

SURVEILLANCE OF TBI-RELATED EMERGENCY DEPARTMENT VISITS, HOSPITALIZATIONS, AND DEATHS – UNITED STATES, 2001-2010

TBI-related Emergency Department Visits, Hospitalizations, and Deaths

This report summarizes data on traumatic brain injury (TBI)-related emergency department visits, hospitalizations, and deaths from 2001-2010, by sex, age group, and injury mechanism. Updated TBI [data and statistics](#) are available on the CDC website.

This report includes TBI morbidity and mortality data collected from multiple sources. Data on emergency department visits come from the [National Hospital Ambulatory Medical Care Survey](#). Hospitalization data come from the [National Hospital Discharge Survey](#). Mortality data come from the National Vital Statistics System multiple-cause-of-death files.



**Centers for Disease
Control and Prevention**
National Center for Injury
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TBI: www.cdc.gov/TraumaticBrainInjury
HEADS UP: www.cdc.gov/HEADSUP

TABLE OF CONTENTS

EMERGENCY DEPARTMENT VISITS, HOSPITALIZATIONS, AND DEATHS	3
Rates of TBI-related Emergency Department Visits, Hospitalizations, and Deaths	3
Rates of TBI-related Emergency Department Visits, Hospitalizations, and Deaths by Sex	5
EMERGENCY DEPARTMENT VISITS	6
Rates of TBI-related Emergency Department Visits by Sex	6
Rates of TBI-related Emergency Department Visits by Age Group	7
Distribution of TBI-related Emergency Department Visits by Age Group and Injury Mechanism	8
HOSPITALIZATIONS	9
Rates of TBI-related Hospitalizations by Sex	9
Rates of TBI-related Hospitalizations by Age Group	10
Distribution of TBI-related Hospitalizations by Age Group and Injury Mechanism	11
DEATHS	12
Rates of TBI-related Deaths by Sex	12
Rates of TBI-related Deaths by Age Group	13
Distribution of TBI-related Deaths by Age Group and Injury Mechanism	14

EMERGENCY DEPARTMENT VISITS, HOSPITALIZATIONS, AND DEATHS

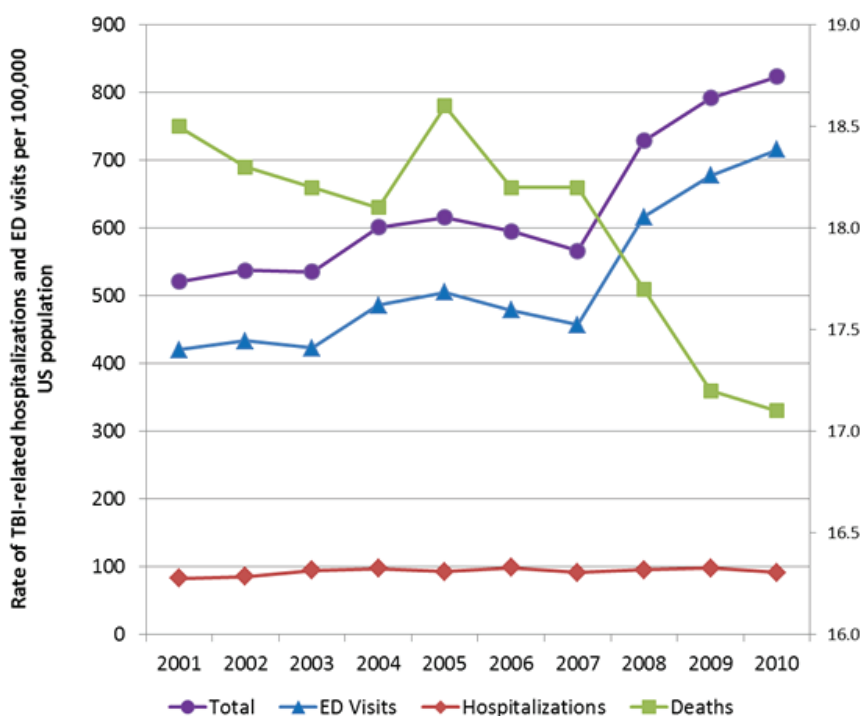
Rates of TBI-related Emergency Department Visits, Hospitalizations, and Deaths

UNITED STATES, 2001-2010

In general, the total combined rates for traumatic brain injury (TBI)-related emergency department (ED) visits, hospitalizations, and deaths increased from 2001 to 2010. Total combined rates of TBI-related ED visits, hospitalizations, and deaths climbed slowly from a rate of 521.0 per 100,000 in 2001 to 615.7 per 100,000 in 2005. Total combined rates decreased to 595.1 per 100,000 during 2006, followed by a sharp increase to 728.9 per 100,000 in 2008. From 2009 to 2010, total combined rates of TBI-related ED visits, hospitalizations, and deaths continued to climb with rates of 791.9 and 823.7, respectively.

