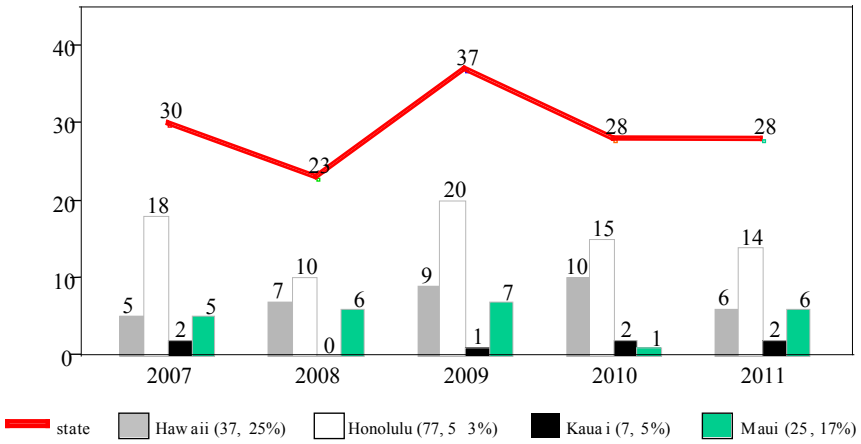
Motorcyclists

Fatal injuries

Deaths among motorcyclists were the 6th leading cause of fatal unintentional injuries in the state, accounting for 146 total deaths from 2007 to 2011. Figure 56 shows there were anywhere from 23 to 37 such fatalities each year, with no apparent trend in the annual number. The 146 fatalities resulted from 144 crashes, as only 2 crashes involved more than 1 victim. Only 5 of the victims were passengers; the rest were drivers of the motorcycle or moped. One-quarter (25%, or 37) of the victims were killed in Hawaii County, although only 14% of the population resides there and only 14% of all motorcycles are registered in this county. More than half (53%, or 77) were killed on the island of Oahu, and only 7 died on Kauai over the 5-year period.

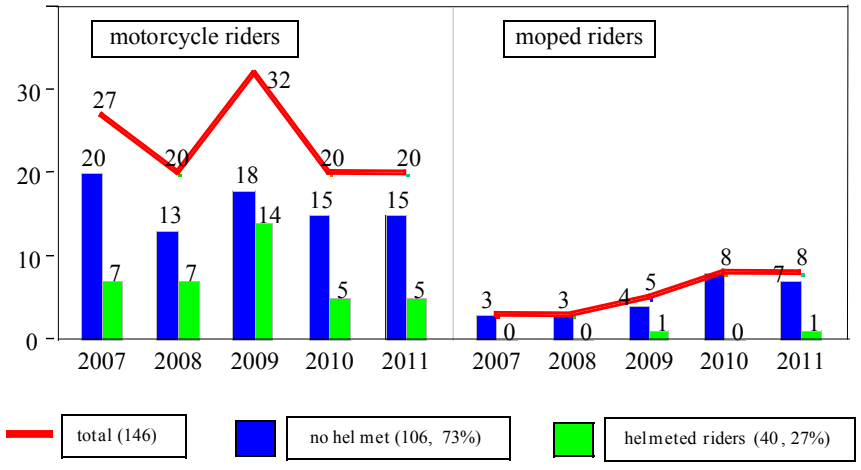
Figure 56. Annual number of fatally injured motorcyclists in Hawaii, by county, 2007-2011.



Eighteen percent (27) of the 146 victims were killed while riding a moped (Figure 57). Most (20, or 74%) of the moped riders were killed on Oahu, which had the highest proportion of victims who were moped riders (26%, vs. 10% for the rest of the state). The number of fatally injured moped riders increased from 3 in 2007 to 8 in both 2010 and 2011.

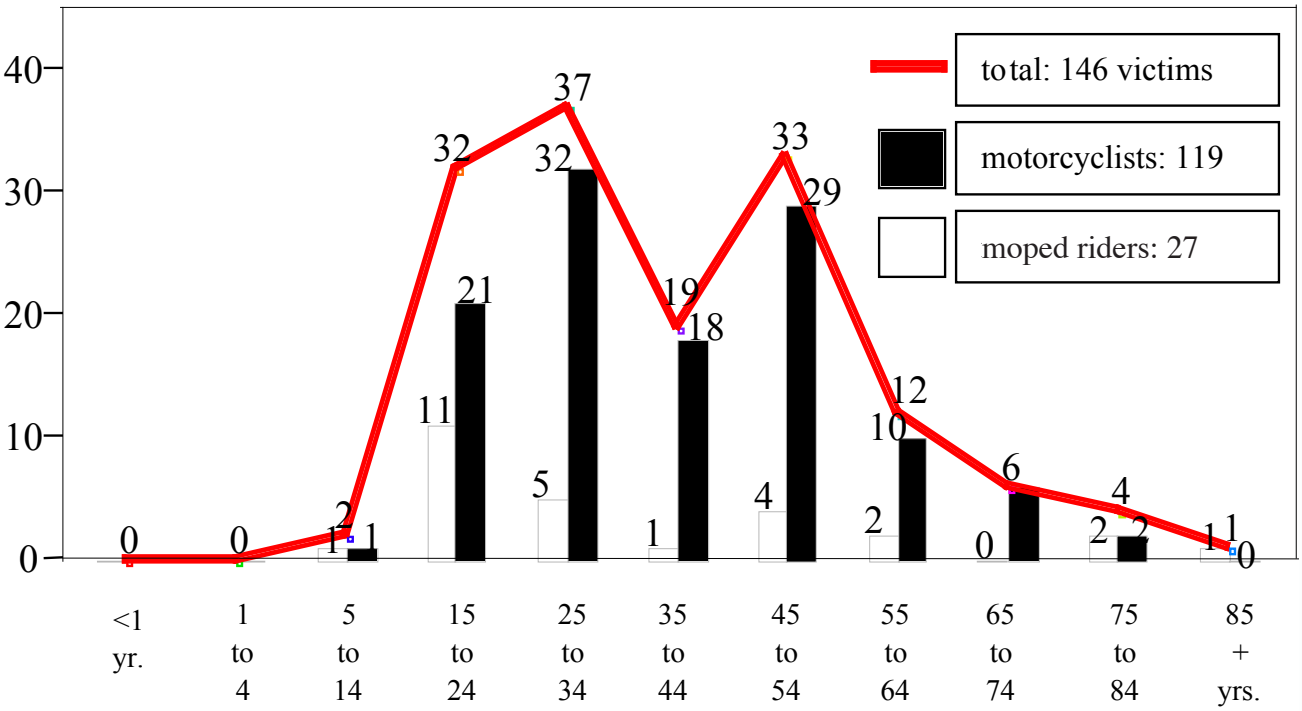
Only about one-fourth (27%, or 40) of the decedents were wearing a helmet at the time of the crash. This proportion did not change over time or across counties, but was much lower among moped riders (7%, or 2 of 27), compared to motorcycle riders (32%, or 38 of 119).

Figure 57. Annual number of fatally injured motorcyclists, by type of vehicle and helmet usage, 2007-2011.



Most of the victims were young to middle-aged adults; 79% (116) were between the ages of 20 and 55 years (Figure 58). Only 8 of the victims were younger than 18 years of age. The peak age was 20 to 34 years, which included 41% (60) of the victims. The age distributions were similar between moped and motorcycle riders. Only 9 (6%) of the victims were females, including the 4 of the 5 victims who were passengers.

Figure 58. Age distribution of fatally injured motorcyclists in Hawaii,by vehicle type, 2007-2011.



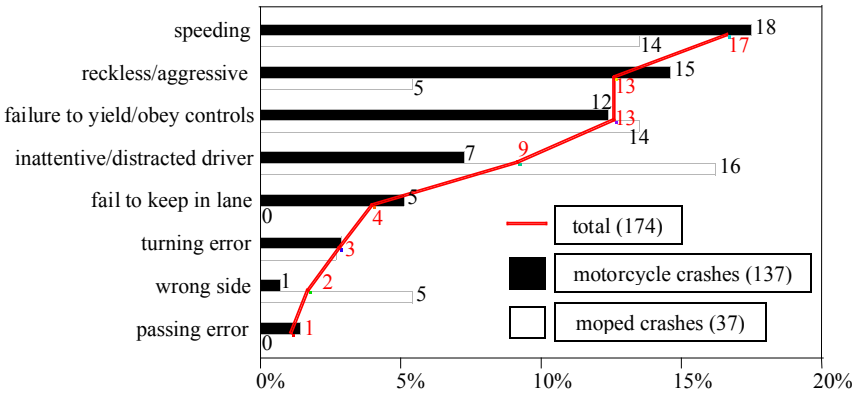
There was no noticeable seasonality in terms of the month of the year for the 144 crashes. Saturdays (24 crashes, 17% of the total) and Sundays (34 crashes) were the most common days for fatal crashes. Nearly half (43%, or 62) of the 144 crashes occurred during nighttime hours (7:30 p.m. to 5:29 a.m), including 51 (35%) during the 6-hour period of from 7:30 p.m. to 1:29 a.m.

Most (93%, or 110) of the 118 fatalities from 2007 through 2010 could be linked to FARS records, which contain information on the involvement of alcohol, helmet use and other risk factors in the crash. This data was available both for the crash decedents and other survivors involved in the crash. The remainder of this chapter (excluding the maps) utilizes FARS data, and is therefore restricted to the 110 victims who died in traffic crashes (i.e. those that occurred on public roadways).

