



Effects of Safety Belt Use on Hospitalization of Occupants Involved in Motor Vehicle Crashes in Oklahoma, 1995-2000

Oklahoma Crash Outcome Data Evaluation System (CODES)

Report Prepared by Betty Harris, M.A., Senior Research Associate

CODES Director: Belinda Biscoe, Ph.D.

CODES Data Linkage: Bruce Vincent, Sudhir Vallamkondu, M.S.,
and Betty Harris, M.A.

CODES Liaison: John Vetter, M.A.

Oklahoma CODES Project
<http://codes.ou.edu/>
University of Oklahoma
College of Continuing Education
Educational Training, Evaluation, Assessment, and Measurement (E-TEAM)
555 Constitution
Norman, OK 73072

Funded by:
The Oklahoma Highway Safety Office
Joe McDonald, Director
Carol Williams, Project Manager
and
The National Center for Statistics and Analysis, National Highway Traffic Safety
Administration



Oklahoma CODES would like to acknowledge the Oklahoma State Department of Health and Oklahoma Department of Public Safety for allowing use of their data for this project and for the support provided by their staffs.

Executive Summary



Motor vehicle crashes are the leading cause of death and disability among persons 1-44 years of age in Oklahoma, resulting more than three hundred thousand persons injured or killed between 1995 and 2000. Even though seat belt use reduces the risk of death or serious injury by about half, observational studies indicate that during this time period, only half of front seat occupants were wearing their seat belts. This study looks at the effects of restraint use on injuries sustained in crashes.

All Crashes: Compared to occupants wearing seat belts, unrestrained occupants:

Who were not ejected were:

-  Nine times more likely to die from the crash
-  Twice as likely to have head, trunk, or extremity (arm or leg) injuries

Who were ejected were:






-  One hundred and sixty times more likely to die from the crash
-  Five times more likely to have head injuries, six times more likely to have trunk injuries and seven times more likely to have extremity injuries

If the unrestrained occupants had been wearing seat belts, approximately 2,400 fewer lives could have been lost during this time period.






Crash data were linked to inpatient hospitalization data to look at health outcomes for persons hospitalized as a result of a crash. The most severe injuries were sustained by unrestrained occupants who were ejected followed by unrestrained occupants who were not ejected.

Hospitalizations: Compared to restrained occupants, unrestrained occupants:

Who were not ejected:

-  Stayed in the hospital five percent longer, accrued 13% higher average charge per hospitalization, and were 29% more likely to die while in the hospital
-  Were 13% more likely to have injuries to multiple body areas
-  Were 44% more likely to suffer critical or un-survivable injuries
-  Were 31% more likely to suffer a brain injury. Their brain injuries tended to be more severe and they were 26% less likely to return to their previous state of consciousness.
-  Were 36% more likely to suffer a spinal cord injury (which often leads to lifetime disability)

Who were ejected:

-  Stayed in the hospital 21% longer, accrued 75% higher average charge per hospitalization, and were almost three times more likely to die in the hospital
-  Were 37% more likely to have injuries to multiple body areas
-  Were two and a half times more likely to suffer critical or un-survivable injuries
-  Were twice as likely to suffer a brain injury. Their brain injuries tended to be more severe and they were almost twice as likely not to return to their previous state of consciousness.
-  Were three and a half times more likely to suffer a spinal cord injury (which often leads to lifetime disability)



Effects of Seat Belt Use on Hospitalization of Occupants Involved in Motor Vehicle Crashes in Oklahoma, 1995-2000

Crash Outcome Data Evaluation System (CODES)

In Oklahoma, motor vehicle crashes are the leading cause of death and disability among persons 1-44 years of age (Oklahoma State Department of Health [OSDH], Injury Prevention Service [IPS], *Oklahoma Motor Vehicle Crash Injuries Fact Sheet*).

According to The Oklahoma Highway Safety Office, *Oklahoma Crash Facts, 2000*, over three hundred thousand persons were injured or killed as a result of motor vehicle crashes in Oklahoma for calendar years 1995 through 2000 (See Table 1).

Table 1. Oklahoma Crash Injuries and Fatalities by Year, 1995-2000

Outcome	Year						Total
	1995	1996	1997	1998	1999	2000	
Persons Injured	51,461	53,264	58,083	50,249	48,478	47,115	308,650
Persons Killed	674	775	846	769	747	662	4,473
Total Crashes	77,712	80,392	79,636	80,376	79,120	78,645	475,881

Seat belts are the single most effective safety device in preventing serious injuries and reducing fatalities in motor vehicle crashes (National Highway Traffic Safety Administration [NHTSA] Occupant Protection Division).