Total combined rates of TBI-related hospitalizations, ED visits, and deaths were driven in large part by the relatively high number of TBI-related ED visits. In comparison to ED visits, the overall rates of TBI-related hospitalizations remained relatively stable, changing from 82.7 per 100,000 in 2001 to 91.7 per 100,000 in 2010. TBI-related deaths decreased slightly over time from 18.5 per 100,000 in 2001 to 17.1 per 100,000 in 2010. Note that the axis scale for TBI-related deaths appears to the right of the chart, whereas the axis for TBI-related hospitalizations and ED visits is to the left of the chart.

Rates of TBI-Related Emergency Department Visits, Hospitalizations, and Deaths– United States, 2001-2010



Rates of TBI-Related Emergency Department Visits, Hospitalizations, and Deaths– United States, 2001-2010

	ED Visits	Hospitalizations	Deaths	Total
2001	420.6	82.7	18.5	521.0
2002	433.9	85.6	18.3	537.2
2003	423.3	94.6	18.2	535.4
2004	486.3	97.6	18.1	601.3
2005	505.0	92.8	18.6	615.7
2006	478.9	98.7	18.2	595.1
2007	457.5	91.7	18.2	566.7
2008	616.4	95.5	17.7	728.9
2009	677.4	98.0	17.2	791.9
2010	715.7	91.7	17.1	823.7

[National Hospital Ambulatory Medical Care Survey](#) – United States, 2001-2010 (Emergency Department Visits)

[National Hospital Discharge Survey](#) – United States, 2001–2010 (Hospitalizations)

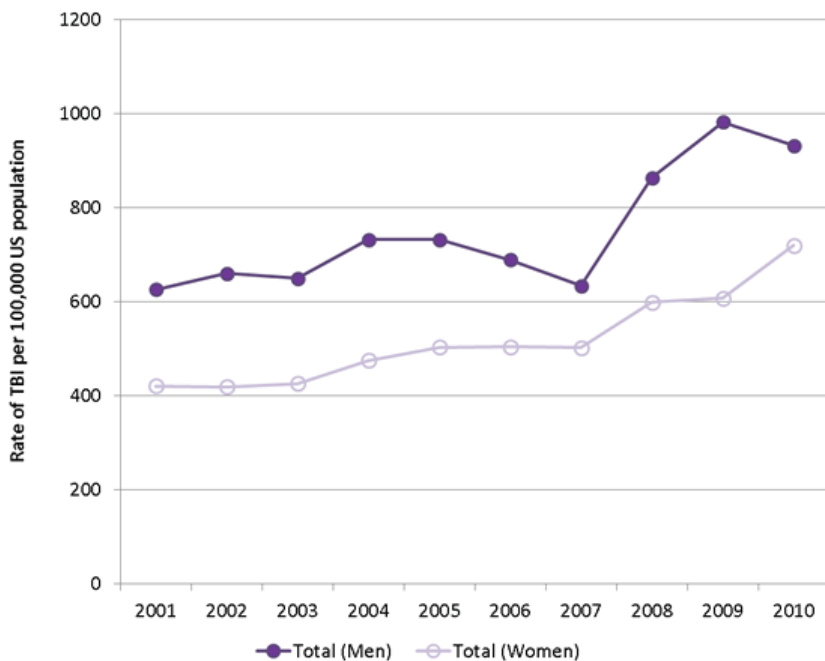
[National Vital Statistics System Mortality Data](#) – United States, 2001–2010 (Deaths)

Rates of TBI-related Emergency Department Visits, Hospitalizations, and Deaths by Sex

UNITED STATES, 2001-2010

Overall, rates of TBI-related ED visits, hospitalizations, and deaths climbed slowly from 2001 through 2007, then spiked sharply in 2008, and continued to climb through 2010. In 2007, overall rates of TBI-related ED visits, hospitalizations, and deaths were 26% higher in men compared to women. The increase in TBI-related ED visits, hospitalizations, and deaths rates in 2008 was much sharper for men (nearly a 40% increase) than for women (20% increase). In 2008, that gap began to widen, reaching 61% in 2009 before narrowing to 29% in 2010. Rates of overall TBI are largely driven by rates of TBI-related ED visits.

Rates of TBI-Related Emergency Department Visits, Hospitalizations, and Deaths by Sex– United States, 2001-2010



	Men	Women
2001	27.8	9.6
2002	27.4	9.5
2003	27.2	9.6
2004	26.8	9.8
2005	27.8	9.7
2006	27.2	9.5
2007	27.0	9.5
2008	26.5	9.1
2009	25.5	9.1
2010	25.4	9.0

National Hospital Ambulatory Medical Care Survey – United States, 2001-2010 (Emergency Department Visits)
 National Hospital Discharge Survey – United States, 2001–2010 (Hospitalizations)
 National Vital Statistics System Mortality Data – United States, 2001–2010 (Deaths)

