



## *Traumatic Brain Injury Data Report, 2004-2007*

Tracy Wendling, M.P.H.  
Director of Surveillance  
Injury Prevention Service  
Oklahoma State Department of Health

Pam Archer, M.P.H.  
Chief  
Injury Prevention Service  
Oklahoma State Department of Health

For more information, please contact:  
Injury Prevention Service  
Oklahoma State Department of Health  
1000 N.E. 10<sup>th</sup> Street  
Oklahoma City, Oklahoma 73117-1299  
(405) 271-3430  
<http://ips.health.ok.gov>

October 2009

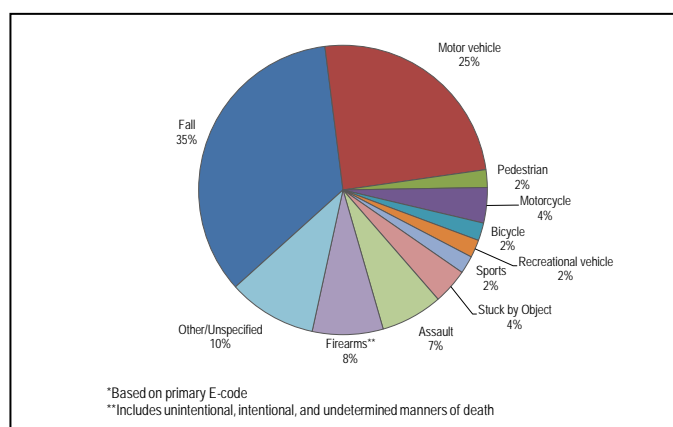
# Section 1: Traumatic Brain Injuries in Oklahoma, 2004-2007

## Background

Statewide surveillance for hospitalized and fatal traumatic brain injuries (TBI) was conducted in Oklahoma using 2004-2007 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.

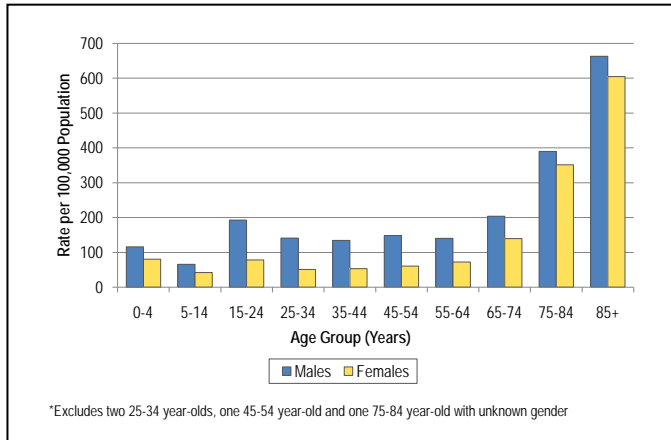
Basic demographic data were collected for all cases. In addition, a stratified random sample of cases was selected for medical record review and detailed information on the injury was collected (see page 7, Section 2). Residents hospitalized out of state or at a federal facility, who survived, were not 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 2004-2007 bridged-race population estimates.

**Figure 1. Traumatic Brain Injuries by Etiology\*, Oklahoma, 2004-2007**



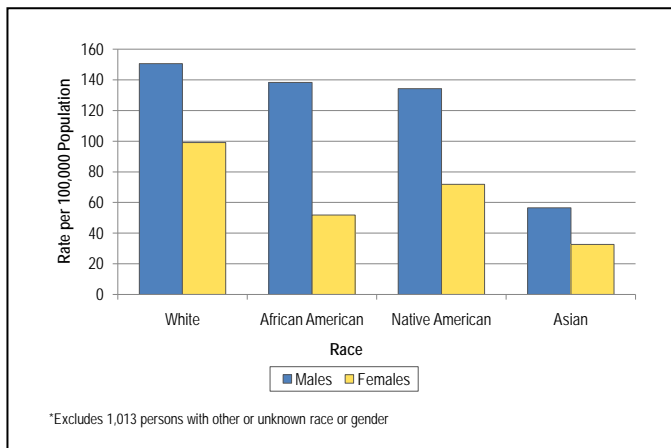
- A total of 17,890 TBIs resulted in hospitalization or death in 2004-2007 (4,386 in 2004; 4,395 in 2005; 4,593 in 2006; and 4,516 in 2007) among Oklahoma residents.
- Falls and motor vehicle crashes were the leading causes of all TBI.
- Gunshot wounds and motor vehicle crashes were the leading causes of TBI preadmission deaths.

