

Supplementary Online Content

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This supplementary material has been provided by the authors to give readers additional information about their work.

eAppendix 1. ICD-9 CM Codes for Acute Traumatic Spinal Cord Injury (SCI) Diagnosis

SCI with Vertebral Fracture

- Cervical closed: 806.00 – 806.09
- Cervical open: 806.10 – 806.19
- Thoracic closed: 806.20 – 806.29
- Thoracic open: 806.30 – 806.39
- Lumbar (open and closed): 806.4; 806.5
- Sacrum and coccyx closed: 806.60 – 806.69
- Sacrum and coccyx open: 806.70 – 806.79
- Unspecified SCI: 806.8 – 806.9

SCI without Vertebral Fracture

- Cervical: 952.00 – 952.09
- Thoracic: 952.10 – 952.19
- Other and unspecified: 952.2 – 952.9

Note: Injury to nerve roots and spinal plexus codes not included

Injury Diagnoses

- Injury and Poisoning: 800.0 – 904.9
- Superficial Injury and Contusions: 910.0 – 929.9
- Burns and injury to nerves and spinal cord : 940.0 – 957.9
- Other and unspecified injury: 959.0 – 959.9

*Note: - Late complications of injury and trauma complication codes excluded
- Poisoning and toxic effects of substances, external causes (radiation, air pressure, heat, electric current, allergy, child abuse, adult abuse) codes excluded
- Complications of surgical and medical care codes excluded*

eAppendix 2. ICD-9-CM Diagnosis and Procedure Codes for Complications, Etiology, and Procedures

Complications

- Pulmonary embolism and infarction (excluding septic): 415.11, 415.19
- Deep venous thrombosis of proximal or distal lower extremity: 453.40, 453.41 453.42
- Pressure ulcer: 707.00 through 707.09

Etiology

- Motor vehicle accidents:
 - Motor vehicle traffic accidents: E810.0 through E819.9
 - Motor vehicle non-traffic accidents: E820.0 through E825.9
- Unintentional Falls* (excludes if undetermined whether accidental or purposely inflicted):
 - E880.0 through E886.9
 - E888.0 through E888.9
- Firearm injuries:
 - E922.0 through E922.3, E922.8, E922.9 (excludes air gun, paintball gun)
 - E955.0 through E955.4 (excludes explosives, air gun, paintball gun, unspecified)
 - E965.0 through E965.4
 - E970
 - E979.4
 - E985.0 through E985.4 (excludes explosives, air gun, paintball gun)

**E917.5 to E917.9 codes are used to designate striking against or struck accidentally by objects or persons. Prior to 2001, there was only one code to designate the injury irrespective of whether or not it resulted in a fall. After 2001, the codes were expanded to have separate codes for injury that resulted in a fall versus not. For instance, E917.0 denoted "In sports" prior to 2001. Subsequently, it was revised as denoting "In sports without subsequent fall" and an E917.5 code was added to denote "Object in sports with subsequent fall."*

Surgical Procedures

- Intervertebral disc excision: 80.51
- Spinal canal decompression: 03.09
- Spinal fusion device insertion: 84.51
- Vena cava filter placement: 38.7

eTable 1. Estimated Numbers of Cases With Acute Traumatic Spinal Cord Injury in the United States, 1993-2012

Year	SCI as Primary Diagnosis* Estimated Patients (Standard Deviation)	SCI as Any Diagnoses Estimated Number (Standard Deviation)
1993	13,706 (1,270)	16,966 (1,420)
1994	13,950 (1,336)	17,245 (1,420)
1995	14,439 (1,108)	17,969 (1,287)
1996	14,024 (1,175)	17,793 (1,371)
1997	12,874 (1,035)	17,390 (1,342)
1998	14,494 (1,228)	17,978 (1,352)
1999	14,087 (1,025)	18,454 (1,288)
2000	13,481 (935)	16,880 (1,019)
2001	12,846 (914)	15,922 (1,002)
2002	14,096 (1,081)	17,789 (1,160)
2003	14,814 (1,139)	18,806 (1,348)
2004	18,715 (1,725)	22,007 (1,794)
2005	14,132 (1,045)	17,649 (1,081)
2006	16,296 (1,120)	20,332 (1,214)
2007	16,185 (1,252)	20,080 (1,357)
2008	15,342 (1,171)	19,250 (1,254)
2009	15,408 (1,048)	19,985 (1,266)
2010	19,853 (1,477)	24,656 (1,698)
2011	15,628 (1,285)	20,276 (1,440)
2012	16,965 (735)	21,695 (800)