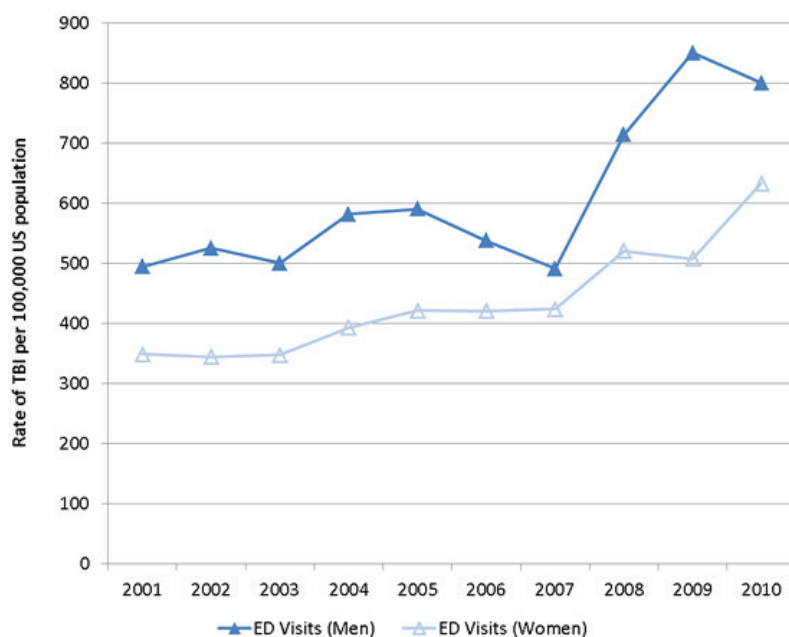
EMERGENCY DEPARTMENT VISITS

Rates of TBI-related Emergency Department Visits by Sex

UNITED STATES, 2001–2010

For each year, 2001–2010, men had higher rates of TBI-related ED visits compared to women. For men, rates of TBI-related ED visits increased by more than 50% over the time period, from 494.6 visits per 100,000 in 2001 to 800.4 per 100,000 in 2010. Similarly, rates of TBI-related ED visits in women increased from 349.3 per 100,000 in 2001 to 633.7 per 100,000 in 2010. From 2007 – 2010, there was a striking increase in rates among both men and women. Rates among men grew from 491.6 per 100,000 in 2007 to 800.4 per 100,000 in 2010, a 63% increase. Similarly, rates among women increased from 424.3 per 100,000 in 2007 to 633.7 per 100,000 in 2010, a 49% increase.

Rates of TBI-Related Emergency Department Visits by Sex– United States, 2001-2010



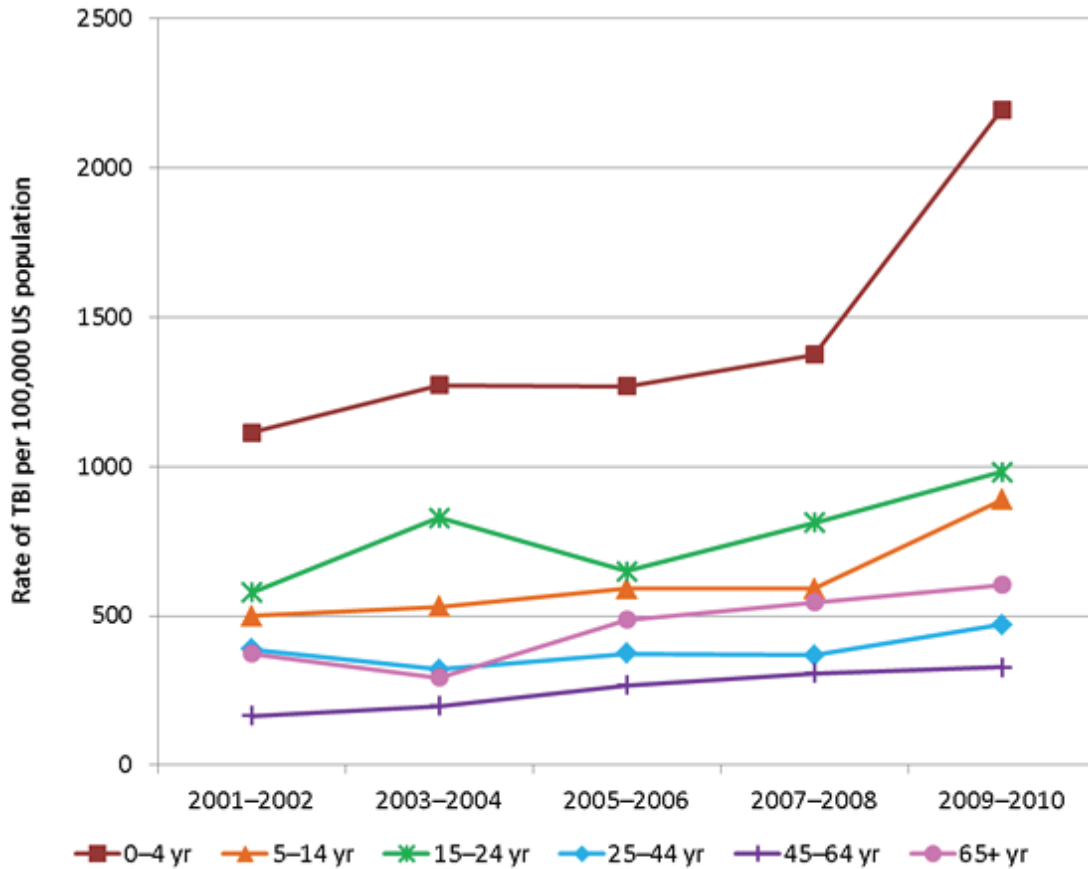
	Men	Women
2001	494.6	349.3
2002	525.8	345.1
2003	500.8	348.4
2004	582.4	393.2
2005	590.9	421.6
2006	538.1	421.4
2007	491.6	424.3
2008	714.1	521.2
2009	850.9	508.1
2010	800.4	633.7

