

Traumatic Brain Injury Data Report, 2004-2006

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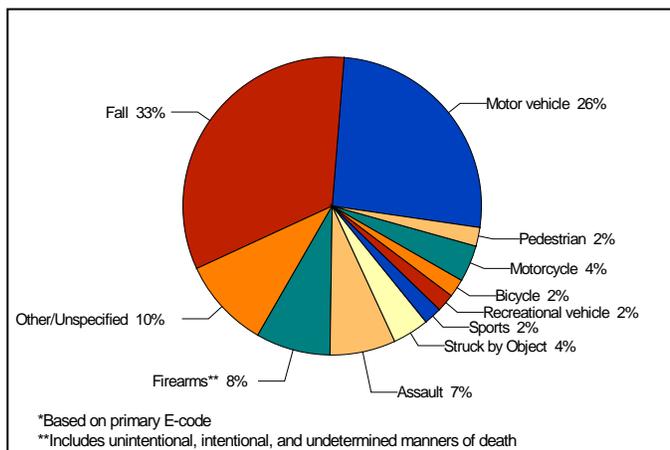
Section 1: Traumatic Brain Injuries in Oklahoma, 2004-2006

Background

Statewide surveillance for hospitalized and fatal traumatic brain injuries (TBI) was conducted in Oklahoma using 2004-2006 hospital discharge data and Vital Statistics (death certificate) data. Persons discharged from an Oklahoma acute care facility with one or more of the following *International Classification of Diseases, Ninth Revision, Clinical Modification* (ICD-9-CM) codes were included in surveillance: 800.0-801.9, 803.0-804.9, 850.0-854.1, 950.1-950.3, 959.01, and 995.55. Deaths were identified by death certificates coded with one or more of the following *International Classification of Diseases, Tenth Revision* (ICD-10) codes: S01.0-S01.9, S02.0, S02.1, S02.3, S02.7-S02.9, S04.0, S06.0-S06.9, S07.0, S07.1, S07.8, S07.9, S09.7-S09.9, T01.0, T02.0, T04.0, T06.0, T90.1, T90.2, T90.4, T90.5, T90.8, or T90.9. Only residents of Oklahoma were included. Oklahoma residents who died out of state were also included. In an attempt to reduce an artificial inflation of the number from readmissions and transfers, the following procedures were used. Discharges for the same person that occurred 2-10 days after the initial stay were removed from the database unless the external cause of injury code (E code) indicated a different type of injury (e.g., fall and motor vehicle crash). If subsequent discharges occurred 11 or more days later, the stays were considered to be related to separate injuries and were included in the database. Back-to-back stays (e.g., transfers where the discharge date at one hospital was the same or one day prior to the admission date at another) were combined into one distinct discharge record. Without a comprehensive review of all medical records, it is unknown exactly how many of the discharges were for follow-up care of a previous injury.

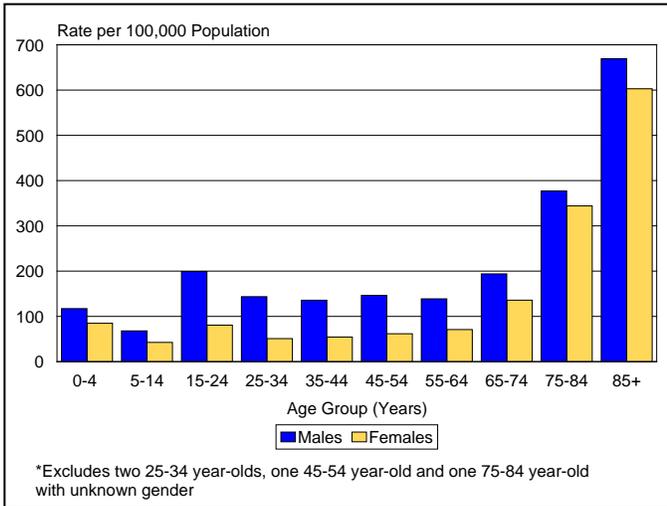
Basic demographic data were collected for all cases. In addition, a stratified random sample of cases was selected for medical record review and detailed information on the injury was collected (see page 7, Section 2). Residents hospitalized out of state or at a federal facility, who survived, were not included in analyses. Therefore, the burden of TBI on Oklahoma's population may be greater than what is presented in this document. Rates were calculated using 2004-2006 bridged-race population estimates.

Figure 1. Traumatic Brain Injuries by Etiology*, Oklahoma, 2004-2006



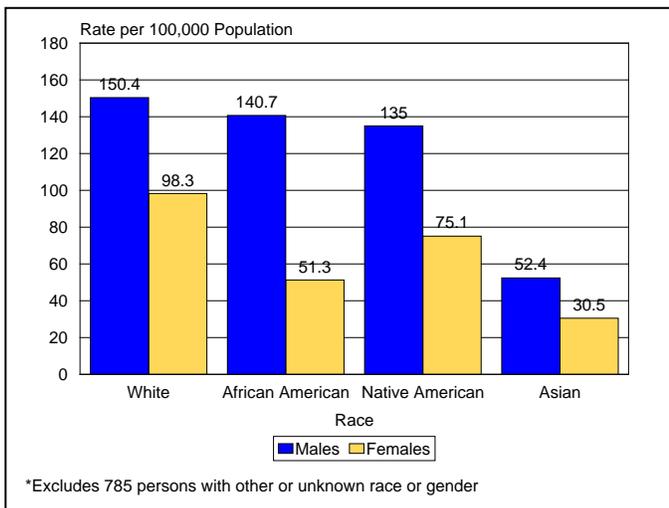
- A total of 13,374 TBIs resulted in hospitalization or death in 2004-2006 (4,386 in 2004; 4,395 in 2005; and 4,593 in 2006) among Oklahoma residents.
- Falls and motor vehicle crashes were the leading causes of all TBI.
- Gunshot wounds and motor vehicle crashes were the leading causes of TBI preadmission deaths.