**Figure 2. Traumatic Brain Injury Rates by Age Group\* and Gender, Oklahoma, 2004-2007**



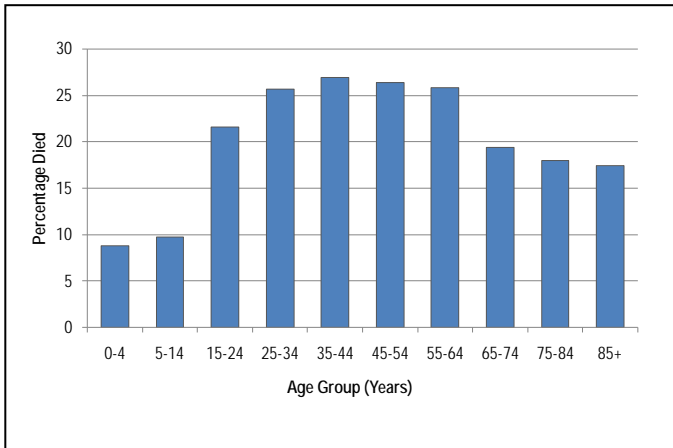
- The age range of persons who suffered a TBI was less than 1 year to 105 years, with an average age of 48 years.
- The injury rate was highest for persons 85 years and older, followed by persons 75-84 years, for both males and females.
- The third highest rate among males and females was in the 65-74 year age group.
- Males were over 1.5 times more likely to be injured than females (156.0 and 95.9 injuries per 100,000 population, respectively).

**Figure 3. Traumatic Brain Injury Rates by Gender and Race\*, Oklahoma, 2004-2007**



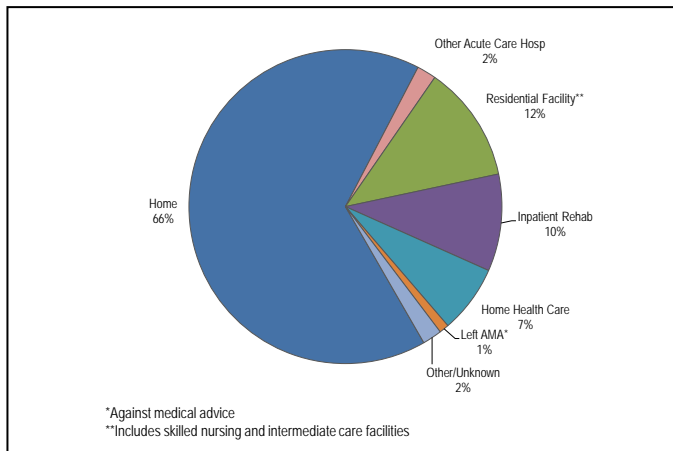
- Whites had the highest rate of TBI (124.5 injuries per 100,000 population), followed by Native Americans (102.5), African Americans (94.8), and Asians (44.5).
- TBI rates were highest among white males, followed closely by African American and Native American males.
- Rates were over 2.5 times higher 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 2.7 times higher than Hispanic females (data not shown; 107.9 and 39.7 injuries per 100,000 population, respectively).

**Figure 4. Traumatic Brain Injury Case Fatality Rates by Age Group, Oklahoma, 2004-2007**



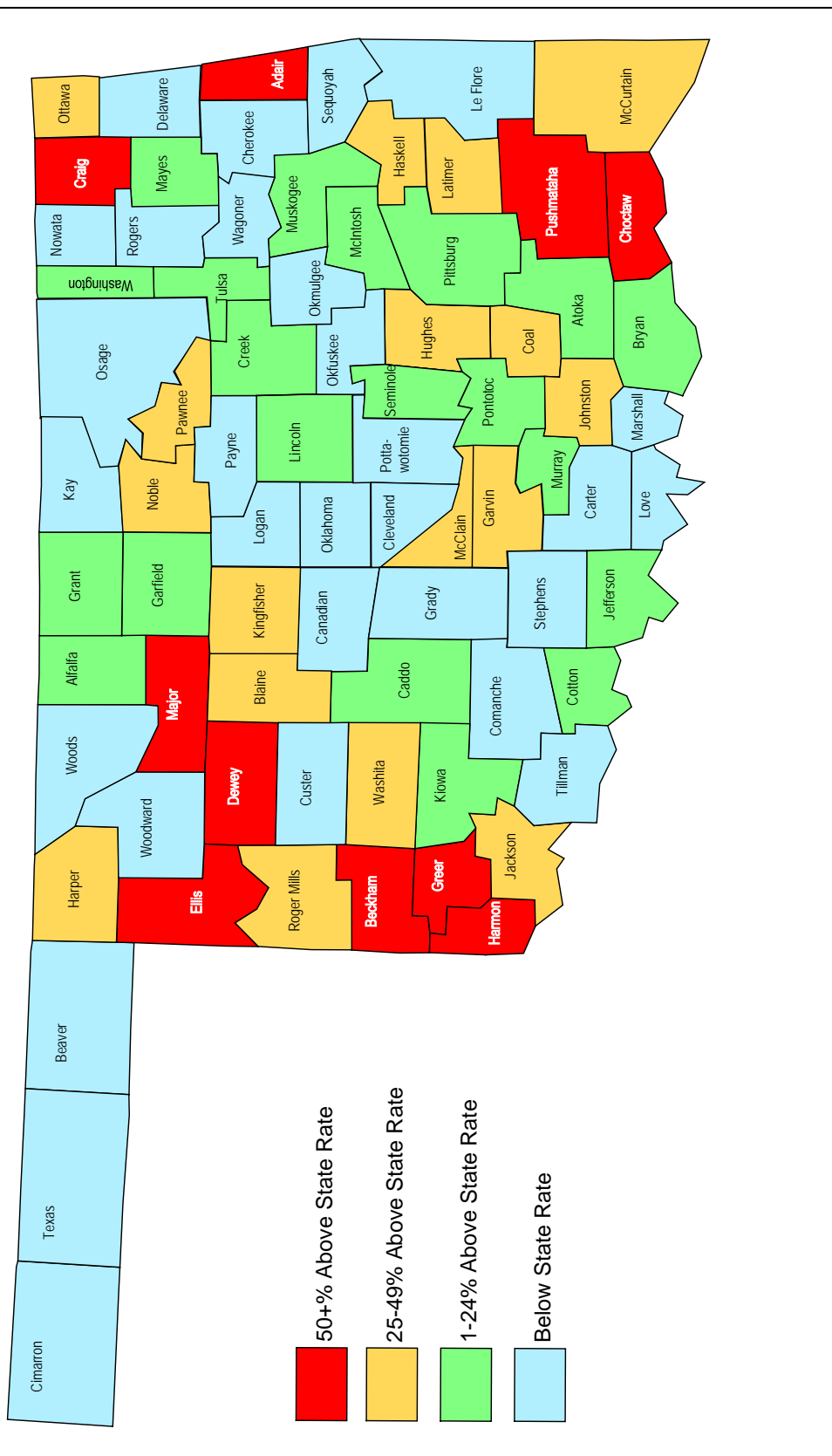
- There was a total of 3,758 deaths (22%) from a TBI in 2004-2007.
- Persons 35-44 and 45-54 years had the highest fatality rates (26.9% and 26.4%, respectively), while children under 15 years had the lowest (9%).
- Males had a higher case fatality rate than females (24% compared to 16%).

