

**5.**

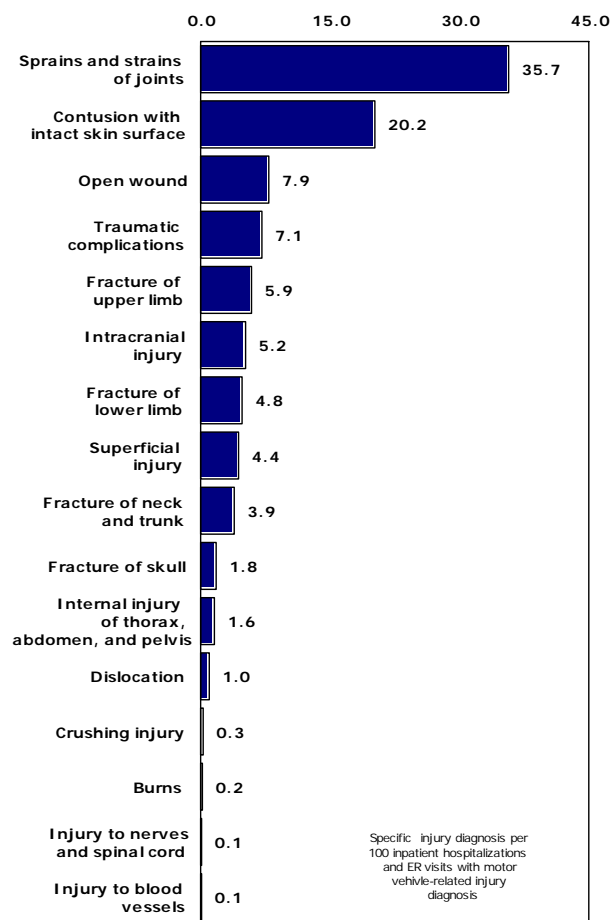
**TYPES OF INJURIES AND TYPES OF INJURED PERSONS  
AMONG EMERGENCY ROOM VISITS AND INPATIENT  
DISCHARGES WITH MOTOR VEHICLE-RELATED  
INJURY DIAGNOSIS, ARIZONA RESIDENTS,  
2005-2007**



The intent of Section 5 of our report is to identify the prevalence of specific injuries, as well as to identify the differences in prevalence by type of victim of vehicular events. The following 16 diagnostic categories of ICD-9-CM (Clinical Modification) equivalent to patient's primary diagnosis are used in Table 5-1 – Table 5-5: *fracture of skull* (ICD-9-CM codes 800-804), *fracture of neck and trunk* (805-809), *fracture of upper limb* (810-819), *fracture of lower limb* (820-829), *dislocation* (830-839), *intracranial injury* (excluding skull fracture, 850-854), *sprains and strains of joints and adjacent muscles* (840-848), *internal injury of chest, abdomen, and pelvis* (860-869), *open wound* (870-897), *injury to blood vessels* (900-904), *superficial injury* (910-919), *contusion with intact skin surface* (920-924), *crushing injury* (925-929), *burns* (940-949), *injury to nerves and spinal cord* (950-957), and *certain traumatic complications and unspecified injuries* (958-959).

**Figure 5-1** is based on the data in **Table 5-1** which combine the first-listed diagnoses from 151,196 emergency room encounters and 22,608 inpatient admissions in 2005-2007. Five ICD-9-CM diagnostic categories captured 76.8 percent of the 173,804 cases. From highest to lowest frequency, these categories were *sprains and strains of joints and adjacent muscles* (35.7 percent), *contusion with intact skin surface* (20.2 percent), *open wound* (7.9 percent), *traumatic complications and unspecified injuries* (7.1 percent), and *fracture of upper limb* (5.9 percent).