Almost half (46%, or 50) of the 108 crashes involved only a single moped or motorcycle, and were likely related to the driver losing control of the motorcycle. The proportion of single vehicle crashes was lower (26%) among the 19 crashes involving mopeds, and 51% for the 89 crashes involving motorcycles.

There were 174 drivers involved in the 108 fatal crashes, including 99 motorcycle drivers, 16 moped riders, 57 car/truck drivers, and 2 drivers of unknown types of vehicles. Speeding was the most common contributing factor among all drivers (17%, or 29 drivers), or drivers of either type of crash (Figure 59). Failure to yield the right-of-way or to obey traffic signs or controls was also a common factor among drivers of both types of crashes. Reckless/aggressive driving was a common factor among drivers involved in fatal motorcyclist crashes (15%), while inattentive/distracted driving was more common among those involved in moped crashes (16%).

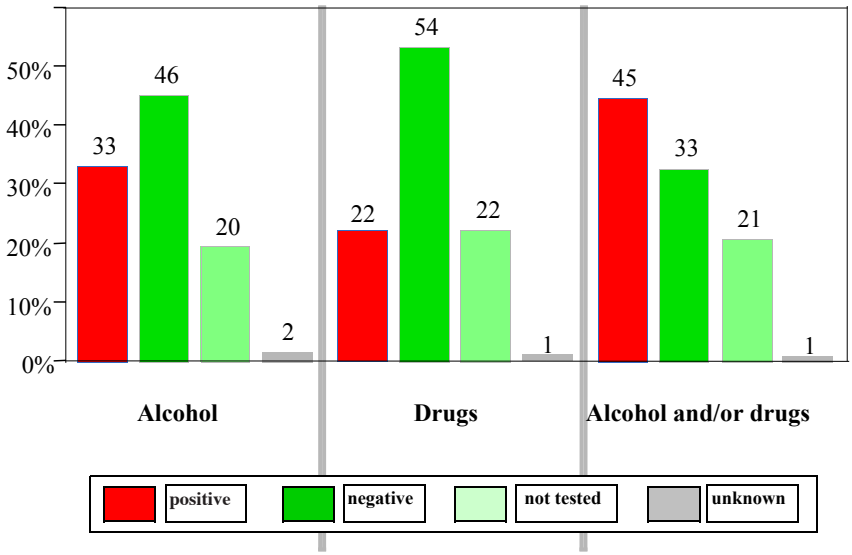
Figure 59. Contributing factors among drivers involved in fatal motorcycle/moped traffic crashes in Hawaii, by crash type, 2007-2010.



Three-fourths (76%, or 38) of the 50 single vehicle crashes involved speeding. Drivers who were speeding were significantly younger than those who were not (35 vs. 40 years), and more likely to have been in a nighttime crash (56%, vs. 33% of those who were not speeding). . Most (68%) of the 57 crashes on Oahu involved a speeding driver; speeding was a less commonly noted factor in Neighbor Islands crashes (47%, or 24 of 51).

One-third of the 174 drivers involved in fatal motorcyclist crashes tested positive for alcohol, and more than one-fifth (22%) tested positive for drugs (Figure 60). Nearly one-half (45%) of the drivers were positive for either alcohol or drugs. Most (82%, or 47 of 57) of the drivers who tested positive for alcohol had BAC levels of 0.08% or greater, and 56% (32 drivers) had BAC levels of 0.16% or greater. There was an increasing trend in the annual proportion of drivers who were drinking, from 30% in 2007 to 36% in 2010. Drivers involved in crashes on Hawaii County were most likely to have been drinking (42%, vs. 29% to 30% for other counties). There was no trend in the proportion of drivers who tested positive for drugs, although this was highest in 2010 (38%, vs. 17% to 18% in earlier years). The most commonly occurring drugs were THC (25 drivers) and stimulants (11 drivers), principally methamphetamine (7 drivers).

Figure 60. Alcohol and/or drug use (percent) among drivers involved in fatal motorcycle crashes in Hawaii, 2007-2010.



Motorcycle and moped drivers who tested positive for alcohol were significantly more likely to have been speeding, in a single vehicle crash, or been in a nighttime crash, compared to drivers who either tested negative for alcohol or drugs or who were untested (Table 10). Alcohol positive drivers were also significantly more likely to have had a previous DUI, a previously suspended license, and less likely to have had a valid motorcycle driver license. Drug positive drivers were also significantly more likely to have had a previous DUI or to have not had a valid license.

Overall, only 49% (52) of the 106 fatally injured motorcycle or moped drivers had a valid motorcycle drivers license at the time of the crash. That proportion was lower among the moped drivers (33%, or 5 of 15), compared to the motorcycle drivers (52%, or 47 of 91), although not to a statistically significant degree. Among the 54 drivers with invalid licenses, about half (52%, or 28) had a general drivers license, but not specific to operating a motorcycle. Another 14 (26%) had licenses that were suspended or revoked, 3 (6%) had expired, and 8 (15%) had no license at all.

Table 10. Characteristics of motorcycle drivers killed in crashes in Hawaii, by category of substance use, 2007-2010.

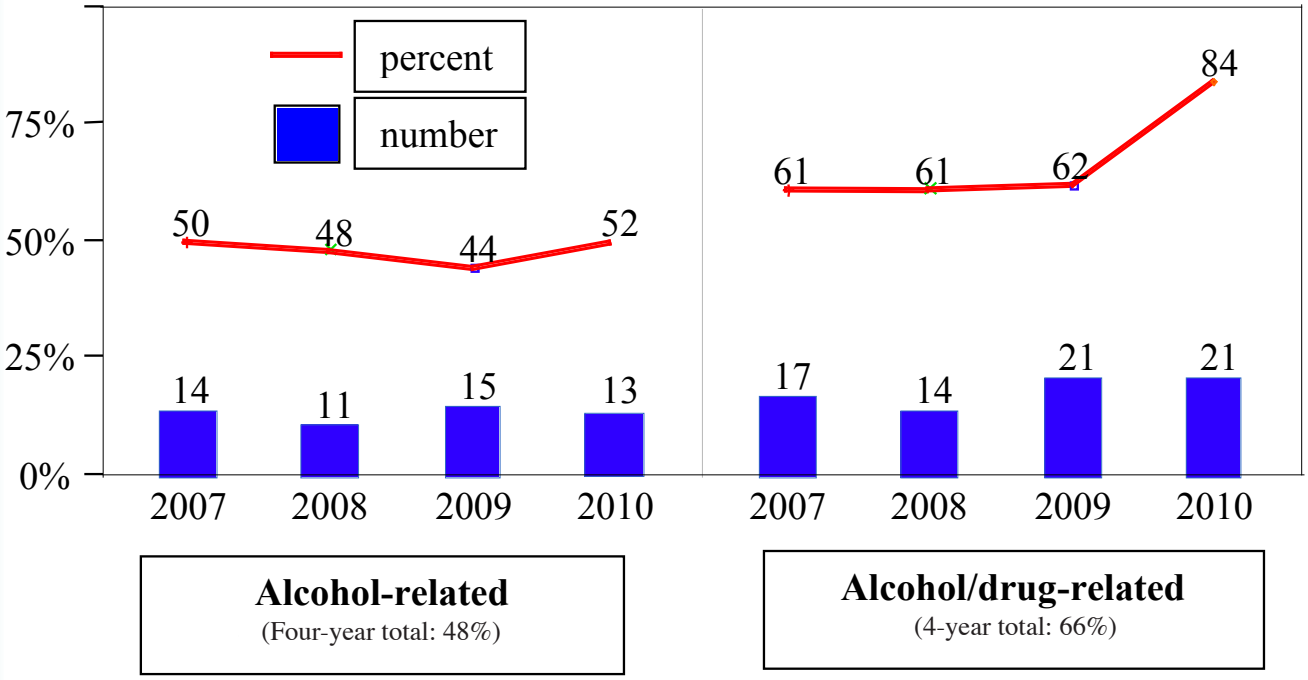
	Alcohol positive (50 drivers)	Drug positive (31 drivers)	No substances/ not tested (39 drivers)
Average age	38 years	39 years	36 years
Gender (% male)	95%	100%	95%
Helmet use	26%	16%*	41%
Speeding	72%*	55%	46%
Previous DUI	24%*	10%	3%
Previous suspension of license	31%*	16%	11%
Previous crashes	27%	35%	39%
Invalid license	58%*	52%	38%
Single vehicle crash	68%*	52%*	21%
Weekend crash (Sat/Sunday)	42%	45%	41%
Nighttime crash (8 pm - 5 am)	67%*	45%	26%

*Indicates statistically significant difference between alcohol/drug positive drivers and drivers negative for these substances. Drivers with "unknown" values for alcohol or drug test results were excluded (n=2). Exclusions were also made for drivers with missing or unknown values for restraint use, previous driving history.

Nearly half (48%, or 53) of the 110 decedents died in alcohol-related crashes (Figure 61). There was somewhat of a decreasing trend in the proportion of fatal motorcycle crashes that involved alcohol over the 2007 to 2009 period, but a subsequent increase to 52% in 2010. Most (92%, or 48) of the 52 crashes that were alcohol related involved drinking only on the part of the fatally injured motorcycle driver. (Or the motorcycle driver in the case of 1 fatally injured passenger.) Another 4 crashes involved drinking on the part of both the motorcyclists and drivers of other motor vehicles. Only 2 of the crashes involved drinking on the part of the car driver and not the motorcycle driver. The proportion of alcohol-related fatalities was highest for crashes in Hawaii County (57%). Alcohol was involved in 69% of the 51 crashes that occurred during nighttime (between 7:31 pm and 5:29 am).