Figure 2. Traumatic Brain Injury Rates by Age Group* and Gender, Oklahoma, 2004-2006



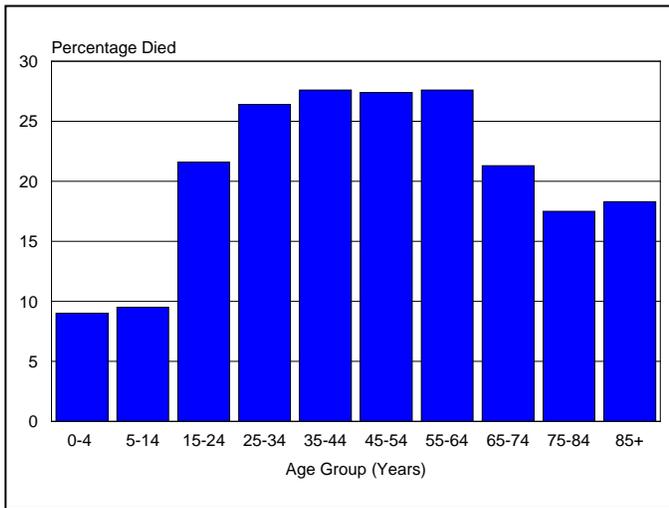
- The age range of persons who suffered a TBI was less than 1 year to 105 years, with an average age of 47 years.
- The injury rate was highest for persons 85 years and older, followed by persons 75-84 years, for both males and females.
- Males 15-24 years had the third highest rate among males, while the third highest rate for females was in the 65-74 year age group.
- Males were over 1.5 times more likely to be injured than females (156.2 and 95.9 injuries per 100,000 population, respectively).

Figure 3. Traumatic Brain Injury Rates by Gender and Race*, Oklahoma, 2004-2006



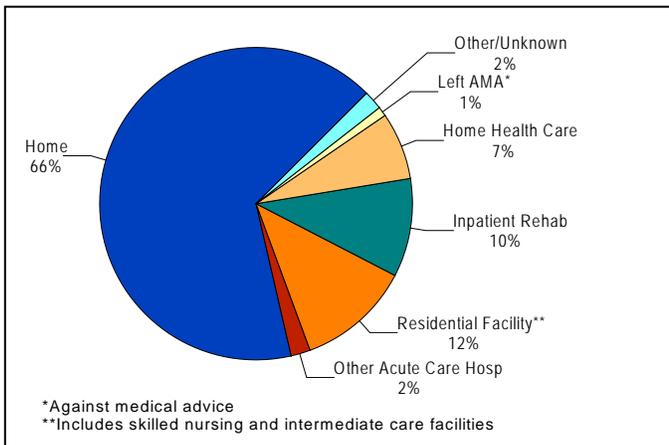
- Whites had the highest rate of TBI (124.0 injuries per 100,000 population), followed by Native Americans (104.5), African Americans (95.5), and Asians (41.3).
- TBI rates were highest among white males, followed closely by African American and Native American males.
- Rates were nearly 3 times higher for African American males than for African American females.
- Rates were lowest for Asian females; all females had lower rates than their male counterparts.
- In terms of ethnicity, Hispanic males had an injury rate 2.5 times higher than Hispanic females (data not shown; 111.3 and 43.7 injuries per 100,000 population, respectively).

Figure 4. Traumatic Brain Injury Case-Fatality Rates by Age Group, Oklahoma, 2004-2006



- There was a total of 2,890 deaths (22%) from a TBI in 2004-2006.
- Persons 35-44 and 55-64 years tied for the highest fatality rate (28%), while children under 15 years had the lowest (9%).
- Males had a higher case-fatality rate than females (25% compared to 16%).

Figure 5. Nonfatal Traumatic Brain Injury Hospitalizations by Discharge Status, Oklahoma, 2004-2006



- Of the 13,374 TBIs identified, 78% were nonfatal.
- The majority of TBI discharges (66%) were to home after inpatient acute care.
- Ten percent of survivors went to an inpatient rehabilitation facility upon discharge.
- Twelve percent of injured patients were discharged to a skilled nursing facility or nursing home.

Table 1. Traumatic Brain Injury Rates by County of Residence*, Oklahoma, 2004-2006

County	2004-2006 Population	Number of Cases	Annual Rate
Harmon	9,086	28	308.2
Major	22,014	64	290.7
Pushmataha	35,044	85	242.6
Beckham	56,432	135	239.2
Ellis	11,838	27	228.1
Dewey	13,642	29	212.6
Adair	66,001	138	209.1
Choctaw	46,026	94	204.2
Harper	10,079	20	198.4
Craig	44,974	88	195.7
Latimer	31,780	62	195.1
Roger Mills	9,854	19	192.8
Greer	17,617	33	187.3
Garvin	81,639	151	185.0
Washita	34,464	61	177.0
Blaine	38,460	68	176.8
Noble	33,588	59	175.7
Jackson	79,448	137	172.4
McCurtain	101,725	172	169.1
Pawnee	50,405	85	168.6
Coal	17,271	29	167.9
Haskell	36,320	60	165.2
Hughes	41,717	68	163.0
McClain	90,098	145	160.9
McIntosh	59,579	94	157.8
Johnston	31,113	48	154.3
Kingfisher	42,637	64	150.1
Ottawa	98,607	148	150.1
Atoka	42,972	64	148.9
Lincoln	97,266	143	147.0
Muskogee	212,075	308	145.2
Alfalfa	17,220	25	145.2
Jefferson	19,314	28	145.0
Caddo	90,306	126	139.5
Kiowa	29,492	41	139.0
Bryan	113,654	157	138.1
Seminole	73,951	102	137.9
Pittsburg	133,729	184	137.6
Garfield	171,191	235	137.3

