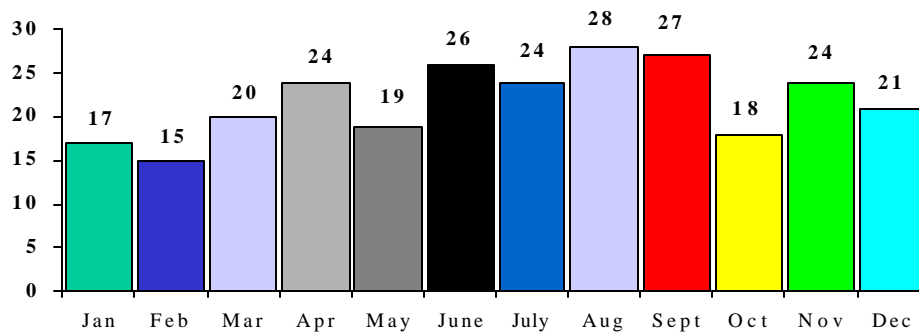
In 2000, the majority of SCI events occurred on Sunday with 55 injuries (20.9%), followed closely by Fridays with 44 injuries (16.7%). Tuesdays have the lowest number of injury events with 21 (8.0%) (Graph 1.4).

Graph 1.4
Admission by Day of the Week
2000



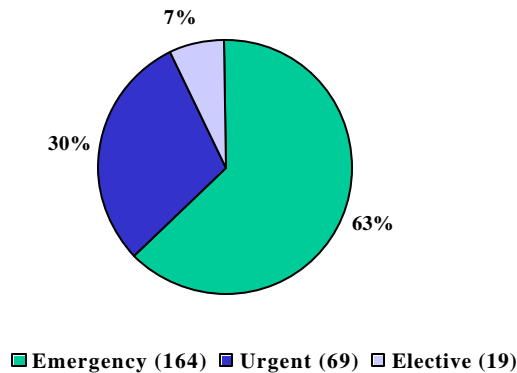
The highest number of injuries during one month, 28, occurred during August followed by 27 injuries in September. January and February had the lowest number of injuries with 17 and 15 respectively (Graph 1.5).

Graph 1.5
Admission by Month
2000



Both the largest type and source of admission to hospitals involving residents with SCIs occurred during emergency situations, 164 or 62.4%, when the patient required immediate medical intervention as a result of severe, life threatening or potentially disabling conditions (Graph 1.6).

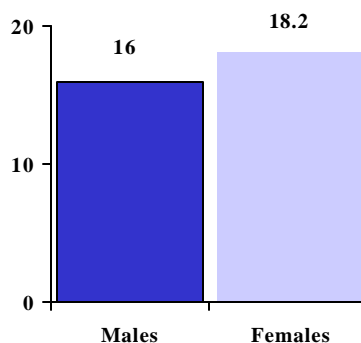
Graph 1.6
Type of Admission
2000



Length of Inpatient Stay

The average length of an acute inpatient hospital stay in 2000 was 16.5 days. The average length of stay for men was 16 days, for women 18.2 days (Graph 1.7). The length of inpatient stay has decreased by 18.7 days since 1990 when the overall average length of stay was 35.2 days, 36.5 for men and 31.5 for women. The average length of stay for a tetraplegia injury was 15.5 days (16.1 for men and 14.2 for women) and for a paraplegia injury, 15.7 days (15.5 for men and 16.6 for women).

Graph 1.7
Average Length of Inpatient Stay by Gender
2000



Cost of Inpatient Hospital Care

In 2000, acute care hospital charges for treatment of spinal cord injury totaled more than \$16 million. In 1990 the overall cost totaled more than \$11 million. Since 1990, which had an incidence of 204 SCIs in Wisconsin, compared with the 2000 incidence of 263, there has been a decrease of 18.7 days in the average length of inpatient stay. The average cost for an acute inpatient hospital stay has increased from \$55,542 in 1990 to \$56,973 in 2000.