“Research has found that lap/shoulder safety belts, when used, reduce the risk of fatal injury to front-seat passenger car occupants by 45 percent and the risk of moderate-to-critical injury by 50 percent. For light truck occupants, safety belts reduce the risk of fatal injury by 60 percent and moderate-to-critical injury by 65 percent.” (*Traffic Safety Facts 2002: Occupant Protection*, NHTSA)

Seat belt use for front-seat occupants in Oklahoma increased between 1995 and 2000 (See Table 2). This increase coincides with the passage of primary seat belt legislation in 1997. Primary seat belt laws enable officers to stop vehicles and write citations when they observe front-seat occupants not wearing seat belts.

Table 2. Seat Belt Use, Oklahoma, 1995-2000

Location	Year					
	1995	1996	1997	1998	1999	2000
Oklahoma	46.4%	47.5%	47.4%	56.0%	60.7%	67.5%

Passenger Vehicle and Pickup Crashes in Oklahoma, 1995-2000

Between 1995 and 2000, there were 860,480 occupants involved in passenger vehicle or pickup crashes in Oklahoma. Restraint use or ejection status was missing for 1.6% of occupants (14,023). The percentage of restrained occupants is higher than would be expected from observation studies of seat belt use (see Tables 2 and 3). Seat belt use is most likely over-reported in the crash data since use is often reported by the occupant rather than being directly observed by the officer. Based on observational studies during this time frame, about half of occupants would be expected to be wearing seat belts.

Table 3. Characteristics of Passenger Vehicle and Pickup Crashes, Oklahoma, 1995-2000

	Restraint Use/Ejected		
	Restrained	Unrestrained Not Ejected	Unrestrained Ejected
Characteristics of Persons			
# Persons	690,007	153,959	2,491
% Persons*	81.5%	18.2%	0.3%
Average Age	33.2	32.2	25.7
% Male	47.0%	59.9%	63.1%
Front Seat	97.8%	94.3%	79.4%
Back Seat	2.1%	5.6%	18.6%
Pinned	0.2%	0.9%	0.0%
Officer Reports of Injuries			
Fatal	0.1%	1.3%	23.1%
Injury Severity	2.1	1.8	3.7
Head Injury	15.5%	32.6%	76.6%
Trunk Injury	12.7%	20.1%	69.9%
Arm or Leg Injury	8.7%	19.0%	59.4%
Characteristics of Crash			
Legal Speed	44.2	41.7	53.5
Speed before Impact	26.9	27.3	53.8
Speed at Impact	20.8	20.6	42.5
Two Lane	35.4%	53.2%	71.1%
Four Lane Divided	24.5%	16.5%	19.5%
Four Lane	30.1%	21.9%	4.7%
City Street	68.5%	57.2%	18.3%
County Road	5.2%	14.2%	32.0%
Highway	16.6%	18.1%	45.4%
Front Impact	42.8%	50.1%	33.4%
Side Impact	33.8%	34.1%	54.9%
# Vehicles Involved	2.0	1.9	1.3
Characteristics of Vehicles			
Passenger Vehicle	77.5%	66.9%	62.8%
Pickup	22.5%	33.1%	37.2%
# Occupants	1.9	1.8	2.7

Note: * percentage based on total number of occupants with known restraint and ejection status. Officer ratings of injury severity range from 1=not injured to 5=killed

- Unrestrained occupants were more likely to be younger, and male than were restrained occupants.
- One point six percent of unrestrained occupants were ejected.
- Fatality rates for unrestrained occupants who were not ejected were nine times higher and unrestrained occupants who were ejected were 160 times higher than for restrained occupants.
- Unrestrained occupants who were not ejected were twice as likely to have head, trunk, or extremity injuries as were restrained occupants.
- Unrestrained occupants who were ejected were five times more likely to have head injuries, six times more likely to have trunk injuries and seven times more likely to have extremity injuries than were restrained occupants.
- Unrestrained occupants who were ejected were in higher speed crashes that were more likely to be side-impact crashes on 2-lane highways than were restrained occupants.
- Unrestrained occupants who were ejected were in vehicles with more occupants.
- Unrestrained occupants who were ejected were less likely to be in passenger vehicles than were restrained occupants and were more likely to be in pickups than were restrained occupants.