County	2004-2006 Population	Number of Cases	Annual Rate
Mayer	118,344	161	136.0
Creek	206,399	278	134.7
Tulsa	1,716,498	2,298	133.9
Cotton	19,531	25	128.0
Washington	147,273	187	127.0
Marshall	42,853	54	126.0
Stephens	128,906	162	125.7
State of Oklahoma	10,645,481	13,374	125.6
Okfuskee	34,366	43	125.1
Pontotoc	105,544	132	125.1
Cherokee	133,467	165	123.6
Custer	75,949	93	122.5
Osage	135,889	164	120.7
Logan	109,475	130	118.7
Nowata	32,286	38	117.7
Okmulgee	119,049	140	117.6
Cimarron	8,515	10	117.4
Payne	220,305	258	117.1
Tillman	25,726	30	116.6
Oklahoma	2,054,108	2,375	115.6
Woodward	57,147	66	115.5
Carter	141,376	162	114.6
Murray	38,449	44	114.4
Grant	14,233	16	112.4
Rogers	241,894	270	111.6
Pottawatomie	204,383	224	109.6
Canadian	295,251	323	109.4
Woods	25,377	27	106.4
Comanche	332,579	327	98.3
Grady	148,092	144	97.2
Kay	138,796	134	96.5
Wagoner	193,216	186	96.3
Love	27,382	26	95.0
Cleveland	673,832	620	92.0
Delaware	118,292	101	85.4
LeFlore	148,596	123	82.8
Sequoyah	122,635	94	76.7
Beaver	16,197	11	67.9
Texas	60,643	36	59.4

*County of residence was unknown for 73 persons.

Table 2. Traumatic Brain Injury Rates by Age Group, Race, Hispanic Ethnicity, Intent, Gender, and Year of Discharge/Death, Oklahoma, 2004-2006

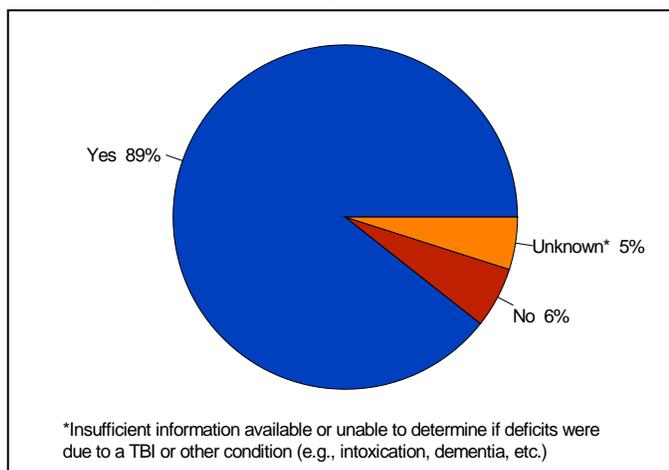
	2004			2005			2006		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Age Group (years)									
0-4	118.4	88.1	103.6	118.4	72.0	95.8	114.8	94.3	104.8
5-14	79.8	49.4	65.0	59.7	42.1	51.1	64.3	36.4	50.7
15-24	212.8	75.9	146.8	188.4	76.7	134.6	196.1	89.4	144.8
25-34	138.4	56.1	97.9	148.6	46.5	98.6	143.6	50.3	97.8
35-44	130.0	49.7	90.0	142.0	56.8	99.5	135.3	57.0	96.3
45-54	141.7	60.6	100.6	138.8	61.3	99.4	158.0	63.1	109.8
55-64	125.3	65.8	94.3	147.4	71.0	107.7	143.1	75.7	108.1
65-74	177.1	133.6	153.5	205.8	129.6	164.5	198.7	144.0	169.1
75-84	348.7	351.5	351.0	402.4	318.4	352.7	379.4	362.3	369.3
85+	680.7	587.9	615.6	676.1	599.4	622.5	651.9	620.1	629.9
Race									
White	149.0	97.3	122.8	150.3	94.5	122.0	151.9	102.9	127.1
Black	132.2	41.1	86.1	145.8	49.2	96.9	143.9	63.4	103.2
Native American	132.2	72.7	101.8	136.7	76.6	106.0	136.2	76.0	105.5
Asian	*	*	40.0	*	*	37.4	75.8	*	46.2
Ethnicity									
Hispanic	119.6	43.5	84.4	103.7	35.8	72.3	110.9	51.4	83.2
Intent									
Unintentional	115.4	82.3	98.6	114.1	79.1	96.4	119.8	89.3	104.4
Suicide/Attempt	12.7	2.1	7.3	12.6	2.2	7.3	13.8	2.1	7.9
Homicide/Assault	17.9	4.9	11.3	17.5	4.4	10.9	17.9	4.5	11.1
Legal Intervention/War	*	*	*	*	*	*	*	*	*
Undetermined	*	*	0.7	*	*	*	*	*	*
Unknown/Missing E Code	7.4	5.5	6.4	11.3	6.3	8.8	4.9	3.9	4.4
Total	154.4	95.3	124.5	156.7	92.3	124.0	157.4	100.0	128.3

