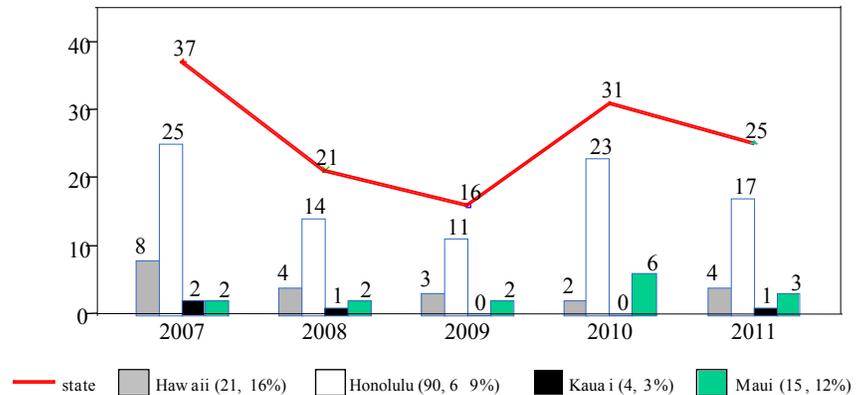


Pedestrians

Fatal injuries

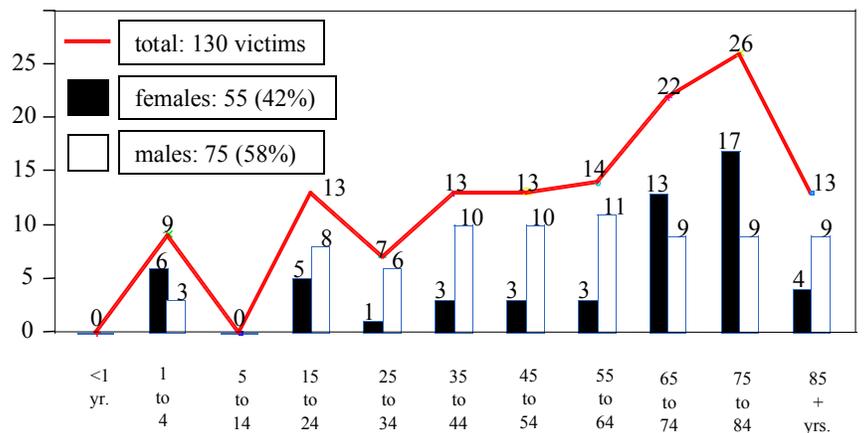
Pedestrian crashes were 7th leading cause of fatal unintentional injuries, as 130 pedestrians were killed in Hawaii over the 5-year period. The annual number of deaths varied inconsistently between 16 and 37 (Figure 75). The deaths were caused by 129 separate crashes, as 1 crashes involved 2 victims. More than two-thirds of the victims (69%, or 90) were struck on Oahu. Another 21 were struck on the island of Hawaii, 15 in Maui County (all on the island of Maui), and only 4 on Kauai. The unadjusted 5-year mortality rate for Honolulu County (10.3 deaths/100,000 residents) was significantly lower than the rates for Hawaii (13.8) and Maui (13.3) counties. There were no significant differences in standardized fatality rates between any county, although these comparisons are limited by the small sample sizes for other than Honolulu County.

Figure 75. Annual number of pedestrian fatalities among Hawaii residents, by county, 2007-2011.



The ages of the victims ranged broadly from 1 to 97 years, although nearly half (47%, or 61) were 65 years or older (Figure 76). Most (80%, or 49) of the senior-aged victims were struck on Oahu, although the 5-year pedestrian fatality rate for senior residents on Oahu (35.9/100,000) was statistically comparable to the rate for Neighbor Island senior residents (22.4/100,000). Nine of the victims were either 1 (7 victims) or 2 (2 victims) years of age. Seven of these victims were run over in private driveways, mostly (6 victims) by a sports utility vehicle. The majority (86%, or 75) of the 130 total victims were males, although female comprised the majority (6 of 9) of toddler-aged victims and senior-aged victims (56%, or 34 of 61). The 13 deaths among residents aged 85 years and older translated into the highest fatality rate (39.2 deaths/100,000), followed by 75-84 year-olds (39.2) and 65-74 year-olds (24.2). Rates for all other age groups ranged from 0 to 10.5 deaths/100,000 residents.

Figure 76. Age and gender distribution of fatally injured pedestrians in Hawaii, 2007-2011.

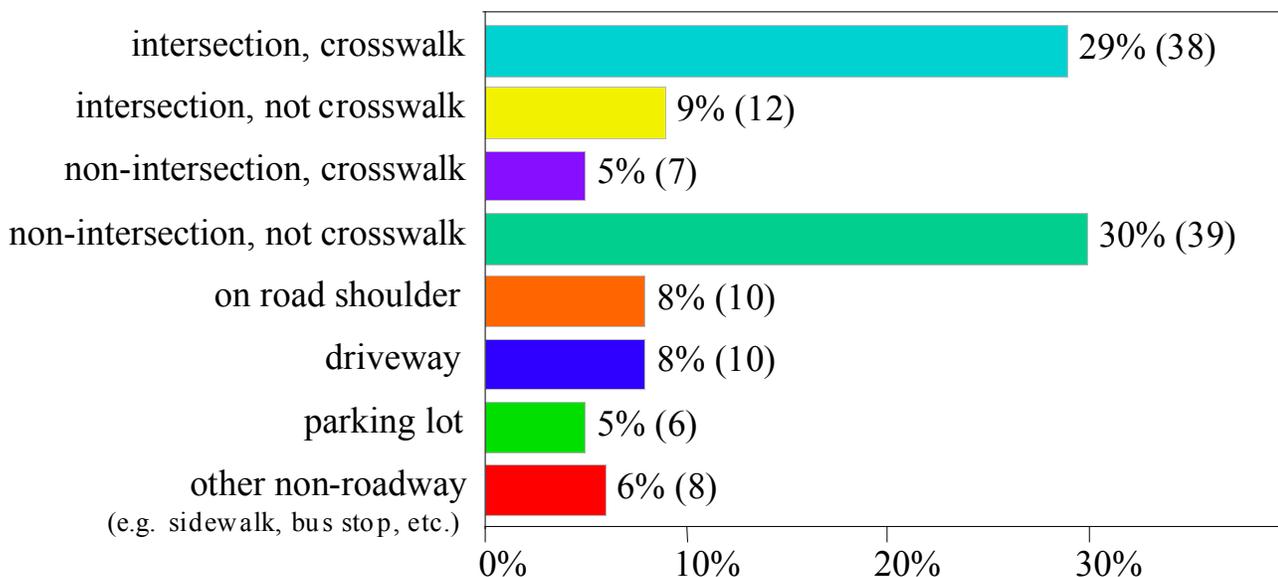


There was no apparent pattern to the month of the year or day of the week in which these fatal crashes occurred. Unlike many other categories of injuries (e.g. drownings, homicides, car crashes) there was not a high frequency of pedestrian fatalities on weekends. The lowest totals were seen for Wednesdays and Thursdays (14 crashes each), with totals varying between 19 and 21 crashes for the other days of the week. The crashes occurred at all hours of the day, but there were two noticeable peak periods: 27 crashes (21% of the total) occurred between 5:31 a.m. and 9:29 a.m., and 40 (31%) took place between 5:31 p.m. and 11:29 p.m.. (These statistics exclude 2 deaths (2% of the total) for which the time of

the crash was not known.) Temporal patterns were associated with the age of the victim, as most (74%, or 20 of 27) of the victims during the morning peak were 65 years of age or older, while most (75%, or 30 of 40) of those struck during the 5:31 p.m. to 11:29 p.m. peak were under 65 years of age. Most (81%) of the senior-aged victims (85%) and all 9 who were under age 15 were struck during daylight hours (5:31 a.m. to 7:29 p.m.). In contrast, most (73%) of the victims aged 25 to 54 years were hit during nighttime hours, between 7:31 p.m. and 5:29 a.m. There were no associations between time of the crash and day of the week or county.