Study Methodology

To explore the effects of seat belt use on health outcomes for persons involved in motor vehicle crashes, Department of Public Safety (DPS) motor vehicle crash data were linked to inpatient hospitalization data from the OSDH. Police officers investigate the crash at the scene and complete reports that include information about the crash, vehicles, and persons involved. The crash data includes all drivers and injured passengers involved in crashes that result in injury or death to a person or total property damage of \$300 or more for calendar year 1995 through October 31, 1999. Beginning November 1, 1999, the amount increased to \$500 or more in property damage.

Inpatient hospitalizations are based on billing data submitted annually to OSDH by general acute care hospitals licensed by the State of Oklahoma. Occupants who were admitted to other types of hospitals in Oklahoma (e.g. rehabilitation, Veterans, military or Indian Health Service) or those who were transported to out-of-state hospitals are not included in the inpatient data. Occupants had to survive long enough to be admitted to the hospital, thus occupants who died at the scene, died en-route to a hospital, or died in the emergency room prior to being admitted to a hospital are not included in the linked data. Data completeness varies for the inpatient hospitalization data. Nineteen ninety-five was the first year inpatient hospitalization data were collected in Oklahoma. Most licensed hospitals submitted data in 1995, 1998 and 1999; however, for 1996, 1997, and 2000 fewer general acute care hospitals submitted data.

Data linkage was performed using CODES 2000 record linkage software which implements Fellegi and Sunter's statistical theory of record linkage. Common information is identified between the crash and inpatient hospitalization data files (e.g., gender, age, event date, etc.). The more information that agrees between any two crash and hospital records, the more likely the two records are to be considered a match. This report is based on linked crash and inpatient records matched at 90% probability or higher. Information from back-to-back admissions was compiled into a single hospitalization record. The following summary information is based on 10,474 matched high-probability crash and inpatient records for passenger car and pickup occupants identified from the 1995-2000 CODES linked dataset. The data summarized below under represents the actual number of hospitalizations from crashes.

ICDMap90 software was used to calculate two scores used in this report. The Abbreviated Injury Scale (AIS) assigns injury severity scores by body region (Head, Face, Chest, Abdomen, Extremities (including Pelvis, External) based on injury diagnoses. The Maximum AIS score is the highest injury severity score across body regions. The Injury Severity Score (ISS) provides an overall score for patients with multiple injuries. ISS scores can range from 1 to 75. If an injury is assigned an AIS of 6 (un-survivable injury), the ISS score is automatically coded 75.

Linked Passenger Vehicle and Pickup Crashes in Oklahoma, 1995-2000

Table 4. Characteristics of Linked Crashes by Restraint Use/Ejected

	Restrained/Ejected		
	Restrained	Unrestrained Not Ejected	Unrestrained Ejected
Characteristics of Persons			
# Persons	5,086	4,305	436
% Persons*	51.8%	43.8%	4.4%
Average Age	42.9	36.7	25.3
% Male	44.2%	59.9%	64.2%
Front Seat	93.6%	92.4%	78.0%
Back Seat	6.3%	7.4%	20.6%
Pinned	6.1%	5.4%	0.0%
Officer Reports of Injuries			
Fatal	1.8%	4.0%	6.7%
Injury Severity	2.9	3.4	3.7
Head Injury	55.7%	73.5%	85.6%
Trunk Injury	57.4%	64.9%	78.9%
Arm or Leg Injury	47.1%	56.5%	69.5%
Characteristics of Crash			
Legal Speed	49.2	50.7	53.2
Speed before Impact	34.6	43.1	55.0
Speed at Impact	27.4	34.5	44.0
Two Lane	49.3%	68.2%	73.9%
Four Lane Divided	27.4%	16.6%	19.0%
Four Lane	17.1%	10.4%	2.5%
City Street	42.4%	26.9%	20.9%
County Road	11.5%	28.2%	31.4%
Highway	36.3%	38.7%	44.5%
Front Impact	48.3%	54.4%	38.8%
Side Impact	37.2%	37.1%	50.2%
# Vehicles Involved	1.9	1.6	1.2
Characteristics of Vehicles			
Passenger Vehicle	81.1%	67.9%	66.7%
Pickup	18.9%	32.1%	33.3%
# Occupants	1.8	2.0	2.5

Note: * percentage based on total number of occupants with known restraint and ejection status. Officer ratings of injury severity range from 1=not injured to 5=killed