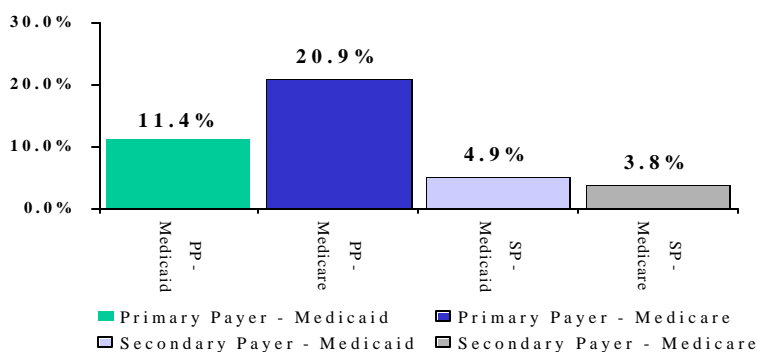
The cost of hospitalization was greater for males than females. In 2000, males averaged \$57,129 per year, females averaged \$56,490 per year, down from an average cost of \$59,597 for men and up from \$43,986 for women in 1990. Thirty-nine percent of all injuries to females (26) resulted in tetraplegia, while 27.4% of injuries to males (54) resulted in a tetraplegia diagnosis. Twenty-seven injuries (40.9% of all injuries to women) resulted in paraplegia, while 91 injuries (46.2% of all injuries to men) resulted in paraplegia.

It is important to remember that these costs do not reflect the total cost for a spinal cord injury, because medical equipment, ongoing medical care, home and vehicle modifications and attendant care add to the overall costs of spinal cord injuries.

Payer Type

In 2000, the majority of initial inpatient stays (141 or 53.6%) were paid for by fee for service insurance. Eighty-eight (33.5%) initial inpatient stays were paid for by an Alternative Health Care Insurance Plan (HMO, PPO, PPA, etc.). Other payment types included worker's compensation (10 or 3.8%), other government agency or program (1 or .4%), and self-pay (17 or 6.5%). For 6 (2.3%) inpatient stays, the exact type of payment, either fee for service or HMO was unable to be determined.

Graph 1.8
Primary and Secondary Payers
2000



Primary and Secondary Payer

Medicare was the primary payer for 55 (20.9%) initial inpatient stays; Medicaid for 30 (11.4%) stays. Medicare was the secondary payer for 10 (3.8%) initial hospital stays; Medicaid for 13 (4.9%) (Graph 1.8).

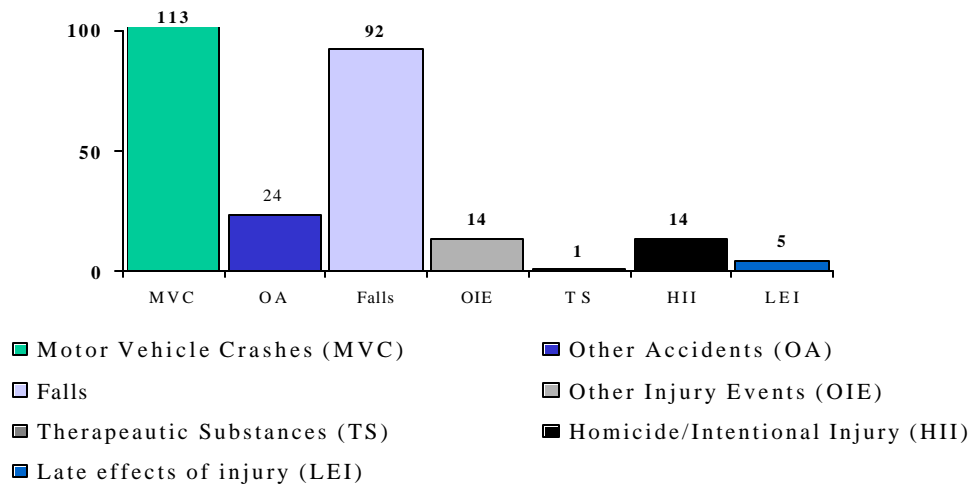
Causes of Injury

Based on E-Codes, the leading cause of SCI during 2000 was motor vehicle accidents (113), followed by falls (92) and then other accidents (24) such as injuries incurred by sports, agriculture or machinery. Motor vehicle crashes were the leading cause of injury to those aged 18-44. After age 45, the leading cause of injury was due to some type of fall (64 or 24.3%) (Graph 1.9).