Only about one-third of the victims (34%, or 45) were known to have been in a crosswalk at the time of the crash, usually at an intersection (29% of victims) (Figure 77). There were nearly equal numbers of victims who were hit at intersections (50, or 38%) and who were hit on open stretches of roadway (46, or 35%). Another 8% were hit while on the shoulder of the road, 8% in driveways, 5% in parking lots, and 6% in other off-road environments (e.g. sidewalks, bus stops, etc.). The environment differed between senior-aged victims and those under 65 years of age, as the former were more likely to be hit in a crosswalk (56% vs. 16%), while younger victims were likely to be hit in driveways (10% vs. 5% for senior-aged victims), on road shoulders (14% vs. none), and on open stretches with no crosswalk (43% vs. 15%). Victims hit on Oahu were more likely to have been in a crosswalk than those hit on Neighbor Islands (44% vs. 13%).

Figure 77. Number of pedestrian fatalities among Hawaii residents, by location on roadway, 2007-2011.



Only 80% (84) of the 105 fatalities from 2007 to 2010 could be matched to FARS records, since this only includes pedestrians hit on public roadways, and also excludes those who died more than one month after the crash. FARS data contains information on alcohol involvement in the crash, and contributing factors for both pedestrians and drivers involved in the crashes. The rest of this section (excluding the maps) will utilize only the data from the 84 pedestrian deaths (from 84 separate crashes) that were linked to FARS records.

The most common speed zone for the 125 crashes was 25 miles per hour (45%, or 38 crashes). Another 35% (29 crashes) were in 30 to 35 mph zones; only 18% (15) were in 40 mph or faster zones. Crashes on Oahu were

more likely to be in 25 mph or slower zones, compared to those on Neighbor Islands (58% vs. 24%). Almost two-thirds than half (63%) of the senior-aged victims were hit in 25 mph or slower zones, compared to 33% of pedestrians under the age of 65 years. All but 5 of the crashes occurred on roads with two-way traffic, usually (66%) with undivided lanes. Most (80%, or 67) of the crashes involved a vehicle going straight. Most of the remaining crashes (15%, or 13) involved a vehicle making a left turn, and 1 crash happened while a car was changing lanes. (This information was not available for the remaining 3 crashes.) Crashes on Neighbor Islands (88%) were more likely to involve cars going straight, compared to crashes on Oahu (76%).

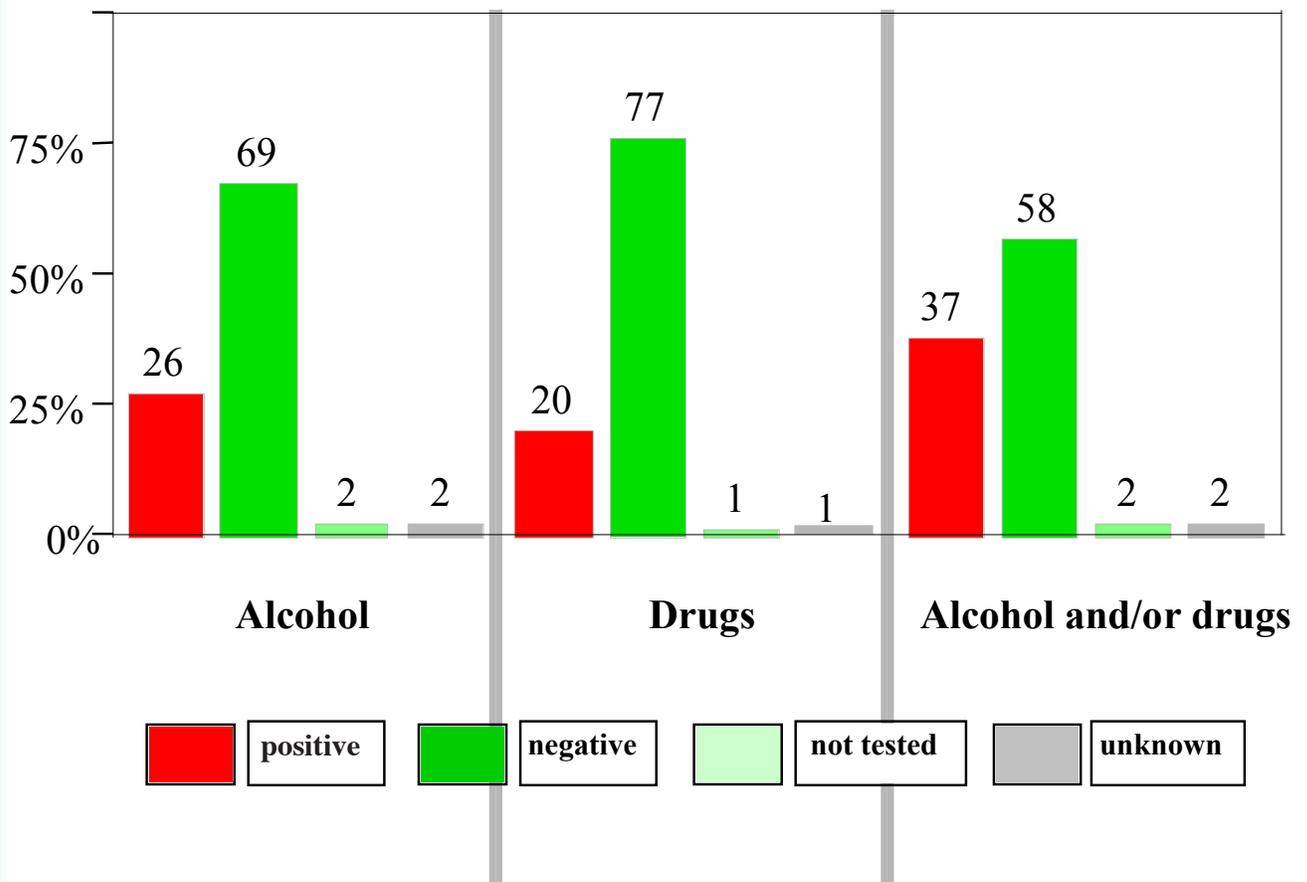
More than one-quarter (26%) of the 84 fatally injured pedestrians tested positive for alcohol, and 25% had BAC levels of 0.08% or higher (Figure 78). Alcohol use was significantly higher among male victims (42%) compared to females (6%). Drinkers were also significantly younger on average than those who tested negative for alcohol (44 vs. 66 years). The highest prevalence of alcohol use was seen among victims in the 21 to 34 year age group (70%, or 7 of 10), and the 35 to 54 year age group (52%, or 11 of 21). Only 5% (2 of 41) of the senior-aged victims tested positive for alcohol. Alcohol use was four times as prevalent among pedestrians hit on the Neighbor Islands (56%) compared to those hit on Oahu (14%). There was little association between alcohol use and the day of the week the crash occurred. However, alcohol use was much more likely among victims hit between 7:31 p.m. and 5:29 a.m. (51%, or 18 of 35), compared to those struck during the daylight hours (8%, or 4 of 49).

Alcohol was actually involved in 33% (28) of these 84 fatalities, as 6 pedestrians who tested negative for alcohol were hit by drivers who had been drinking. Overall, 15% (13) of the 88 drivers involved in the crash tested positive for alcohol, including 6% (5 drivers) who had BAC of 0.08% or higher.