Abbreviations: SCI, Spinal Cord Injury

*Primary diagnosis indicates primary SCI diagnosis or secondary SCI diagnosis with a primary trauma diagnosis.

eTable 2. Age and Sex Stratified Number of Patients in Nationwide Inpatient Samples With Acute Traumatic Spinal Cord Injury in the United States

Year	Age Groups					
	16-24	25-44	45-64	65-74	75-84	≥85
	Male					
1993	457	751	351	134	87	38
1994	474	771	399	128	103	36
1995	464	818	369	135	111	42
1996	447	782	413	163	98	31
1997	427	786	410	141	111	38
1998	431	847	419	120	142	44
1999	435	774	486	141	129	58
2000	436	770	490	151	125	47
2001	381	647	453	147	154	50
2002	420	775	555	158	150	61
2003	426	729	637	167	147	62
2004	573	897	816	195	167	66
2005	420	659	591	158	138	61
2006	444	811	706	202	176	82
2007	455	718	715	193	169	82
2008	385	645	700	222	184	85
2009	372	586	727	232	177	80
2010	439	836	907	276	218	100
2011	348	586	756	269	212	97
2012	354	586	851	293	171	92
	Female					
1993	122	197	129	67	87	48
1994	109	205	111	65	71	44
1995	110	258	138	104	117	41
1996	102	231	151	72	95	60
1997	113	226	132	101	99	51
1998	120	198	156	78	96	58
1999	133	202	163	68	95	54
2000	112	208	125	71	104	73
2001	94	155	144	75	124	46
2002	112	215	189	78	129	63
2003	130	226	205	106	127	71
2004	178	291	267	113	159	75
2005	117	193	185	88	138	78
2006	139	198	250	93	136	90
2007	125	193	227	100	155	85
2008	101	208	254	123	161	97
2009	98	178	254	139	155	98
2010	135	236	305	148	177	118
2011	87	170	271	141	165	126
2012	105	170	294	135	154	105

eTable 3. Age and Sex Stratified Estimated Number of Patients with Acute Traumatic Spinal Cord Injury in the United States

Year	Age Groups					
	16-24	25-44	45-64	65-74	75-84	≥85
	Male					
	<i>Number of Estimated Patients (95% Confidence Intervals)</i>					
1993	2,405 (1,860, 2,950)	3,959 (3,114, 4,804)	1,816 (1,455, 2,176)	695 (518, 871)	428 (305, 551)	197 (128, 266)
1994	2,508 (1,958, 3,057)	4,031 (3,102, 4,961)	2,110 (1,719, 2,502)	666 (505, 826)	533 (398, 668)	179 (119, 239)
1995	2,317 (1,756, 2,877)	4,080 (3,331, 4,830)	1,891 (1,594, 2,188)	678 (530, 826)	562 (437, 686)	209 (144, 275)
1996	2,225 (1,682, 2,769)	3,969 (3,142, 4,795)	2,083 (1,718, 2,449)	805 (635, 976)	487 (366, 608)	144 (77, 211)
1997	1,961 (1,457, 2,465)	3,595 (2,923, 4,268)	1,906 (1,522, 2,291)	644 (505, 782)	501 (395, 607)	174 (117, 231)
1998	2,211 (1,744, 2,679)	4,320 (3,425, 5,214)	2,135 (1,651, 2,618)	597 (459, 734)	714 (572, 855)	227 (151, 302)
1999	2,097 (1,686, 2,508)	3,698 (3,023, 4,373)	2,329 (1,941, 2,718)	681 (538, 825)	620 (485, 754)	274 (187, 362)
2000	2,052 (1,676, 2,428)	3,639 (3,000, 4,279)	2,321 (1,931, 2,711)	716 (573, 859)	597 (475, 719)	223 (159, 287)
2001	1,882 (1,483, 2,281)	3,171 (2,588, 3,754)	2,236 (1,902, 2,569)	730 (584, 877)	753 (614, 891)	249 (172, 326)
2002	1,950 (1,523, 2,377)	3,618 (2,930, 4,307)	2,594 (2,232, 3,055)	747 (608, 886)	705 (570, 841)	288 (216, 360)
2003	1,992 (1,576, 2,407)	3,404 (2,759, 4,049)	2,977 (2,466, 3,487)	766 (610, 923)	680 (553, 807)	300 (218, 382)
2004	2,675 (2,086, 3,264)	4,208 (3,366, 5,049)	3,824 (3,094, 4,554)	920 (721, 1,120)	778 (609, 948)	314 (225, 402)
2005	1,967 (1,563, 2,371)	3,053 (2,437, 3,668)	2,767 (2,286, 3,247)	746 (593, 898)	655 (519, 791)	283 (206, 360)
2006	2,102 (1,694, 2,509)	3,812 (3,141, 4,484)	3,346 (2,856, 3,836)	940 (777, 1,102)	834 (684, 984)	388 (299, 478)
2007	2,194 (1,734, 2,654)	3,481 (2,813, 4,148)	3,448 (2,844, 4,053)	924 (751, 1,098)	820 (654, 983)	399 (303, 495)
2008	1,787 (1,408, 2,167)	3,017 (2,429, 3,606)	3,263 (2,710, 3,816)	1,046 (860, 1,232)	869 (698, 1,041)	401 (295, 506)
2009	1,771 (1,427, 2,115)	2,796 (2,296, 3,297)	3,479 (2,934, 4,024)	1,141 (959, 1,323)	860 (695, 1,025)	389 (296, 483)
2010	2,173 (1,742, 2,604)	4,127 (3,382, 4,872)	4,463 (3,731, 5,194)	1,364 (1,112, 1,615)	1,076 (884, 1,268)	485 (368, 602)
2011	1,645 (1,274, 2,017)	2,750 (2,119, 3,382)	3,581 (2,926, 4,235)	1,283 (1,032, 1,534)	997 (828, 1,165)	449 (350, 548)
2012	1,770 (1,522, 2,018)	2,930 (2,573, 3,287)	4,255 (3,784, 4,726)	1,465 (1,264, 1,666)	855 (718, 992)	460 (360, 560)