Falls were the leading cause of injury to whites with 81 injuries, 30.8% overall or 39.5% of injuries to that population. Homicide and intentional injury (assault and self-inflicted injuries) were the leading cause of injuries to African Americans (11 or 4.2% overall) which represents 47.8% of injuries to that populations.

The second leading cause of injury to whites was Motor Vehicle Accidents (79 or 30% overall), followed by Other Accidents with 18 or 6.8% of injuries overall. For African Americans, the second leading cause of injury was motor vehicle accidents (8 or 3.0% overall) which represent 34.8% of all SCIs to that group.

Graph 1.9
**Causes of Injury
 2000**



The causes of SCIs for 2000 are listed in Table 1.4 in Appendix 1.1.

Table 1.1
Causes of SCI by Selected Age Groups and Gender: 2000

Age Groups and Causes	Total		Male		Female	
	Number of SCI Events	%	Number of SCI Events	%	Number of SCI Events	%
0-17						
Total All Causes	27	100	21	77.8	6	22.2
Motor Vehicle Crashes	12		6		6	
Other Accidents	5		5		0	
Falls	7		7		0	
Other Injury Events	2		2		0	
Homicide/Intentional Injury	1		1		0	
18-44						
Total All Causes	117	100	91	77.8	26	22.2
Motor Vehicle Crashes	65		48		17	
Falls	21		16		5	
Other Accidents	9		9		0	
Homicide/Intentional Injury	13		10		3	
Other Injury Events	7		6		1	
Late Effects of Injury	2		2		0	
45-64						
Total All Causes	58	100	51	87.9	7	12.1
Falls	27		21		6	
Motor Vehicle Crashes	20		20		0	
Other Accidents	4		4		0	
Homicide/Intentional Injury	1		1		0	
Other Injury Events	4		4		0	
Therapeutic Substances	1		0		1	
Late Effects of Injury	1		1		0	
65+						
Total All Causes	61	100	34	55.7	27	44.3
Falls	37		19		18	
Motor Vehicle Crashes	16		9		7	
Other Injury Events	1		1		0	
Other Accidents	6		4		2	
Late Effects of Injury	1		1		0	

Motor Vehicle Accidents

In 2000, motor vehicle accidents (MVAs) were the leading cause of SCI in Wisconsin and the leading cause of injury to males and to ages 0 to 44 for both genders. Of the 113 injury events, 63 (24%) resulted in injuries to males and 29 (11%) to females.

In 26.2% (69) of MVAs, the driver sustained an SCI. The remainder of injuries sustained in an MVA occurred to passengers or pedestrians. Fifteen (5.7%) of all MVAs occurred to individuals on a motorcycle (Table 1.9).

Falls

Falls were the second leading cause of SCI among Wisconsin residents, comprising 35.0% of all injuries (92). Males sustained approximately two times as many injuries as females. Falls were the leading cause of spinal cord injury for both genders ages 45 and older. Ten (3.8%) falls occurred when an individual fell from one level to another while 11 (4.2%) falls were the result of a slip, trip or stumble (a fall on the same level). Of all falls, 40.2% occurred to persons older than 65.

Other Accidents

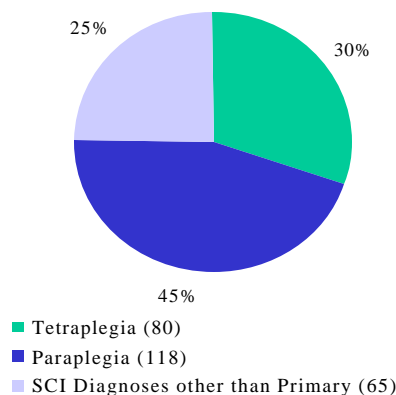
This was the third leading cause of injury, not related to transport vehicles, but including injuries incurred from sports, agriculture, machinery and over-exertion. Twenty-four injuries (9.1%) were sustained due to these events.

