



## *Profile of Fall-Related Injuries in Oklahoma, 2003*

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## Background

In the United States, falls are the second leading cause of unintentional injury deaths and the most common cause of injuries and hospital admissions for trauma. Falls account for 783,357 hospitalizations and an estimated 11.5 million non-hospitalized injury cases each year. Recent estimated costs are \$26 billion per year. Oklahoma has increasingly high rates of fall-related injuries. From 1992 to 2003, trends show a steady increase in fall-related traumatic brain injuries from 764 cases in 1992 to 1,254 cases in 2001, and 1,451 cases in 2003.

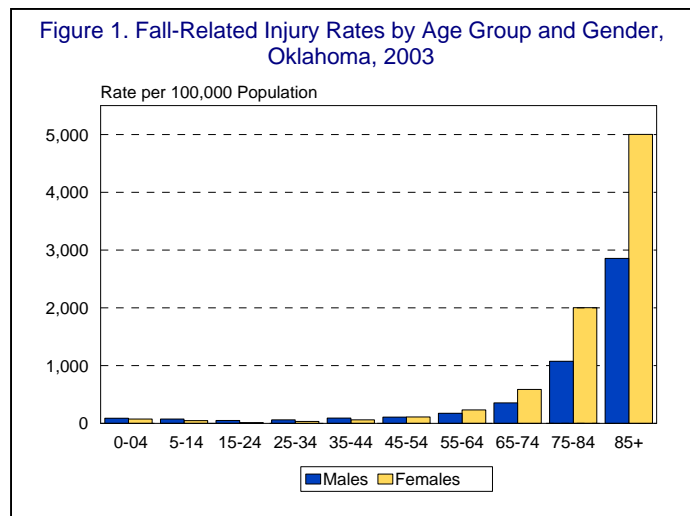
## Methods

The 2003 hospital discharge data were used to describe the magnitude and characteristics of fall-related injuries, including at risk populations, types of injuries incurred, and other factors. Data on falls (E codes 880-886, 888) among Oklahoma residents were extracted from a subset of cases with injury as the primary ICD-9-CM code from the Oklahoma hospital discharge database. Variables included demographics, ICD-9-CM codes, E codes, discharge destination, length of hospital stay, payment sources, charges, and urban/rural residence. Anatomic location of injuries were analyzed in relation to external cause of injuries, length of stay and charges. Type of injury and cause, using E codes, were examined by selected age groups.

## Magnitude of the Fall-Related Injury Problem in Oklahoma

In 2003, 8,733 fall-related injuries were reported in the hospital discharge database. Ages ranged from 0-104 years (mean 69 years; median 78 years). The 75-84 year age group had the highest incidence (2,614; 30% of all fall-related injuries; rate 1,551.8 per 100,000 population). Rates increased dramatically with increasing age from 110.1 for the 45-54 age group to 487.1 and 4,357 for ages 65-74 and 85 years and over, respectively. Injury rates among females began to surpass males after age 54 years, increasing to a female to male ratio of 3:1 among persons 85 years and older (Figure 1). Females experienced 66% of all fall-related injuries (rate 326.1 per 100,000 population compared to 170.2 in males).

Whites incurred 85% of fall-related injuries, with a rate of 262.2 per 100,000 population followed by Native Americans (173.4), African Americans (93.0), and Asians (33.3). Females had higher rates among all races ranging from a ratio of 2:1



among whites to 1.1:1 among Asians (Figure 2).

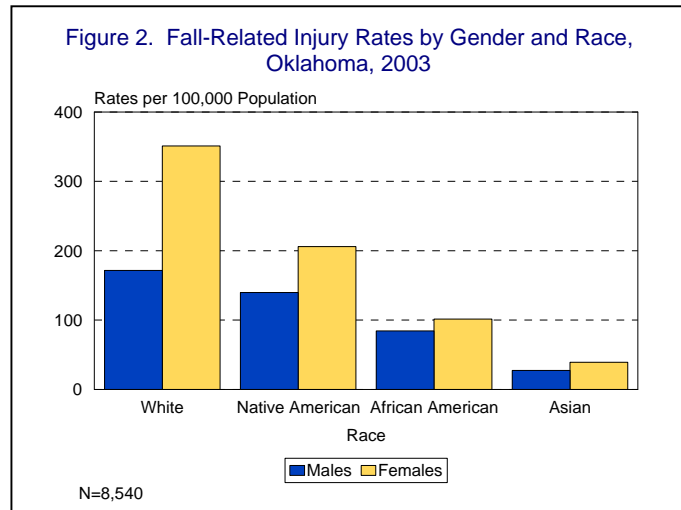
Fifty-three percent of fall-related injuries occurred among urban residents (233.5 per 100,000 population) compared to 47% among rural residents (263.9 per 100,000 population).