**Figure 5. Nonfatal Traumatic Brain Injury Hospitalizations by Discharge Status, Oklahoma, 2004-2007**



- Of the 17,890 TBIs identified, 79% 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.

**Figure 6. Traumatic Brain Injury Rates by County of Residence, Oklahoma, 2004-2007**



**Table 1. Traumatic Brain Injury Rates by County of Residence\*, Oklahoma, 2004-2007**

County	2004-2007 Population	Number of Cases	Annual Rate
Harmon	11,614	38	327.2
Major	28,836	78	270.5
Beckham	75,846	170	224.1
Pushmataha	46,224	101	218.5
Adair	86,814	181	208.5
Ellis	15,534	32	206.0
Dewey	17,643	35	198.4
Greer	23,207	46	198.2
Craig	60,103	117	194.7
Choctaw	60,396	114	188.8
Blaine	50,407	93	184.5
Latimer	41,972	77	183.5
Pawnee	65,868	117	177.6
Garvin	107,839	190	176.2
Roger Mills	13,056	23	176.2
Kingfisher	56,512	98	173.4
Hughes	54,856	95	173.2
Washita	45,669	79	173.0
Coal	22,868	39	170.5
Harper	13,139	22	167.4
Johnston	41,257	69	167.2
McCurtain	134,089	215	160.3
Haskell	48,047	77	160.3
Noble	44,546	71	159.4
Ottawa	130,256	205	157.4
Jackson	105,681	166	157.1
McClain	121,607	191	157.1
Caddo	118,550	178	150.1
McIntosh	78,054	116	148.6
Lincoln	128,669	189	146.9
Creek	273,722	398	145.4
Muskogee	282,110	408	144.6
Seminole	96,691	135	139.6
Jefferson	25,428	35	137.6
Pittsburg	176,766	243	137.5
Alfalfa	22,677	31	136.7
Grant	18,399	25	135.9
Murray	50,544	68	134.5
Mayes	156,878	209	133.2

County	2004-2007 Population	Number of Cases	Annual Rate
Atoka	57,458	76	132.3
Tulsa	2,301,339	3,041	132.1
Kiowa	38,610	51	132.1
Bryan	153,517	202	131.6
Garfield	229,203	298	130.0
Pontotoc	143,233	184	128.5
Washington	196,362	248	126.3
<b>State of Oklahoma</b>	<b>14,247,330</b>	<b>17,890</b>	<b>125.6</b>
Woodward	76,239	95	124.6
Stephens	171,206	210	122.7
Tillman	33,368	40	119.9
Nowata	42,594	51	119.7
Marshall	57,679	69	119.6
Oklahoma	2,764,507	3,286	118.9
Okmulgee	157,405	186	118.2
Rogers	322,682	381	118.1
Logan	142,685	168	117.7
Cotton	25,489	30	117.7
Custer	102,869	121	117.6
Cherokee	179,163	210	117.2
Canadian	395,336	461	116.6
Carter	188,067	217	115.4
Okfuskee	45,242	51	112.7
Pottawatomie	272,496	306	112.3
Osage	180,431	200	110.8
Payne	310,162	341	109.9
Comanche	451,859	482	106.7
Cimarron	10,866	11	101.2
Woods	33,859	34	100.4
Grady	197,684	194	98.1
Wagoner	257,597	248	96.3
Kay	183,985	175	95.1
Cleveland	917,055	869	94.8
Love	36,189	32	88.4
LeFlore	196,584	168	85.5
Delaware	157,988	131	82.9
Beaver	21,612	17	78.7
Sequoyah	162,203	115	70.9
Texas	80,133	39	48.7

\*County of residence was unknown for 78 persons.