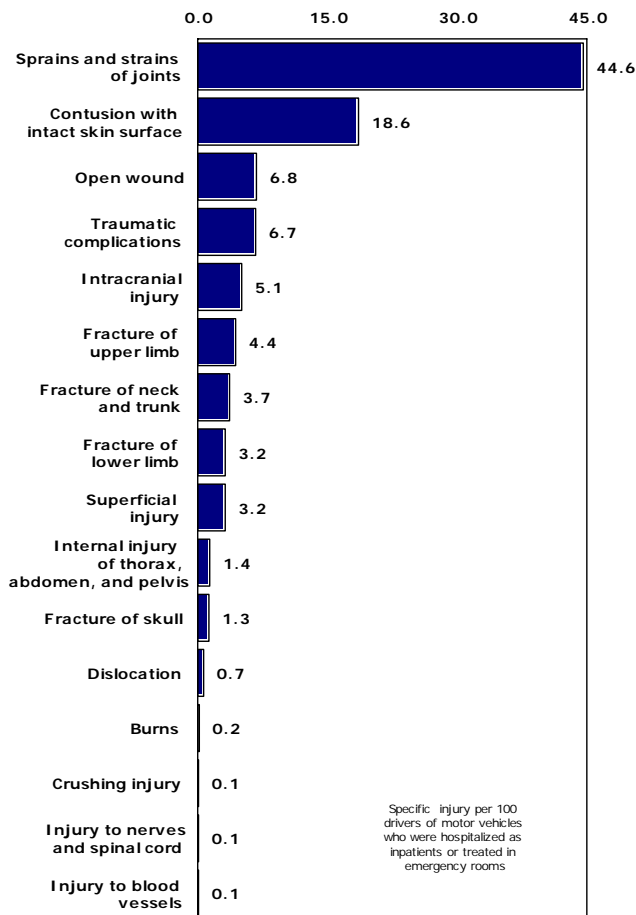
**Figure 5-1**  
**Prevalence of Specific Injuries among Inpatient Hospitalizations and Emergency Room Visits with Motor Vehicle-Related Injury Diagnosis, Arizona Residents, 2005-2007**



Compared to other types of victims in **Table 5-1**, the highest prevalence of *sprains and strains of joints and adjacent muscles* (44.6 percent) was among the injured **drivers of motor vehicles (Figure 5-2)**. The frequency of *contusion with intact skin surface* (18.6 percent), *open wound* (6.8 percent), and *traumatic complication* (6.7 percent) was lower among drivers of motor vehicles than among all victim types combined (**Figure 5-1**). In contrast, *intracranial injury* (5.1 percent) replaced *fracture of upper limb* as the fifth most prevalent type of injury among drivers of motor vehicles.

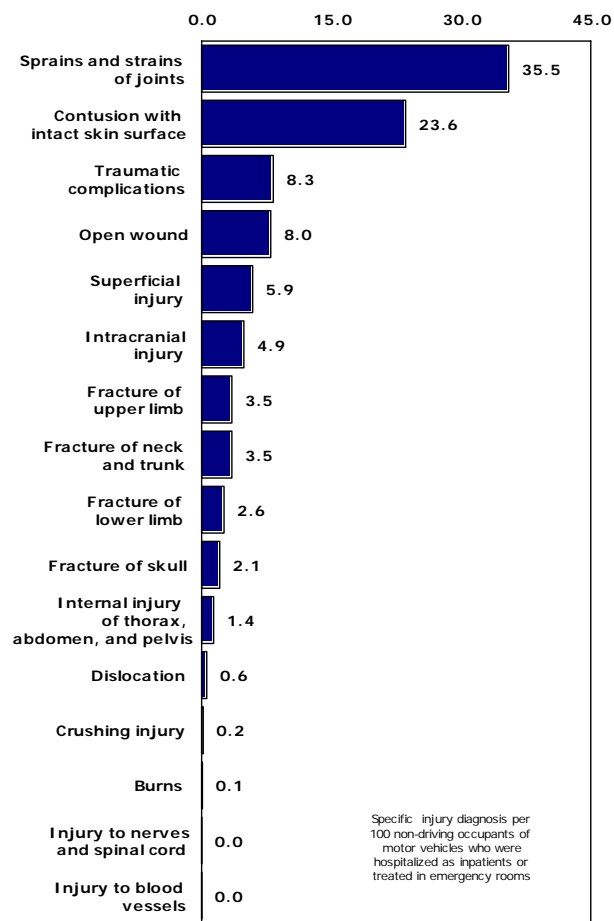
Drivers of motor vehicles had a 69.8 percent lower risk of *fracture of skull* than pedestrians (1.3 percent vs. 4.3 percent, **Table 5-1**). Interestingly, the risk of *injury to nerves and spinal cord* was identical for drivers of motor vehicles, motorcycle riders, pedestrians, and pedal cyclists (0.1 percent).