Rates of TBI-related Emergency Department Visits by Age Group

UNITED STATES, 2001-2010

Rates of TBI-related ED visits increased for all age groups from the period of 2001–2002 through 2009–2010. The rates of TBI-related ED visits increased the most for youth four years of age and younger. From 2007–2008 to 2009–2010, the rates of TBI-related ED visits in this group increased by more than 50% from 1374.0 to 2193.8 per 100,000. Children 0 to 4 years of age had the highest rates of any age group, typically with almost twice the rate of those in the next highest age group (15–24 year-olds).

Rates of TBI-Related Emergency Department Visits by Age Group– United States, 2001-2010



Rates of TBI-Related Emergency Department Visits by Age Group– United States, 2001-2010

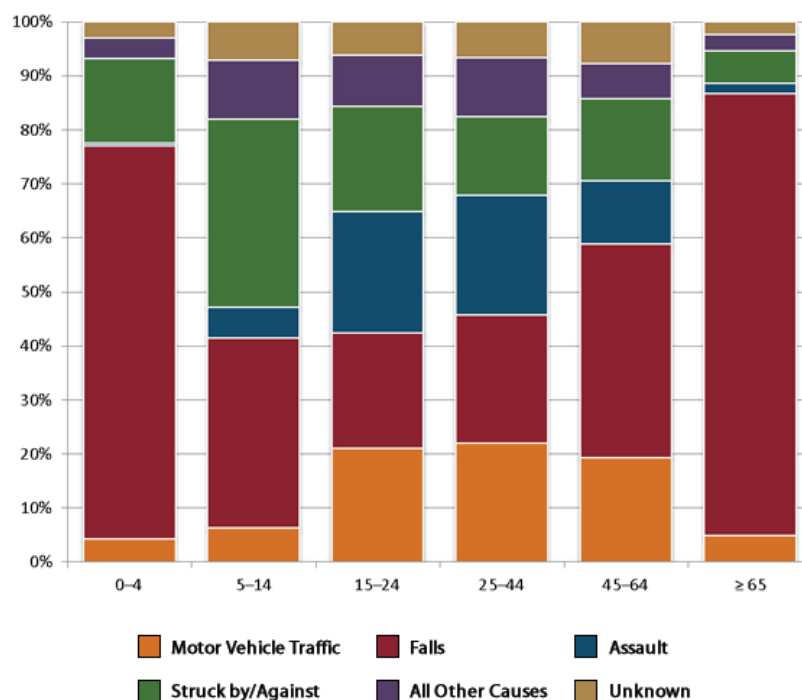
	0-4 yr	5-14 yr	15-24 yr	25-44 yr	45-64 yr	65+ yr
2001-2002	1112.6	498.8	576.9	388.3	164.8	373.1
2003-2004	1272.3	529.8	827.5	320.3	197.3	293.3
2005-2006	1268.3	591.4	648.3	373.0	267.0	485.8
2007-2008	1374.0	590.2	811.3	366.7	307.4	544.7
2009-2010	2193.8	888.7	981.9	470.0	328.2	603.3

Distribution of TBI-related Emergency Department Visits by Age Group and Injury Mechanism

UNITED STATES, 2006–2010

The injury mechanisms (external causes of injury) associated with TBI-related ED visits varied by age group between 2006-2010. Falls were the primary mechanisms of TBI-related ED visits in the youngest (0–4 years) and oldest (65 years and older) age groups, accounting for 72.8% and 81.8% of TBI-related ED visits, respectively. Injuries caused by being struck by/against an object (34.9%) and falls (35.1%) accounted for the majority of injury in youth 5–14 years of age with respect to TBI-related ED visits. For persons in age groups 15–24 years and 25–44 years, the proportions of TBI-related ED visits due to assaults, falls, and motor vehicle crashes were nearly equal within and across both age groups.