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). Based on Primary Diagnosis data, 80 (30.4%) of all SCIs resulted in tetraplegia and 118 (44.9%) in paraplegia (Graph 1.10). Men sustained 54 injuries (67.5% of all tetraplegia injuries) and women 26, 32.5% of injuries resulting in tetraplegia. Men received 91 injuries (77.1% of all paraplegia injuries) and women 27, 22.9% of injuries resulting in paraplegia.

Graph 1.10

Severity of Injury 2000



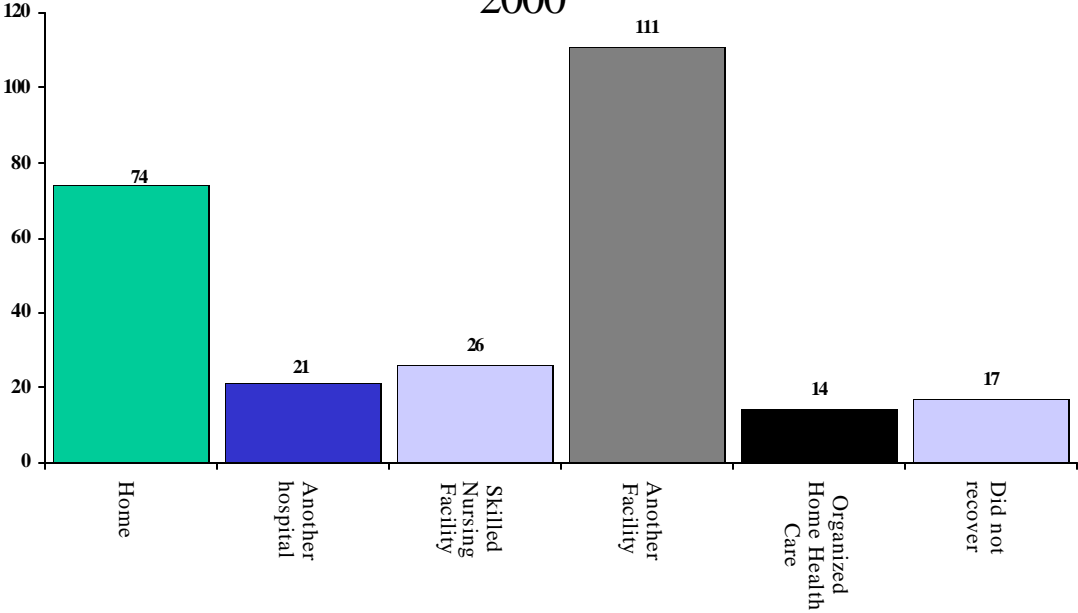
The severity of a spinal cord injury is determined by the level of the injury and by the amount of neurological impairment. A spinal cord injury at any level may impair strength, sensation, bowel, bladder and sexual functioning.

An SCI can also be described as complete or incomplete. With a complete injury an individual has no function, sensation or voluntary movement below the level of injury. In most cases, both sides are equally affected. With an incomplete injury there is some functioning below the primary level of injury and 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.

Discharge Location

The majority of SCI patients were discharged to another facility of type of institution (110 or 41.8%). Discharges to home were the second most common with 74 (28.1%) discharges (Graph 1.11).

Graph 1.11
Patient Discharge Location
2000



conclusions

The statewide SCI database documents factors and demographics associated with individuals who sustain SCIs. These data indicate major etiologies of injury, the disproportionate injuries sustained by certain age and gender groups and the cost of these injuries.

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All population estimates

Wisconsin Department of Health and Family Services. <http://www.dhfs.state.wi.us/population>