Length of hospital stay ranged from 1-97 days (mean 5 days); most common lengths of stay were 1 day (16%), 3-5 days (43%), and 6-20 days (23%).

Persons were admitted and referred mainly through emergency departments (71%), or physicians (22%). Thirty-four percent of persons were discharged home, 19% to skilled nursing facilities, 15% to inpatient rehabilitation, 8% to nursing homes, 7% to home health, 6% to another type institution for inpatient care, and 11% to other destinations such as another short term hospital, a long term acute care hospital, or hospice.

Overall, the main types of falls included: other and unspecified falls (42%), falls on the same level from slipping, tripping, and stumbling (25%), and falls from one level to another (12%). Leading types of injuries were hip fractures (39%), head injuries (10%), vertebral/spinal injuries (10%), and upper extremity (humerus, radius/ulna) injuries (10%).

The types of falls and injuries sustained, and the consequent length of hospital stays, charges and payer source varied considerably by age group. Across all age groups, falls occurred mainly in and around the home. The following tables illustrate the factors and circumstances of the fall-related injury problem in Oklahoma.



## Factors and Circumstances Related to Fall-Related Injuries in Oklahoma

Children under five years of age are likely to fall as they become increasingly mobile, curious, and confident. Among children less than a year old, being dropped or rolling off beds is more common while 2-4 year-olds more often fall from furniture or playground equipment, or trip/stumble. Some characteristics of injuries in children under five years are shown in Table 1. Of those who were hospitalized, nearly a third suffered head injuries that could lead to learning and behavioral problems.

Persons aged 5 to 14 years experienced increasing numbers of falls associated with recreation and public places. Persons 15 to 44 years had higher incidence of falls at industrial and public places and more commonly sustained injuries from falling one level to another and from ladders/on stairs. Among persons 45 years and older, falls from tripping or stumbling and same-level falls became increasingly common. Also, the occurrence of lower extremity fractures, and vertebral and head injuries increased with age.

**Table 1. Characteristics of Fall-Related Injuries Among Children Under Five Years of Age, Oklahoma, 2003 (N=199)**

Characteristic	Number	(Percent)
<b>Demographics</b>		
Gender		
Male	110	(55%)
Female	89	(45%)
Race		
White	151	(76%)
Other	19	(10%)
Black	14	( 7%)
Native American	10	( 5%)
Unknown	5	( 2%)
<b>Medical/Epidemiologic</b>		
Main Types of Injuries (Principal Diagnosis)		
Skull fracture, intracranial/other injury	60	30%
Fracture of humerus	50	25%
Fracture of shaft of femur	42	21%
Main Causes of Injuries (E codes)		
Fall from chair, bed, furniture	70	35%
Fall from playground equipment	30	15%
Fall from stairs, ladders, building	20	10%
Other falls from one level to another	40	20%
Length of Hospital Stay		
Mean 1.8 days (Range 1-21 days)		
1 day stay	137	69%
2-3 day stay	22	11%
Discharge destination		
Home	191	96%
Charges totaled \$1,331,444		
Mean \$6,691 (Range \$336-\$98,712)		
Main sources of charges		
Private/Commercial	94	47%
Medicaid	88	44%
Self pay	18	9%

For persons age 75 years and older, the risk and occurrence of falls increased dramatically. The characteristics of fall-related injuries in this age group are shown in Table 2. Various types of hip fracture accounted for the majority of injuries followed by skull/intracranial injuries, pelvis, and lower extremity fractures. The majority of falls were same level or unspecified falls; 26% of injuries occurred from stumbling, slipping and tripping. Further care following hospitalization was required for the majority of older persons, indicating the moderate to high levels of functional limitations and dependence. Hospital charges for this age group totaled \$86,030,592 and the main source of charges was Medicare.

