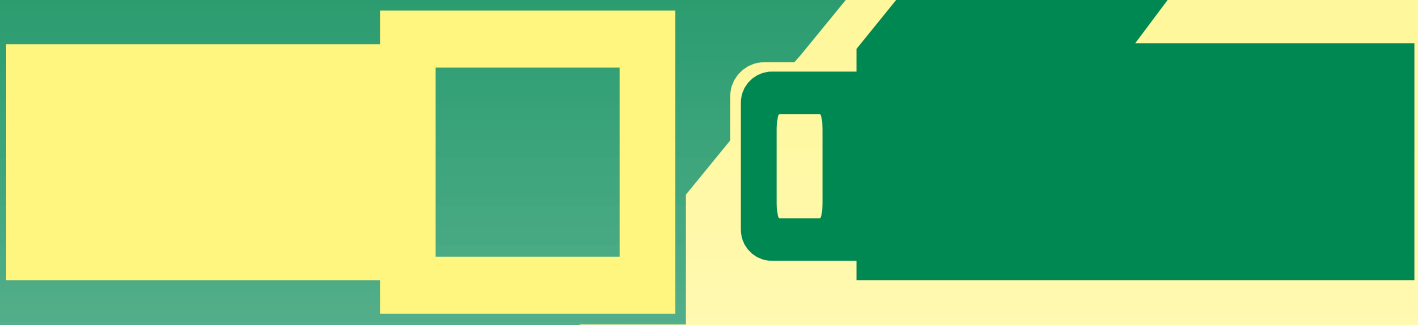
Injuries in Hawai‘i 2001-2006



Injury Prevention and Control Program
Hawai‘i State Department of Health

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Memo from Director of Health

Message from Director of Health

The Hawaii State Department of Health is pleased to present "Injuries in Hawaii: 2001-2006". This report contains recent findings on the leading causes of injury mortality and morbidity in Hawaii .

Injuries are a major public health problem in Hawaii. They are by far the leading cause of death among children and young adults, and the fourth leading cause of death among state residents of all ages. Over the 6-year period covered in this report, a total of 3,579 residents died from injuries.

The information in this report is for health and safety professionals, policy makers, and for everyone interested in protecting and improving the health of the people of Hawaii. The report includes descriptions of the geography and magnitude of the problem, trends, and populations at higher risk, and provides insight into some of the circumstances of these injury fatalities. It is crucial that good data be available to guide prevention and policy efforts to reduce injuries in Hawaii. This report is a first step. Please join the Department of Health, state and local agencies, and community organizations in working toward a safer Hawaii.

Additional copies of this report and other injury prevention information may be obtained by calling the Department's Injury Prevention and Control Program at 808-733-9320.

Chiyome Leinaala Fukino, M.D.
Director of Health

Introduction

What is the leading cause of death among Hawaii's children and young adults? The answer is not infectious disease or chronic diseases, such as cancer, but a public health problem that is chiefly non-medical in nature: injuries. The field of "injury" includes a diversity of events, ranging from unintentional motor vehicle crashes, drownings, falls, and poisonings, to assaults and suicides. Injuries currently account for more deaths among Hawaii residents aged 1 to 39 years than all other diseases combined. Injuries are also a leading cause of mortality in later ages, and for some outcomes (e.g. suicides) the highest risks are seen in the elderly.

There are risk factors for injuries, just as there are for certain diseases. To a large degree, many injuries can be prevented by reducing these risk factors, either to prevent the original cause (e.g. observing posted speed limits to prevent a crash) or the severity of the injury (e.g. utilizing seat belts). Injury risk factors generally take two forms: risks imposed by the physical environment in which the injury takes place, and perhaps more commonly, individual behaviors which place a person at risk. This report describes fatal injuries in Hawaii over the 2001-2006 period, with an emphasis on the environmental and individual risk factors involved. This includes the geographic mapping of fatal injuries, and the analysis of the demography and behaviors of the victims. For many types of fatal injuries, this involved linking the basic information contained on death certificates to more detailed information from crash reports, autopsy records, and criminal investigations. Nonfatal injuries over the 2003-2006 period are also described in this report. These far outnumber fatal injuries and in many respects impose a greater public health burden.

Although this report provides perhaps the most detailed summary of injuries currently available in the state, it was not intended to be completely comprehensive. Also, injury data for 2007 has become available since the completion of this report. Readers who are interested in further information on a given area are encouraged to contact the Injury Prevention and Control Program. This report is intended to bring attention to the problem of injuries, and to help inform and direct efforts to prevent fatal injuries in Hawaii.

Executive Summary

Fatal injuries are a major public health problem in Hawaii, constituting the 4th leading cause of death among state residents. Injuries are by far the leading cause of mortality among residents aged 1 to 39 years, accounting for more deaths in this age group than all other diseases combined. This report describes the magnitude of fatal injuries in the state, examines trends over time, and identifies geographic areas and segments of the population that are at increased risk of fatal injuries. This detailed report is a first step in bringing attention to the problem of fatal injuries, and providing information to design and direct injury prevention programs.

Although a leading cause of mortality, fatal injuries are relatively less common in Hawaii, compared to the rest of the United States. The age-standardized 5-year rate for unintentional injuries is 18% lower in Hawaii, a statistically significant difference. The homicide rate in Hawaii is less than half that for the rest of the U.S., while the suicide rates are comparable.