*Case count is less than 20; rate not calculated

Section 2: Sampled Hospitalized Traumatic Brain Injuries in Oklahoma, 2004-2006

In order to obtain detailed information on the circumstances and outcomes of traumatic brain injuries (TBI) in Oklahoma, a random sample of cases was selected based on hospital size. The medical records of sampled cases were reviewed by trained abstractors and detailed data were recorded and analyzed. Preadmission deaths and hospitalizations occurring at facilities outside of Oklahoma were not eligible to be selected in the sample. A random sample of 1,200 records was drawn using 2004 discharge data, which resulted in 1,191 successfully abstracted cases. From 2005 data, the random sample consisted of 1,051 records, producing 1,029 successful reviews. Finally, the 2006 discharge data produced a random sample of 1,050 records with 1,038 successful reviews. The most common reasons that a record could not be reviewed or did not qualify as a successful abstraction included that the medical record was not located by hospital staff, the patient was found not to be an Oklahoma resident, or the record was discovered to be an old injury or a subsequent visit for a previously abstracted injury (e.g., a prevalent case). Since these records were selected randomly stratified by hospital size, the samples are representative of all resident hospitalized TBI cases in Oklahoma.

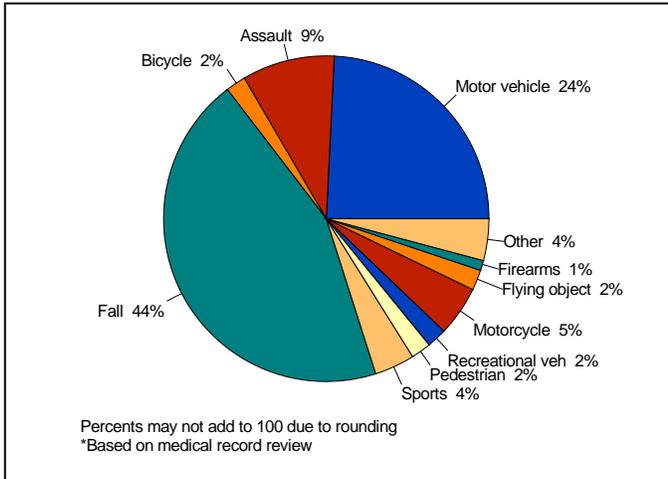
Figure 7. Sampled Hospitalized Traumatic Brain Injuries Meeting the Clinical Case Definition, Oklahoma, 2004-2006



- All sampled injuries met the case inclusion criteria, which are the code-based definitions provided in the Section One background.
- The Centers for Disease Control and Prevention has also published a clinical case definition for traumatic brain injuries.
- To meet the clinical case definition, one or more of the following conditions must be documented in the medical record and attributed to the head injury:

- Decreased level of consciousness
 - Amnesia
 - Skull fracture
 - Intracranial lesion
 - Neurological or neuropsychological abnormality
- The majority of sampled records (89%) met the clinical case definition.
 - Subsequent analyses, however, include all cases meeting the code-based inclusion criteria (n = 3,258).

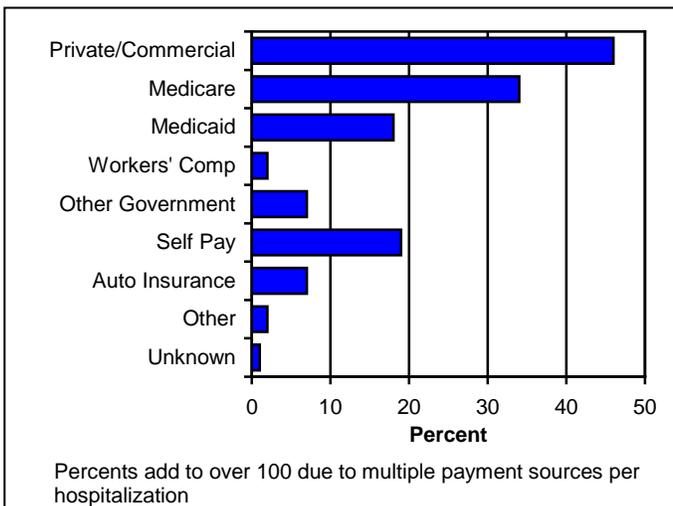
Figure 8. Sampled Hospitalized Traumatic Brain Injuries by Etiology,* Oklahoma, 2004-2006



- Falls and motor vehicle crashes were the primary mechanisms of TBI.
- Of the motor vehicle crash-related injuries, 66% were drivers, 30% were passengers, and the remaining 5% had an unknown seating position. Forty-six percent of injured patients were reported to be using a safety belt or child safety seat.
- The majority of falls (59%) occurred in a home or yard, followed by 16% in a residential institution, such as a nursing home or hospital.

- Of the motorcycle injuries, 18% of patients were reported to be wearing a helmet. Eleven percent of patients injured in bicycle-related incidents were reported to be wearing a helmet.
- Forty-six percent of the sports-related injuries resulted from horseback riding.
- Of the assaults, 7% were the result of intimate partner violence and 7% were shaken babies. Overall, the most common methods of assault were blunt instruments (34%) and fists/kicks (26%).
- The majority of hospitalized TBIs (88%) occurred unintentionally; 10% were caused intentionally by another person; 1% were self-inflicted injuries; and 2% had an unknown intentionality.
- The total number of days in the hospital ranged from 1 to 148; the average stay was 7 days.