**Figure 5-2**  
**Prevalence of Specific Injuries among Drivers of Motor Vehicles who were Hospitalized as Inpatients or Treated in Emergency Rooms with Motor Vehicle-Related Injury Diagnosis, Arizona Residents, 2005-2007**



Following sprains and strains of joints and adjacent muscles (35.5 percent), contusion with intact skin surface (23.6), *traumatic complications* were the 3<sup>rd</sup> most frequent injury among non-driving occupants of motor vehicles (Figure 5-3). In fact, non-driving occupants of motor vehicles had higher risk of *traumatic complications* than any other type of victim (Table 5-1). Occupants of motor vehicles had a 61.5 percent higher risk of *skull fracture* (2.1 percent) than drivers (1.3 percent). The risk of *crushing injury* was 2 times as high among occupants (0.2 percent) than it was among drivers of motor vehicles (0.1 percent). Only 21 out of 43,769 non-driving occupants of motor vehicles sustained injury to nerves and spinal cord for a prevalence rate of 0.05 percent (Table 5-1).

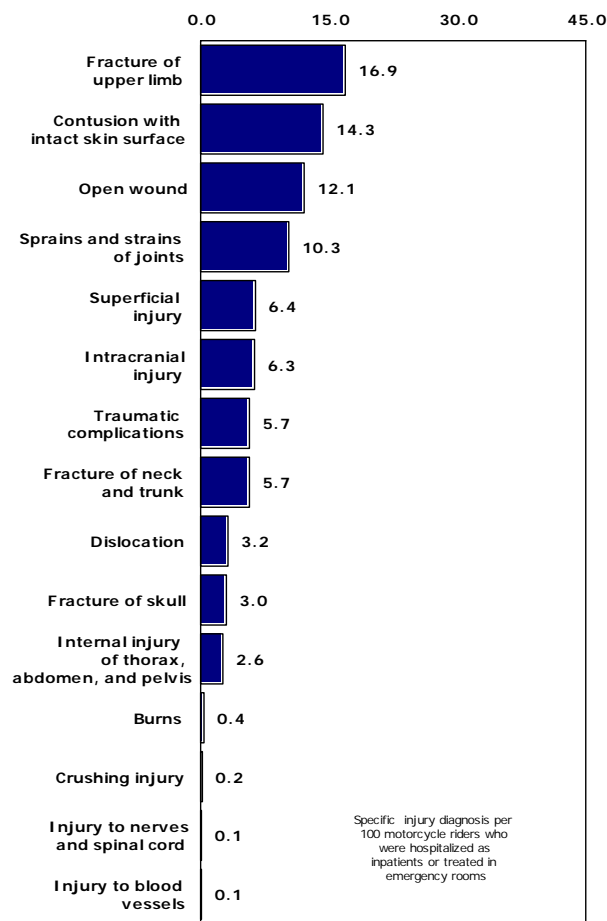
**Figure 5-3**  
**Prevalence of Specific Injuries among Non-Driving Occupants of Motor Vehicles who were Hospitalized as Inpatients or Treated in Emergency Rooms with Motor Vehicle-Related Injury Diagnosis, Arizona Residents, 2005-2007**



The pattern of injuries sustained by **motorcycle riders** was quite different from those of driving or non-driving occupants of motor vehicles. Five ICD-9-CM diagnostic categories comprised 60 percent of injuries to motorcycle riders. From highest to lowest frequency, these categories were *fracture of upper limb* (16.9 percent), *contusion with intact skin surface* (14.3 percent), *open wound* (12.1 percent), *sprains and strains of joints and adjacent muscles* (10.3 percent), and *superficial injury* (6.4 percent). Compared to drivers of motor vehicles, motorcycle riders had a 2.3 times higher risk of skull fracture (1.3 vs. 3.0 percent), and a higher risk than any other type of victim to have *fracture of neck and trunk* (5.7 percent, **Table 5-1, Figure 5-4**). Compared to non-driving occupant of motor vehicles, motorcycle riders had a 4 times higher risk of *burns*.

In 2005-2007, motorcycle riders comprised 9.9 percent of patients with motor vehicle-related injury diagnosis (17,218 out of 173,804), but accounted for 16.2 percent of hospital deaths with motor vehicle-related injury diagnosis (135 out of 834).