Opiates (5 victims), methamphetamine (5), and thc (3) were the most commonly detected drugs among the 84 decedents. The profile of drug users was similar to that for pedestrians who tested positive for alcohol: drug users were younger, and more likely to be males. Drug use was also more common among pedestrians who were hit during nighttime hours (31% of victims, vs. 12% for victims hit at other times), and among pedestrians hit on Neighbor Islands (48% vs. 8% for pedestrians hit on Oahu).

Overall, 37% (or 31) of the 84 victims were possibly impaired by alcohol and/or drugs. This proportion was particularly high among younger victims (83% of the 24 victims between 21 and 49 years of age), those hit on Neighbor Islands (76%), and those hit during nighttime hours (66%).

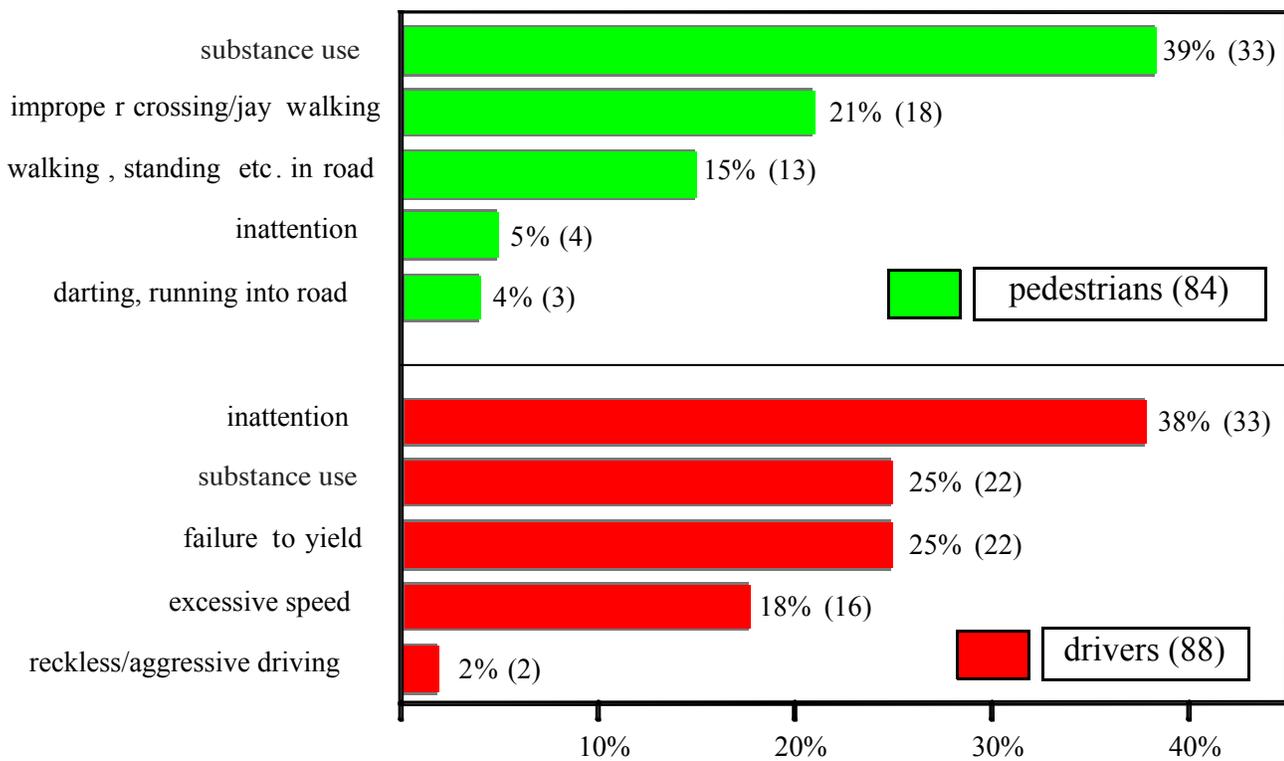
Figure 78. Alcohol and/or drug use (percent) among pedestrians killed in Hawaii, 2007-2010.



According to FARS data, 39% (33) of the pedestrian victims were in the roadway erroneously, most commonly by “improper crossing of roadway or intersection”, including jaywalking (21%, or 18 victims) (Figure 79). Including the victims who tested positive for alcohol or drugs, 54% (or 45) of the pedestrians made an error that contributed to the crash. Pedestrians who tested positive for alcohol or drugs were significantly more likely to have been in the roadway illegally, usually while crossing, than were the other victims (66% vs. 22%).

More than half (59%, or 52) of the 88 drivers made an error which contributed to the crash. Most commonly, they were described as “inattentive” (38%), failed to yield the right of way (25%), or were speeding (18%). One-quarter (25%) tested positive for alcohol or drugs. Errors were documented for about two-thirds (67%, or 40) of the 60 drivers involved in crashes in Honolulu County, a significantly higher proportion than for drivers involved in crashes in other counties (43%, or 12 of 28 drivers).

Figure 79. Contributing factors for fatal pedestrian crashes in Hawaii, by person type, 2007-2010.



The approximate location of the pedestrian crashes for Oahu and the Neighbor Islands are shown in the following maps. The areas of Kalihi-Palama (13 deaths), Waianae (10), Waipahu (6), and Makakilo/Kapolei, McCully/Moiliili, and Waikiki (5 each) had the highest totals on Oahu (Figure 80). The highest numbers of crashes on the Neighbor Islands were generally in the urbanized parts of Maui and Hawaii, with 10 in Wailuku, 6 in North Kona, and 5 each in the Lahaina, South Hilo and Puna districts (Figure 81).

Figure 80. Approximate location of fatal pedestrian crashes on Oahu and eastern Oahu (bottom map), by age group of victim, 2007-2011.