The relationship of anatomical location of injury, length of hospital stay, and charges for fall-related injuries is shown in Tables 3 and 4. Data shown in Tables 3 and 4 relate to

**Table 2. Characteristics of Fall-Related Injuries Among Persons 75 Years and Older, Oklahoma, 2003 (N=5,008)**

Characteristic	Number	(Percent)
<b>Demographics</b>		
Gender		
Male	1175	23%
Female	3833	77%
<b>Medical/Epidemiologic</b>		
Main Types of Injuries (Primary diagnosis)		
Hip Fracture	2649	(53%)
Skull fracture/intracranial injuries	424	( 8%)
Fracture of pelvis	358	( 7%)
Fracture of shaft of femur	209	( 4%)
Fracture of humerus	203	( 4%)
Fracture of ankle	134	( 3%)
Main Causes of Injuries (E codes)		
Other/unspecified fall	2449	(49%)
Slipping/tripping	1284	(26%)
Fall from chair, bed, furniture	419	( 8%)
Fall from stairs, ladders, building	189	( 4%)
Discharge Destination		
Skilled nursing facility	1402	(28%)
Inpatient rehabilitation	952	(19%)
Home	701	(14%)
Nursing home	601	(12%)
Home health	300	( 6%)
Medicare swing bed	200	( 4%)
Other short-term facility	150	( 3%)
Other destinations (Long-term care hospital, Medicare/Medicaid special hospitals, hospice, etc.)	702	(14%)
Length of Hospital Stay		
Mean 5 days (Range 1-59 days)		
1 day stay	394	8%
2-3 day stay	1141	23%
4-10 day stay	3073	61%
Charges totaled \$86,030,592		
Mean \$17,179 (Range \$125-\$396,553)		
Main sources of charges		
Medicare	4,407	(88%)
Private/Commercial	362	( 7%)

primary diagnoses for injuries. Excluded from these tables are primary diagnoses for long-term effects, poisoning by drugs, medicinal, and biological substances and adverse effects (N=449). Table 3 illustrates the relationship for fractures by body region. The lower extremity was the leading region for injuries; fracture of the femoral neck accounted for the highest incidence of injury, length of stay and hospital charges. Factors related to fall-related injuries, excluding fractures, are described in Table 4.

The high incidence of fractures occurring from the impact of falls demonstrates the importance of recognizing risks in everyday life for all age groups and utilizing basic safety measures. The outcome after a fall-related fracture injury requiring hospitalization usually involves days or weeks of pain and limited mobility, risk of complications, and disruption of work, school and daily activities. Lower extremity fractures posed the greatest risk and were the most costly, amounting to charges of \$100,225,320 in 2003, followed by neck and trunk fractures (\$13,387,884). Longer hospital stays were associated with skull, neck/trunk, and femoral fractures.

**Table 3. Factors Related to Fall-Related Fracture Injuries by Body Region (N=7,260)**

<b>Body Region</b>	<b>(ICD-9-CM codes)</b>	<b>Number</b>	<b>Average Length of Stay</b>	<b>Total Hospital Charges</b>
<b>Head</b> 209 (2% of all cases)	Principal Diagnosis		(Range)	
Fx Skull	(800.0-801.9)	122	6 days (R1-49)	\$3,594,025
Fx Facial bones	(802.0-802.9)	60	3 days (R1-12)	\$ 675,590
Other Skull Fx	(803.0-804.9)	27	5 days (R1-18)	\$ 771,813
<b>Fx Neck/Trunk</b> 1086 (12% of all cases)				
Fx vertebral column				
Without mention SCI	(805.0-805.9)	420	5 days (R1-43)	\$ 6,195,439
With SCI	(806.0-806.9)	28	9 days (R1-45)	\$ 1,476,046
Fx ribs, sternum, larynx, trachea	(807.0-807.6)	166	5 days (R1-46)	\$ 1,818,789
Fx pelvis	(808-809)	472	5 days (R1-50)	\$ 3,897,610
<b>Fx Upper limb</b> 911 (10% of all cases)				
Fx clavicle	(810.0-810.1)	14	4 days (R1-14)	\$ 172,986
Fx scapula	(811.0-811.1)	10	5 days (R1-11)	\$ 178,269
Fx humerus	(812.0-812.5)	525	3 days (R1-38)	\$ 5,769,017
Fx radius, ulna	(813.0-813.9)	348	2 days (R1-10)	\$ 3,534,532
Fx carpal, metacarpal	(814.0-817.1)	14	2 days (R1-10)	\$ 113,768
<b>Lower Extremity</b> 4844 (55% of all cases)				
Fx Neck of femur	(820.0-820.9)	3391	6 days (R1-59)	\$75,167,254
Fx Shaft of femur	(821.0-821.3)	410	6 days (R1-57)	\$ 9,900,204
Fx Patella	(822.0-822.1)	94	4 days (R1-15)	\$ 1,044,458
Fx Tibia/Fibula	(823.0-823.9)	320	4 days (R1-45)	\$ 5,720,592
Fx Ankle	(824.0-824.7)	564	3 days (R1-41)	\$ 7,600,518
Fx Tarsal/Metatarsal	(825.0-825.39)	65	3 days (R1-17)	\$ 792,294
<b>Dislocations all Joints/Sprains and Strains</b> 210 (2% all cases)	(830-848)	210	3 days (R1-23)	\$ 1,937,370