Of the 10,474 occupants of pickups or passenger vehicles in the linked data, restraint use and/or ejection status was unknown for 6.2% of occupants (647). Table 4 includes only occupants with known restraint use and ejection status. For the linked crash-inpatient data:

- Unrestrained occupants were more likely to be male and younger than restrained occupants.
- Nine percent of unrestrained occupants were ejected from the vehicle.
- Unrestrained occupants who were not ejected were 2.2 times more likely to die as result of their injuries, and unrestrained occupants who were ejected, were 3.7 times more likely to die as a result of their injuries than were restrained occupants.
- Unrestrained occupants who were not ejected were 30% more likely to have head injuries, 13% more likely to have trunk injuries, and 20% more likely to have arm or leg injuries than were restrained occupants.
- Unrestrained occupants who were ejected were 50% more likely to have head injuries, 40% more likely to have trunk injuries, and 50% more likely to have arm or leg injuries than were restrained occupants.
- Crashes involving unrestrained occupants were at higher speeds, were more likely to be on 2-lane roads, and on average involved

fewer vehicles and more occupants.

- About half of unrestrained and restrained occupants who were not ejected were involved in front-impact crashes; however, about half of unrestrained occupants who were ejected were involved in side-impact crashes.
- Unrestrained occupants who were ejected were less likely to be in passenger vehicles than were restrained occupants and were more likely to be in pickups than were restrained occupants.

Linked Hospitalizations of Persons Involved in Passenger Vehicle and Pickup Crashes in Oklahoma, 1995-2000

The 1995-2000 high probability linked data contain records from 10,474 hospitalizations for crashes involving passenger cars or pickups. Across all linked records, the average length of hospitalization was 7.8 days, resulting in 81,582 patient days spent in the hospital. The average charge per hospitalization was \$21,066 resulting in total charges of \$220,646,049. Almost 300 persons (3.4%) died while in the hospital and another 15.6% of persons were discharged to other types of facilities (not to home).

Table 5. Characteristics of Persons Hospitalized for Crashes by Restraint Use/Ejected

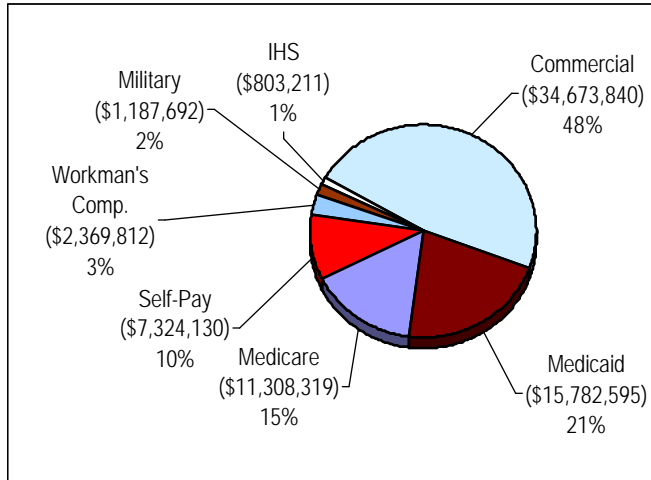
Characteristics of Hospitalizations	Restraint Use/Ejected		
	Restrained	Unrestrained Not Ejected	Unrestrained Ejected
# Hospitalizations	5,086	4,305	436
% Hospitalizations*	51.8%	43.8%	4.4%
Average Length of Hospitalization	7.6	7.9	9.2
Patient Days	38,495	34,127	4,017
Average Charge per Hospitalization	\$19,238	\$21,804	\$33,661
Total Charges	\$97,842,281	\$93,866,467	\$14,676,013
Charges per Patient Day	\$2,542	\$2,751	\$3,653
In-hospital Deaths	119	134	31
Percent Who Died In-hospital	2.9%	3.7%	8.3%
Discharged Alive, but Not to Home	652	543	58
Percent Discharged Alive, to Other Facilities (Not to Home)	15.8%	15.1%	15.5%
Average Injury Severity Score	8.8	9.9	13.3

Note: * percentage based on total number of occupants with known restraint use and ejection status.

Table 5 displays summary information on hospitalizations of occupants for whom restraint use and ejection status are known.

- For unrestrained occupants who were not ejected, the average length of hospitalization was five percent longer and charges per hospitalization were 13% higher than for persons who were restrained.
- Unrestrained occupants who were not ejected were 29% more likely to die while in the hospital than were restrained occupants.
- Unrestrained occupants who were ejected stayed in the hospital on average 21% longer, accrued 75% higher average charge per hospitalization, and were almost three times more likely to die in the hospital than were restrained occupants.
- Charges per patient day for unrestrained occupants who were ejected were 44% higher compared to restrained occupants. This reflects the higher intensity of care needed for their injuries.