Distribution of TBI-Related Emergency Department Visits by Age Group and Injury Mechanism– United States, 2006-2010



Number of TBI-Related Emergency Department Visits by Age Group and Injury Mechanism– United States, 2006-2010

	Motor Vehicle Crashes	Falls	Assault	Struck by/Against	All Other Causes	Unknown
0–4	14,655	250,413	1,513	53,761	13,222	10,225
5–14	18,110	101,790	16,612	101,112	31,355	20,763
15–24	76,602	77,951	81,822	71,031	34,486	22,722
25–44	75,122	80,867	75,527	49,505	36,933	22,855
45–64	46,923	95,824	28,206	36,925	15,843	18,804
≥ 65	10,359	174,544	4,068	12,815	6,285	5,216

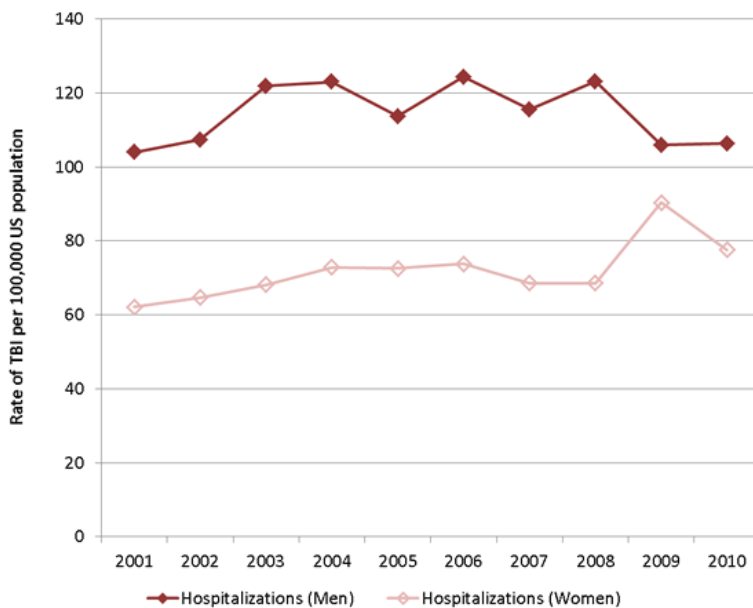
HOSPITALIZATIONS

Rates of TBI-related Hospitalizations by Sex

UNITED STATES, 2001–2010

For each year between 2001–2010, men had higher rates of TBI-related hospitalizations compared to women. For men, while the rate of TBI-related hospitalizations fluctuated between these years, the rates in 2010 (106.3 per 100,000) remained virtually unchanged from the rate in 2001 (104.0 per 100,000). In contrast, rates of TBI-related hospitalizations in women increased by 20%, from 62.1 per 100,000 in 2001 to 77.6 per 100,000 in 2010.

Rates of TBI-Related Hospitalizations by Sex– United States, 2001-2010



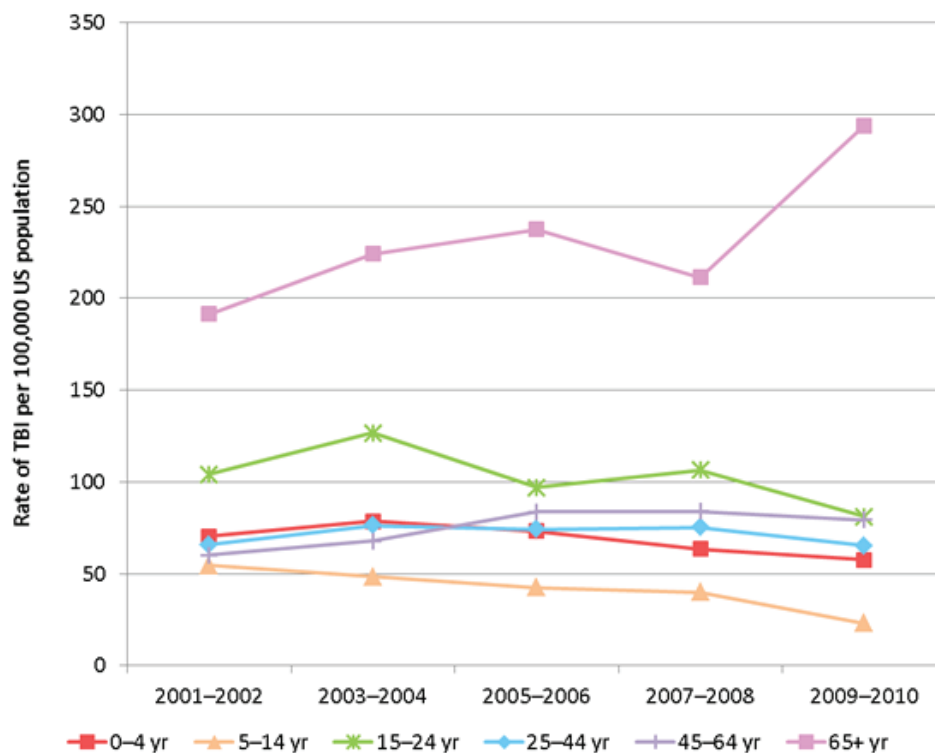
	Men	Women
2001	104.0	62.1
2002	107.3	64.7
2003	121.9	68.2
2004	123.0	72.9
2005	113.7	72.6
2006	124.3	73.8
2007	115.5	68.6
2008	123.1	68.6
2009	105.9	90.4
2010	106.3	77.6