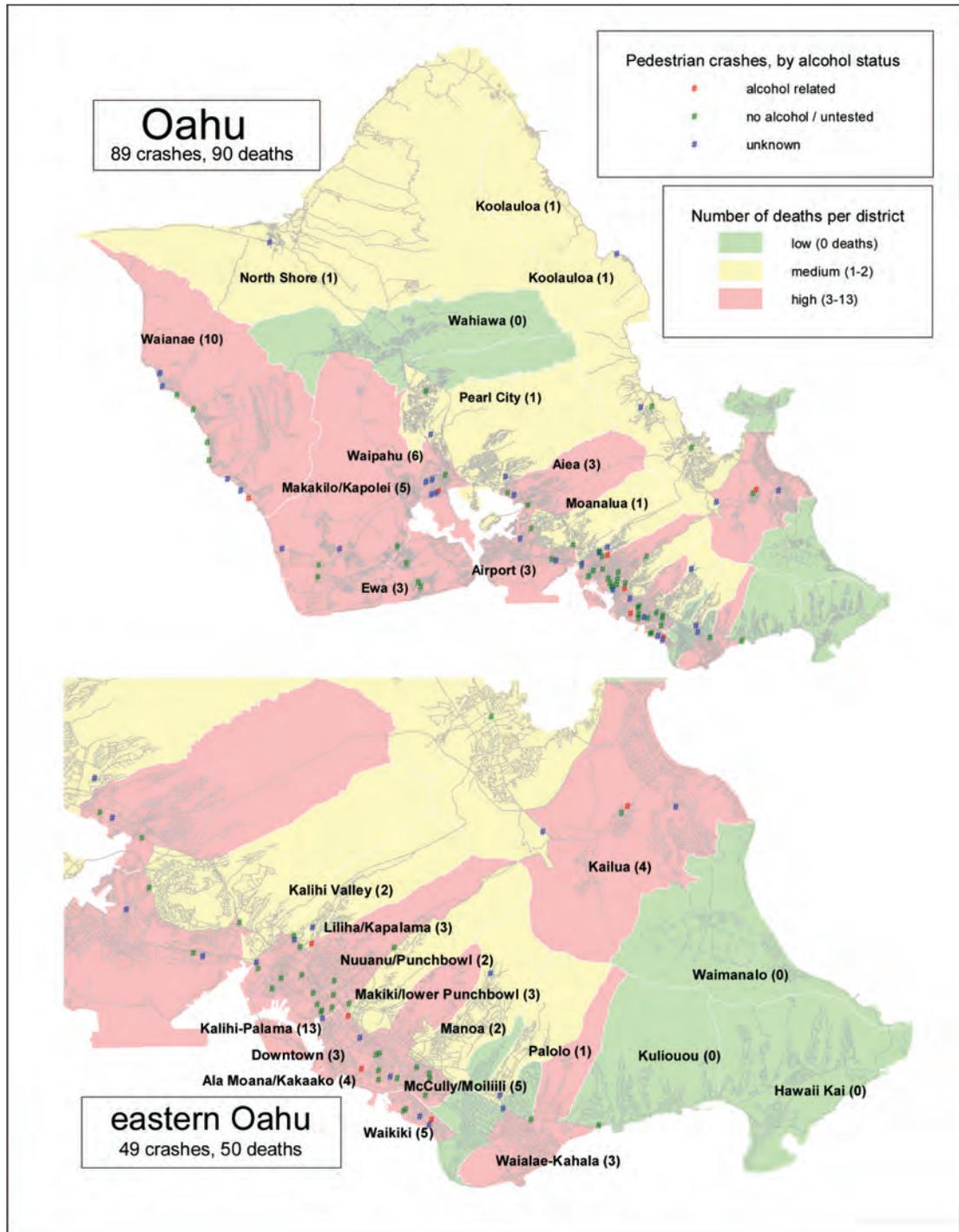
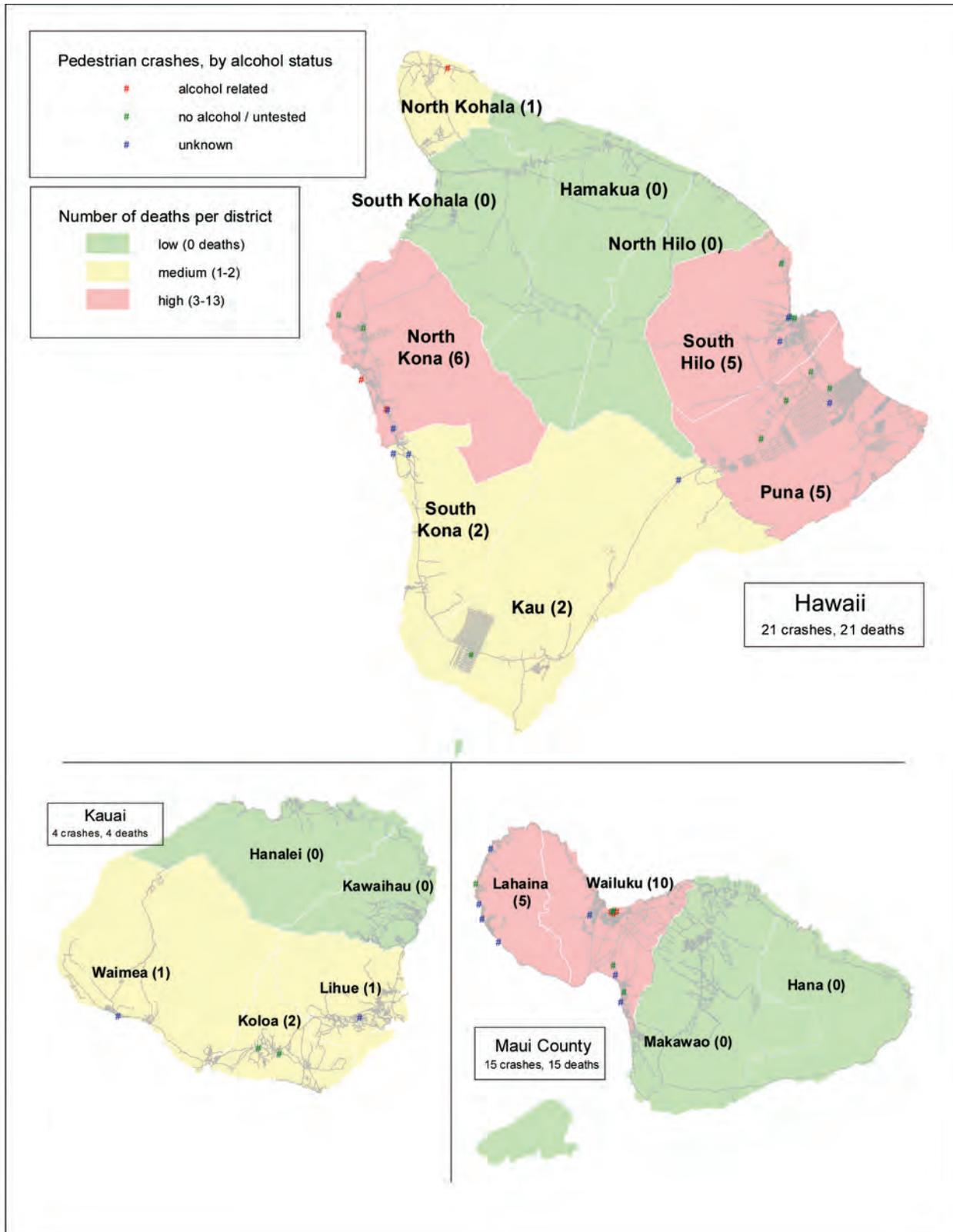


Figure 81. Approximate location of fatal pedestrian crashes on Neighbor Islands, by age group of victim, 2007-2011.



Nonfatal injuries

There was a slight decrease in the annual number of nonfatal injuries among pedestrians that were treated in EDs, although the total changed little after 2008 (Table 15). There was no apparent trend in injuries requiring hospitalization. Gender was nearly equally distributed, with slightly more males for both ED visits (55%) and hospitalizations (56%). These proportions were reversed among senior-aged patients, of whom 59% were female and 41% were male. Patient age was widely distributed, but one-third (32%) were in the 5 to 24 year age group. Patients who were hospitalized were generally older; 27% were 65 years or older, compared to 13% of patients who were treated in EDs. About three-fourths (72%) of the patients were residents of Honolulu County, including 78% of those who were admitted to hospitals.

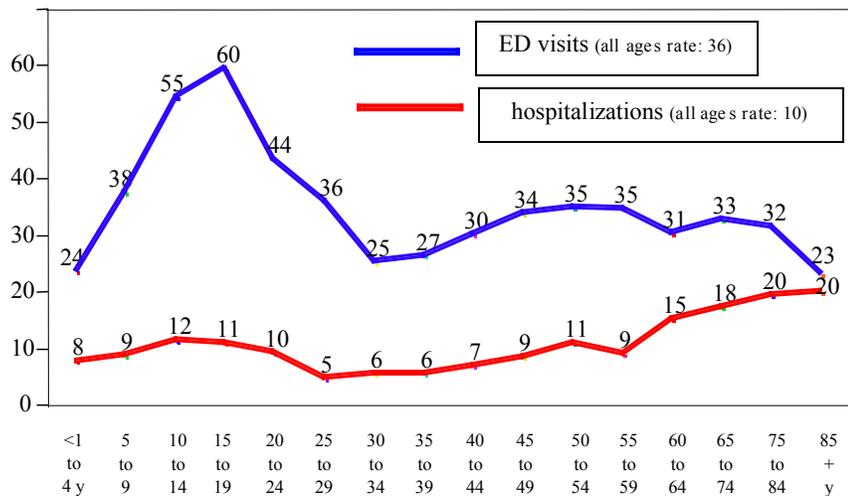
Table 15. Demographic characteristics* of Hawaii residents with nonfatal injuries from pedestrian crashes.