appendix 1.1

Hospitals Reporting SCI
Principal Diagnoses
E Codes

hospitals reporting SCI table 1.2

hospital	city	county
Amery Regional Medical Center	Amery	Polk
Appleton Medical Center	Appleton	Outagamie
St. Elizabeth Hospital	Appleton	Outagamie
Memorial Medical Center	Ashland	Ashland
Barron Memorial Medical Center	Barron	Barron
Beloit Memorial Hospital, Inc.	Beloit	Rock
Berlin Memorial Hospital	Berlin	Green Lake
Elmbrook Memorial Hospital	Brookfield	Waukesha
Columbus Community Hospital	Columbus	Columbia
Upland Hills Health, Inc.	Dodgeville	Iowa
Luther Hospital	Eau Claire	Eau Claire
Sacred Heart Hospital	Eau Claire	Eau Claire
Lakeland Medical Center, Inc.	Elkhorn	Walworth
Agnesian Health Care, Inc.	Fond du Lac	Fond du Lac
St. Mary's Hospital Medical Center	Green Bay	Brown
St. Vincent Hospital	Green Bay	Brown
Kindred Hospital – Milwaukee	Greenfield	Milwaukee
Mercy Health System Corporation	Janesville	Rock
Gunderson Lutheran Medical Center, Inc.	La Crosse	La Crosse
Franciscan Skemp Medical Center, Inc.	La Crosse	La Crosse
Grant Regional Health Center, Inc.	Lancaster	Grant
St. Mary's Hospital Medical Center	Madison	Dane
University of Wisconsin Hospital and Clinics	Madison	Dane
Holy Family Memorial Medical Center	Manitowoc	Manitowoc
Saint Joseph's Hospital	Marshfield	Wood
Community Memorial Hospital	Menomonee Falls	Waukesha
Good Samaritan Health Center	Merrill	Lincoln
St. Mary's Hospital – Ozaukee	Mequon	Ozaukee
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. Michael Hospital	Milwaukee	Milwaukee
St. Luke's Medical Center	Milwaukee	Milwaukee
Theda Clark Medical Center	Neenah	Winnebago

hospital	city	county
Mercy Medical Center	Oshkosh	Winnebago
Prairie du Chien Memorial Hospital	Prairie du Chien	Crawford
All Saints - Saint Mary's Medical Center, Inc.	Racine	Racine
Tomah Memorial Hospital, Inc.	Tomah	Monroe
Lakeview NeuroRehab Center - Midwest	Waterford	Racine
Watertown Memorial Hospital	Watertown	Jefferson
West Allis Memorial Hospital	West Allis	Milwaukee
Howard Young Medical Center, Inc.	Woodruff	Oneida

principal diagnosis

table 1.3

diagnosis code	principal diagnosis	all	male	female
806	fracture of vertebral column with SCI			
806.0	cervical, closed			
806.00	C1-C4 level with unspecified spinal cord injury	8	6	2
806.01	C1-C4 level with complete lesion of cord	9	7	2
806.03	C1-C4 level with central cord syndrome	4	3	1
806.04	C1-C4 level with other specified spinal cord injury	5	4	1
806.05	C5-C7 level with unspecified spinal cord injury	10	9	1
806.06	C5-C7 level with complete lesion of cord	13	10	3
806.08	C5-C7 level with central cord syndrome	5	4	1
806.09	C5-C7 level with other specified spinal cord injury	8	5	3
806.1	cervical, open			
806.11	C1-C4 level with complete lesion of cord	1	1	0
806.14	C1-C4 level with other specified spinal cord injury	1	1	0
806.19	C5-C7 level with other specified spinal cord injury	1	0	1
806.2	dorsal (thoracic), closed			
806.21	T1-T6 level with complete lesion of cord	10	7	3
806.23	T1-T6 level with central cord syndrome	2	2	0
806.24	T1-T6 level with other specified spinal cord injury	5	1	4
806.25	T7-T12 level with unspecified spinal cord injury	6	3	3
806.26	T7-T12 level with complete lesion of cord	11	9	2
806.28	T7-T12 level with central cord syndrome	1	1	0
806.29	T7-T12 level with other specified spinal cord injury	4	1	3
806.3	dorsal (thoracic), open			
806.35	T7-T12 level with unspecified spinal cord injury	1	1	0
806.36	T7-T12 level with complete lesion of cord	3	3	0
806.4	lumbar, closed	23	14	9
806.6	sacrum and coccyx, closed			
806.60	Sacrum, coccyx with unspecified spinal cord injury	2	1	1
806.62	Sacrum, coccyx with other cauda equina injury	1	1	0