Rates of TBI-related Hospitalizations by Age Group

UNITED STATES, 2001-2010

Changes in the rates of TBI-related hospitalizations varied depending on age between 2001-2010. For persons 44 years of age and younger, TBI-related hospitalizations decreased between the periods of 2001-2002 and 2009-2010. However, rates for age groups 45-64 years of age and 65 years and older increased between these time periods. Rates in persons 45-64 years of age increased almost 25% from 60.1 to 79.4 per 100,000. Rates of TBI-related hospitalizations in persons 65 years of age and older increased more than 50%, from 191.5 to 294.0 per 100,000 during the same period, largely due to a substantial increase (39%) between 2007-2008 and 2009-2010. In contrast, rates of TBI-related hospitalizations in youth 5-14 years of age fell from 54.5 to 23.1 per 100,000, decreasing by more than 50% during this period.

Rates of TBI-related Hospitalizations by Age Group – United States, 2001-2010



Rates of TBI-related Hospitalizations by Age Group – United States, 2001-2010

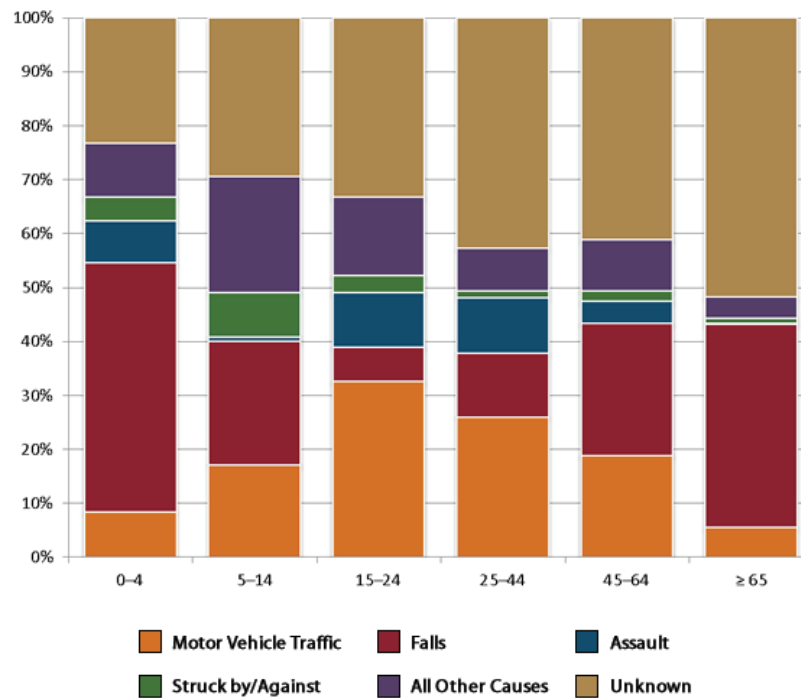
	0-4 yr	5-14 yr	15-24 yr	25-44 yr	45-64 yr	65+ yr
2001-2002	70.3	54.5	104.1	65.9	60.1	191.5
2003-2004	78.7	48.5	126.6	76.4	67.9	224.2
2005-2006	73.3	42.5	97.1	74.2	83.7	237.5
2007-2008	63.4	40.0	106.5	75.2	83.9	211.4
2009-2010	57.7	23.1	81.2	65.3	79.4	294.0

Distribution of TBI-related Hospitalizations by Age Group and Injury Mechanism

UNITED STATES, 2006–2010

The injury mechanisms (external causes of injury) associated with TBI-related ED visits varied by age group between 2006-2010. Falls were the primary mechanisms of TBI-related ED visits in the youngest (0–4 years) and oldest (65 years and older) age groups, accounting for 72.8% and 81.8% of TBI-related ED visits, respectively. Injuries caused by being struck by/against an object (34.9%) and falls (35.1%) accounted for the majority of injury in youth 5–14 years of age with respect to TBI-related ED visits. For persons in age groups 15–24 years and 25–44 years, the proportions of TBI-related ED visits due to assaults, falls, and motor vehicle crashes were nearly equal within and across both age groups.