**Table 2. Traumatic Brain Injury Rates by Age Group, Race, Hispanic Ethnicity, Intent, Gender, and Year of Discharge/Death, Oklahoma, 2004-2007**

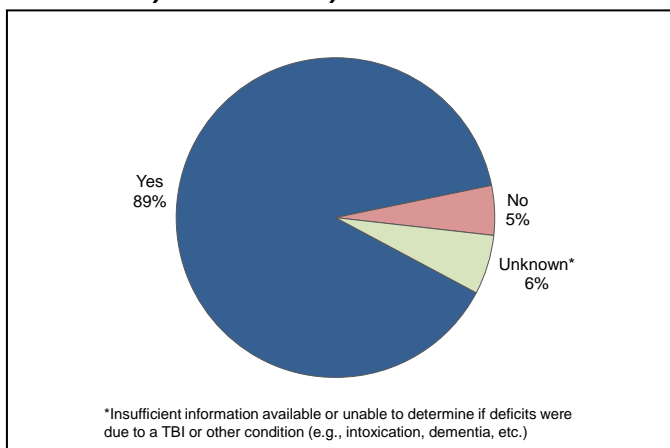
	2004			2005			2006			2007		
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
<b>Age Group</b>												
0-4	118.4	88.1	103.6	118.4	72.0	95.8	114.8	94.3	104.8	109.0	66.8	88.5
5-14	79.8	49.4	65.0	59.7	42.1	51.1	64.3	36.4	50.7	57.5	38.3	48.2
15-24	212.8	75.9	146.8	188.4	76.7	134.6	196.1	89.4	144.8	181.3	72.0	129.1
25-34	138.4	56.1	97.9	148.6	46.5	98.6	143.6	50.3	97.8	134.2	50.2	93.1
35-44	130.0	49.7	90.0	142.0	56.8	99.5	135.3	57.0	96.3	128.1	50.7	89.5
45-54	141.7	60.6	100.6	138.8	61.3	99.4	158.0	63.1	109.8	152.2	56.8	103.7
55-64	125.3	65.8	94.3	147.4	71.0	107.7	143.1	75.7	108.1	144.9	75.9	109.1
65-74	177.1	133.6	153.5	205.8	129.6	164.5	198.7	144.0	169.1	232.6	149.3	187.6
75-84	348.7	351.5	351.0	402.4	318.4	352.7	379.4	362.3	369.3	429.7	372.5	396.0
85+	680.7	587.9	615.6	676.1	599.4	622.5	651.9	620.1	629.9	654.6	608.1	622.7
<b>Race</b>												
White	149.0	97.3	122.8	150.3	94.5	122.0	151.9	102.9	127.1	150.7	101.1	125.6
Black	132.2	41.1	86.1	145.8	49.2	96.9	143.9	63.4	103.2	133.9	53.1	93.3
AIAN	132.2	72.7	101.8	136.7	76.6	106.0	136.2	76.0	105.5	128.9	59.0	93.3
Asian	*	*	40.0	*	*	37.4	75.8	*	46.2	67.4	*	52.8
<b>Ethnicity</b>												
Hispanic	119.6	43.5	84.4	103.7	35.8	72.3	110.9	51.4	83.2	99.2	28.8	66.5
<b>Intent</b>												
Unintentional	115.4	82.3	98.6	114.1	79.1	96.4	119.8	89.3	104.4	118.0	84.2	100.9
Suicide/Attempt	12.7	2.1	7.3	12.6	2.2	7.3	13.8	2.1	7.9	12.9	2.2	7.5
Homicide/Assault	17.9	4.9	11.3	17.5	4.4	10.9	17.9	4.5	11.1	18.9	4.7	11.7
Legal Intervention/War	*	*	*	*	*	*	*	*	*	*	*	*
Undetermined	*	*	0.7	*	*	*	*	*	*	*	*	0.6
Unknown/Missing E Code	7.4	5.5	6.4	11.3	6.3	8.8	4.9	3.9	4.4	4.7	3.5	4.1
<b>Total</b>	154.4	95.3	124.5	156.7	92.3	124.0	157.4	100.0	128.3	155.3	95.1	124.8

\*Case count is less than 20; rate not calculated

## Section 2: Sampled Hospitalized Traumatic Brain Injuries in Oklahoma, 2004-2007

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. The 2006 discharge data produced a random sample of 1,050 records with 1,038 successful reviews. Finally, 2007 discharge data yielded 1,036 successful reviews from a random sample of 1,050 records. 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, 2004-2007**