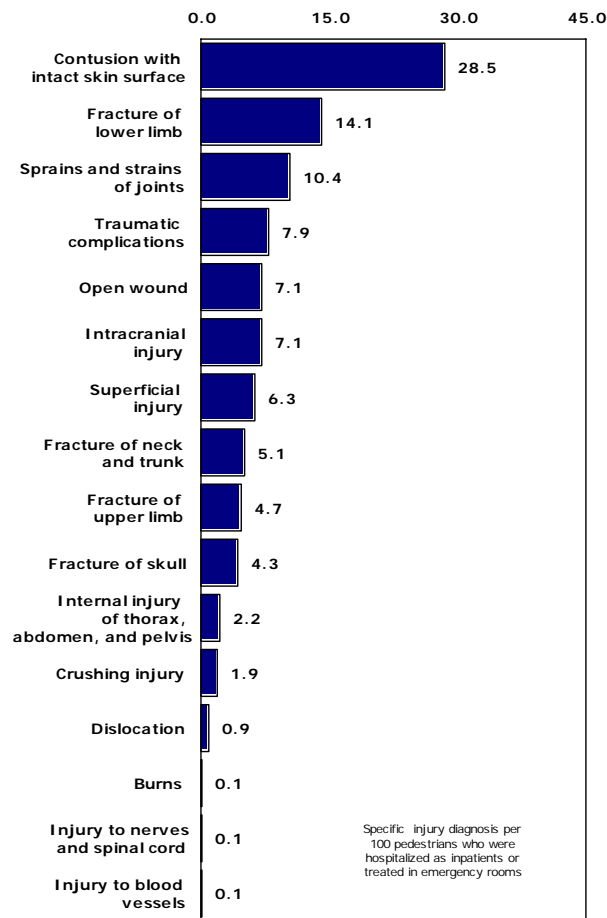
**Figure 5-4**  
**Prevalence of Specific Injuries among Motorcycle Riders who were Hospitalized as Inpatients or Treated in Emergency Rooms with Motor Vehicle-Related Injury Diagnosis, Arizona Residents, 2005-2007**



**Pedestrians** had a 41 percent higher risk of contusion with intact skin surface than any other type of victim (28.5 percent; **Figure 5-5, Figure 5-1**). Moreover, pedestrians clearly had the highest risk to suffer a serious injury, i.e. *skull fracture* (4.3 percent), *fracture of neck and trunk* (5.1 percent), *fracture of lower limb* (14.1 percent), *intracranial injury* (7.1 percent), or *crushing injury* (1.9 percent or 19 times higher risk than drivers of motor vehicles).

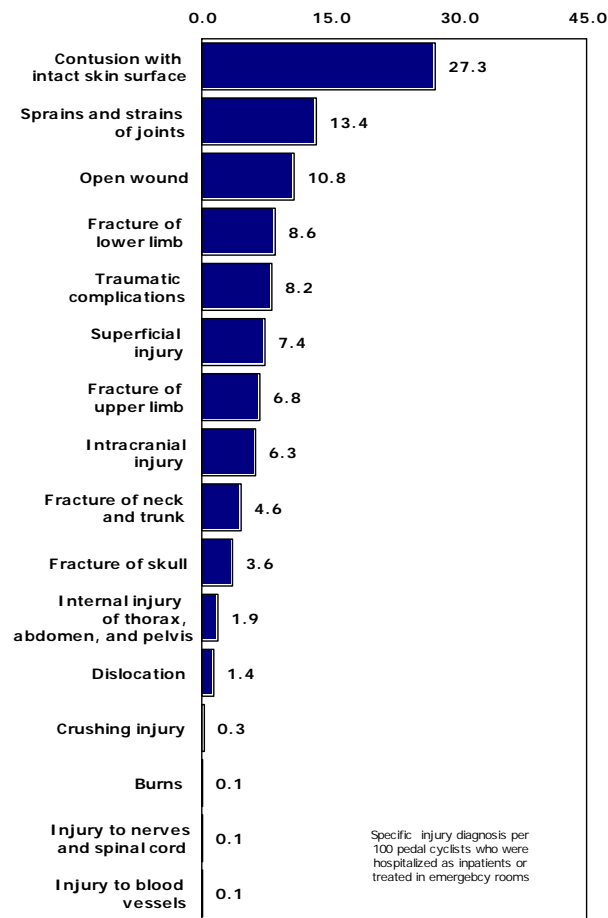
In 2005-2007, pedestrians comprised 4.4 percent of patients with motor vehicle-related injury diagnosis (7,644 out of 173,804), but accounted for 20.5 percent of hospital deaths with motor vehicle-related injury diagnosis (171 out of 834; see Section 6 “Probability of Various Outcomes for Inpatient Discharges and Emergency Room Visits with Motor Vehicle-Related Injury Diagnosis by Type of Injury and type of Injured Person, Arizona residents 2005-2007”).