	ED visits	hospitalizations	total
Year of admission			
2007	507	142	649
2008	489	135	624
2009	441	125	566
2010	444	139	583
2011	440	143	583
average annual total	464	137	601
Patient gender			
Female	210 (45%)	61 (44%)	271 (45%)
Male	254 (55%)	76 (56%)	330 (55%)
Patient age			
infants	0 (0%)	0 (0%)	0 (0%)
1-4 y	21 (4%)	7 (5%)	28 (5%)
5-14 y	73 (16%)	16 (12%)	89 (15%)
15-24 y	90 (19%)	18 (13%)	108 (18%)
25-34 y	58 (13%)	11 (8%)	69 (11%)
35-44 y	49 (11%)	11 (8%)	60 (10%)
45-54 y	63 (14%)	18 (13%)	81 (14%)
55-64 y	52 (11%)	20 (14%)	71 (12%)
65-74 y	30 (7%)	16 (12%)	46 (8%)
75-84 y	21 (4%)	13 (10%)	34 (6%)
85+ y	7 (2%)	6 (5%)	14 (2%)
County of residence of patient			
Hawaii	66 (14%)	14 (10%)	80 (13%)
Honolulu	328 (71%)	106 (78%)	434 (72%)
Kauai	25 (5%)	4 (3%)	29 (5%)
Maui	45 (10%)	13 (9%)	58 (10%)

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

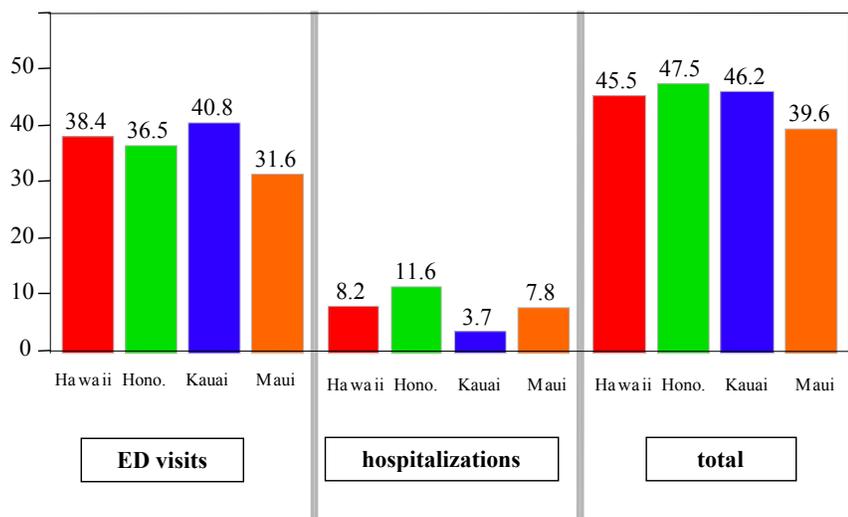
Residents aged 5 to 24 had the highest rates for injuries treated in EDs, with a peak in the 15 to 19 year age group (Figure 82). Rates for ED visits were relatively low for ages 30 and older, especially among residents aged 85 years and older. A different pattern was seen for hospitalizations, with low rates for residents under 60 years of age, but progressively higher rates among older residents. For all injuries (combining ED visits and hospitalizations), there were two peak age ranges: from 5 to 24 years of age (60 injuries/100,000 residents), and 65 years and older (50/100,000).

Figure 82. Average annual rates (per 100,000 residents) of hospitalizations and ED visits for nonfatal injuries from pedestrian crashes in Hawaii, by age of patient, 2007-2011.



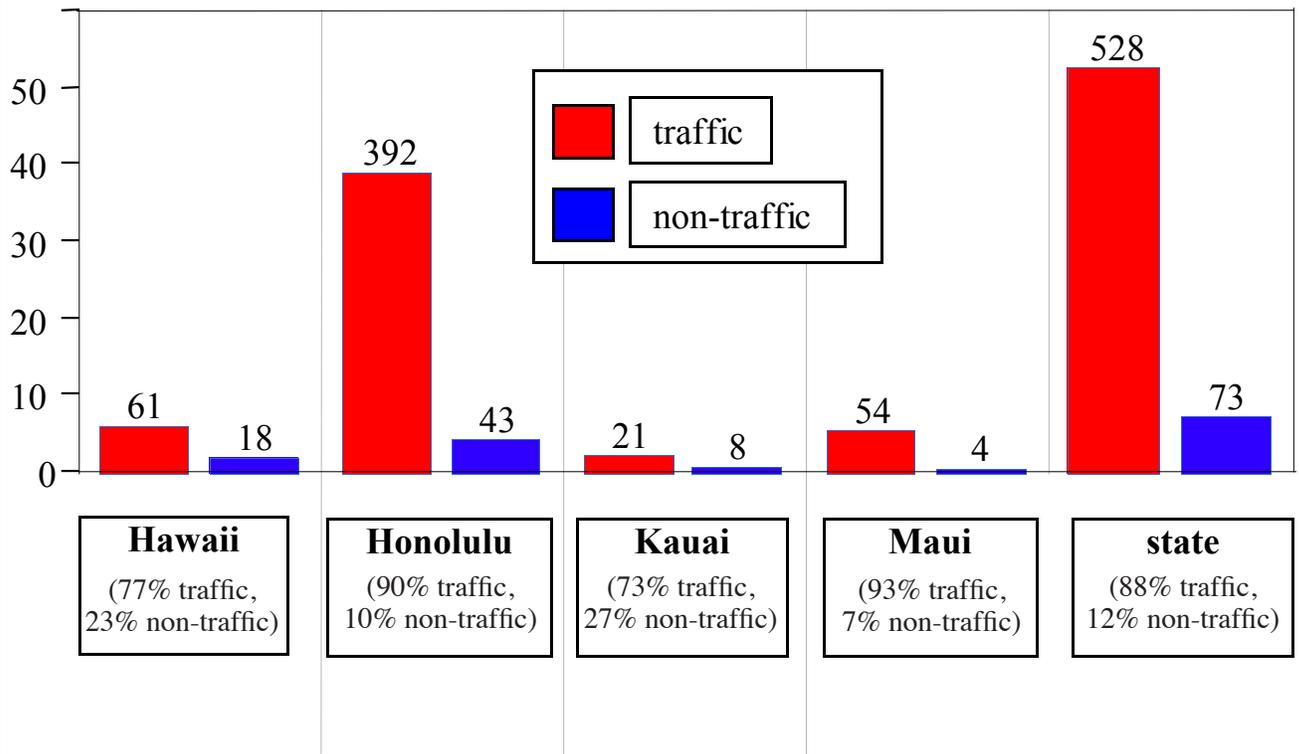
Residents of Maui County had the lowest rates of all nonfatal pedestrian injuries (ED visits combined with hospitalizations), although none of the rate differences between counties were statistically significant (Figure 83). Kauai County residents had the lowest rates of injuries requiring hospitalization, although this comparison is limited by small numbers (Table 11).

Figure 83. Age adjusted annual rates (per 100,000 residents) of nonfatal injuries from pedestrian crashes, by level of care and county of residence of patient, 2007-2011.