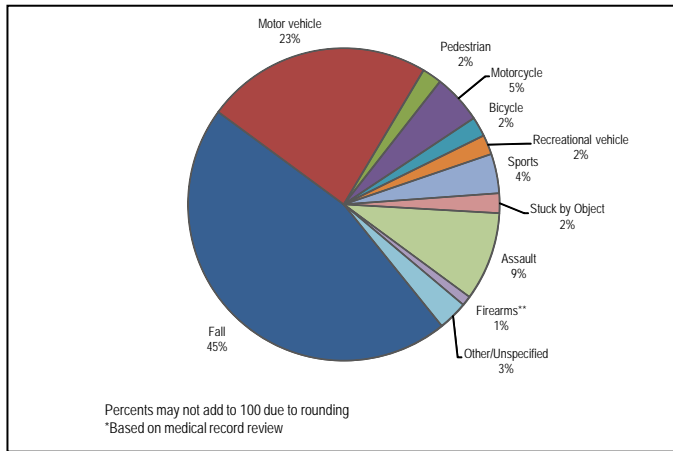
- All sampled injuries met the case inclusion criteria, which are the code-based definitions provided in the Section One background.
- The Centers for Disease Control and Prevention has also published a clinical case definition for traumatic brain injuries.
- To meet the clinical case definition, one 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 = 4,294).



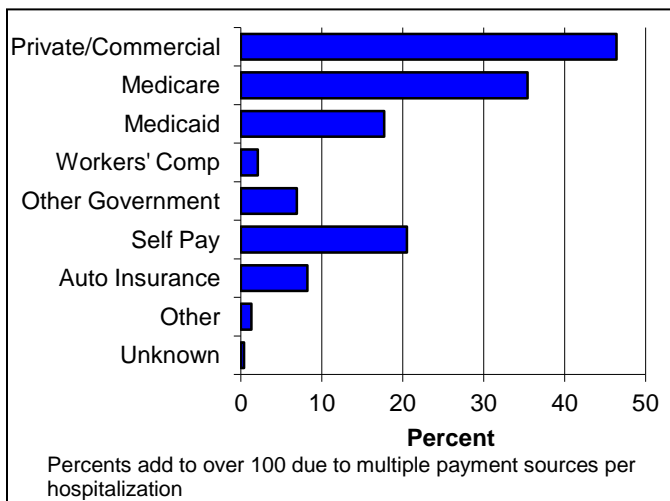
**Figure 8. Sampled Hospitalized Traumatic Brain Injuries by Etiology,\* Oklahoma, 2004-2007**



- Falls and motor vehicle crashes were the primary mechanisms of TBI.
- Of the motor vehicle crash-related injuries, 66% were drivers, 29% were passengers, and the remaining 5% had an unknown seating position. Forty-seven 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, 19% of patients were reported to be wearing a helmet. Nine percent of patients injured in bicycle-related incidents were reported to be wearing a helmet.
- Forty-seven percent of the sports-related injuries resulted from horseback riding.
- Of the assaults, 8% were the result of intimate partner violence and 7% were shaken babies. Overall, the most common methods of assault were blunt instruments (32%) and fists/kicks (27%).
- The majority of hospitalized TBIs (88%) occurred unintentionally; 10% were caused intentionally by another person; 1% were self-inflicted injuries; and 1% 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, 2004-2007**



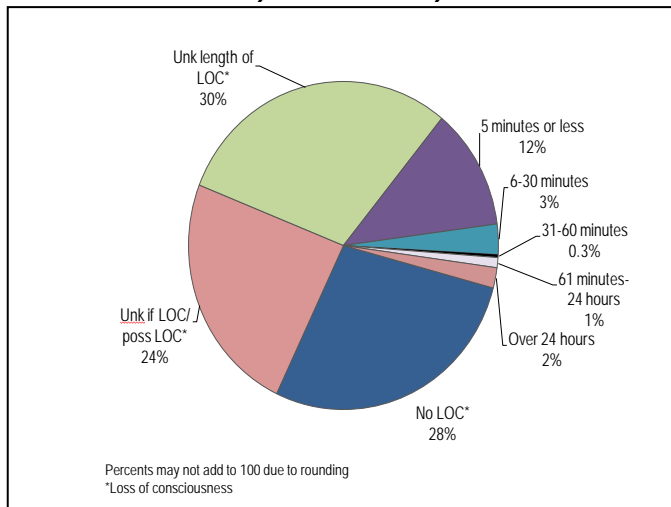
- Nearly one-half of all hospitalizations were paid at least in part by private or commercial insurance.
- Medicare, Medicaid, or other government programs paid at least a part of 60% of the hospitalizations.
- Just over 20% of the hospitalizations were self pay (uninsured).

**Table 3. Imaging Characteristics of Sampled Hospitalized Traumatic Brain Injuries, Oklahoma, 2004-2007**

Variable	Level	Percentage
CT*/MRI** of head performed	Yes	96%
	No/Unknown	4%
CT*/MRI** results	Abnormal (likely due to TBI)	52%
	Normal	43%
	Unknown	2%
Skull fracture	Diagnosed, with imaging/surgery	19%
	Diagnosed, not confirmed by imaging	1%
	No/Unknown	80%
Intracranial lesion	Lesion documented by imaging/surgery	46%
	No lesion found on imaging	48%
	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; over 50% had documented abnormalities likely due to the TBI.
- Nearly one-fifth of the sample suffered a skull fracture and 46% had an intracranial lesion.