diagnosis code	principal diagnosis	all	male	female
952	SCI without evidence of spinal bone injury			
952.0	cervical			
952.00	C1-C4 level with unspecified spinal cord injury	10	8	2
952.01	C1-C4 level with complete lesion of spinal cord	2	1	1
952.03	C1-C4 level with central cord syndrome	11	6	5
952.04	C1-C4 level with other specified spinal cord injury	4	3	1
952.05	C1-C4 level with unspecified spinal cord injury	9	7	2
952.06	C5-C7 level with complete lesion of spinal cord	2	2	0
952.08	C5-C7 level with central cord syndrome	11	10	1
952.09	C5-C7 level with other specified spinal cord injury	4	4	0
952.1	dorsal (thoracic)			
952.10	T1-T6 level with unspecified spinal cord injury	1	1	0
952.11	T1-T6 level with complete lesion of spinal cord	3	3	0
952.13	T1-T6 level with central cord syndrome	1	1	0
952.14	T1-T6 level with other specified spinal cord injury	1	1	0
952.18	T7-T12 level with central cord syndrome	1	1	0
952.2	lumbar	3	2	1
952.8	multiple sites of spinal cord	1	1	0
952.9	unspecified site of spinal cord	10	8	2
totals*		208	153	55

*Numbers do not coincide with 2000 incidence because only principal diagnoses are counted here.

e codes
Table 1.4

e code	description	all	male	female
E810.0- E819.9	motor vehicle accidents – traffic			
812.0	Traffic accident with motor vehicle, driver	19	11	8
812.1	Traffic accident with motor vehicle, passenger	9	4	5
812.2	Traffic accident with motor vehicle, motorcyclist	5	5	0
813.8	Traffic accident with other vehicle, other person	1	1	0
814.7	Traffic accident, collision with pedestrian, pedestrian	2	2	0
815.0	Traffic accident, collision on the highway, driver	3	2	1
815.9	Traffic accident, collision on the highway, unspecified	1	1	0
816.0	Traffic accident, loss of control, driver	34	26	8
816.1	Traffic accident, loss of control, passenger	9	6	3
816.2	Traffic accident, loss of control, motorcyclist	6	6	0
818.0	Traffic accident, non-collision, driver	2	1	0
818.1	Traffic accident, other, non-collision, passenger	1	1	0
819.0	Unspecified motor vehicle accident, driver	4	3	1
819.2	Unspecified motor vehicle accident, motorcyclist	3	3	0
819.9	Unspecified motor vehicle accident, unspecified person	2	2	0
E820.0-E825.9	motor vehicle accidents – non traffic			
820.0	Non-traffic accident (snow vehicle), driver	5	5	0
821.0	Off-road motor vehicle, driver	1	1	0
821.1	Off-road motor vehicle, passenger	2	0	2
821.2	Off-road motor vehicle, motorcyclist	1	1	0
821.9	Off-road motor vehicle, unspecified person	1	1	0
823.0	Collision with moving object, driver	1	1	0
825.1	Motor vehicle, non traffic, unspecified nature, passenger	1	0	1
E826.0-E829.9	other road vehicle accidents			
826.1	Pedal cycle accident, cyclist	1	1	0
827.3	Animal-drawn vehicle accident, occupant of vehicle	1	1	0
828.2	Animal being ridden, accident, rider	2	2	0
E830.0-E838.9	water transport accidents			
835.3	Fall in water transport, unspecified, non-crew occupant	1	1	0
838.4	Water transport accident, unspecified, water skier	1	1	0
E840.0-E845.9	air and space transport accidents			
840.2	Powered aircraft accident, take-off or landing, crew	1	1	0
E849.0-E849.9	place of occurrence			
849.0	Home	1	1	0
849.4	Place for recreation and sport	1	1	0
E878.0-E879.9	surgical and medical procedure			
878.1	Surgical implant of artificial, internal device	1	0	1
879.6	Later complication or abnormal reaction from procedure	1	1	0
879.8	Blood transfusion	1	1	0