If drugs were also considered, two-thirds (66%) of all fatal crashes were related to drivers who tested positive for either alcohol or drugs. This proportion increased to 84% in 2010, due mostly to crashes in Honolulu County, 12 of 13 of which were related to substance use among drivers. Nearly all (86%, or 44) of the 51 nighttime crashes involved substance use by at least one driver in the crash

Figure 61. Annual number and percentage of substance-related deaths among motorcycle and moped riders in Hawaii, 2007-2010.



Figures 62 and 63 show the approximate geographic location of the fatal motorcycle crashes. There were 13 deaths in the North Shore district, and 7 in both the Kailua and Waipahu districts (Figure 62). On Maui there were 17 deaths in the Wailuku district, and 5 in Makawao (Figure 63). There were also high numbers of deaths in the Hawaii County districts of North Kona (12), Puna (10) and South Hilo (6). The fatal moped crashes were widely distributed; South Hilo had the highest total (3 deaths).

Figure 62. Approximate location of fatal motorcycle/moped crashes on Oahu and eastern Oahu (bottom map), by alcohol status, 2007-2011.

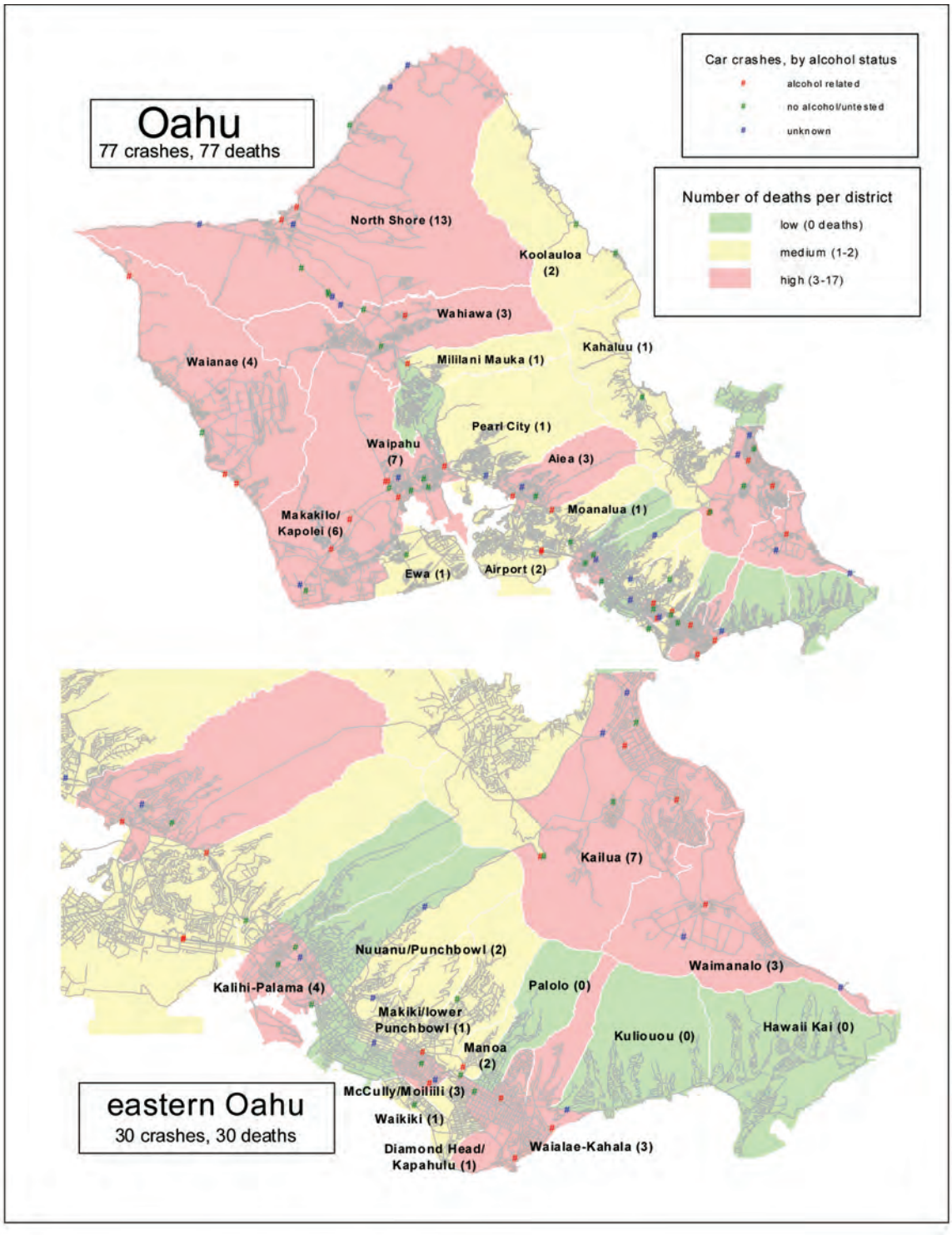
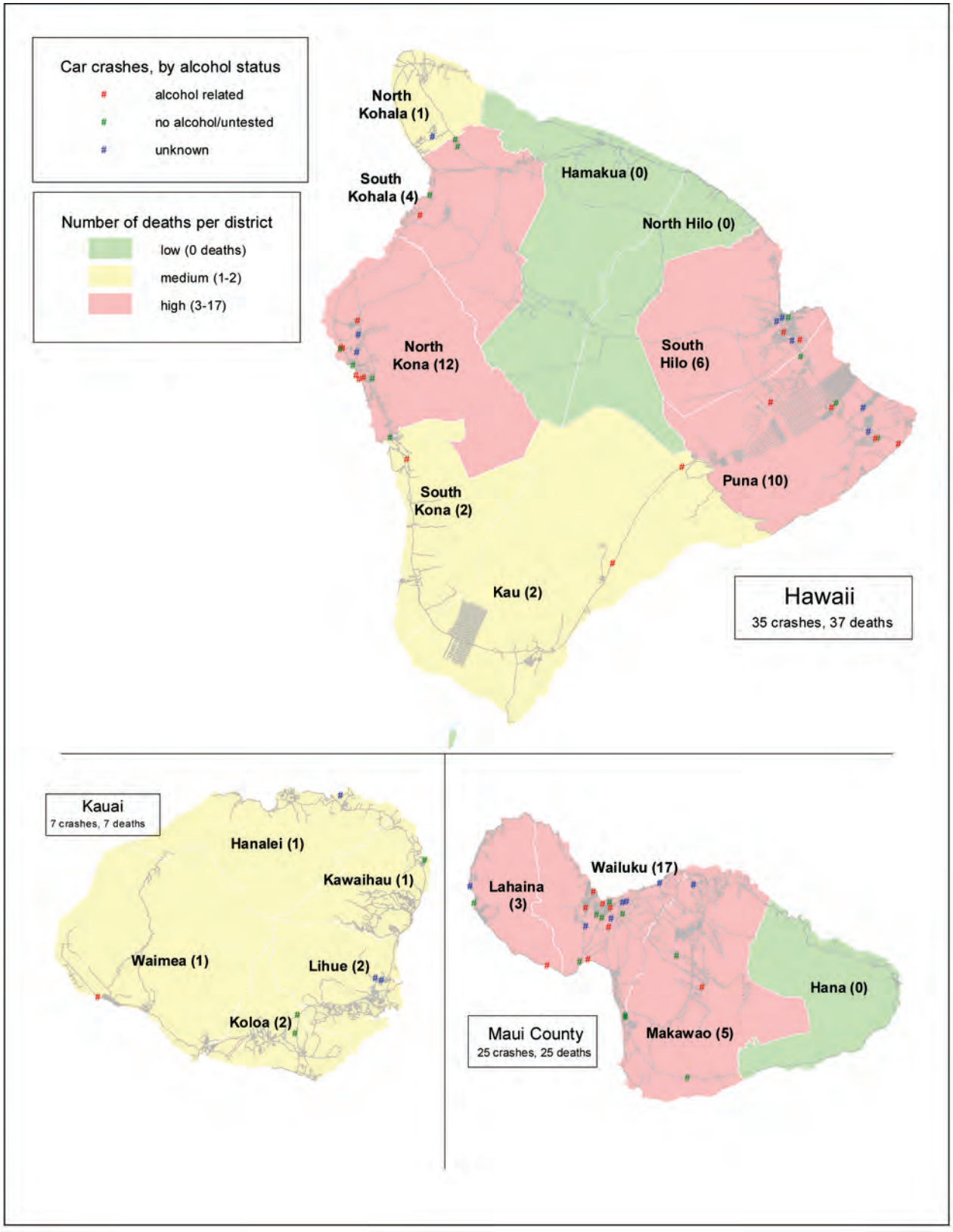


Figure 63. Approximate location of fatal car motorcycle/moped crashes on Neighbor Islands, by alcohol status, 2007-2011.



Nonfatal injuries

There was an decreasing trend in the annual number of nonfatal injuries among both motorcyclists treated in EDs and those admitted to hospitals over the 2007-2010 period, but increases in 2011 (Table 11). Hospitalizations comprised about one-fifth (21%) of the nonfatal injuries to motorcyclists. Most (83%) of the patients were males, and this distribution was consistent across counties. Patient age was narrowly distributed, as about half (51%) were 15 to 34 years of age, and most (82%) were between 15 and 54 years of age. About half (54%) of the patients were residents of Oahu. Almost all (94%) of the patients were motorcycle drivers; only 6% were passengers.