The mean total hospital charges was highest for head injuries (\$24,122) followed by lower extremity injuries (\$20,691), neck and trunk injuries (\$12,328), upper limb injuries (\$10,723), and dislocations (\$9,226).

The incidence of serious fall-related injuries not accompanied by fracture was substantially lower (Table 4). Length of stay was high for persons who incurred intracranial, thoracic, or spinal cord injuries. Head injury hospital charges were highest at \$11,545,598. The leading fall-related injuries in terms of length of stay and charges (with and without accompanying fracture) involved the following regions; 1) lower extremity with 4844 cases and total charges of \$100,225,320; 2) neck and trunk with 1086 cases and charges of \$13,387,884; and 3) head with 923 cases and charges of \$16,587,026. Medicare was the primary charges source for care among persons 65 years and older (86%). Private/commercial, self-pay, and Medicaid were principal charges sources in younger age groups.

**Table 4. Factors Related to Fall-Related Injuries, Excluding Fractures, by Body Region (N=1,024)**

Body Region – Injuries	(ICD-9-CM Codes)	Number	Average Length of Stay (Range)	Total Hospital Charges
Head – Intracranial Injury excluding skull fracture 584 (7% of all cases)				
Concussion	(850.0-850.9)	197	3 days (R1-12)	\$ 1,182,247
Cerebral laceration and Contusion	(851.0-851.9)	71	5 days (R1-41)	\$ 1,348,676
Subarachnoid, subdural, extradural hemorrhage	(852.0-852.5)	254	7 days (R1-33)	\$ 7,157,502
Other Intracranial injury	(853.0-854.1)	62	6 days (R1-26)	\$ 1,102,894
131 Non-specific head injury (18% of 715 head injuries without fracture)	(959.01)	131	3 days (R1-17)	\$ 754, 279
Injury Thorax, Abdomen, Pelvis 153 (2% all injuries)				
Pneumo/hemothorax,	(860.0-860.5)	81	6 days (R1-17)	\$ 1,308,850
Injury heart, lung	(861.0-861.3)	9	10 days (R1-33)	\$ 295,304
Injury other intrathoracic organs	(862.0-862.9)	2	6 days (R4-7)	\$ 32,378
Injury gastrointestinal, liver, spleen, kidney	(863.0-866.1)	51	5 days (R1-19)	\$ 1,241,903
Injury pelvic, other abdominal organs	(867.0-869.1)	10	7 days (R1-12)	\$ 216,541
Superficial Bodily Injuries 125 (1% of all injuries)	(870.0-897.7)/	125	3 days (R1-8)	\$ 971, 867
Open wound/superficial injury any area body	(910-919)			
Injury to Nerves and Spinal Cord Injury to Spinal Cord without spinal bone injury 31 (< 1% of all cases)				
Cervical	(952.0-952.09)	18	12 days (R3-97)	\$ 1,149,447
Dorsal	(952.1-952.19)	2	10 days (R3-17)	\$ 58,398
Lumbar/sacral/other	(952.2-952.9)	2	5 days (R2-6)	\$ 29,640
Injury Nerve roots, peripheral and other nerves	(953.0-957.9)	9	4 days (R2-7)	\$ 83,477

The mean total hospital charges was highest for nerves and spinal cord injuries (\$42,612) followed by thorax, abdomen and pelvis injuries (\$20,229), intracranial head injuries (\$16,170) and superficial bodily injuries (\$7,775).

This profile demonstrates that fall-related injuries are a major public health problem. Numerous risk factors are associated with falls and fall-related injury including physical, physiologic, medical and behavioral factors of individuals, and environmental factors. Several programs are in place to help reduce falls such as patient fall-risk assessments and protocols in most hospitals and both focused and multifactorial interventions in homes and communities.