**Figure 10. Sampled Hospitalized Traumatic Brain Injuries by Length of Time of Unconsciousness, Oklahoma, 2004-2007**



- 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-fourth 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.

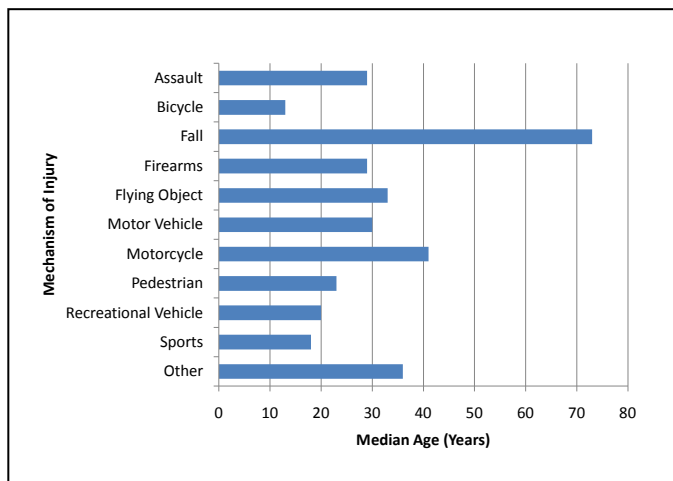
**Table 4. Sampled Hospitalized Traumatic Brain Injuries by Etiology and Glasgow Coma Scale Score, Oklahoma, 2004-2007**

Glasgow Coma Scale (GCS)					
Etiology	≤8 Coma	9-12 Moderate Impairment	13-14 Minimal Impairment	15 No Impairment	Invalid or Unknown
Fall	5%	6%	17%	38%	34%
Motor Vehicle	14%	10%	24%	36%	15%
Assault	8%	8%	16%	29%	39%
Motorcycle	20%	10%	27%	28%	15%
Sports	4%	9%	23%	39%	26%
Recreational Vehicle	12%	8%	28%	33%	19%
Bicycle	9%	10%	15%	43%	24%
Flying Object	4%	1%	25%	53%	17%
Pedestrian	18%	9%	29%	33%	10%
Firearms	48%	2%	5%	27%	18%
Other	13%	6%	13%	31%	36%
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, 2004-2007**



- The median age of all injuries combined was 48 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, 2004-2007**

<b>Etiology</b>	<b>Definite/Likely Alcohol Use Prior to Injury</b>	<b>Definite/Likely Drug Use Prior to Injury</b>
Fall	7%	4%
Motor Vehicle	20%	15%
Assault	44%	25%
Motorcycle	31%	16%
Sports	5%	3%
Recreational Vehicle	16%	5%
Bicycle	7%	7%
Flying Object	1%	4%
Pedestrian	19%	8%
Firearms	32%	23%
Other	12%	18%
<b>TOTAL</b>	<b>15%</b>	<b>10%</b>

- 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, 83% tested above the legal limit of 0.08 g/dL; results ranged from 0.01 to 0.53 g/dL.
- Approximately one-fourth of all assaults and firearm-related injuries involved definite or likely illicit drug use prior to the injury.
- Motorcycle crashes were the third highest mechanism of injury to involve drug use.

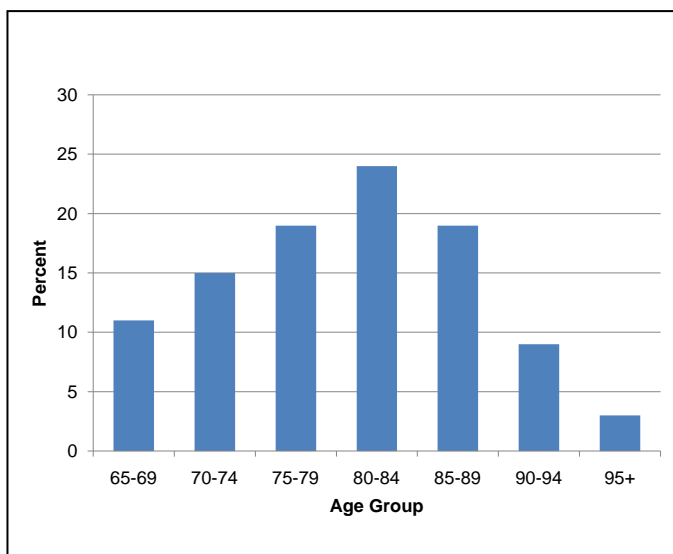
**Table 6. Characteristics of Sampled Hospitalized Traumatic Brain Injuries by Year of Discharge and Gender, Oklahoma, 2004-2007**