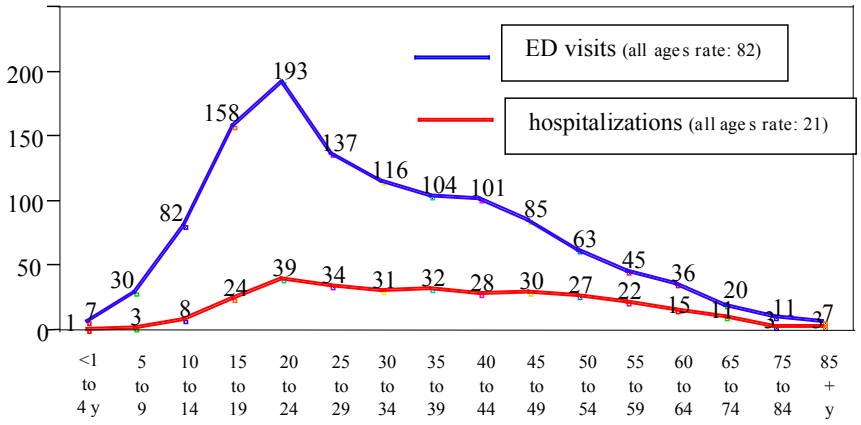
Table 11. Demographic characteristics* of Hawaii residents with nonfatal injuries from motorcycle crashes.

	ED visits	hospitalizations	total
Year of admission			
2007	1125	309	1434
2008	1049	276	1325
2009	990	257	1247
2010	964	274	1238
2011	1092	263	1355
average annual total	1044	276	1320
Patient gender			
Female	187 (18%)	36 (13%)	223 (17%)
Male	857 (82%)	240 (87%)	1097 (83%)
Patient age			
infants	1 (0%)	0 (0%)	1 (0%)
1-4 y	6 (1%)	1 (0%)	7 (1%)
5-14 y	87 (8%)	9 (3%)	95 (7%)
15-24 y	311 (30%)	58 (21%)	368 (28%)
25-34 y	238 (23%)	61 (22%)	299 (23%)
35-44 y	177 (17%)	53 (19%)	230 (17%)
45-54 y	134 (13%)	52 (19%)	185 (14%)
55-64 y	65 (6%)	30 (11%)	95 (7%)
65-74 y	18 (2%)	10 (4%)	29 (2%)
75-84 y	7 (1%)	2 (1%)	8 (1%)
85+ y	2 (0%)	1 (0%)	3 (0%)
County of residence of patient			
Hawaii	218 (21%)	47 (17%)	265 (20%)
Honolulu	552 (53%)	161 (58%)	713 (54%)
Kauai	89 (8%)	17 (6%)	106 (8%)
Maui	185 (18%)	51 (18%)	236 (18%)

*Statistics are annual averages over the 2007-2011 period.

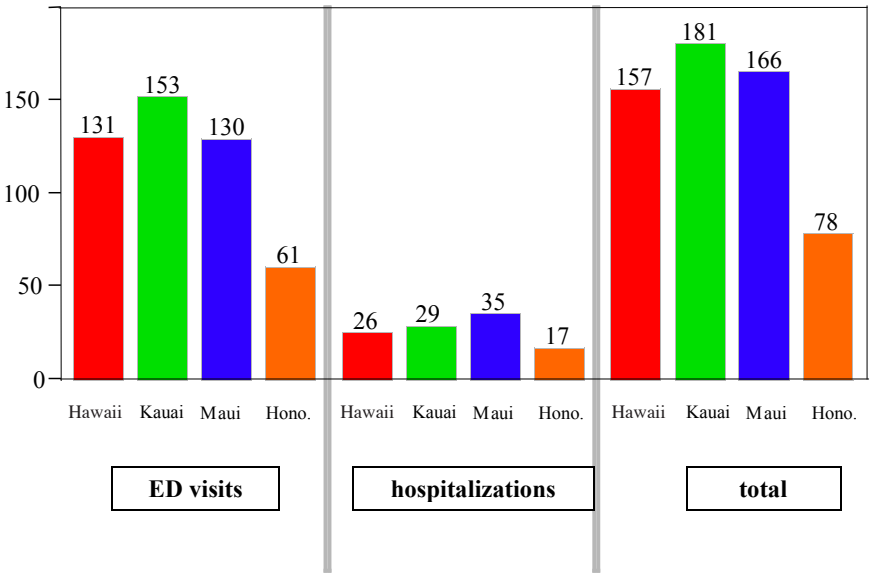
The peak age for rates of both ED visits and hospitalizations was among 15 to 29 year-old residents, particularly 20 to 24 year-olds (Figure 64). Rates of either type of injury declined steadily from the 20 to 24 year-old peak, more sharply in the case of ED visits.

Figure 64. Average annual rates (per 100,000 residents) of hospitalizations and ED visits for nonfatal injuries from motorcycle crashes in Hawaii, by age of patient, 2007-2011.



The rate of ED visits for residents of Honolulu County was significantly lower, by at least 2 times, than the rate for residents of any other county (Figure 65). Rates were statistically comparable among the other 3 counties. A similar pattern was seen for hospitalization rates, although there was no significant difference between the rates for Kauai and Honolulu residents. The highest rate of hospitalizations was computed for Maui County residents, although they were statistically comparable to the rates for residents of Hawaii and Kauai counties.

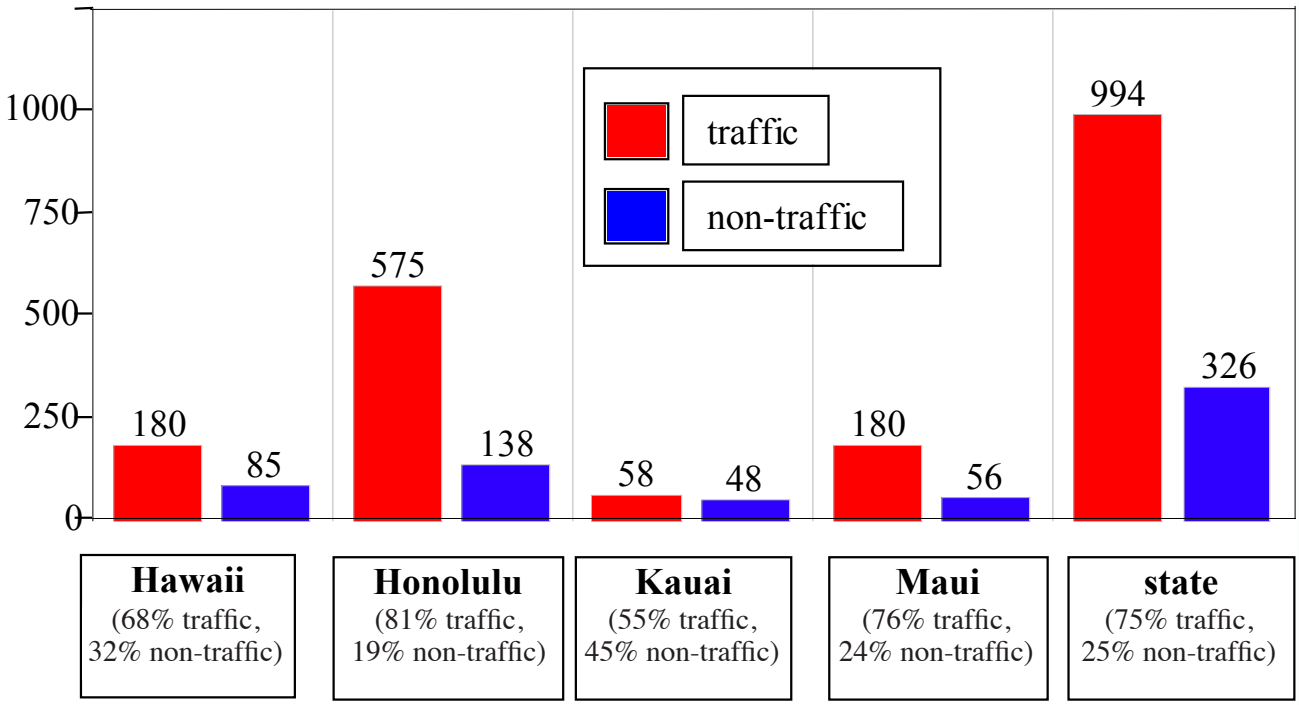
Figure 65. Age adjusted annual rates (per 100,000 residents) of nonfatal injuries from motorcycle crashes, by level of care and county of residence of patient, 2007-2011.



Only about half (46%) of the injuries resulted from crashes that involved a collision, most commonly another motor vehicle (39%). Forty-four percent of the crashes did not involve a collision, but were due to loss of control by the rider. (This status was not known for the remaining 10% of crashes.) The distribution of crash type was similar for injuries treated in EDs and those that required hospitalization.

Three-fourths (75%) of the nonfatal injuries were coded as "traffic" related, or occurring on a public roadway, while 25% were in "non-traffic" environments, including private roads, driveways and parking lots (Figure 66). The proportion of traffic crashes varied by the county of residence of the patients, being highest for residents of Honolulu (81%) and Maui (76%) counties, and lowest for residents of Hawaii (68%) and Kauai (55%) counties. Injuries that required hospitalization were significantly more likely to be from traffic crashes, compared to those that were treated in EDs (89% vs. 72%, respectively). Patients who were injured from non-traffic crashes were significantly younger on average than those involved in traffic crashes (28 vs. 35 years, respectively). Nearly one-fifth (19%) of the patients who were injured in non-traffic crashes were 5 to 14 years of age, compared to only 3% of those who were injured in traffic crashes.

Figure 66. Average annual number of nonfatal injuries from motorcycle crashes in Hawaii, by type of crash and county of residence of patient, 2007-2011.