eTable 3. Age and Sex Stratified Estimated Number of Patients with Acute Traumatic Spinal Cord Injury in the United States (continued)

	Female					
	<i>Number of Estimated Patients (95% Confidence Intervals)</i>					
1993	674 (490, 858)	1,061 (779, 1,342)	682 (509, 856)	334 (245, 424)	431 (328, 533)	265 (177, 353)
1994	595 (422, 769)	1,082 (818, 1,347)	586 (446, 727)	338 (249, 426)	356 (267, 444)	233 (156, 309)
1995	534 (420, 648)	1,304 (1,059, 1,548)	677 (523, 831)	535 (413, 658)	571 (449, 692)	205 (142, 269)
1996	511 (391, 630)	1,218 (986, 1,450)	766 (603, 929)	397 (286, 508)	476 (372, 580)	300 (224, 376)
1997	512 (387, 638)	1,029 (850, 1,208)	612 (490, 734)	451 (349, 554)	455 (354, 555)	239 (165, 313)
1998	613 (448, 779)	1,018 (799, 1,236)	803 (646, 959)	392 (306, 478)	475 (371, 579)	286 (207, 365)
1999	633 (473, 794)	954 (786, 1,122)	768 (620, 915)	322 (238, 406)	458 (356, 560)	255 (179, 332)
2000	531 (384, 678)	978 (785, 1,171)	602 (457, 746)	337 (247, 426)	496 (397, 595)	355 (265, 445)
2001	462 (336, 587)	765 (575, 956)	715 (564, 865)	365 (274, 456)	605 (489, 721)	221 (155, 287)
2002	521 (391, 650)	996 (797, 1,195)	885 (685, 1,085)	362 (274, 450)	616 (491, 741)	291 (212, 371)
2003	605 (446, 764)	1,039 (787, 1,291)	956 (772, 1,140)	490 (390, 589)	596 (466, 725)	325 (244, 406)
2004	828 (606, 1,051)	1,360 (1,036, 1,684)	1,253 (989, 1,516)	540 (368, 712)	749 (615, 884)	356 (263, 449)
2005	542 (407, 677)	901 (704, 1,098)	869 (706, 1,031)	406 (314, 498)	654 (546, 761)	371 (282, 461)
2006	657 (503, 811)	939 (754, 1,124)	1,182 (974, 1,390)	437 (347, 528)	649 (532, 766)	428 (329, 528)
2007	605 (452, 759)	927 (753, 1,101)	1,095 (899, 1,292)	482 (379, 586)	752 (623, 881)	402 (299, 504)
2008	469 (327, 611)	980 (739, 1,222)	1,189 (962, 1,415)	587 (468, 705)	768 (627, 909)	460 (353, 567)
2009	464 (337, 591)	836 (656, 1,016)	1,228 (1,028, 1,428)	668 (527, 809)	761 (609, 913)	467 (365, 569)
2010	668 (497, 840)	1,157 (892, 1,423)	1,488 (1,233, 1,742)	730 (587, 873)	856 (701, 1,011)	579 (466, 692)
2011	409 (293, 525)	807 (608, 1,006)	1,269 (1,049, 1,489)	666 (532, 800)	761 (629, 894)	580 (470, 691)
2012	525 (405, 645)	850 (697, 1003)	1,470 (1,280, 1,660)	675 (560, 790)	770 (644, 896)	525 (426, 624)