	Male				Female			
	2004	2005	2006	2007	2004	2005	2006	2007
Number of records sampled	694	616	615	625	497	413	423	411
Percent of total sampled	58%	60%	59%	60%	42%	40%	41%	40%
Median age (years)	36	41	39	46	64	58	61	66
Mean age (years)	40	43	41	44	55	54	54	58
Age range (years)	<1-96	<1-98	<1-98	<1-96	<1-101	<1-100	<1-100	<1-101
<b>Percent by age group (years)</b>								
0-4	6%	7%	6%	7%	6%	6%	8%	5%
5-14	8%	7%	8%	6%	6%	6%	4%	3%
15-24	24%	18%	21%	16%	10%	11%	12%	9%
25-34	12%	13%	11%	10%	7%	7%	6%	7%
35-44	10%	9%	11%	10%	7%	7%	7%	7%
45-54	11%	12%	13%	13%	6%	10%	8%	9%
55-64	9%	9%	9%	12%	7%	8%	10%	10%
65-74	9%	9%	8%	10%	13%	10%	11%	13%
75-84	8%	10%	8%	11%	21%	20%	22%	23%
85+	4%	6%	5%	5%	16%	16%	13%	16%
<b>Percent by etiology</b>								
Fall	32%	35%	36%	40%	59%	59%	58%	62%
Motor vehicle	25%	21%	24%	22%	24%	23%	27%	21%
Assault	12%	13%	12%	13%	5%	3%	6%	4%
Motorcycle	8%	8%	6%	6%	1%	2%	1%	2%
Sports	5%	5%	5%	3%	3%	4%	2%	3%
Recreational vehicle	4%	3%	2%	2%	2%	2%	1%	1%
Bicycle	3%	2%	3%	4%	1%	2%	1%	1%
Flying Object	3%	3%	3%	3%	1%	1%	1%	2%
Pedestrian	3%	3%	3%	2%	<1%	2%	2%	1%
Firearms	2%	2%	2%	3%	0%	1%	<1%	1%
Other	5%	4%	4%	2%	3%	3%	2%	2%
<b>Percent by Intent</b>								
Unintentional	85%	83%	85%	84%	93%	94%	93%	94%
Self-inflicted	2%	1%	1%	1%	<1%	1%	1%	1%
Intentional by other	12%	13%	13%	14%	5%	3%	6%	4%
Unknown	1%	2%	2%	1%	1%	2%	1%	1%
<b>Percent definitely/likely using alcohol or drugs prior to injury</b>								
Alcohol	23%	19%	21%	23%	6%	7%	7%	6%
Illicit drugs	16%	11%	11%	11%	9%	6%	6%	4%
Percent of injuries work-related	6%	7%	6%	7%	2%	2%	2%	3%
Percent with a skull fracture	23%	24%	24%	25%	11%	13%	14%	16%
Percent with an intracranial lesion	44%	47%	49%	53%	38%	41%	42%	45%
Percent with amnesia	26%	25%	25%	27%	23%	22%	28%	24%
<b>Percent by Glasgow Coma Scale score</b>								
<= 8 (coma)	13%	9%	10%	9%	10%	9%	6%	8%
9-12 (moderate)	10%	7%	9%	7%	7%	6%	8%	6%
13-14 (minimal)	20%	19%	22%	20%	16%	21%	22%	18%
15 (no impairment)	34%	31%	36%	34%	37%	36%	43%	42%
Invalid/unknown	23%	33%	23%	30%	31%	29%	20%	27%
Median days in the hospital (acute care)	4	4	4	4	4	4	4	5
Mean days in the hospital (acute care)	7	7	7	7	6	6	6	7
Range of days in the hospital (acute care)	1-104	1-148	1-123	1-85	1-52	1-59	1-78	1-84

### *Section 3: Profile of Sampled Hospitalized Traumatic Brain Injuries Resulting from Falls among Persons 65 Years of Age and Older in Oklahoma, 2005-2007*

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 13,504 TBIs in Oklahoma in 2005-2007, 4,332 (32%) occurred in persons 65 years of age or older. Seventy-three percent of these injuries were falls. In order to obtain more detailed information surrounding these incidents, supplemental data were abstracted from all 2005 through 2007 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. In 2007, the criteria were met by 327 of the 1,036 successfully abstracted records (32%).

**Figure 12. Sampled Hospitalized Fall-Related Traumatic Brain Injuries by Age Group, 65 Years and Older, Oklahoma, 2005-2007**



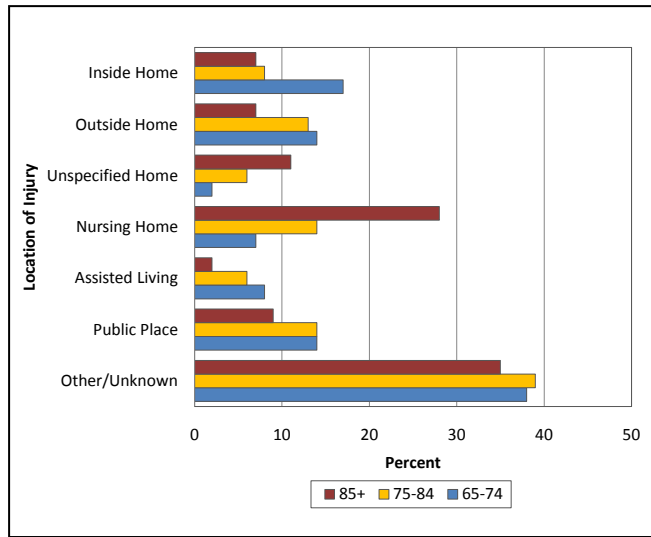
- The majority of fall-related injuries occurred among persons between the ages of 75 and 89 years.
- Fifty-nine percent of patients were female.
- The median age of males was 79 years and the median for females was 81 years.
- Eighty-six percent of patients had one or more of the following conditions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