Because patients were hospitalized for an average of 1 week, the total number of days of care was greater for hospitalizations than ED visits (Table 12). Hospitalizations also comprised most (85%) of the annual total of $16.7 million in medical charges in the state. The average hospitalization resulted in over $51,000 in medical charges, compared to about $2,700 for each ED visit.

Nearly two-thirds (64%) of the hospitalized patients and one-quarter (23%) of those treated in EDs had fractures, most commonly in the lower leg or foot, although fractures were widely distributed among areas of the body. Internal injuries were also prevalent (24%) among hospitalized patients, while open wounds (15%) and contusions and superficial injuries (31%) were more common among those treated in EDs. One-fifth (21%) of the patients had a traumatic brain injury, including 39% of those who were hospitalized.

Table 12. Clinical characteristics* of Hawaii residents with nonfatal injuries from motorcycle crashes.

	ED visits	hospitalizations	total
Length of care and financial charges			
Ave. length of stay (days)	1.0	7.2	2.3
Total number of days	1,044	1,980	3,024
Average charge	$2,725	$51,626	$12,625
Total charges	$2.8 million	$14.2 million	$16.7 million
Primary injury diagnosis			
fractures	245 (23%)	178 (64%)	423 (32%)
fracture of skull	12 (1%)	35 (13%)	48 (4%)
vertebral column	8 (1%)	12 (4%)	20 (2%)
ribs, pelvis or trunk	80 (8%)	26 (9%)	106 (8%)
humerus	13 (1%)	6 (2%)	19 (1%)
lower arm or hand	70 (7%)	14 (5%)	85 (6%)
femur	2 (0%)	26 (9%)	28 (2%)
lower leg or foot	60 (6%)	58 (21%)	117 (9%)
sprains and strains	124 (12%)	2 (1%)	126 (10%)
internal injuries	64 (6%)	66 (24%)	130 (10%)
open wounds	153 (15%)	16 (6%)	169 (13%)
contusion/superficial	323 (31%)	3 (1%)	326 (25%)
other/unspecified	135 (13%)	12 (4%)	146 (11%)
traumatic brain injury (any priority diagnosis)	172 (16%)	108 (39%)	280 (21%)

*Statistics are annual averages over the 2007-2011 period.

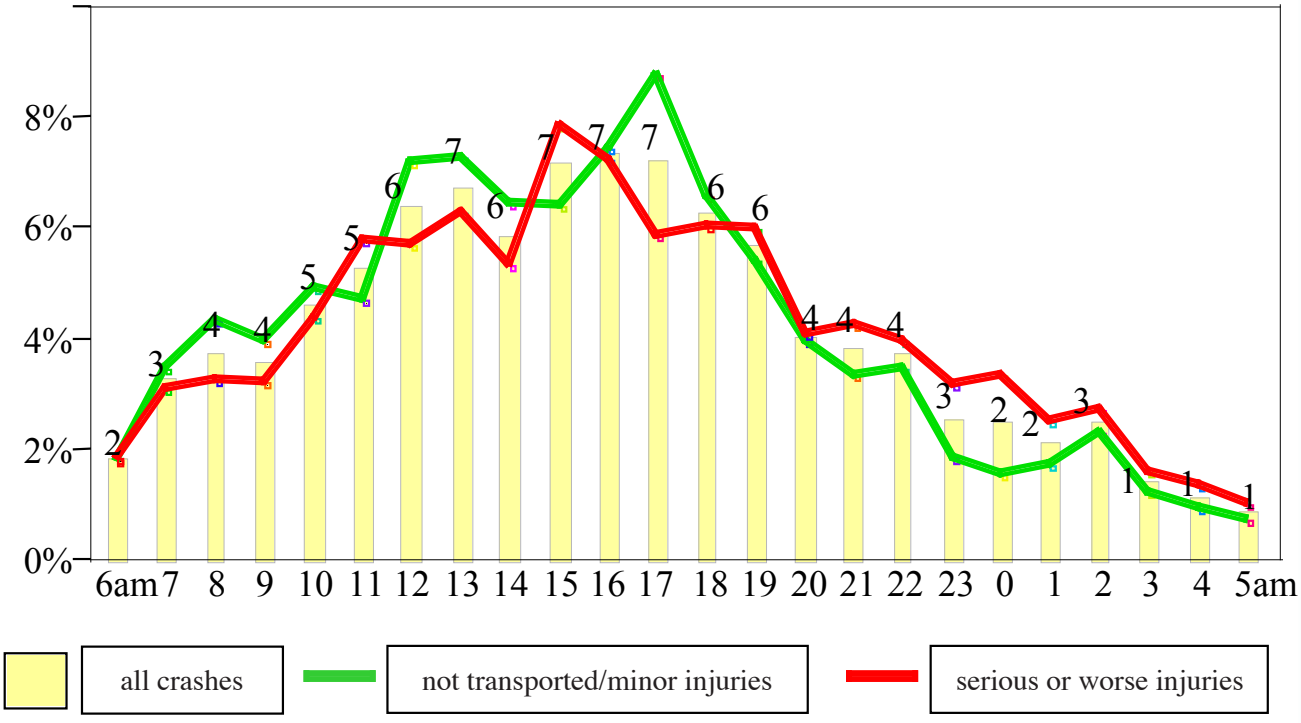
There were 3,724 EMS records for Hawaii residents who were treated by EMS personnel for injuries from motorcycle and moped crashes over the 5-year period. (Records for 79 patients whose residence could not be determined were excluded.) An additional 52 records of patients who were transferred to another ambulance were also excluded, to avoid double-counting. The final sample was 3,593 records. This total includes 128 patients who ultimately died from the crashes, since this is an important outcome to examine in terms of helmet usage by riders. (All deaths were confirmed by linkage to death certificates.)

The 3,593 injuries resulted from an estimated 3,444 separate crashes, as most (96%) of the crashes involved only a single injury. Figure 67 shows a broad peak in the time of the crashes from 9:31 a.m. to 7:29 p.m. (63% of crashes). Crashes with no patient transports or only minor/moderate injuries were somewhat more likely to occur daytime hours (5:29 a.m to 7:30 p.m.), compared to crashes which resulted in "serious" or worse injuries (79% vs. 72%, respectively). Fifteen-percent (274) of the latter type of crashes occurred between 7:31 p.m. and 2:29 a.m.

Sundays (20%, or 710 crashes) and Saturdays (17%, or 614) were by far the most common days of the week for crashes (12% to 14% for all other days); more than one-third (37%, or 1324) of the crashes occurred on weekends. There were no large difference in the time distribution between weekend and weekday crashes, although 13% of the latter occurred during the morning rush hour period of 7:31 a.m. to 9:29 a.m., compared to only 7% of the weekend crashes. One-fifth (20%, or 2634 of 13,034 crashes) of the weekday crashes occurred during the 3-hour period from 2:31 p.m. to 5:29 p.m., compared to 15% (806) of the 5486 crashes on weekends.

Figure 67. Time distribution of EMS-attended motorcycle/moped crashes, by highest severity of injury in crash, 2007-2011.

(Horizontal scale indicates time of EMS dispatch, rounded up to nearest hour (military time scale, starting at 6:00am). Vertical scale indicates percent of all crashes, rounded to nearest whole number.)



Four of the 5 highest crash locations on Oahu were in the metropolitan Honolulu area, from Kalihi-Palama to Waikiki (Figure 68). Two-thirds (68%) of the 519 crashes in Hawaii County were in North Kona (46%) or South Hilo (21%) (Figure 69). The Wailuku and Lahaina districts accounted for most (78%) of the crashes on the island of Maui. There were also 13 crashes on the island of Molokai and 4 on Lanai (not shown on the Figure).

Figure 68. Number of EMS attended motorcycle/moped crashes on Oahu and eastern Oahu (bottom map), by Neighborhood Board, 2007-2011.

(Percent of all EMS-attended crashes in the state is shown in parentheses.)