Figure 1. Total Inpatient Charges by Primary Payer, 1998-1999



Primary payer data were available only for calendar year 1998 and 1999 hospitalizations. Payer was not coded for 36% of total charges for 1998 and 1999. For hospitalizations with known payers, commercial insurance accounted for 48% of total inpatient hospitalization charges, followed by Medicaid (21%), Medicare (15%), and Self-Pay (10%).

To examine the effects of restraint use on patterns of injuries, diagnosis codes were used to identify body areas injured--head, trunk, or extremity (arm or leg) (see Table 6).

Table 6. Body Area(s) Injured, by Restraint Use/Ejected

Injuries			% Hospitalizations			Average LOS (Days)			% Died In-hospital		
Head	Trunk	Arm/ Leg	Restrained	Unrestrained, Not Ejected	Unrestrained, Ejected	Restrained	Unrestrained, Not Ejected	Unrestrained, Ejected	Restrained	Unrestrained, Not Ejected	Unrestrained, Ejected
X	X	X	11.1%	14.1%	20.4%	10.1	9.8	11.3	6.3%	7.5%	9.0%
X	X		13.0%	14.9%	22.0%	8.5	10.4	11.4	6.3%	6.4%	17.4%
X		X	11.1%	13.3%	11.7%	7.0	7.4	6.9	2.8%	2.0%	0.0%
	X	X	10.8%	9.6%	8.9%	8.1	8.4	7.9	1.8%	2.3%	2.9%
X			15.3%	17.0%	17.2%	6.6	6.0	5.9	2.3%	4.3%	8.5%
	X		18.5%	13.3%	8.3%	6.6	6.9	11.9	1.5%	2.8%	3.5%
		X	17.4%	16.0%	9.9%	7.7	7.5	7.4	1.1%	0.2%	5.1%

Injuries			Average Charge per Patient Day			Average Charge per Hospitalization			Average Injury Severity Score		
Head	Trunk	Arm/ Leg	Restrained	Unrestrained, Not Ejected	Unrestrained, Ejected	Restrained	Unrestrained, Not Ejected	Unrestrained, Ejected	Restrained	Unrestrained, Not Ejected	Unrestrained, Ejected
X	X	X	\$3,079	\$3,493	\$3,723	\$30,932	\$34,078	\$41,878	14.0	15.3	17.8
X	X		\$2,552	\$2,758	\$4,224	\$21,594	\$28,571	\$48,181	12.6	14.4	19.6
X		X	\$2,376	\$2,445	\$2,913	\$16,597	\$18,140	\$20,160	8.1	9.3	8.4
	X	X	\$3,129	\$3,108	\$3,102	\$25,417	\$25,997	\$24,574	9.7	9.9	11.6
X			\$2,178	\$2,766	\$4,104	\$14,450	\$16,553	\$24,074	7.4	7.2	9.5
	X		\$2,521	\$2,130	\$4,015	\$16,656	\$14,723	\$47,960	7.4	8.6	11.9
		X	\$2,013	\$2,255	\$1,931	\$15,455	\$16,946	\$14,281	5.3	5.5	6.1

Note: *Hospitalizations are counted within an injury grouping if principal diagnosis or diagnosis 1 through 15 falls within that injury grouping. Percent of Hospitalizations is calculated within each restraint use/ejected group: Restrained (N=5,086), Unrestrained, Not Ejected (N=4,305) and Unrestrained, Ejected (N=436). Average Injury Severity Score ranges from 1 to 75, with higher scores indicating more severe injuries. ISS were calculated using ICDMap90 software.

- Sixty-three percent of unrestrained occupants who were ejected had injuries to more than one body area, as compared to 52% of unrestrained occupants who were not ejected, and 46% of occupants who were wearing safety belts.
- Across almost all body area injury groupings, injuries were more severe for unrestrained occupants who were not ejected compared to restrained occupants. This effect was even more pronounced for unrestrained occupants who were ejected.
- The rate of multiple injuries was 13% higher for unrestrained occupants who were not ejected, and 37% higher for occupants who were not restrained and who were ejected compared to occupants wearing safety belts.
- For occupants who had injuries to head, trunk and extremities, unrestrained occupants who were not ejected were 19% more likely to die in the hospital and unrestrained occupants who were ejected were 71% more likely to die in the hospital than were restrained occupants.