Most (88%) of the nonfatal injuries were coded as “traffic” related, or occurring on a public roadway, while 12% were in “non-traffic” environments, including private roads, driveways and parking lots (Figure 84). That proportion varied by the county of residence of the patients, however, and was significantly higher for patients from Oahu (90%) and Maui counties (93%), compared to those from Hawaii or Kauai counties. Proportionally more of the injuries treated in EDs were from non-traffic crashes compared to those requiring hospitalization (14% vs. 7%), perhaps reflecting higher speeds among the latter types of crashes. Patients who were injured from non-traffic crashes were significantly younger on average than those involved in traffic crashes (34 vs. 38 years, respectively), as there were more young patients (ages 1 to 14 years) among those who were injured in non-traffic crashes (30% vs. 18%, respectively).

Figure 84. Average annual number of nonfatal injuries from pedestrian crashes in Hawaii, by type of crash and county of residence of patient, 2007-2011.



Patients were hospitalized for 9 days on average, and hospitalizations comprised most (73%) of the total days of care from nonfatal injuries to pedestrians and 87% of the associated medical charges (Table 16). More than half (61%) of the hospitalized patients had fractures, most commonly leg fractures (27%), and one-quarter (26%) had internal injuries. Thirty-nine percent of these patients had a traumatic brain injury. Fractures (13%) and internal injuries (5%) were much less common among the pedestrians treated in EDs, about half (48%) of whom were treated for contusions or superficial injuries.

Table 16. Clinical characteristics* of Hawaii residents with nonfatal injuries from pedestrian crashes.

	ED visits	hospitalizations	total
Length of care and financial charges			
Ave. length of stay (days)	1.0	9.0	2.8
Total number of days	464	1,229	1,693
Average charge	\$2,880	\$59,886	\$15,709
Total charges	\$1.3 million	\$8.2 million	\$9.4 million
Primary injury diagnosis			
fractures	60 (13%)	83 (61%)	143 (24%)
fracture of skull	2 (1%)	15 (11%)	18 (3%)
vertebral column	4 (1%)	10 (7%)	14 (2%)
ribs, pelvis or trunk	8 (2%)	15 (11%)	24 (4%)
humerus	5 (1%)	3 (2%)	8 (1%)
lower arm or hand	12 (3%)	3 (2%)	15 (3%)
femur	1 (0%)	9 (7%)	10 (2%)
lower leg or foot	27 (6%)	27 (20%)	54 (9%)
sprains and strains	50 (11%)	1 (1%)	51 (8%)
internal injuries	24 (5%)	35 (26%)	59 (10%)
open wounds	34 (7%)	7 (5%)	40 (7%)
contusion/superficial	225 (48%)	3 (2%)	228 (38%)
other/unspecified	73 (16%)	8 (6%)	81 (13%)
traumatic brain injury (any priority diagnosis)			
traumatic brain injury (any priority diagnosis)	71 (15%)	54 (39%)	125 (21%)

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

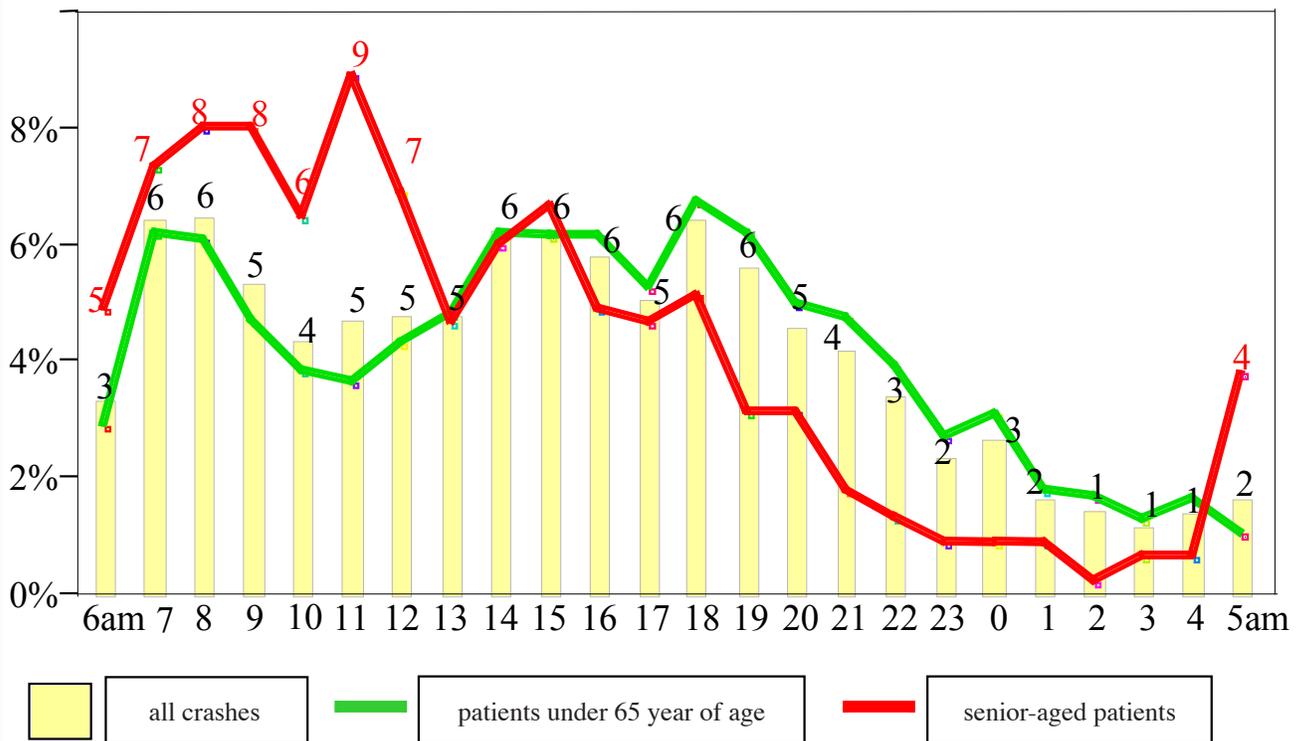
There were 2,335 EMS records for Hawaii residents who were treated by EMS personnel for occupant injuries over the 2007 to 2011 period. (Records for 182 patients whose residence could not be determined were excluded.) To avoid double-counting of injuries, the records of 22 patients who were transferred to another ambulance were excluded, resulting in the final sample of 2313 records. Included in this total were 114 patients who ultimately died from the crashes, since this is an important outcome to examine in terms of patient age. (All of these deaths were confirmed by linkage to death certificates.)

The patients were injured in 2,225 separate crashes, as most (96%) crashes involved only a single patient. There were 2 peak periods for the time of the crashes, from 6:31 a.m. to 8:29 a.m. (13%, or 287 crashes), and from 2:29 p.m. to 7:29 p.m. (35%, or 788 crashes) (Figure 85). Most (76%, or 1682) of the crashes occurred during daytime hours (5:29 a.m. to 7:30 p.m.). The time distribution differed by patient age, as crashes with senior-aged pedestrians were more likely to occur during daytime hours (86%), compared to crashes involving pedestrians under 65 years of age (73%). Only a minority (12%) of the night time crashes involved senior-aged pedestrians.

There was no clear pattern as to the day of the week for crashes, although the lowest totals occurred on Sundays (10%, or 218 crashes, compared to 318 to 358 crashes for other days of the week). Nearly one-third (31%) of the crashes on weekends occurred during nighttime hours (31%), compared to 22% of crashes during the week.

Figure 85. Time distribution of EMS-attended pedestrian crashes, by highest age of patient 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 with injured pedestrians, rounded to nearest whole number.)