Figure 9. Sampled Hospitalized Traumatic Brain Injuries by Payment Source, Oklahoma, 2004-2006



- Nearly one-half of all hospitalizations were paid at least in part by private or commercial insurance.
- Medicare, Medicaid, or other government programs paid at least a part of 59% of the hospitalizations.
- Nineteen percent of the hospitalizations were self pay.

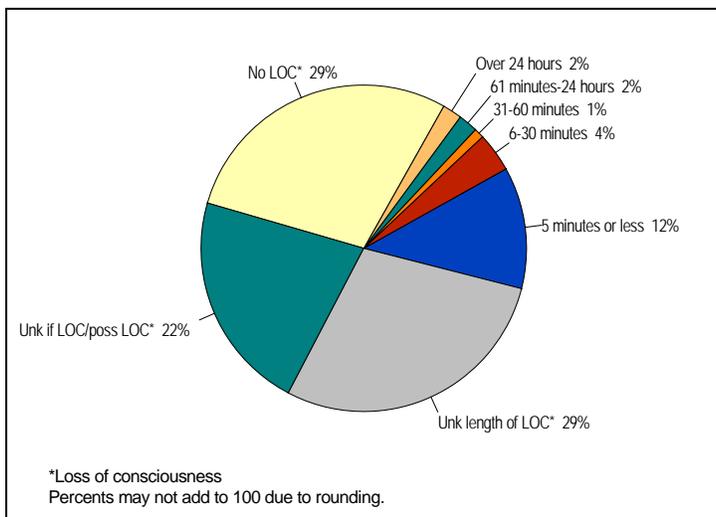
Table 3. Imaging Characteristics of Sampled Hospitalized Traumatic Brain Injuries, Oklahoma, 2004-2006

Variable	Level	Percentage
CT*/MRI** of head performed	Yes	96%
	No/Unknown	4%
CT*/MRI** results	Abnormal (likely due to TBI)	50%
	Normal	44%
	Unknown	2%
Skull fracture	Diagnosed, with imaging/surgery	18%
	Diagnosed, not confirmed by imaging	1%
	No/Unknown	81%
Intracranial lesion	Lesion documented by imaging/surgery	45%
	No lesion found on imaging	49%
	No imaging/Unknown	6%

*Computed tomography scan
 **Magnetic resonance imaging
 Percents may not add to 100 due to rounding.

- Nearly all of the sampled TBI cases had a CT scan or MRI of the head performed; 50% had documented abnormalities likely due to the TBI.
- Nearly one-fifth of the sample suffered a skull fracture and 45% had an intracranial lesion.

Figure 10. Sampled Hospitalized Traumatic Brain Injuries by Length of Time of Unconsciousness, Oklahoma, 2004-2006



- Nearly one-half of the patients were documented to have lost consciousness for some length of time as a result of their injury, and another one-fifth had possible, questionable, or unknown unconsciousness.
- Just under 30% had no reported loss of consciousness.
- One-fourth of persons with a TBI experienced some form of amnesia and did not remember events preceding, during and/or after their injury.

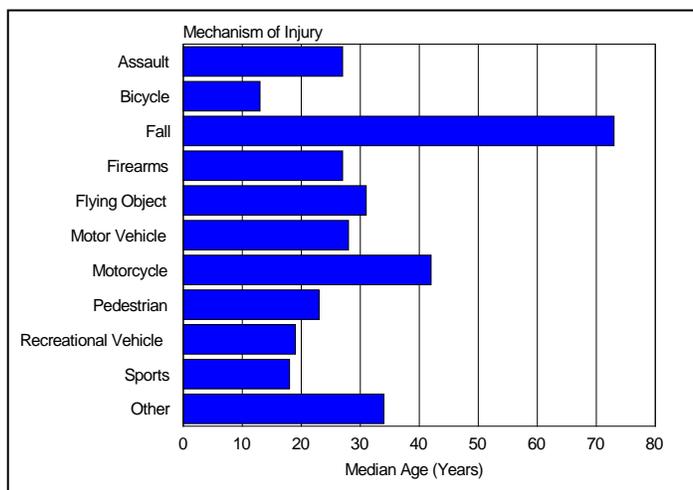
Table 4. Sampled Hospitalized Traumatic Brain Injuries by Etiology and Glasgow Coma Scale Score, Oklahoma, 2004-2006

Glasgow Coma Scale (GCS)					
Etiology	≤8 Coma	9-12 Moderate Impairment	13-14 Minimal Impairment	15 No Impairment	Invalid or Unknown
Fall	6%	7%	18%	36%	34%
Motor Vehicle	15%	11%	24%	37%	13%
Assault	8%	7%	16%	30%	39%
Motorcycle	21%	10%	29%	27%	14%
Sports	4%	9%	23%	36%	28%
Recreational Vehicle	13%	6%	27%	34%	20%
Bicycle	8%	11%	10%	50%	21%
Flying Object	5%	1%	23%	51%	19%
Pedestrian	18%	11%	29%	33%	9%
Firearms	45%	2%	5%	31%	17%
Other	15%	7%	11%	29%	38%
TOTAL	10%	8%	20%	36%	27%

Percents may not add to 100 due to rounding.