eTable 4. Total Population*¹⁻³ Estimates Used for Calculation of Incidence Rates

Year	Total Resident Population
1993	257,783,000
1994	260,327,000
1995	262,803,000
1996	265,229,000
1997	267,784,000
1998	270,248,000
1999	272,691,000
2000	282,171,957
2001	285,081,556
2002	287,803,914
2003	290,326,418
2004	293,045,739
2005	295,753,151
2006	298,593,212
2007	301,579,895
2008	304,374,846
2009	307,006,550
2010	308,745,538
2011	311,587,816
2012	313,914,040

*Population estimates as of July 1 for each year used except for the year 2010 where April 1 estimates used

eTable 5. Population*¹⁻³ Estimates by Age and Sex Used for Calculation of Incidence Rates

Year	Age-Groups					
	16-24	25-44	45-64	65-74	75-84	≥85
	Male					
1993	16,680,000	41,089,000	23,924,000	8,235,000	4,108,000	964,000
1994	16,604,000	41,237,000	24,572,000	8,291,000	4,219,000	1,003,000
1995	16,545,000	41,401,000	25,234,000	8,345,000	4,345,000	1,045,000
1996	16,569,000	41,544,000	25,966,000	8,336,000	4,500,000	1,086,000
1997	16,743,000	41,507,000	26,817,000	8,284,000	4,645,000	1,132,000
1998	17,044,000	41,332,000	27,697,000	8,248,000	4,760,000	1,187,000
1999	17,371,000	41,081,000	28,650,000	8,199,000	4,871,000	1,240,000
2000	18,117,715	42,558,568	30,366,914	8,303,225	4,912,292	1,238,127
2001	18,531,222	42,435,306	31,337,511	8,315,726	5,015,752	1,271,345
2002	18,849,847	42,252,218	32,372,437	8,323,850	5,119,703	1,308,544
2003	19,051,397	42,013,026	33,374,129	8,378,523	5,207,047	1,361,463
2004	19,297,618	41,958,828	34,362,813	8,454,163	5,277,601	1,407,491
2005	19,453,413	41,886,372	35,410,204	8,548,674	5,349,022	1,476,971
2006	19,679,820	41,930,561	36,384,295	8,687,370	5,389,647	1,556,119
2007	19,829,243	41,992,219	37,280,536	8,911,783	5,420,783	1,636,041
2008	19,932,617	42,062,538	37,996,624	9,277,863	5,445,819	1,711,328
2009	20,026,980	42,080,689	38,754,970	9,593,390	5,447,496	1,782,674
2010	20,140,820	41,068,090	39,743,507	10,096,519	5,476,762	1,789,679
2011	20,295,728	41,260,776	40,384,134	10,477,161	5,570,786	1,886,138
2012	20,393,957	41,512,399	40,409,764	11,202,862	5,648,150	1,964,033
	Female					
1993	15,980,000	41,522,000	25,648,000	10,395,000	6,630,000	2,482,000
1994	15,912,000	41,697,000	26,311,000	10,412,000	6,726,000	2,560,000
1995	15,838,000	41,886,000	26,996,000	10,412,000	6,833,000	2,640,000
1996	15,845,000	42,066,000	27,746,000	10,355,000	6,967,000	2,714,000
1997	16,000,000	42,066,000	28,626,000	10,244,000	7,099,000	2,781,000
1998	16,283,000	41,910,000	29,544,000	10,141,000	7,187,000	2,862,000
1999	16,580,000	41,668,000	30,543,000	10,020,000	7,275,000	2,935,000
2000	17,222,725	42,436,055	32,034,958	10,071,381	7,516,285	3,032,394
2001	17,571,659	42,213,338	33,037,253	10,026,654	7,607,929	3,083,046
2002	17,852,182	41,957,845	34,112,757	9,986,312	7,697,177	3,135,305
2003	18,074,292	41,696,998	35,148,946	10,002,268	7,760,781	3,212,825
2004	18,256,975	41,511,385	36,170,563	10,047,624	7,799,612	3,277,003
2005	18,358,892	41,370,744	37,228,170	10,116,963	7,827,137	3,384,930
2006	18,524,457	41,292,574	38,228,904	10,248,779	7,817,044	3,506,957
2007	18,681,302	41,229,658	39,136,259	10,477,521	7,792,702	3,628,315
2008	18,809,577	41,135,931	39,860,005	10,861,120	7,765,319	3,738,442
2009	18,916,681	41,015,589	40,624,462	11,198,677	7,700,366	3,847,987
2010	19,242,702	41,066,464	41,745,938	11,616,910	7,584,360	3,703,754
2011	19,349,664	41,171,522	42,420,427	12,008,524	7,601,156	3,828,765
2012	19,405,934	41,313,342	42,445,176	12,782,530	7,624,484	3,923,297