e code	description	all	male	female
E880.0-E888.9	accidental falls			
880	Fall on or from stairs or steps	1	1	0
880.9	Fall from stairs or steps, other stairs or steps	17	13	4
881.0	Fall from ladder	2	1	1
881.1	Fall from scaffolding	1	1	0
882	Fall from or out of building	7	6	1
883.0	Accident from diving or jumping into water, pool	8	8	0
883.9	Accident from diving or jumping into water, hole/other	1	1	0
884.4	Fall from bed	4	1	3
884.5	Fall from other furniture	1	1	0
884.6	Fall from commode	1	0	1
884.9	Fall from one level to another	10	9	1
885	Fall from same level, slip, trip, or stumble	11	6	5
885.9	Sports tackle	8	4	4
887	Fracture, cause unspecified	1	1	0
888	Other and unspecified fall	19	10	9
E910.0-E915.9	submersion, suffocation and foreign bodies			
910.2	Drowning/submersion, without diving equipment	1	1	0
910.8	Drowning/submersion, tank or pool	1	1	0
E916.0-E928.9	other accidents			
916	Struck by falling object	4	4	0
917.0	Struck by objects or persons – in sports	6	6	0
919.0	Accident caused by agricultural machinery	1	1	0
919.8	Accident caused by machinery	2	2	0
920.1	Accident by cutting/piercing instruments, hand tools	1	1	0
920.8	Accident by cutting/piercing instruments, unspecified	2	2	0
922.2	Accident caused by firearm, hunting rifle	1	1	0
922.9	Accident caused by firearm, unspecified firearm	1	1	0
928.8	Environmental/accidental causes, other	2	1	1
928.9	Environmental/accidental causes, unspecified	4	3	1
E929.0-E929.9	late effects of injury			
929.0	Of motor vehicle accident	4	4	0
929.3	Of accidental fall	1	1	0
E930.0-E949.9	therapeutic use			
943.8	Agents affecting gastrointestinal system	1	0	1
E960.0-E969.9	homicide and intentional injury			
960.0	Unarmed fight or brawl	2	1	1
965.0	Assault by firearms, handgun	3	3	0
965.4	Assault by firearms, other and unspecified firearms	6	6	0
968.5	Assault by unspecified means, transport vehicle	1	1	0
968.8	Assault by unspecified means, other	1	0	1
E980.0-E989.9	injury, undetermined accidental or intentional			
987.0	Fall from a high place, residential premises	1	0	1

appendix 1.2

SCI Data 2000

2000 data

Table 1.5

category of data	total	male	female
incidence			
Incidence (by gender)	263	197 (74.9)	66 (25.1)
age			
0-17	27	21	6
18-44	117	91	26
45-64	58	51	7
65+	61	34	27
race			
American Indian, Native Alaskan	0	0	0
Asian, Pacific Islander	2	2	0
African American	23	19	4
White	205	154	51
Hispanic	1	1	0
Other	4	4	0
Unspecified	28	17	11
admission month			
January	17	12	5
February	15	11	4
March	20	17	3
April	24	19	5
May	19	16	3
June	26	21	5
July	24	16	8
August	28	19	9
September	27	20	7
October	18	14	4
November	24	16	8
December	21	16	5
admission day			
Monday	42	30	12
Tuesday	21	18	3
Wednesday	33	24	9
Thursday	28	21	7
Friday	44	31	13
Saturday	40	31	9
Sunday	55	42	13
admission type			
Emergency	164	123	41
Urgent	80	62	18
Elective	19	12	7

category of data	total	male	female
admission source			
Physician referral	25	16	9
Clinic or HMO referral	0	0	0
Transfer from hospital	51	40	11
Transfer from skilled nursing facility	1	1	0
Transfer from another health care facility	3	3	0
Emergency room	181	135	46
Information not available	2	2	0
length of inpatient stay			
Total number of days	4881	3569	1312
Average number of days	16.5	16.0	18.2
cost of inpatient hospital data			
Total	\$16,807,100.57	\$12,739,808.20	\$4,067,292.37
Average	\$56,973.22	\$57,129.18	\$56,490.17
causes of injury			
Falls	92	63	29
Motor vehicle accidents – traffic and non traffic	113	83	30
Other accidents	24	22	2
Other injury events	14	13	1
Homicide/intentional injury	14	11	3
Late effects of injury	5	5	0
Therapeutic Substances	1	0	1
level of severity			
Tetraplegia	80	54	26
Paraplegia	118	91	27
patient discharge location			
Discharged to home or self-care	74	55	19
Discharged or transferred to another short-term general hospital	21	14	7
Discharged or transferred to a skilled nursing facility	26	15	11
Discharged or transferred to an intermediate care facility	1	1	0
Discharged or transferred to another type of institution	110	91	19
Discharged or transferred to home under care of organized home health service	14	8	6
Left against medical advice	0	0	0
Expired or did not recover	17	13	4