**Figure 5-5**  
**Prevalence of Specific Injuries among Pedestrians who were Hospitalized as Inpatients or Treated in Emergency Rooms with Motor Vehicle-Related Injury Diagnosis, Arizona Residents, 2005-2007**



In 2005-2007, **pedal cyclists** who comprised 2.2 percent of patients (3,802 out of 173,804, **Table 5-1**) disproportionately accounted for 3.6 percent of hospital deaths with motor vehicle-related injury diagnosis (30 out of 834). Three ICD-9-CM categories captured more than half (51.5 percent) of injuries to pedal cyclists: *contusion with intact skin surface* (27.3 percent), *sprains and strains of joints and adjacent muscles* (13.4 percent), and *open wound* (10.8 percent, **Figure 5-6**). Only motorcycle riders had a higher risk of laceration or penetration of a body part or organ (*open wound*) than pedal cyclists (**Table 5-1**). In contrast, pedal cyclists had a 20 percent higher risk of *skull fracture* than motorcycle riders (3.6 vs. 3.0 percent). Moreover, pedal cyclists had a 3 times higher risk of crushing injury than drivers of motor vehicles (0.3 vs. 0.1 percent).

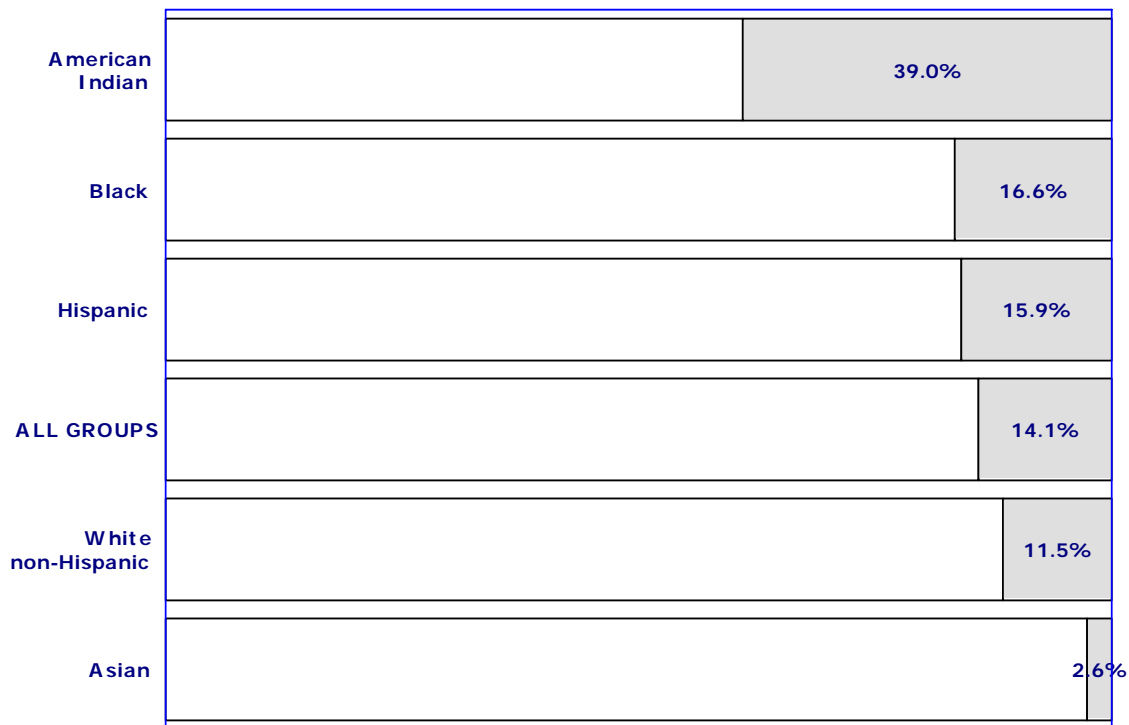
**Figure 5-6**  
**Prevalence of Specific Injuries among Pedal Cyclists who were Hospitalized as Inpatients or Treated in Emergency Rooms with Motor Vehicle-Related Injury Diagnosis, Arizona Residents, 2005-2007**



In 2005-2007, up to nine diagnoses were coded for each hospital discharge. In order to identify the specific injuries in motor vehicle accidents we used the primary diagnosis, or the first one listed on the discharge summary of the medical record. However, we also looked for **any mention of alcohol use/abuse** among the inpatients with motor vehicle-related injury diagnosis. Detailed description of ICD-9-CM codes used to identify alcohol misuse/abuse is available at <http://www.azdhs.gov/plan/hip/for/alcohol/index.htm> . We were unable to determine whether any of the diagnoses mentioning alcohol misuse/abuse was present on admission (this new data element becomes available beginning with the 2008 HDD). We are not claiming that the presence of a diagnostic code related to alcohol abuse signifies that the patient with motor vehicle-related injury was intoxicated at the time of the accident. However, we do think that this additional information about co-morbidity is of heuristic value: it may aid our understanding why certain population subgroups have higher incidence of motor vehicle accidents and fatalities.