Distribution of TBI-related Hospitalizations by Age Group and Injury Mechanism – United States, 2006-2010



Number of TBI-related Hospitalizations by Age Group and Injury Mechanism – United States, 2006-2010

	Motor Vehicle Crashes	Falls	Assault	Struck by/ Against	All Other Causes	Unknown
0–4	1,116	6,184	1,044	589	1,327	3,123
5–14	2,306	3,077	111	1,118	2,887	3,976
15–24	13,257	2,590	4,131	1,230	5,949	13,517
25–44	15,522	7,045	6,134	777	4,670	25,539
45–64	12,178	15,962	2,668	1,296	6,091	26,775
≥ 65	5,282	36,525	285	912	3,774	50,197

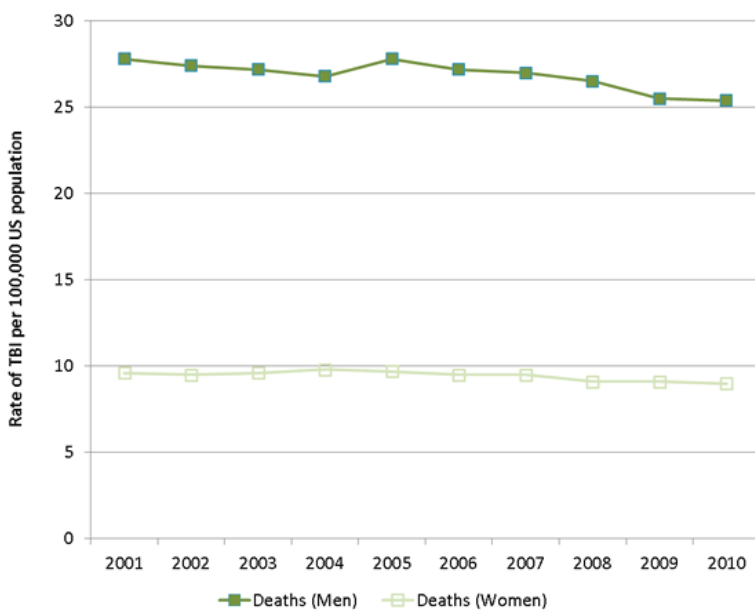
DEATHS

Rates of TBI-related Deaths by Sex

UNITED STATES, 2001–2010

Rates of TBI-related deaths decreased for both men and women between the years 2001–2010. During these ten years, rates in men decreased from 27.8 to 25.4 per 100,000 and rates in women decreased from 9.6 to 9.0 per 100,000. In each year, men had more than twice the rate of TBI-related deaths compared to women.

Rates of TBI-Related Deaths by Sex– United States, 2001-2010



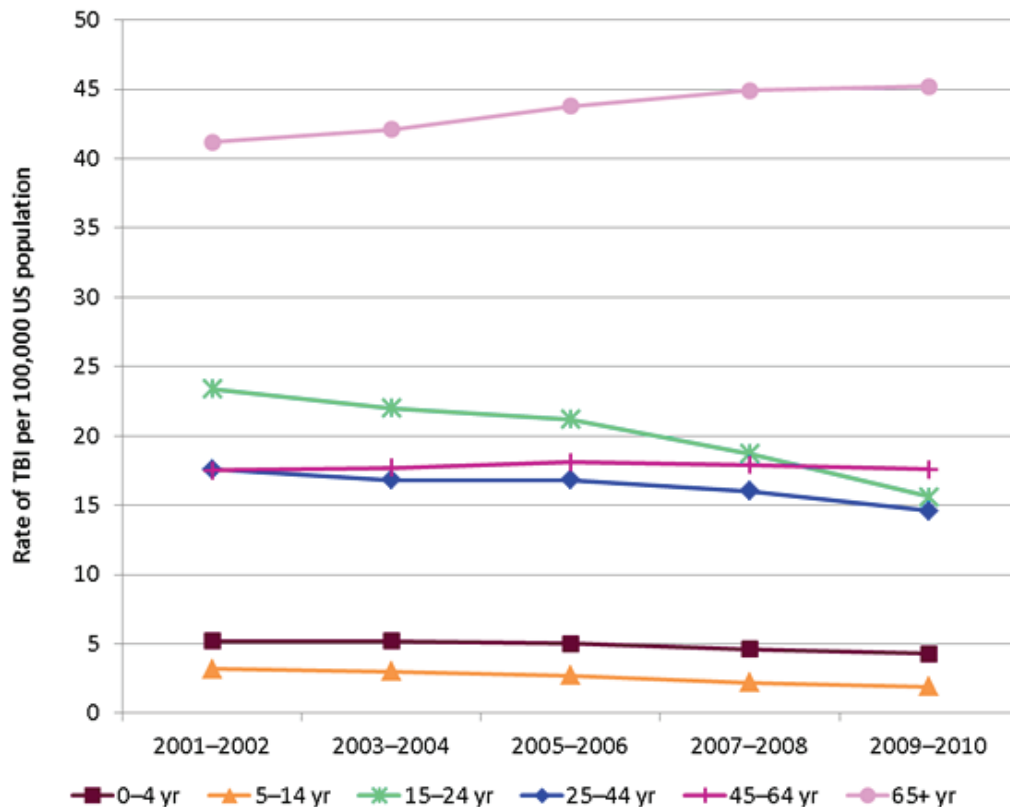
	Men	Women
2001	27.8	9.6
2002	27.4	9.5
2003	27.2	9.6
2004	26.8	9.8
2005	27.8	9.7
2006	27.2	9.5
2007	27.0	9.5
2008	26.5	9.1
2009	25.5	9.1
2010	25.4	9.0