The Abbreviated Injury Scale (AIS) is a scoring system that assigns injury severity scores by body region based on injury diagnoses. The Maximum AIS score is the highest injury severity score across body regions (see Table 7).

- Fifty-nine percent of restrained occupants suffered only minor or moderate injuries as compared to 54% of unrestrained occupants who were not ejected and 44% of unrestrained occupants who were ejected.
- Unrestrained occupants who were not ejected were 44% more likely to suffer critical or un-survivable injuries and unrestrained occupants who were ejected were two and a half times more likely to suffer critical or un-survivable injuries than were restrained occupants.

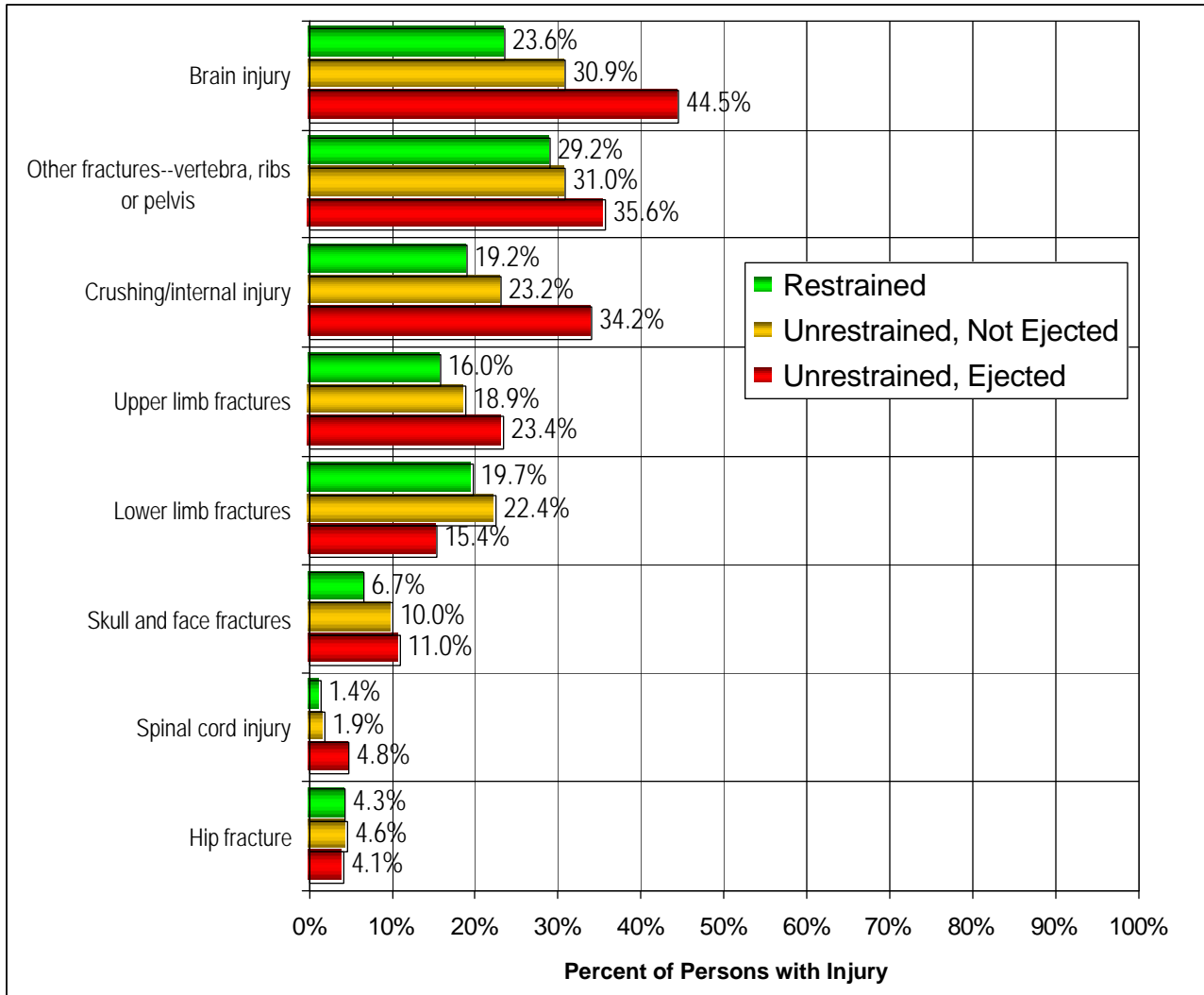
Table 7. Number and Percent of Persons Hospitalized by Abbreviated Injury Score Overall Maximum Score and Restraint Use/Ejected