Thirty-nine percent of American Indian inpatients with motor vehicle-related injury diagnosis also had alcohol misuse/abuse diagnosis (or diagnoses, since the discharge record may include more than one diagnosis of specific to alcohol abuse, such as alcohol dependence syndrome and excessive blood level of alcohol), the highest ratio among the race/ethnic groups (**Figure 5-7, Table 5-5**). The rank order from highest to lowest ratio in **Figure 5-7** resembles the order of age-adjusted mortality rates for motor vehicle-related injuries, with American Indians having the highest mortality rate and Asians the lowest rate among race/ethnic groups (**Table 1-1**).

**Figure 5-7**  
**Any Mention of Alcohol Use/Abuse\* by Race/Ethnicity among Inpatient Discharges with Motor Vehicle-Related Injury Diagnosis, Arizona Residents, 2005-2007**



\*Any mention of alcohol use/abuse per 100 inpatient discharges with motor vehicle-related injury diagnosis.

**Table 5-1  
Inpatient Hospitalizations and Emergency Room Visits with Motor Vehicle-Related Injury Diagnosis by  
Type of Injured Person and Diagnostic Category, Arizona Residents, 2005-2007**

	M.V. driver		M.V. passenger		Motorcycle rider		Pedestrian		Pedal cyclist		Other person		Total	
	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %
Fracture of skull	1,128	1.3	913	2.1	514	3.0	328	4.3	136	3.6	191	1.5	3,210	1.8
Fracture of neck and trunk	3,268	3.7	1,521	3.5	983	5.7	390	5.1	174	4.6	507	4.0	6,843	3.9
Fracture of upper limb	3,935	4.4	1,545	3.5	2,910	16.9	362	4.7	259	6.8	1,178	9.3	10,189	5.9
Fracture of lower limb	2,822	3.2	1,130	2.6	2,235	13.0	1,078	14.1	328	8.6	705	5.6	8,298	4.8
Dislocation	643	0.7	246	0.6	548	3.2	70	0.9	54	1.4	175	1.4	1,736	1.0
Sprains and strains of joints and adjacent muscles	39,506	44.6	15,536	35.5	1,781	10.3	796	10.4	508	13.4	3,959	31.2	62,086	35.7
Intracranial injury, excluding those with skull fracture	4,563	5.1	2,160	4.9	1,084	6.3	540	7.1	240	6.3	474	3.7	9,061	5.2
Internal injury of thorax, abdomen, and pelvis	1,245	1.4	632	1.4	447	2.6	165	2.2	72	1.9	136	1.1	2,697	1.6
Open wound	6,013	6.8	3,506	8.0	2,078	12.1	543	7.1	409	10.8	1,233	9.7	13,782	7.9
Injury to blood vessels	52	0.1	20	0.0	18	0.1	7	0.1	5	0.1	10	0.1	112	0.1
Contusion with intact skin surface	16,466	18.6	10,318	23.6	2,466	14.3	2,176	28.5	1,037	27.3	2,644	20.8	35,107	20.2
Crushing injury	77	0.1	79	0.2	43	0.2	148	1.9	10	0.3	182	1.4	539	0.3
Burns	183	0.2	45	0.1	73	0.4	7	0.1	5	0.1	71	0.6	384	0.2
Injury to nerves and spinal cord	79	0.1	21	0.0	14	0.1	11	0.1	2	0.1	8	0.1	135	0.1
Superficial injury	2,831	3.2	2,561	5.9	1,109	6.4	482	6.3	282	7.4	446	3.5	7,711	4.4
Traumatic complications and unspecified injuries	5,945	6.7	3,647	8.3	987	5.7	601	7.9	313	8.2	829	6.5	12,322	7.1
<b>Total</b>	<b>88,671</b>	<b>100.0</b>	<b>43,769</b>	<b>100.0</b>	<b>17,218</b>	<b>100.0</b>	<b>7,644</b>	<b>100.0</b>	<b>3,802</b>	<b>100.0</b>	<b>12,700</b>	<b>100.0</b>	<b>173,804</b>	<b>100.0</b>

**Table 5-2  
Emergency Room Visits with Motor Vehicle-Related Injury Diagnosis by Type of Injured Person and Diagnostic Category,  
Arizona Residents, 2005-2007**