Rates of TBI-related Deaths by Age Group

UNITED STATES, 2001-2010

Rates of TBI-related deaths varied depending on age. For persons 44 years of age and younger, TBI-related deaths decreased between the periods of 2001-2002 and 2009-2010. Rates for those aged 45-64 years remained stable for this same ten-year period. For persons 65 years and older, rates of TBI-related deaths increased during this time period, from 41.2 to 45.2 deaths per 100,000.

Rates of TBI-related Deaths by Age Group – United States, 2001-2010



Rates of TBI-related Deaths by Age Group – United States, 2001-2010

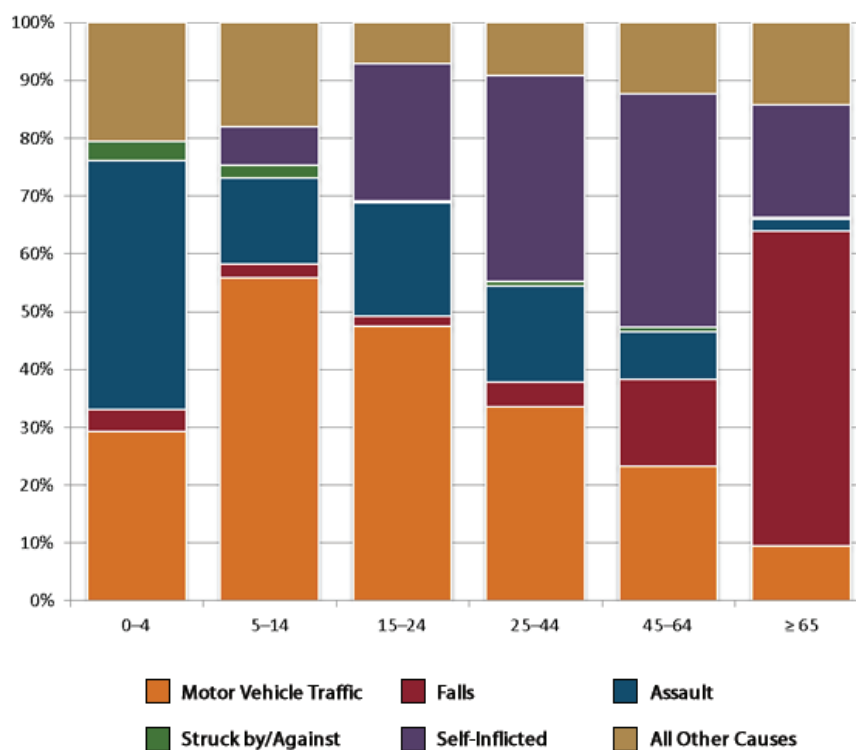
	0-4 yr	5-14 yr	15-24 yr	25-44 yr	45-64 yr	65+ yr
2001-2002	5.2	3.2	23.4	17.6	17.5	41.2
2003-2004	5.2	3.0	22.0	16.8	17.7	42.1
2005-2006	5.0	2.7	21.2	16.8	18.1	43.8
2007-2008	4.6	2.2	18.7	16.00	17.9	44.9
2009-2010	4.3	1.9	15.6	14.6	17.6	45.2

Distribution of TBI-related Deaths by Age Group and Injury Mechanism

UNITED STATES, 2006–2010

The injury mechanisms (external causes of injury) associated with TBI-related deaths varied by age group between 2006-2010. TBI-related deaths in children 0–4 years were primarily associated with assault (42.9%) and motor vehicle crashes (29.2%). Motor vehicle crashes accounted for a majority of TBI-related deaths (55.8%) in youth 5–14 years, and contributed to almost half (47.4%) of TBI-related deaths in young adults aged 15-24 years. Falls accounted for the majority (54.4%) of TBI-related deaths in adults 65 years of age and older.

Distribution of TBI-related Deaths by Age Group and Injury Mechanism – United States, 2006-2010



Number of TBI-Related Deaths by Age Group and Injury Mechanism– United States, 2006-2010

	Motor Vehicle Traffic	Falls	Assault	Struck by/ Against	Self-Inflicted	All Other Causes
0–4	278	37	408	32		196
5–14	488	21	131	19	58	158
15–24	3,670	139	1,515	28	1,834	551
25–44	4,310	548	2,151	88	4,587	1,186
45–64	3,230	2,077	1,142	126	5,601	1,710
≥ 65	1,651	9,444	357	79	3,362	2,483