- Lower Glasgow Coma Scale (GCS) scores indicate a lower level of consciousness. Scores are based on three elements: best eye response, best verbal response, and best motor response. Scores are invalid or not applicable in situations where each component cannot be accurately assessed (e.g., the patient is intubated, sedated, intoxicated, not fully resuscitated, mentally impaired, etc.).
- The lowest valid score assigned prior to or immediately upon hospital admission was abstracted and included in this analysis.
- Motorcycle, motor vehicle, pedestrian, and firearm injuries had the lowest proportions of invalid or unknown scores and also had the largest proportions of coma or severely impaired levels of consciousness.

Figure 11. Sampled Hospitalized Traumatic Brain Injuries by Etiology and Median Age, Oklahoma, 2004-2006



- The median age of all injuries combined was 46 years; all mechanisms of injury were below this overall median, except for falls.
- Bicycle and sports-related injuries occurred more often in younger ages (median ages 13 and 18 years, respectively).
- Falls were more likely to occur in the older population (median age 73 years).

Table 5. Sampled Hospitalized Traumatic Brain Injuries by Etiology and Drug and Alcohol Use, Oklahoma, 2004-2006

Etiology	Definite/Likely Alcohol Use Prior to Injury	Definite/Likely Drug Use Prior to Injury
Fall	7%	4%
Motor Vehicle	20%	17%
Assault	42%	25%
Motorcycle	29%	14%
Sports	5%	3%
Recreational Vehicle	12%	6%
Bicycle	8%	10%
Flying Object	1%	5%
Pedestrian	16%	9%
Firearms	36%	26%
Other	14%	17%
TOTAL	15%	11%

- There was a higher proportion of alcohol use among those injured in assaults or by firearms, while alcohol use was less prevalent in bicycle, sports, and fall-related injuries.
- Of those with a positive blood alcohol concentration, 84% tested above the legal limit of 0.08 g/dL; results ranged from 0.01 to 0.51 g/dL.
- Over one-fourth of all assaults and firearm-related injuries involved definite or likely illicit drug use prior to the injury.
- Motor vehicle crashes were the third highest mechanism of injury to involve drug use.

Table 6. Sampled Hospitalized Traumatic Brain Injuries by Etiology and Glasgow Outcome Scale Score, Oklahoma, 2004-2006

Glasgow Outcome Scale (GOS)						
Etiology	1 Death	2 Persistent Vegetative State	3 Severe Disability	4 Moderate Disability	5 Good Recovery or Minor Deficits	Unknown
Fall	8%	1%	4%	18%	67%	2%
Motor Vehicle	6%	1%	3%	11%	79%	1%
Assault	4%	1%	3%	10%	82%	2%
Motorcycle	10%	0%	5%	16%	69%	1%
Sports	1%	0%	0%	4%	95%	0%
Recreational Vehicle	4%	1%	3%	8%	84%	0%
Bicycle	2%	2%	0%	3%	94%	0%
Flying Object	3%	0%	1%	9%	86%	1%
Pedestrian	7%	0%	5%	13%	72%	3%
Firearms	38%	0%	17%	5%	40%	0%
Other	9%	0%	2%	9%	78%	3%
TOTAL	7%	1%	3%	14%	74%	1%

Percents may not add to 100 due to rounding.

- Nearly three-quarters of patients had a GOS score of 5, which indicates a good recovery; the person is independent and may resume a "normal" life, but may have minor deficits.
- Persons injured from a firearm, fall, or motorcycle were less likely to have a good recovery and more likely to die.
- Sports- and bicycle-related TBIs were more likely than other etiologies to result in a good recovery. Firearm-related injuries had the poorest outcomes.

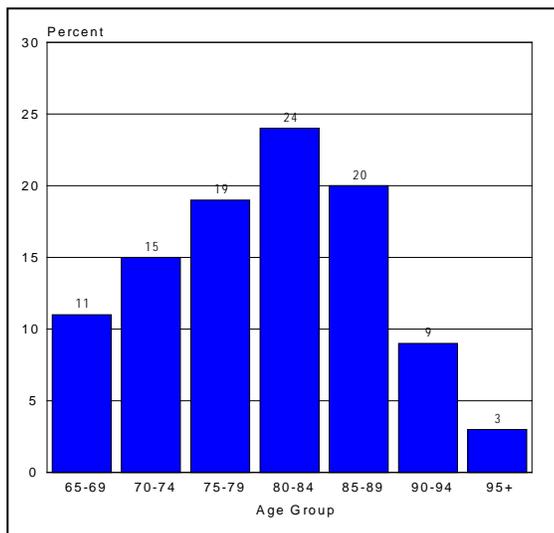
Table 7. Characteristics of Sampled Hospitalized Traumatic Brain Injuries by Year of Discharge and Gender, Oklahoma, 2004-2006