**Table 7. Sampled Hospitalized Fall-Related Traumatic Brain Injuries by Health History, 65 Years and Older, Oklahoma, 2005-2007**

Health Condition	Percent of Patients with a Documented History of the Condition		
	Male	Female	Total
Alzheimer's disease/dementia	22%	33%	28%
Arthritis	31%	41%	37%
Atrial fibrillation/pacemaker	29%	20%	24%
Cerebrovascular accident/stroke	21%	24%	23%
Depression/bipolar disorder	15%	26%	21%
Diabetes	29%	24%	26%
Hypertension	64%	76%	71%
Osteoporosis	3%	19%	12%
Parkinson's disease	4%	4%	4%
Recent acute illness	19%	24%	22%
Vision problems	28%	31%	30%

- Four percent of the sampled records had no documentation of any of the listed health conditions; 96% had a history of one or more.
- Taking multiple medications has been shown to increase one's risk of falling. Seventy-eight 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 (56%) of the sampled patients were on anticoagulant therapy at the time of the fall. Twenty-five percent were on aspirin only; 17% were on a prescription medication; and 13% were on both aspirin and a prescription medication.
- Forty-two percent of males and 39% 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, 2005-2007**



- Most patients (74%) resided in a private home prior to hospital admission; 17% lived in a nursing home and 8% 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, bathroom, and kitchen.
- Males were more likely to be injured outside their home than females (20% and 7%, respectively), while females were more likely to be injured in a nursing home than males (21% and 10%, respectively).
- Of those injured in a public area, the most common sites were hospitals (30%), parking lots (18%), retail stores (16%), and streets (9%).

- 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 8. Sampled Hospitalized Fall-Related Traumatic Brain Injuries by Body Position at the Time of the Fall and Gender, 65 Years and Older, Oklahoma, 2005-2007**

Body Position/ Mechanics	Male	Female	Total
Lying down	4%	3%	3%
Sitting	5%	6%	6%
Standing	16%	10%	13%
Walking	22%	33%	29%
Running	0.3%	0%	0.1%
Climbing	3%	1%	2%
Transitioning from lying down/sitting to standing	6%	7%	6%
Transitioning from standing to lying down/sitting	1%	1%	1%
Other/Unknown	43%	39%	41%

Percents may not add to 100 due to rounding.

- Over 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.
- Thirty-two percent of falls were known to involve a loss of consciousness; of these cases, 34% had a time of unconsciousness of 5 minutes or less.
- Over one-third 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.



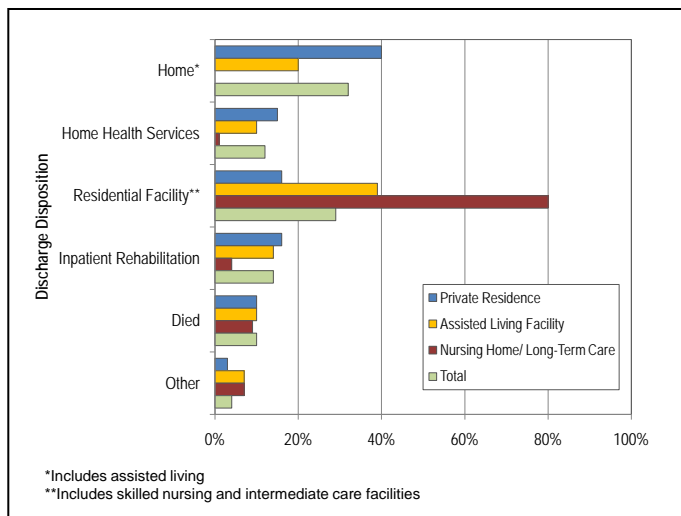
**Table 9. Characteristics of Sampled Hospitalized Fall-Related Traumatic Brain Injuries by History of Previous Falls, 65 Years and Older, Oklahoma, 2005-2007**

	History of Previous Falls	No or Unknown History of Previous Falls
Median age	81 years	80 years
Assisted living/nursing home residence prior to admission	28%	23%
GCS* ≤8	5%	4%
Acute intracranial lesion diagnosed***	54%	51%
Skull fracture diagnosed	4%	5%
Documented loss of consciousness	27%	36%
Amnesia occurred	21%	20%
Discharged home	25%	36%
Died in the hospital	8%	10%

\*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 slightly more serious injuries and were less likely to be discharged home than those without such a history.

**Figure 14. Sampled Hospitalized Fall-related Traumatic Brain Injuries by Patient's Residence at the Time of Admission and Disposition of the Patient at the Time of Acute Care Discharge, 65 Years and Older, Oklahoma, 2005-2007**



- The majority of nursing home residents returned to a residential facility upon discharge, while less than one-half of patients who had been living at home were able to return there independently.
- Nursing home residents were least likely to be discharged to an inpatient rehabilitation facility.
- Overall, and regardless of prior residence, about 10% of the sample died while in the hospital.