The locations with the 3 highest pedestrian crash totals on Oahu were all in the metropolitan Honolulu area: Ala Moana/Kakaako, Kalihi-Palama, and Downtown (Figure 86). Other high frequency areas were Waianae, Waipahu, and Waikiki. South Hilo had the highest total among Hawaii County districts, while most (63%) of the crashes on the island of Maui were in the Wailuku district (Figure 87). There were only 8 crashes on the island of Molokai and 2 on Lanai (not shown on the Figure).

Figure 86. Number of EMS-attended pedestrian 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.)

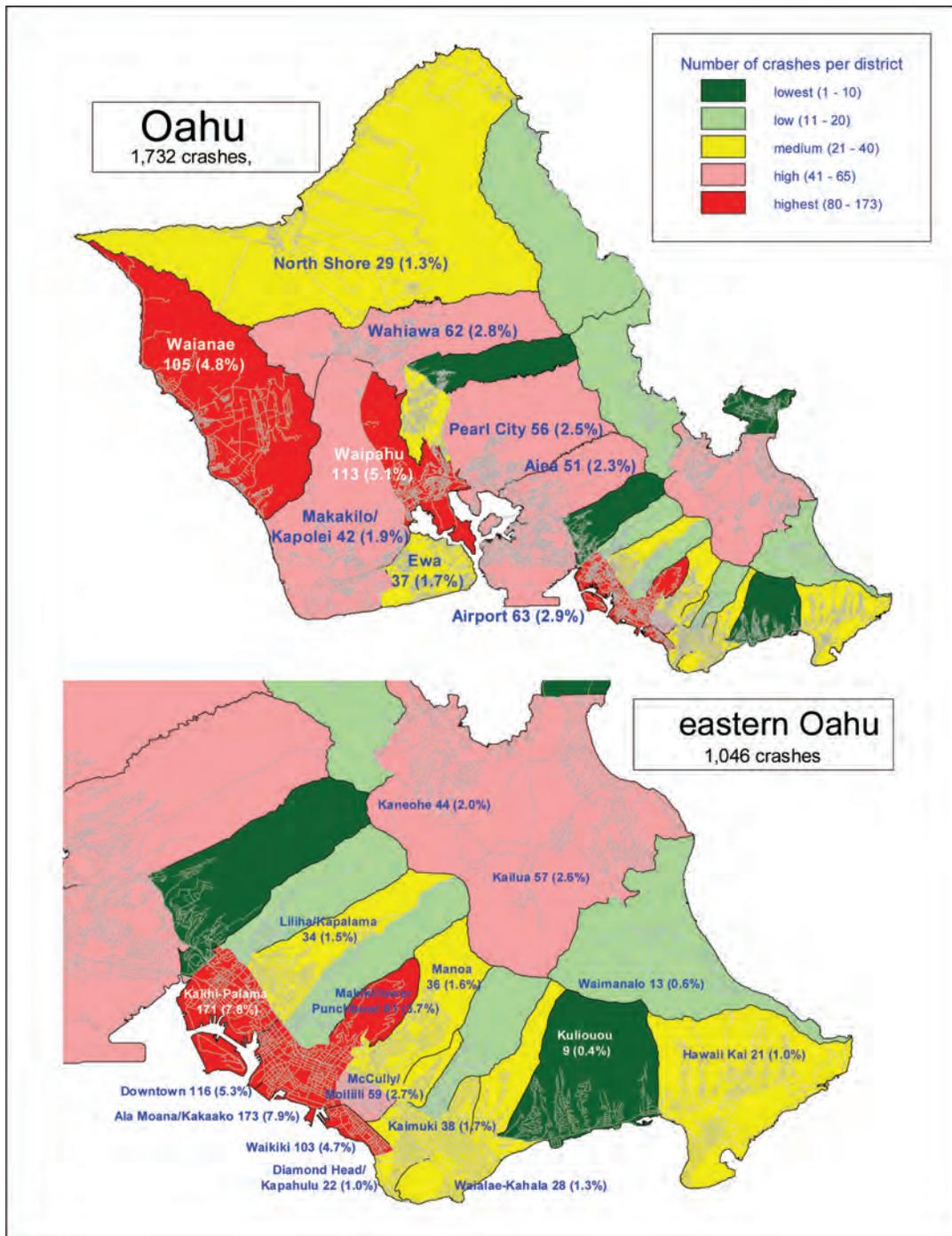
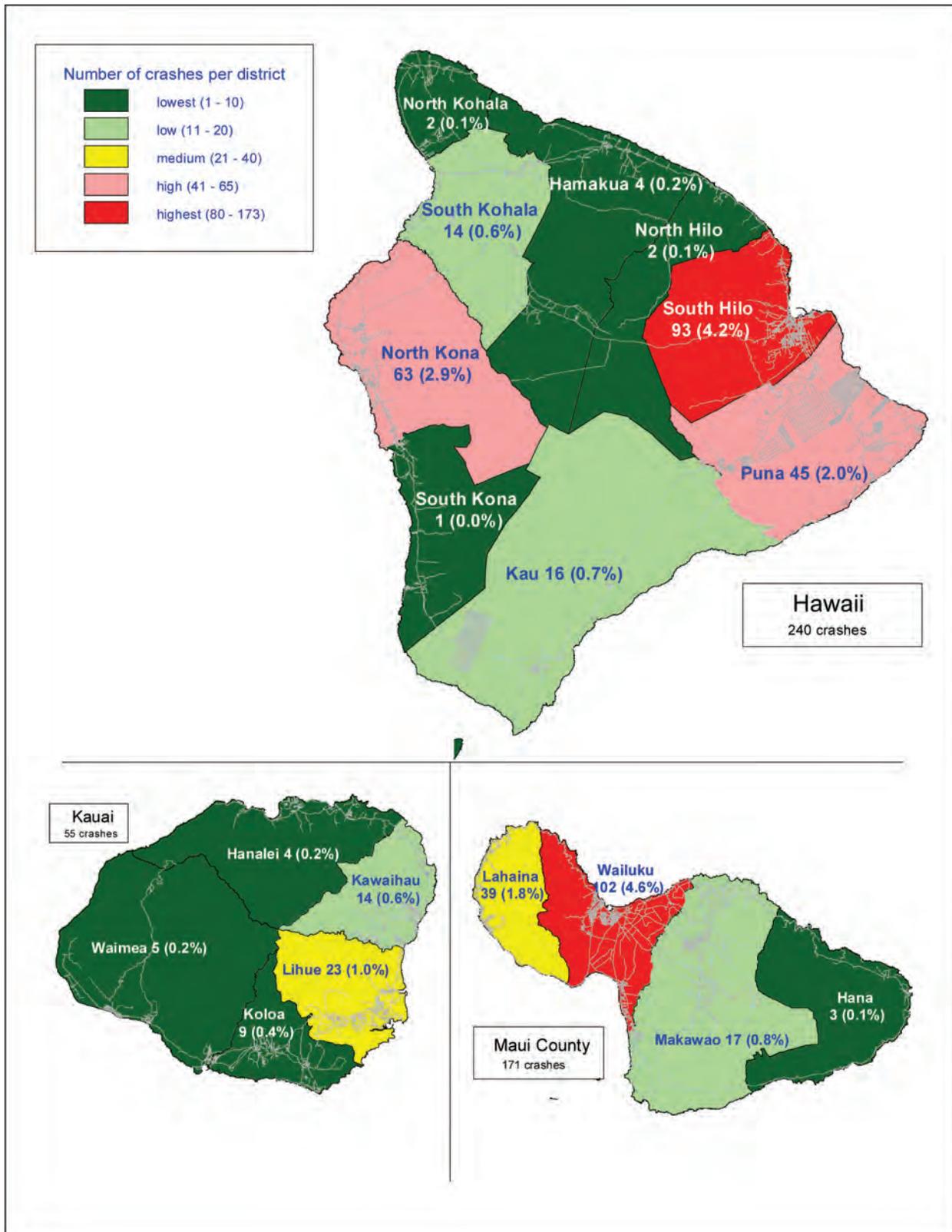


Figure 87. Number of EMS-attended pedestrian crashes on Neighbor Islands, by district, 2007-2011.