Abbreviated Injury Scale Overall Maximum Score	Restrained		Unrestrained, Not Ejected		Unrestrained, Ejected	
	#	%	#	%	#	%
Minor	924	19.4%	690	16.8%	65	15.2%
Moderate	1,857	39.1%	1,513	36.8%	122	28.6%
Serious	1,430	30.1%	1,337	32.5%	123	28.8%
Severe	368	7.7%	358	8.7%	77	18.0%
Critical	162	3.4%	201	4.9%	38	8.9%
Un-survivable	11	0.2%	13	0.3%	2	0.5%
Total AIS Coded	4,752	100.0%	4,112	100.0%	427	100.0%

Note: Records Not AIS Coded: 334 Restrained; 193 Unrestrained, Not Ejected; 9 Unrestrained, Ejected;

The Single Level Clinical Classification System from the Agency for Healthcare Research and Quality’s Healthcare Cost and Utilization project was used to group diagnoses to examine the types of injuries that result from crash hospitalizations (See Figure 2 and Table 8).

Figure 2. Percent of Persons with Each Injury Type, by Restraint Use/Ejected



- Brain injuries were the most frequently occurring injury for persons who were not restrained and who were ejected—44.5% of unrestrained occupants who were ejected had brain injuries as compared to 30.9% of unrestrained occupants who were not ejected and 23.6% of occupants who were wearing safety belts.
- For persons with a diagnosis of brain injury, unrestrained occupants who were ejected were 86% more likely to die in the hospital than were restrained occupants (see Table 8).

Table 8. Characteristics of Selected Injuries for Persons Hospitalized, by Restraint Use/Ejected

	Hospitalizations		Utilization		Hospital Charges			Died In-Hospital		Discharged Alive, Not to Home		Injury Severity Score
	#	%	LOS	Patient Days	Per Hospitalization	Total Charges	Per Patient Day	#	%	#	%	
Brain injury												
Restrained	1,267	23.6%	8.9	11,304	\$23,735	\$30,072,533	\$2,660	77	7.2%	190	17.7%	13.9
Unrestrained, Not Ejected	1,329	30.9%	8.8	11,741	\$25,390	\$33,743,776	\$2,874	90	7.8%	222	19.2%	14.7
Unrestrained, Ejected	194	44.5%	9.5	1,837	\$35,795	\$6,944,304	\$3,780	22	13.3%	25	15.2%	17.8
Crushing/internal injury												
Restrained	1,032	19.2%	10.5	10,852	\$35,810	\$36,956,272	\$3,405	58	6.8%	186	21.8%	16.1
Unrestrained, Not Ejected	999	23.2%	10.8	10,780	\$36,812	\$36,774,814	\$3,411	70	8.3%	155	18.4%	17.8
Unrestrained, Ejected	149	34.2%	12.3	1,828	\$53,494	\$7,970,602	\$4,360	22	17.1%	19	14.7%	21.4
Hip fracture												
Restrained	230	4.3%	12.9	2,960	\$27,285	\$6,275,633	\$2,120	5	3.2%	77	49.7%	10.2
Unrestrained, Not Ejected	200	4.6%	13.1	2,615	\$37,781	\$7,556,136	\$2,890	7	4.6%	65	42.5%	12.2
Unrestrained, Ejected	18	4.1%	18.2	328	\$60,464	\$1,088,346	\$3,318	1	6.3%	8	50.0%	14.4
Lower limb fractures												
Restrained	1,058	19.7%	10.0	10,626	\$30,568	\$32,341,083	\$3,044	29	3.4%	184	21.5%	10.0
Unrestrained, Not Ejected	965	22.4%	9.9	9,582	\$32,155	\$31,030,053	\$3,238	24	2.9%	131	16.1%	11.0
Unrestrained, Ejected	67	15.4%	11.2	752	\$37,990	\$2,545,359	\$3,385	4	6.7%	14	23.3%	16.4
Other fractures--vertebra, ribs or pelvis												
Restrained	1,566	29.2%	9.4	14,724	\$26,829	\$42,014,405	\$2,853	55	4.2%	282	21.6%	12.1
Unrestrained, Not Ejected	1336	31.0%	10.4	13,828	\$32,245	\$43,079,656	\$3,115	73	6.5%	215	19.0%	13.7
Unrestrained, Ejected	155	35.6%	12.5	1,945	\$52,645	\$8,159,902	\$4,195	16	11.5%	30	21.6%	18.4
Skull and face fractures												
Restrained	357	6.7%	10.4	3,718	\$26,345	\$9,405,017	\$2,530	12	3.9%	73	24.0%	13.1
Unrestrained, Not Ejected	429	10.0%	9.0	3,843	\$30,672	\$13,158,159	\$3,424	7	1.9%	63	16.9%	13.2
Unrestrained, Ejected	48	11.0%	10.2	488	\$37,721	\$1,810,619	\$3,710	1	2.4%	6	14.6%	16.1
Spinal cord injury												
Restrained	75	1.4%	18.1	1,355	\$53,477	\$4,010,747	\$2,960	15	23.1%	23	35.4%	20.6
Unrestrained, Not Ejected	82	1.9%	28.2	2,315	\$90,293	\$7,404,027	\$3,198	11	16.4%	40	59.7%	20.1
Unrestrained, Ejected	21	4.8%	23.1	485	\$113,519	\$2,383,893	\$4,915	2	14.3%	9	64.3%	28.1
Upper limb fractures												
Restrained	859	16.0%	8.6	7,423	\$27,267	\$23,422,043	\$3,155	22	3.2%	145	20.9%	12.1
Unrestrained, Not Ejected	813	18.9%	8.9	7,220	\$28,367	\$23,062,322	\$3,194	34	5.0%	113	16.6%	13.0
Unrestrained, Ejected	102	23.4%	11.4	1,160	\$40,310	\$4,111,665	\$3,545	6	7.2%	15	18.1%	16.4