	Male			Female		
	2004	2005	2006	2004	2005	2006
Number of records sampled	694	616	615	497	413	423
Percent of total sampled	58.3%	59.9%	59.3%	41.7%	40.1%	40.8%
Median age (years)	36	41	39	64	58	61
Mean age (years)	40	43	41	55	54	54
Age range (years)	<1-96	<1-98	<1-98	<1-101	<1-100	<1-100
Percent by age group (years)						
0-4	5.5%	6.5%	6.3%	6.2%	5.6%	7.6%
5-14	8.4%	7.1%	7.6%	6.2%	6.1%	4.0%
15-24	24.0%	18.3%	21.1%	10.3%	11.4%	11.6%
25-34	11.5%	12.5%	10.7%	7.2%	6.5%	5.7%
35-44	9.9%	8.8%	11.1%	6.6%	7.0%	7.1%
45-54	10.8%	11.9%	13.2%	6.4%	10.4%	8.0%
55-64	9.4%	9.1%	9.3%	7.0%	7.5%	10.4%
65-74	8.5%	9.4%	7.5%	13.3%	10.2%	11.1%
75-84	8.4%	10.1%	7.8%	21.1%	19.6%	21.8%
85+	3.8%	6.3%	5.4%	15.5%	15.7%	12.8%
Percent by etiology						
Fall	31.6%	34.9%	36.1%	59.4%	58.8%	57.9%
Motor vehicle	24.8%	21.3%	23.6%	24.3%	22.5%	27.2%
Assault	12.1%	13.3%	12.4%	5.4%	2.9%	5.7%
Motorcycle	7.8%	7.6%	6.0%	1.0%	2.2%	0.5%
Sports	4.8%	5.0%	4.7%	3.4%	3.6%	1.7%
Recreational vehicle	3.6%	3.4%	2.3%	1.6%	1.7%	0.5%
Bicycle	2.6%	2.3%	2.8%	0.6%	1.7%	0.7%
Flying Object	3.3%	3.4%	3.1%	1.2%	0.7%	1.2%
Pedestrian	2.9%	2.6%	3.3%	0.4%	1.9%	2.4%
Firearms	1.9%	1.8%	2.0%	0.0%	1.2%	0.2%
Other	4.8%	4.4%	3.9%	2.6%	2.7%	2.1%
Percent by Intent						
Unintentional	85.2%	83.4%	84.6%	93.2%	94.2%	92.7%
Self-inflicted	1.6%	1.3%	0.7%	0.2%	0.5%	0.5%
Intentional by other	12.1%	13.1%	12.9%	5.2%	3.4%	5.9%
Unknown	1.2%	2.1%	2.0%	1.4%	1.9%	1.0%
Percent definitely/likely using alcohol or drugs prior to injury						
Alcohol	23.1%	19.0%	20.5%	6.2%	7.3%	6.6%
Illicit drugs	16.3%	11.4%	11.4%	8.9%	6.3%	5.7%
Percent of injuries work-related	6.3%	6.7%	6.3%	2.0%	1.7%	1.7%
Percent with a skull fracture	22.5%	23.9%	23.9%	11.3%	12.8%	14.2%
Percent with an intracranial lesion	43.7%	46.9%	48.5%	37.6%	41.2%	42.3%
Percent with amnesia	25.5%	24.5%	25.0%	22.9%	21.8%	27.7%
Percent by Glasgow Coma Scale score						
<= 8 (coma)	13.4%	9.4%	10.2%	9.5%	8.5%	6.4%
9-12 (moderate)	10.4%	7.3%	8.5%	6.6%	6.1%	7.8%
13-14 (minimal)	19.5%	19.0%	22.3%	16.1%	20.8%	22.2%
15 (no impairment)	33.7%	31.0%	35.9%	36.6%	35.8%	43.3%
Invalid/unknown	23.1%	33.3%	23.1%	31.2%	28.8%	20.3%
Median days in the hospital (acute care)	4	4	4	4	4	4
Mean days in the hospital (acute care)	7	7	7	6	6	6
Range of days in the hospital (acute care)	1-104	1-148	1-123	1-52	1-59	1-78

Section 3: Profile of Sampled Hospitalized Traumatic Brain Injuries Resulting from Falls among Persons 65 Years of Age and Older in Oklahoma, 2005-2006

Falls among the older population, both nationally and in Oklahoma, are a growing public health problem. As the country's population ages, the problem will likely continue to worsen. Of the 8,988 TBIs in Oklahoma in 2005-2006, 2,797 (31%) occurred in persons 65 years of age or older. Seventy-two percent of these injuries were falls. In order to obtain more detailed information surrounding these incidents, supplemental data were abstracted from all 2005 and 2006 sampled records that involved a patient 65 years of age or older who was injured in a fall. Of the 1,029 successfully abstracted records from 2005, 290 (28%) met this fall criteria. Of the 1,038 successfully reviewed records from 2006, 280 (27%) met the criteria.

Figure 12. Sampled Hospitalized Fall-Related Traumatic Brain Injuries by Age Group, 65 Years and Older, Oklahoma, 2005-2006



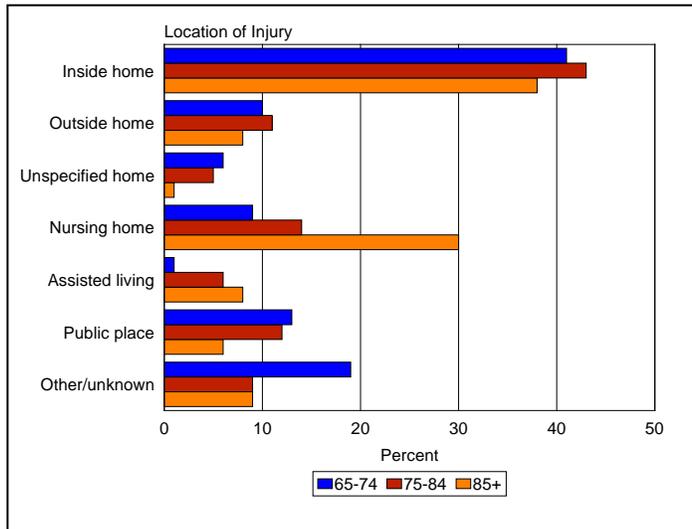
- The majority of fall-related injuries occurred among persons between the ages of 75 and 89 years.
- Fifty-nine percent of patients were female.
- The median age of males was 79 years and the median for females was 81 years.
- Eighty-six percent of patients had one or more of the following conditions documented in the record: skull fracture, intracranial lesion, amnesia, decreased level of consciousness, or neurological/neuropsychological abnormalities.
- Fifty percent of patients had abnormal imaging results that were likely due to the TBI; 5% were diagnosed with a skull fracture, while nearly 50% had an intracranial lesion.