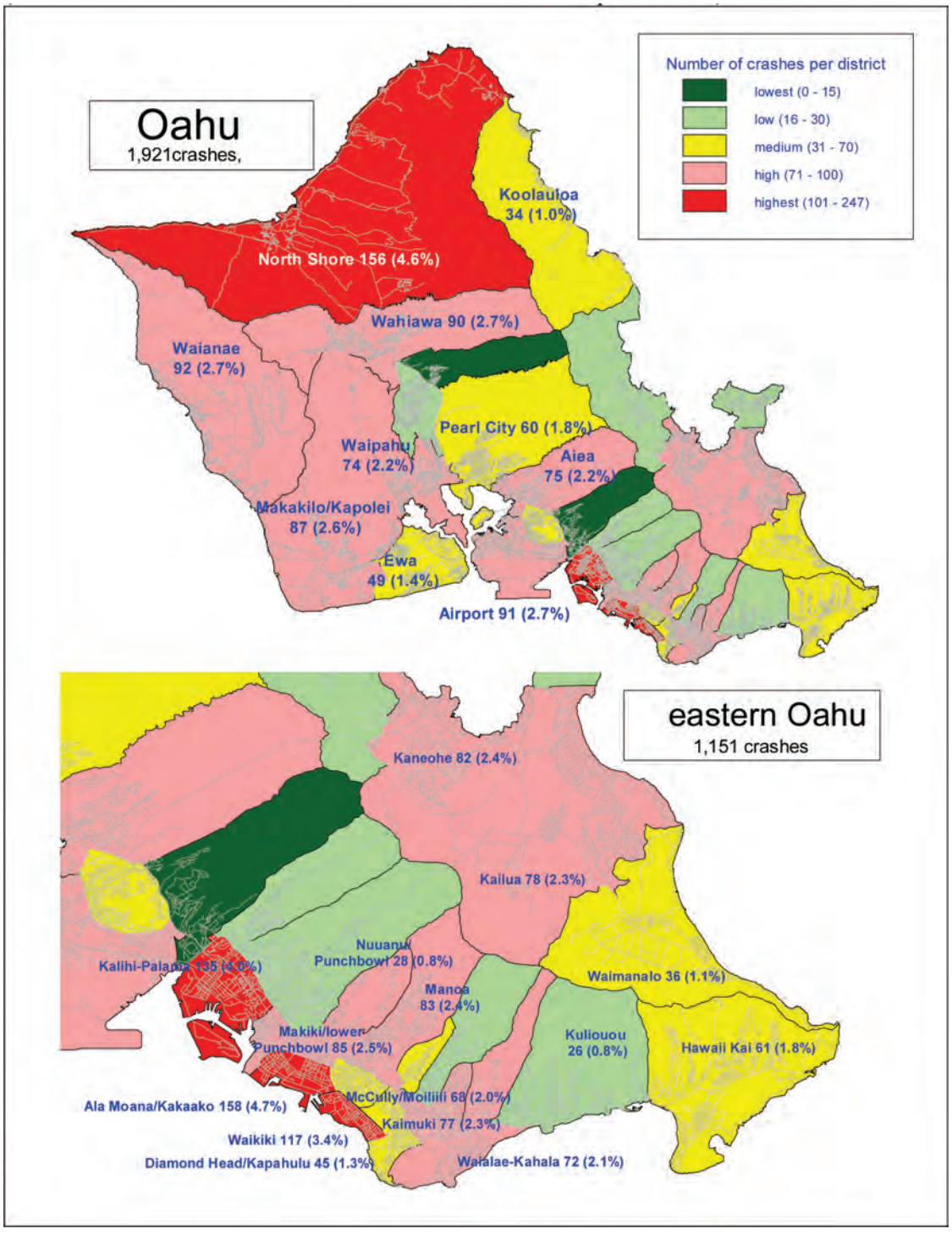
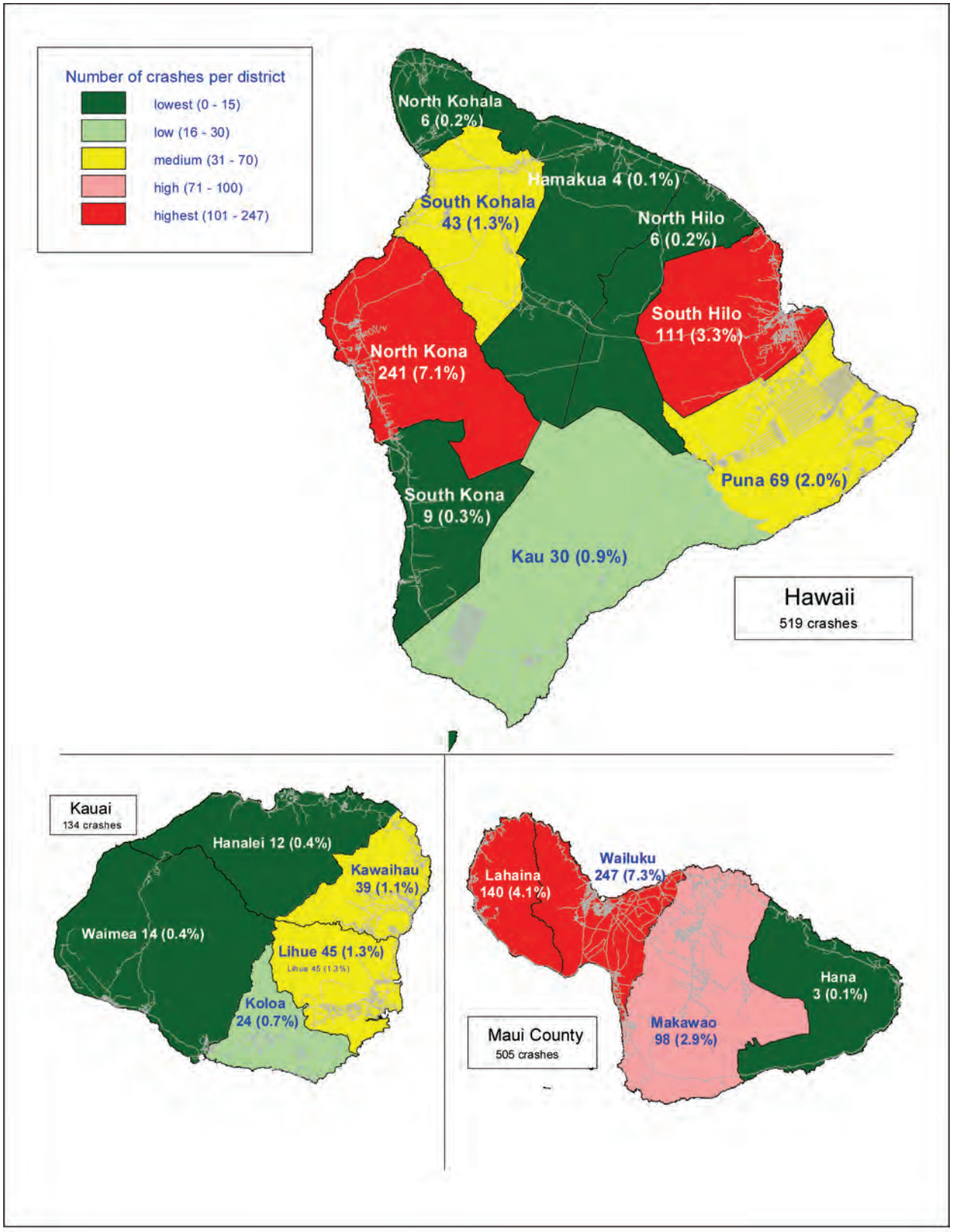


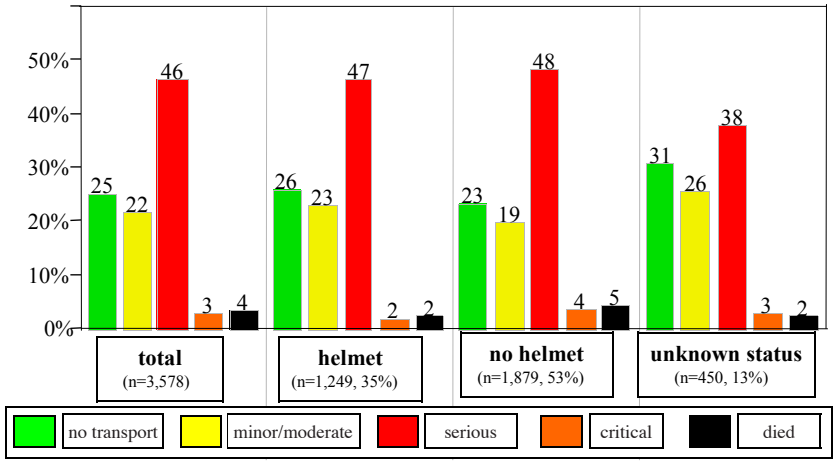
Figure 69. Number of EMS attended motorcycle/moped crashes on Neighbor Islands, by district, 2007-2011.

(Percent of all EMS-attended crashes in the state is shown in parentheses.)



About half (47%, or 1688) of the riders refused EMS transport to hospitals (25%), or were transported with only "minor" or "moderate" injuries (22%) (Figure 70). Another 46% (1670) were transported with "serious" injuries, 107 in "critical" condition, and another 128 who ultimately died. (The latter status included those described as deceased on the scene as well as those linked to death certificates after they were transported to hospitals.)

Figure 70. Distribution of injury severity/transport status of motorcycle and moped riders treated by EMS personnel, by helmet usage, 2007-2011.

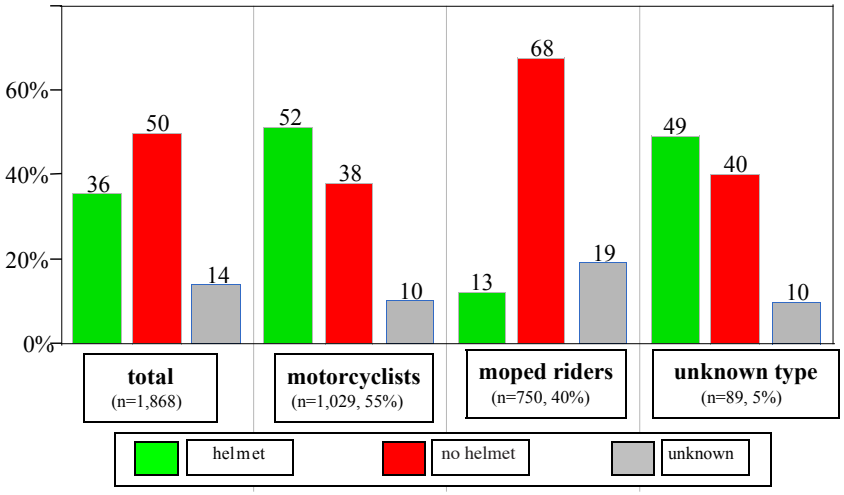


*Not shown are 15 patients who were transported with injuries of unknown severity.

Patient condition differed by helmet usage, as helmeted riders were significantly more likely to be transported with minor or moderate injuries (23%, compared to 19% for unhlemeted riders), and significantly less likely to be transported in critical condition (1.9% vs. 3.7%). The mortality rate among helmeted riders (2.5%, or 31 of 1249) was also significantly less than that among unhelmeted riders (4.6%, or 86 of 1879). Helmet status was not recorded for 13% (450) of these patients, whose disposition was generally more favorable than the other two groups of riders.