Notes: * Percent of Hospitalizations is calculated within each restraint use/ejected group: Restrained (N=5,086), Unrestrained, Not Ejected (N=4,305) and Unrestrained, Ejected (N=436). Hospitalizations are counted within an injury grouping if principal diagnosis or diagnosis 1 through 15 falls within that injury grouping. Average Injury Severity Score ranges from 1 to 75, with higher scores indicating more severe injuries. ISS were calculated using ICDMap90 software.

- Even though fractures of the vertebra, ribs or pelvis were the most frequently occurring injuries for restrained occupants, the percentage of restrained occupants who sustained these injuries and the injury severity was lower than for unrestrained occupants.
- For persons with a diagnosis of fractures of the vertebra, ribs or pelvis, unrestrained occupants who were ejected stayed in the hospital 33% longer, accrued almost twice the average hospital charge and were about three times more likely to die in the hospital than were restrained occupants.
- For persons with a diagnosis of crushing or internal injury, unrestrained occupants who were not ejected were 23% more likely, and unrestrained occupants who were ejected were two and a half times more likely to die in the hospital as compared to restrained occupants.
- Unrestrained occupants who were not ejected were 36% more likely to suffer a spinal cord injury and unrestrained occupants who were ejected were 3.5 times more likely to suffer a spinal cord injury than were restrained occupants (See Table 10). Spinal cord injuries often result in lifetime disabilities.
- Injury severity scores are consistently higher for unrestrained occupants.
- Across almost all injury groupings, the percentage of persons hospitalized with each injury was lower for people wearing safety belts.

Motor vehicle crashes are the leading cause of traumatic brain injuries in Oklahoma (IPS, OSDH). According to *Traumatic Brain Injuries In Oklahoma, 1992-1997* (OSDH IPS):

“Survivors of severe brain injuries have persistent physical and behavioral problems which may require months or years of rehabilitation. The lifetime costs for persons suffering the most severe brain injuries have been estimated at \$4 million.”

For persons with a diagnosis of head injury for whom level of consciousness was specified, unrestrained persons who were not ejected were 26% less likely to return to their former state of consciousness, and unrestrained persons who were ejected were 83% less likely to not return to their former state of consciousness by the time of discharge as compared to restrained occupants (See Table 9).

Table 9. Outcomes of Head Injuries, by Restraint Use/Ejected

Person Who Sustained Head Injuries:	Restrained	Unrestrained, Not Ejected	Unrestrained, Ejected
with no loss of consciousness (n=615)	41.8%	36.8%	31.0%
with loss of consciousness, with return to previous state of consciousness (n=647)	44.4%	45.7%	43.7%
with loss of consciousness, no return to previous state of consciousness (n=87)	13.8%	17.5%	25.3%