*Numbers do not coincide with 2000 incidence because only principal diagnoses are counted here.

appendix 1.3

Glossary of Terms

Wisconsin's Population and Incidence of Injury by County

Wisconsin's Population Projections by Age Group

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.

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.

wisconsin's population and incidence of injury by county

table 1.6

county name	1990 census	2000 census	number of injuries
Adams	15,682	18,643	0
Ashland	16,307	16,866	0
Barron	40,750	44,963	3
Bayfield	14,008	15,013	1
Brown	195,594	226,778	14
Buffalo	13,584	13,804	1
Burnett	13,084	15,674	0
Calumet	34,291	40,631	0
Chippewa	52,360	55,195	4
Clark	31,647	33,557	1
Columbia	45,088	52,468	4
Crawford	15,940	17,243	1
Dane	367,085	426,526	16
Dodge	76,559	85,897	5
Door	25,690	27,961	2
Douglas	41,758	43,287	0
Dunn	35,909	39,858	2
Eau Claire	85,183	93,142	5
Florence	4,590	5,088	0
Fond du Lac	90,083	97,296	9
Forest	8,776	10,024	0
Grant	49,266	49,597	4
Green	30,339	33,647	0
Green Lake	18,651	19,105	1
Iowa	20,150	22,780	3
Iron	6,153	6,861	0
Jackson	16,588	19,100	2
Jefferson	67,783	74,021	1
Juneau	21,650	24,316	1
Kenosha	128,181	149,577	9
Kewaunee	18,878	20,187	1
LaCrosse	97,904	107,120	3
Lafayette	16,074	16,137	1
Langlade	19,505	20,740	0
Lincoln	26,993	29,641	2
Manitowoc	80,421	82,887	10
Marathon	115,400	125,834	10

county name	1990 census	2000 census	number of injuries
Marinette	40,548	43,384	0
Marquette	12,321	15,832	3
Menominee	3,890	4,562	0
Milwaukee	959,275	940,164	51
Monroe	36,633	40,899	2
Oconto	30,226	35,634	4
Oneida	31,679	36,776	1
Outagamie	140,510	160,971	8
Ozaukee	72,831	82,317	3
Pepin	7,107	7,213	0
Pierce	32,765	36,804	0
Polk	34,773	41,319	1
Portage	61,405	67,182	1
Price	15,600	15,822	0
Racine	175,034	188,831	9
Richland	17,521	17,924	1
Rock	139,510	152,307	6
Rusk	15,079	15,347	3
St. Croix	50,251	63,155	1
Sauk	46,975	55,225	5
Sawyer	14,181	16,196	0
Shawano	37,157	40,664	1
Sheboygan	103,877	112,646	6
Taylor	18,901	19,680	0
Trempealeau	25,263	27,010	1
Vernon	25,617	28,056	1
Vilas	17,707	21,033	0
Walworth	75,000	93,759	8
Washburn	13,772	16,036	0
Washington	95,328	117,493	4
Waukesha	304,715	360,767	13
Waupaca	46,104	51,731	4
Waushara	19,385	23,154	1
Winnebago	140,320	156,763	6
Wood	73,605	75,555	3
	4,891,769	5,363,675	263

wisconsin population projections by age group

Table 1.7

age group	male	female	2000 census
0 - 17	701,705	667,051	1,368,756
18 - 44	1,063,176	1,039,143	2,102,319
45 - 64	592,650	597,397	1,190,047
65+	291,510	411,043	702,553
totals	2,649,041	2,714,634	5,363,675