Due to software changes, information on the type of vehicle was available only for the 2007 through 2008 period and from July, 2011 onwards. Over those two time periods, 55% (1029 of 1868) of the riders were injured on motorcycles, 40% (750) were on mopeds, and vehicle status was unknown for the remaining 5% (89) riders. These proportions did not differ significantly across counties, although 64% of the riders in Kauai crashes were on motorcycles, compared to 52% to 56% for other counties. Only 36% of the riders were wearing helmets at the time of the crash, 50% were not helmeted, and the status was not available for the remaining 14% of riders (Figure 71). The proportion not wearing helmets was significantly higher, nearly doubled, among the moped riders (68%), compared to motorcycle riders (38%). These proportions are 84% and 43%, respectively, if riders with unknown helmet status are excluded.

Figure 71. Helmet usage among motorcycle and moped riders treated by EMS personnel, 2007-2008, and July-December, 2011.



The positive associations between helmet use and patient disposition (Figure 70, above) was apparent for both types of riders. Helmeted moped riders were significantly less likely to be transported in critical condition or suffer fatal injuries (none among 94 riders), compared to unhelmeted riders (5%, or 26 of 510). Similarly, the rate of these types of injuries was significantly lower among helmeted motorcycle riders (5%, or 26 of 530), compared to unhelmeted riders (15%, or 59 of 392). The mortality rate among unhelmeted motorcycle riders (8.4%, or 33 of 392) was nearly 5 times that of helmeted riders (1.9%, or 10 of 530).

Probable alcohol use was noted for about 12% of the patients, as EMS personnel documented physical evidence (e.g. containers) at the crash scene, alcohol odor on the patients' breath, or the patient admitted to alcohol consumption (Table 13). This proportion was much higher among riders who crashed on Neighbor Islands (16% to 19%) than those who crashed on Oahu (10%). Alcohol users were significantly older than occupants who did not use alcohol, but by only 1 year on average. They were also more likely to be males, less likely to use helmets, and more likely to have been in a night time crash or a crash on the weekend. There were also significant differences in the disposition of patients, as those who had used alcohol were three times as likely to have been transported in critical condition, or to have died, compared to those who did not use alcohol. For the periods for which vehicle type was recorded, alcohol users were more likely to have been injured riding a moped (45%), compared to those who did not use alcohol (37%). Alcohol use was significantly more likely among moped riders than motorcycle riders (16% vs. 13%, respectively).

Table 13. Characteristics of motorcycle/moped riders treated by EMS personnel, by category of alcohol use, 2007-2011.

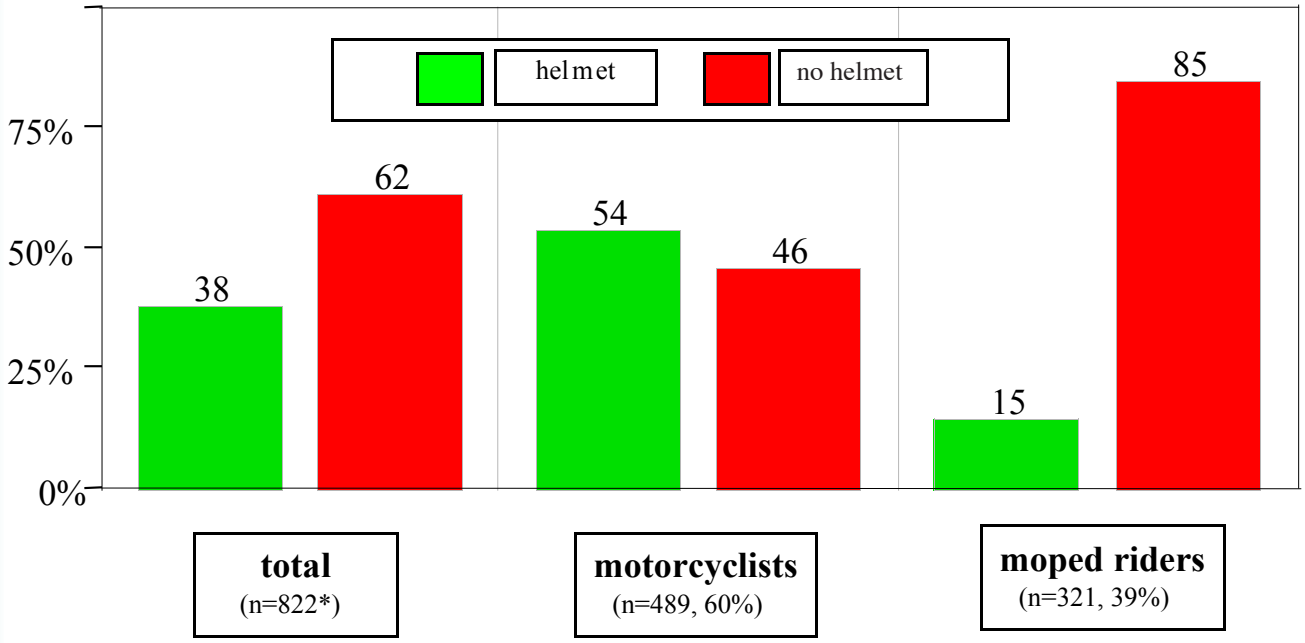
	Alcohol use (n=445, 12%)	No alcohol use (n=1,851, 52%)	No data/unknown (n=1,282, 36%)
Average age	37 years	35 years*	36 years
Gender (% male)	91%	81%*	82%*
Helmet use			
helmeted	14%	41%*	33%*
no helmet	77%	49%*	49%*
unknown	8%	10%	18%*
Disposition			
no transport	7%	29%*	27%*
minor/moderate injuries	17%	24%*	20%
serious injuries	60%	43%*	47%*
critical injuries	5.4%	1.6%*	4.1%
died	10.3%	2.9%*	2.3%*
Weekend crash (Sat/Sunday)	44%	36%*	35%*
Nighttime crash (8 pm - 5 am)	63%	18%*	21%*
Vehicle type#			
motorcycle	49%	58%*	50%
moped	45%	37%*	46%
unknown	6%	5%	4%

*Indicates statistically significant difference between riders who used alcohol vs. other riders.
#For patients injured during the 2007 through 2008 and July through December, 2011 periods.

This section summarizes results from the 2007 EMS data that was linked to multiple data systems: FARS, death certificates, DOT reports, and hospital records. Only about two-thirds (65%, or 538) of the 822 EMS records for injured Hawaii residents were probabilistically linked to DOT records, a lower proportion compared to injured occupants (72%, see page 63). That proportion only varied across counties by 60% (Kauai) to 66% (Honolulu). Hospital records were deterministically linked to 92% (600) of the 653 patients who were transported to hospitals by EMS. Hospital records were also linked to 51 additional EMS patients who refused EMS transport but apparently took private vehicles to hospitals.

Only 38% of the injured riders were wearing helmets at the time of the crash (Figure 72). This proportion differed greatly by the type of rider, as 54% of motorcyclists were wearing helmets, compared to only 15% of moped riders. (Helmet status was known for all but 3 (0.4%) of the riders.) Helmet use was highest among riders who crashed on Oahu (44%), 37% on Kauai, 28% in Hawaii County and only 26% in Maui County. The high proportion for riders on Oahu was mainly due to the 63% usage rate among motorcyclists injured there, compared to 35% to 48% of motorcyclists injured in other counties. Riders who used helmets were significantly younger (32 years, on average) compared to unhelmeted riders (36 years), and significantly more likely to be males (87%, vs. 81% males among unhelmeted riders).

Figure 72. Helmet use among motorcycle/moped riders treated by EMS personnel, by vehicle type, 2007



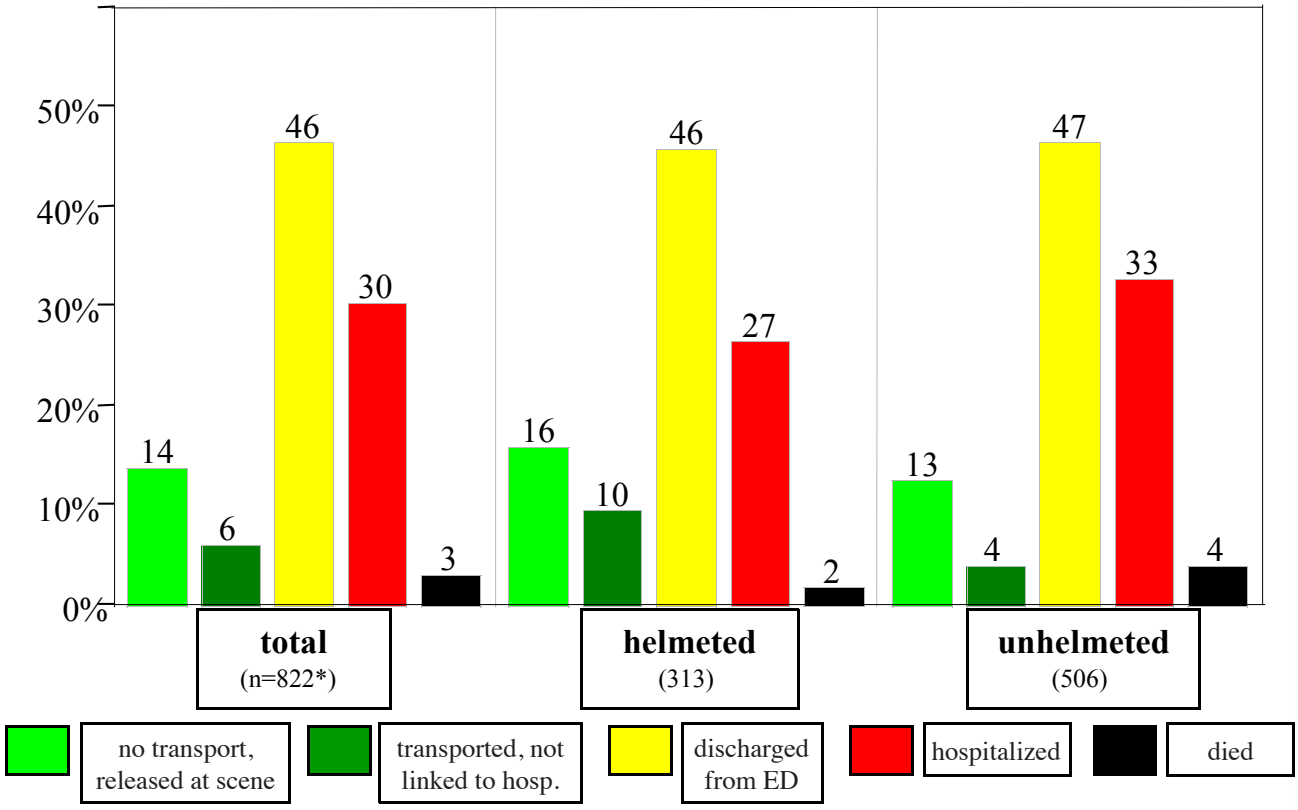
*Includes 10 riders of motor scooters and 2 of unknown types of vehicles.