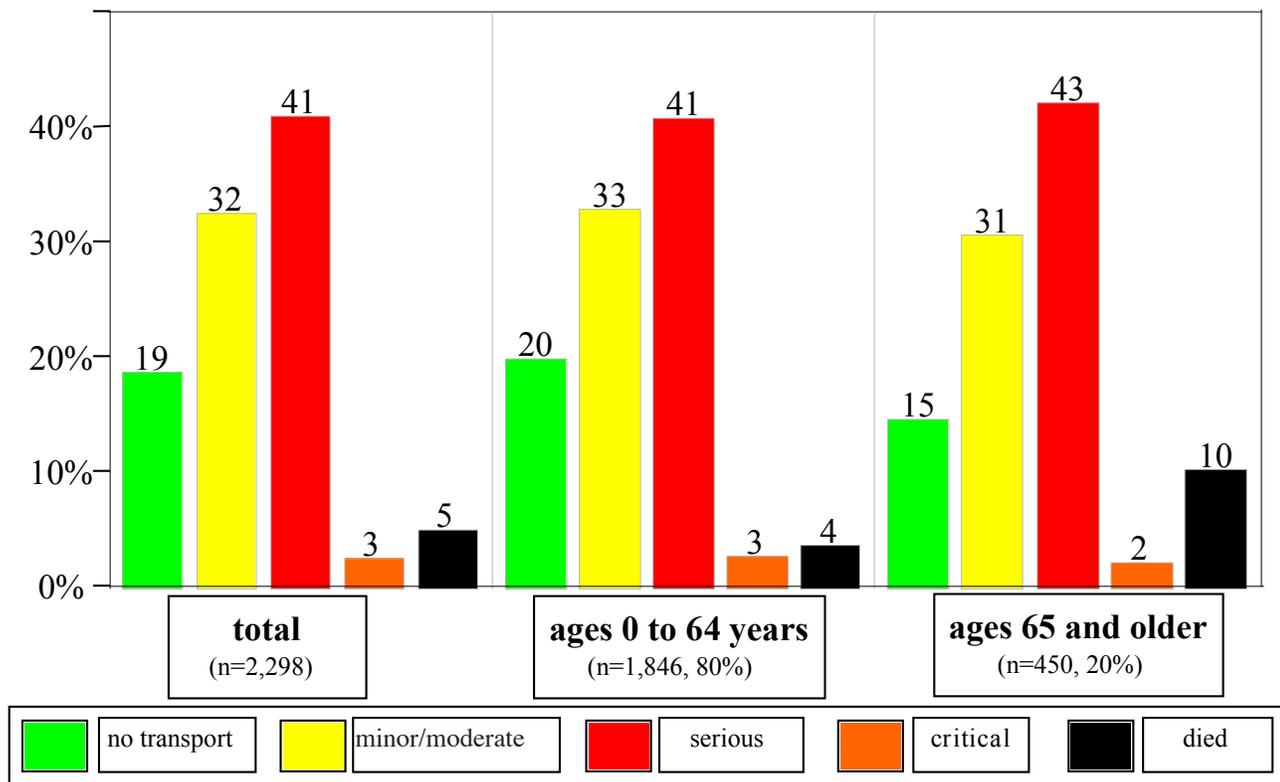
(Percent of all EMS-attended crashes in the state is shown in parentheses.)



About half (51%, or 1187) of the pedestrians either refused EMS transport to hospitals (19%), or were transported with only “minor” or “moderate” injuries (32%) (Figure 88). Another 41% (1670) were transported with “serious” injuries, 61 in “critical” condition, and another 114 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.)

Patient condition differed by age, as senior-aged pedestrians were significantly less likely to not be transported, compared to pedestrians less than 65 years of age (15% vs. 20%, respectively), and had a significantly higher mortality rate (10.3%, or 47 of 456, vs. 3.6%, or 67 of 1855). The mortality rate was also significantly elevated among pedestrians who were hit during night time hours (7.4%, or 42 of 566), compared to those hit between 5:31 a.m. and 7:29 p.m. (4.1%, or 72 of 1747), despite the younger age distribution among the former. Pedestrians hit on Neighbor Islands had generally worse dispositions compared to those hit on Oahu, with proportionally fewer released at the scene (14%, vs. 20% for Oahu patients), and more who ultimately died (7.6% vs. 4.2%).

Figure 88. Distribution of injury severity/transport status of pedestrians treated by EMS personnel, by age group, 2007-2011.



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

Probable alcohol use was noted for about 9% 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 17). This proportion was much higher among pedestrians who were hit on Neighbor Islands (16%) than among those hit on Oahu (7%). There were no differences in average patient age across the groups, but the alcohol users were significantly less likely to be seniors (2%) compared to the others (20% to 22%). They were also more likely to be males, and more likely to have been injured in a night time crash or a crash on the weekend. Patients who had used alcohol had generally worse dispositions, and were more than three times as likely to require transport in critical condition, and nearly twice as likely to have died, compared to those who did not use alcohol.

Table 17. Characteristics of pedestrians treated by EMS personnel, by category of alcohol use, 2007-2011.

	Alcohol use (n=202, 9%)	No alcohol use (n=1,196, 52%)	No data/unknown (n=915, 40%)
Average age	38 years	41 years	41 years
Ages 65 years and older	2%	22%*	20%*
Gender (% male)	76%	51%*	52%*
Disposition			
no transport	10%	19%*	20%*
minor/moderate injuries	20%	36%*	30%
serious injuries	54%	37%*	43%*
critical injuries	5.0%	1.4%*	3.7%
died	10.9%	5.7%*	2.6%*
Weekend crash (Sat/Sunday)	36%	24%*	21%*
Nighttime crash (8 pm - 5 am)	68%	19%*	22%*

*Indicates statistically significant difference between riders who used alcohol vs. other riders.

Trauma Registry data

Only 16% of the injured pedestrians in the HTR had been drinking at the time they were hit (Figure 89). This percentage was significantly higher among those under 65 years of age (22%), as only 2% (3) of the 138 senior-aged pedestrians tested positive for alcohol. Illicit drug usage was documented for 25% of the patients, including 30% of those who were under 65 years of age. Considered together, about one-third (34%, or 164) of the patients tested positive for either alcohol or drugs, although that proportion was much lower among the senior-aged patients (12%), compared to younger patients (43%). Narcotics were the most commonly found illicit drug (16% of patients), followed by THC (8%), and amphetamines (6%). Most (87%, or 13) of the 15 senior-aged pedestrians who were positive for drugs had used narcotics; less than 2% were positive for THC or amphetamines.

Alcohol use was significantly more likely among the male pedestrians (23%) compared to females (7%), and among those hit on weekends (21% vs. 14% for those hit on weekdays). Alcohol use was nearly 8 times likely among pedestrians hit during night time hours (41%) than among those hit between 6:30 a.m. and 7:29 p.m. (5%). Alcohol use was not significantly associated with final disposition of patients, including the mortality rate.

Figure 89. Alcohol and/or drug use (percent) among pedestrians in the Hawaii Trauma Registry, by age group, 2008-2011.