	M.V. driver		M.V. passenger		Motorcycle rider		Pedestrian		Pedal cyclist		Other person		Total	
	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %
Fracture of skull	415	0.5	326	0.8	138	1.0	71	1.3	41	1.3	90	0.8	1,081	0.7
Fracture of neck and trunk	1,425	1.8	570	1.5	460	3.4	104	1.9	63	2.0	304	2.6	2,926	1.9
Fracture of upper limb	3,051	3.9	1,136	2.9	2,327	17.4	233	4.2	206	6.6	1,043	9.0	7,996	5.3
Fracture of lower limb	1,146	1.5	441	1.1	1,070	8.0	448	8.1	149	4.8	425	3.7	3,679	2.4
Dislocation	529	0.7	188	0.5	499	3.7	53	1.0	46	1.5	161	1.4	1,476	1.0
Sprains and strains of joints and adjacent muscles	39,344	49.8	15,465	40.1	1,755	13.1	778	14.0	504	16.2	3,949	34.0	61,795	40.9
Intracranial injury, excl. those with skull fracture	2,724	3.4	1,208	3.1	630	4.7	199	3.6	116	3.7	325	2.8	5,202	3.4
Internal injury of thorax, abdomen, and pelvis	223	0.3	80	0.2	97	0.7	24	0.4	12	0.4	43	0.4	479	0.3
Open wound	5,428	6.9	3,082	8.0	1,870	14.0	424	7.6	375	12.1	1,173	10.1	12,352	8.2
Injury to blood vessels	6	0.0	1	0.0	1	0.0	1	0.0	0	0.0	2	0.0	11	0.0
Contusion with intact skin surface	16,139	20.4	10,101	26.2	2,427	18.2	2,144	38.5	1,016	32.7	2,625	22.6	34,452	22.8
Crushing injury	48	0.1	55	0.1	19	0.1	119	2.1	9	0.3	167	1.4	417	0.3
Burns	161	0.2	36	0.1	62	0.5	4	0.1	2	0.1	57	0.5	322	0.2
Injury to nerves and spinal cord	27	0.0	3	0.0	3	0.0	6	0.1	1	0.0	5	0.0	45	0.0
Superficial injury	2,773	3.5	2,489	6.5	1,079	8.1	452	8.1	276	8.9	439	3.8	7,508	5.0
Traumatic complications and unspecified injuries	5,505	7.0	3,382	8.8	927	6.9	516	9.3	296	9.5	803	6.9	11,429	7.6
<b>Total</b>	<b>78,972</b>	<b>100.0</b>	<b>38,573</b>	<b>100.0</b>	<b>13,361</b>	<b>100.0</b>	<b>5,564</b>	<b>100.0</b>	<b>3,108</b>	<b>100.0</b>	<b>11,618</b>	<b>100.0</b>	<b>151,196</b>	<b>100.0</b>

**Table 5-3  
Inpatient Hospitalizations with Motor Vehicle-Related Injury Diagnosis by Type of Injured Person, Gender and Diagnostic Category, Arizona Residents, 2005-2007**

	M.V. driver		M.V. passenger		Motorcycle rider		Pedestrian		Pedal cyclist		Other person		Total	
	F	M	F	M	F	M	F	M	F	M	F	M	F	M
Fracture of skull	186	527	267	320	43	333	66	191	11	84	31	70	604	1,525
Fracture of neck and trunk	753	1,090	577	374	54	468	144	142	17	94	94	109	1,639	2,277
Fracture of upper limb	383	501	228	181	61	522	51	78	12	41	60	75	795	1,398
Fracture of lower limb	679	997	391	298	115	1,050	204	425	25	154	134	146	1,548	3,070
Dislocation	45	69	25	33	0	49	1	16	1	7	3	11	75	185
Sprains and strains of joints and adjacent muscles	80	82	41	30	2	24	7	11	0	4	2	8	132	159
Intracranial injury, excluding those with skull fracture	647	1,192	487	465	47	407	110	230	24	100	42	107	1,357	2,501
Internal injury of thorax, abdomen, and pelvis	351	671	268	284	34	316	47	94	8	52	36	57	744	1,474
Open wound	186	399	181	243	32	176	28	91	7	27	22	38	456	974
Injury to blood vessels	15	31	8	11	3	14	1	5	1	4	4	4	32	69
Contusion with intact skin surface	179	148	131	86	7	32	15	17	6	15	4	15	342	313
Crushing injury	9	20	12	12	1	23	12	17	0	1	0	15	34	88
Burns	3	19	6	3	2	9	1	2	0	3	1	13	13	49
Injury to nerves and spinal cord	17	35	10	8	1	10	0	5	0	1	0	3	28	62
Superficial injury	23	35	30	42	4	26	11	19	0	6	0	7	68	135
Traumatic complications and unspecified injuries	164	276	136	129	3	57	29	56	6	11	7	19	345	548
<b>Total</b>	<b>3,676</b>	<b>6,023</b>	<b>2,728</b>	<b>2,468</b>	<b>404</b>	<b>3,452</b>	<b>701</b>	<b>1,377</b>	<b>117</b>	<b>577</b>	<b>411</b>	<b>671</b>	<b>8,037</b>	<b>14,568</b>