Only 14% (114) of the 822 riders refused EMS transport and were released at the crash scene. About half (46%) were transported and eventually discharged from the ED, nearly one-third (30%) were hospitalized, and 3% (26) ultimately died from their injuries (Figure 73). The remaining 6% were transported by EMS, but could not be linked to hospital records. Paramedic described "minor" injuries for 66% of these patients, and "serious" injuries for 34%. This distribution is closer to that patients whose medical records showed a discharge from ED (49% with "minor" injuries, 51% with "serious"), than for patients who were eventually hospitalized or died from their injuries (13% minor, 87% "serious" or worse).

Helmeted riders had a significantly lower rate of the most severe injuries, those requiring hospitalization or resulting in death (28%, or 89 of 313), compared to unhelmeted riders (37%, or 186 of 506). The incidence of traumatic brain injury was nearly twice as high among unhelmeted riders (31%), compared to helmeted riders (18%).

There were no significant differences in the average hospital charges for helmeted and unhelmeted riders treated in either the ED ($4,363, on average) or inpatient setting ($70,139). The average length of each hospitalization was somewhat longer among unhelmeted riders (9.5 days, vs. 7.0 for helmeted riders), but not to a statistically significant degree.

Figure 73. Final medical disposition of motorcycle and moped riders treated by EMS personnel, by helmet use, 2007



* Includes 3 riders for whom helmet status was not known.

The odds of sustaining an injury that required hospitalization or resulted in death were 40% higher among unhelmeted rides compared to helmeted riders, and the former also had more than twice the odds of a fatal injury (Table 14). The odds of sustaining a traumatic brain injury were also more than double among unhelmeted riders compared to helmeted riders. All of these excess risk estimates were statistically significant and adjusted for the possible influence of rider age and gender and the county in which the crash occurred. The protective effects of helmet use were magnified if only motorcycle riders were considered. Unhelmeted motorcycle riders had twice the odds of an injury that required hospitalization or resulted in death, more than 3 times the odds of a fatal injury, and 3 times the odds of a TBI. In contrast, none of these odds varied significantly by helmet usage among moped riders, although it was not possible to asses the risk of fatal injuries, since there only 3 among all 320 moped riders and none among the 48 who wore helmets.

Table 14. Adjusted* odds ratios for adverse medical dispositions among motorcycle/moped riders treated by EMS personnel, by helmet use, 2007

(Odds ratio 95% confidence intervals given in parentheses.)

	All riders		Motorcyclists only	
Restraint group	**number (% of group)**	**odds ratios**	**number (% of group)**	**odds ratios**
Odds of no transport (released at scene) or discharged from ED, vs. hospital admission or death				
helmeted	186/506 (37%)	1.0 (reference)	80/263 (30%)	1.0 (reference)
unhelmeted	89/313 (28%)	1.4 (1.2 – 1.9)	112/224 (50%)	2.1 (1.4 – 3.2)
Odds of no transport (released at scene) or transported to hospital, vs. death				
helmeted	6/313 (1.9%)	1.0 (reference)	6/263 (2.3%)	1.0 (reference)
unhelmeted	20/506 (4.0%)	2.2 (0.9 – 6.1)	17/224 (7.6%)	3.3 (1.3 – 9.8)
Odds of traumatic brain injury				
helmeted	56/313 (17.9%)	1.0 (reference)	44/263 (16.7%)	1.0 (reference)
unhelmeted	158/506 (31.2%)	2.2 (1.5 – 3.1)	78/224 (34.8%)	3.1 (2.0 – 5.0)

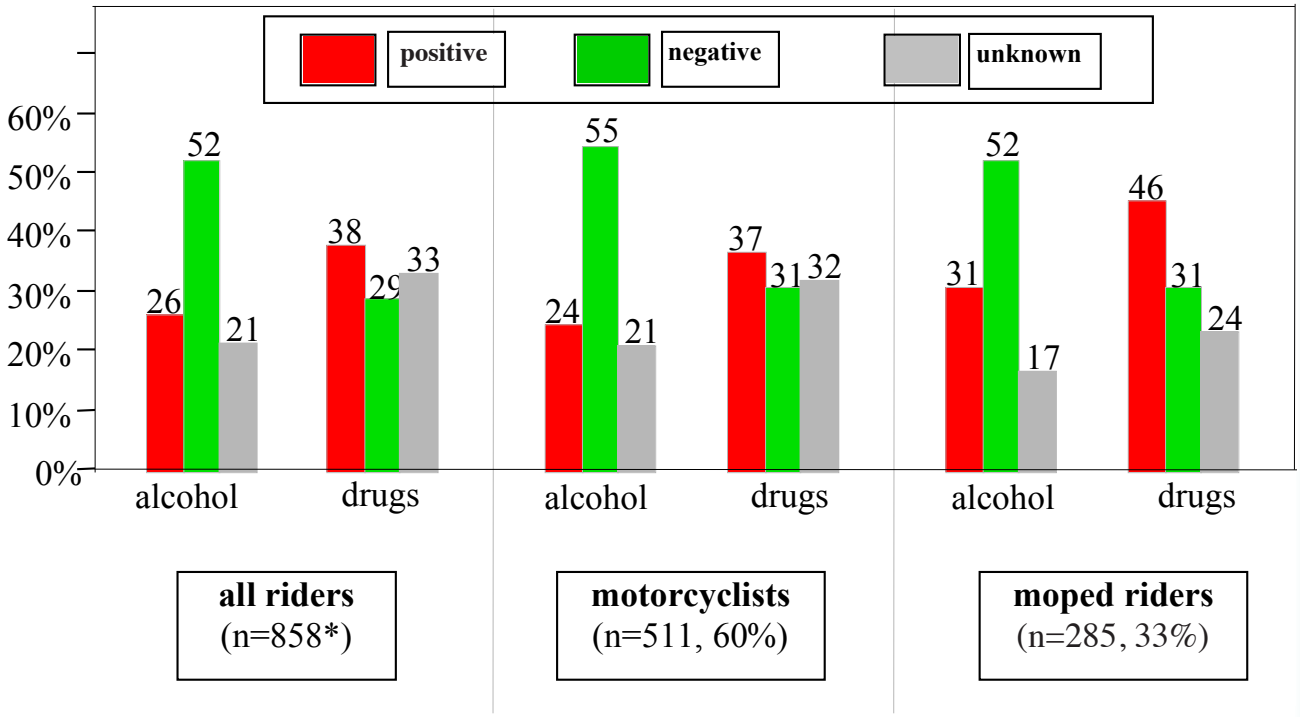
*Adjusted for occupant age, gender, and county in which crash occurred.

Trauma Registry data

About one-fourth (26%) of the injured resident motorcycle/moped riders in the HTR tested positive for alcohol, including 21% (178) with BAC levels of 0.08 or greater, and 14% (117) with BAC levels of 0.16% or greater (Figure 74). Moped riders were significantly more likely than motorcyclists to have been drinking (31% vs 24%, respectively). More than half (54%, or 464) of the riders tested positive for either alcohol or drugs, including most (78%) of the 285 moped riders. The most commonly occurring drugs were narcotics (21% of patients), THC (17%), and amphetamines (9%). Moped riders were significantly more likely to test positive for THC (24%, vs 15% for motorcyclists).

There were no significant differences in the age or gender distribution of riders who were drinking and riders who tested negative for alcohol. Helmet usage was significantly lower among the former, however, as only 17% wore helmets, compared to 37% of the non-drinkers. Among motorcyclists, helmet usage was 52% among the non-drinkers compared to only 23% among those who were positive for alcohol. Alcohol usage was comparable between riders who crashed on weekends and those who crashed on weekdays (26% for each group), but 4 times more common among those who crashed during night time (54%) compared to those who crashed between 6:30 a.m. and 7:29 p.m. (14%). The mortality rate among drinkers (7.5%, or 17 of 226) was significantly higher than that among non-drinkers (3.8%, or 17 of 448). This elevated risk of mortality was more apparent among the motorcyclists than the moped riders.

Figure 74. Alcohol and/or drug use (percent) among motorcycle/moped riders in the Hawaii Trauma Registry, by seating position, 2008-2011.



*Includes 62 patients for whom seating position was not known.