Table 8. Sampled Hospitalized Fall-Related Traumatic Brain Injuries by Health History, 65 Years and Older, Oklahoma, 2005-2006

Health Condition	Percent of Patients with a Documented History of the Condition		
	Male	Female	Total
Alzheimer's disease/dementia	21%	34%	28%
Arthritis	29%	41%	36%
Atrial fibrillation/pacemaker	30%	21%	25%
Cerebrovascular accident/stroke	25%	28%	27%
Depression/bipolar disorder	17%	28%	23%
Diabetes	30%	23%	26%
Hypertension	64%	75%	70%
Osteoporosis	2%	19%	12%
Parkinson's disease	5%	4%	5%
Recent acute illness	19%	23%	22%
Vision problems	30%	30%	30%

- Three percent of the sampled records had no documentation of any of the listed health conditions; 97% had a history of one or more.
- Taking multiple medications has been shown to increase one's risk of falling. Seventy-nine percent of patients were on four or more prescription medications at the time of the fall.
- The use of anticoagulant and antiplatelet medications may put TBI patients at increased risk of hemorrhagic complications. Over one-half (57%) of the sampled patients were on anticoagulant therapy at the time of the fall. Twenty-six percent were on aspirin only; 18% were on a prescription medication; and 14% were on both aspirin and a prescription medication.
- Forty-four percent of males and 40% of females had a documented history of previous falls, which may or may not have required medical treatment.

Figure 13. Sampled Hospitalized Fall-Related Traumatic Brain Injuries by Location of Injury and Age Group, 65 Years and Older, Oklahoma, 2005-2006



- Most patients (74%) resided in a private home prior to hospital admission; 18% lived in a nursing home and 7% at an assisted living facility.
- More injuries occurred at home than any other location. The most common areas where injuries occurred inside the home were the bedroom and bathroom.
- Males were more likely to be injured outside their home than females (15% and 6%, respectively), while females were more likely to be injured in a nursing home than males (22% and 11%, respectively).
- Of those injured in a public area, the most common sites were hospitals (28%), parking lots (15%), streets (13%), and retail stores (12%).
- Of those injuries with a known time of occurrence, two-thirds occurred during the morning and afternoon hours; falls were least likely during the overnight hours (12%, midnight-5:59 a.m.).

Table 9. Sampled Hospitalized Fall-Related Traumatic Brain Injuries by Body Position at the Time of the Fall and Glasgow Outcome Scale Score, 65 Years and Older, Oklahoma, 2005-2006

Glasgow Outcome Scale (GOS)							
Body Position/ Mechanics	1 Death	2 Persistent Vegetative State	3 Severe Disability	4 Moderate Disability	5 Good Recovery or Minor Deficits	Unknown	Total
Lying down	12%	0%	12%	20%	56%	0%	4%
Sitting	6%	0%	6%	21%	61%	6%	6%
Standing	4%	0%	4%	21%	67%	3%	12%
Walking	9%	1%	3%	28%	59%	1%	27%
Running	0%	0%	0%	100%	0%	0%	<1%
Climbing	17%	0%	0%	33%	50%	0%	1%
Transitioning from lying down/sitting to standing	16%	0%	3%	16%	66%	0%	7%
Transitioning from standing to lying down/sitting	0%	0%	0%	33%	67%	0%	1%
Unknown	12%	2%	6%	27%	52%	1%	42%
Total	10%	1%	5%	25%	57%	1%	
Percents may not add to 100 due to rounding.							

- Approximately 40% of falls occurred while the patient was standing or walking. Slipping, tripping, and experiencing a syncopal episode were the factors most commonly associated with all falls.
- One-fourth of patients suffered moderate disabilities as a result of their fall, meaning that they are disabled, but can participate in activities of daily living and be self-sufficient. While the majority of patients had a good recovery, 10% died.
- Thirty-one percent of falls were known to involve a loss of consciousness; of these cases, 32% had a time of unconsciousness of 5 minutes or less.
- Half of all falls were known to involve some type of object and 5% had documented involvement of more than one object. The most common objects included beds, chairs, walkers, and wheelchairs.

Table 10. Characteristics of Sampled Hospitalized Fall-Related Traumatic Brain Injuries by History of Previous Falls, 65 Years and Older, Oklahoma, 2005-2006

	History of Previous Falls	No or Unknown History of Previous Falls
Median age	82 years	80 years
Assisted living/nursing home residence prior to admission	28%	23%
GCS* ≤ 8	5%	5%
Acute intracranial lesion diagnosed***	51%	46%
Skull fracture diagnosed	5%	5%
Documented loss of consciousness	25%	35%
Amnesia occurred	19%	18%
Discharged home	24%	36%
Severe disability or death	17%	16%
*Initial lowest Glasgow Coma Scale score (≤ 8 indicates coma)		
** Of those with a CT scan or MRI of the head (95%)		

- Persons with a history of previous falls (with or without medical treatment) were slightly older and more likely to have resided in an assisted living facility or a nursing home than those with no fall history.
- In general, those with a history of falls had more severe and debilitating injuries and were less likely to be discharged home than those without such a history.