**Table 5-4  
Emergency Room Visits with Motor Vehicle-Related Injury Diagnosis by Type of Injured Person, Gender and  
Diagnostic Category, Arizona Residents, 2005-2007**

	M.V. driver		M.V. passenger		Motorcycle rider		Pedestrian		Pedal cyclist		Other person		Total	
	F	M	F	M	F	M	F	M	F	M	F	M	F	M
Fracture of skull	162	253	170	155	23	115	20	51	8	33	23	67	406	674
Fracture of neck and trunk	508	916	329	241	47	413	32	72	15	48	123	181	1,054	1,871
Fracture of upper limb	1,178	1,872	642	494	253	2,074	87	146	32	174	396	647	2,588	5,407
Fracture of lower limb	514	632	283	158	108	962	147	301	28	121	168	257	1,248	2,431
Dislocation	132	397	98	90	28	471	13	40	2	44	38	123	311	1,165
Sprains and strains of joints and adjacent muscles	23,323	16,020	10,326	5,137	288	1,467	355	423	102	402	2,243	1,705	36,637	25,154
Intracranial injury, excluding those with skull fracture	1,100	1,624	620	588	98	532	74	125	24	92	127	198	2,043	3,159
Internal injury of thorax, abdomen, and pelvis	61	162	41	39	12	85	7	17	2	10	14	29	137	342
Open wound	1,724	3,704	1,411	1,671	251	1,619	126	298	71	304	440	733	4,023	8,329
Injury to blood vessels	2	4	0	1	0	1	0	1	0	0	0	2	2	9
Contusion with intact skin surface	8,858	7,281	6,330	3,771	405	2,022	962	1,182	239	777	1,347	1,278	18,141	16,311
Crushing injury	16	32	29	26	4	15	58	61	3	6	87	80	197	220
Burns	94	67	19	17	17	45	0	4	1	1	22	35	153	169
Injury to nerves and spinal cord	12	15	2	1	1	2	2	4	0	1	2	3	19	26
Superficial injury	1,194	1,577	1,253	1,235	164	915	161	291	65	211	187	252	3,024	4,481
Traumatic complications and unspecified injuries	2,675	2,830	1,922	1,460	140	787	221	295	68	228	377	426	5,403	6,026
<b>Total</b>	<b>41,570</b>	<b>37,397</b>	<b>23,478</b>	<b>15,091</b>	<b>1,839</b>	<b>11,522</b>	<b>2,260</b>	<b>3,304</b>	<b>659</b>	<b>2,449</b>	<b>5,599</b>	<b>6,018</b>	<b>75,405</b>	<b>75,781</b>

**Table 5-5  
Any Mention of Alcohol Use/Abuse among Inpatient Discharges with Motor Vehicle-Related Injury Diagnosis  
by Race/Ethnicity and Year, Arizona Residents, 2005-2007**

	2005	2006	2007
<b>American Indian or Alaska Native</b>	456	445	369
Any mention of alcohol use/abuse	153	168	144
%	<b>33.6</b>	<b>37.8</b>	<b>39.0</b>
<b>Asian or Pacific Islander</b>	106	108	77
Any mention of alcohol use/abuse	9	6	2
%	<b>8.5</b>	<b>5.6</b>	<b>2.6</b>
<b>Black or African American</b>	252	259	277
Any mention of alcohol use/abuse	30	28	46
%	<b>11.9</b>	<b>10.8</b>	<b>16.6</b>
<b>Hispanic or Latino</b>	2,048	1,858	1,658
Any mention of alcohol use/abuse	250	263	263
%	<b>12.2</b>	<b>14.2</b>	<b>15.9</b>
<b>White non-Hispanic</b>	4,945	4,588	4,573
Any mention of alcohol use/abuse	438	508	528
%	<b>8.9</b>	<b>11.1</b>	<b>11.5</b>
<b>Total, all groups*</b>	8,036	7,450	7,122
Any mention of alcohol use/abuse	912	1,004	1,005
%	<b>11.3</b>	<b>13.5</b>	<b>14.1</b>

\* Includes other race.