*Population estimates as of July 1 for each year used except for the year 2010 where April 1 estimates used

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eTable 6. Etiology of Acute Traumatic Spinal Cord Injury, United States

Year	Motor Vehicle Accidents	Unintentional Falls	Firearm Injuries
	<i>% of Total SCI Cases (95% CI)</i>		
1997	31.4 (29.7, 33.0)	19.3 (17.9,20.7)	7.0 (6.1, 7.9)
1998	32.9 (31.2, 34.6)	21.6 (20.1, 23.1)	6.4 (5.5, 7.3)
1999	35.0 (33.3, 36.8)	21.8 (20.3, 23.3)	5.4 (4.6, 6.3)
2000	31.7 (30.0, 33.4)	21.4 (19.9, 22.9)	6.5 (5.6, 7.4)
2001	33.1 (31.3, 34.9)	25.0 (23.3, 26.6)	4.1 (3.3, 4.9)
2002	33.9 (32.2, 35.6)	30.3 (28.7, 31.9)	7.5 (6.6, 8.4)
2003	35.3 (33.7, 37.0)	32.0 (30.4, 33.6)	5.5 (4.7, 6.3)
2004	38.6 (37.1, 40.1)	30.4 (29.0, 31.9)	5.0 (4.3, 5.7)
2005	37.1 (35.3, 38.8)	29.8 (28.2, 31.4)	5.8 (4.9,6.6)
2006	34.1 (32.5, 35.7)	32.3 (30.7, 33.8)	6.0 (5.2, 6.8)
2007	33.8 (32.2, 35.4)	31.4 (29.8, 32.9)	6.9 (6.0, 7.7)
2008	33.1 (31.5, 34.7)	39.4 (37.7, 41.0)	5.7 (4.9, 6.5)
2009	33.3 (31.7, 34.9)	38.6 (36.9, 40.3)	5.2 (4.4, 6.0)
2010	30.6 (29.2, 32.0)	38.4 (36.9, 39.9)	5.6 (4.9, 6.3)
2011	29.8 (28.2, 31.3)	42.1 (40.5, 43.8)	5.5 (4.7, 6.2)
2012	31.0 (29.4, 32.5)	40.4 (38.7, 42.0)	5.4 (4.6, 6.2)

CI=Confidence Intervals

Note: The terms motor vehicle accidents and motor vehicle crashes are used interchangeably.

eTable 7. Select Age-Stratified Trends in Etiology of Acute Traumatic Spinal Cord Injury in the United States

Etiology and Age-Group	Years				Armitage Trend p-value
	1997-2000	2001-2004	2005-2009	2010-2012	
	<i>Percentage of patients (95% Confidence Limits) (Total number of patients in age-group)</i>				
MVA in 16-24 years	40 (38, 42) (2,255)	47 (45, 49) (2,314)	45 (43, 47) (2,664)	44 (42, 47) (1,480)	0.019
MVA in 25-44 years	37 (36, 39) (4,105)	43 (42, 45) (3,936)	44 (43, 46) (4,397)	40 (38, 42) (2,609)	0.0002
Firearm injury in 16-24 years	17 (16, 19) (2,255)	14 (13, 15) (2,314)	18 (17, 20) (2,664)	18 (16, 20) (1,480)	0.065
Falls in elderly (≥ 65 years)	28 (26, 30) (2,226)	51 (49, 53) (2,694)	60 (59, 62) (3,986)	66 (64, 68) (3,022)	<0.0001

MVA=Motor Vehicle Accidents

Note: Unweighted calculations are presented in this table. The terms motor vehicle accidents and motor vehicle crashes are used interchangeably.

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