A total of 3,579 residents were killed by injuries over the 6-year period. Most deaths (2,387, or 67%) were unintentional, 722 (20%) were suicides, and 165 (5%) were homicides. The intent could not be determined for 296 (8%) deaths. There were no significant trends in the annual totals of unintentional or intentional injuries.

Although of a lesser severity, nonfatal injuries greatly outnumber fatal injuries, and constitute significant medical and financial burdens for the residents of Hawaii. For every resident who dies from an injury there are nearly 10 others who are hospitalized for nonfatal injuries, and another 112 who are treated and released from emergency departments (EDs). These ratios translate to 6,208 hospitalizations from nonfatal injuries and over 70,000 visits to EDs each year in Hawaii. Unlike fatal injuries, there was a significantly increasing trend in the annual number of nonfatal injuries treated at hospitals in Hawaii, from 66,229 in 2003 to 84,384 in 2006.

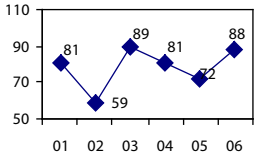
Unintentional injuries, by main categories

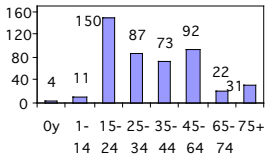
Motor vehicle crashes, occupants (excluding motorcyclists)

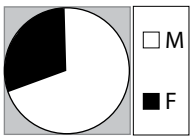
Fatal injuries

This category was the 3rd leading cause of fatal injuries to Hawaii residents, averaging 78 deaths per year. About one-third (32%) of the victims were 15 to 24 years of age. Most (69%) of the victims were males. Rates were significantly higher among Neighbor Island residents, compared to Oahu residents. The rates among residents of Hawaii County were particularly high, more than 3 times higher than rates for residents of Oahu.

Trend: no trend Total: 470, Ave: 78/year	Age groups: 15-24y = 32%	Gender: 69% M, 31% F	County totals and 6-year rates (deaths/100,000):







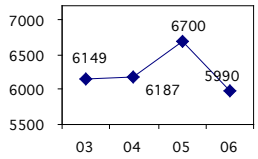
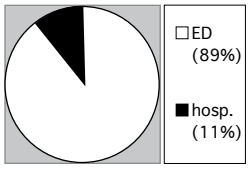
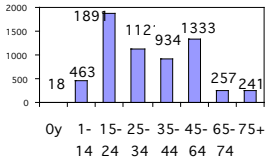
County	Num.	Rate
Hawaii	140	89.0
Honolulu	235	25.8
Kauai	34	57.9
Maui	61	45.6

More than half (60%) of the crashes occurred during nighttime hours (7:30 p.m. to 6:30 a.m.). Slightly more than half (54%) of the fatal traffic crashes involved only a single vehicle. Lack of restraint use was a major risk factor for occupant fatalities, as less than half of the victims (44%) were wearing seat belts at the time of the crash. Restraint use was especially low among back seat passengers (11%). Speeding was the most common contributing factor, noted for more

than one-third (36%) of the drivers. There was a significantly increasing trend in the annual proportion of drivers who were speeding, from 27% in 2001 to 50% by 2005. Substance use was also an important contributing factor, as almost one-third (32%) of the drivers involved in fatal car crashes tested positive for alcohol, almost one-fifth (19%) tested positive for drugs, and 42% tested positive for either alcohol or drugs. The peak age of alcohol use among drivers was 21 to 24 years of age, as 59% tested positive for alcohol. More than half of the fatal car crashes (51%) and resulting deaths (54%) were related to alcohol consumption by at least one driver involved in the crash.

Nonfatal injuries

There were more than 6000 nonfatal injuries among car occupants each year in Hawaii, making this the 2nd most common cause of nonfatal injuries in the state. Most (89%) of the injuries were treated in EDs. Patient age was widely distributed, although about one-third (30%) were 15 to 24 years of age, and this age group also had by far the highest rate of injury. There were nearly equal numbers of female (51%) and male (49%) patients.

Trend: no trend. Ave: 6257/year	Treatment: 5591 ED, 666 hosp.	Age groups: 15-24y = 30%	County totals, annual number and rate (/100,000):
			

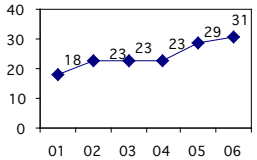
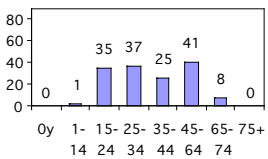
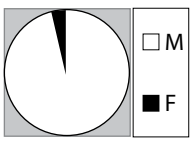
County	Num.	Rate
Hawaii	1719	1052.8
Honolulu	3445	381.4
Kauai	451	754.3
Maui	642	470.8

The nonfatal injury rate for residents of Hawaii County was significantly higher than the rate for residents of any other county, while the rate for Honolulu County residents was significantly lower than that for residents of any other county. Almost all (96%) of the injuries were coded as "traffic", or occurring on public roads. Patients were hospitalized for an average of nearly 6 days, with nearly $35,000 in average medical charges per patient.

Motor vehicle crashes, motorcyclists

Fatal injuries

There was an increasing trend in the annual number of deaths among motorcyclists and moped riders from 18 in 2001 to 31 in 2006. More than half (56%) of the fatally injured motorcyclists were adult males 20 to 40 years of age. Most (80%) of the decedents were riding motorcycles; there were also 30 moped riders who were killed, including 15 over the 2005 to 2006 period. The 6-year fatality rates were significantly higher for residents of Hawaii and Maui counties compared to Honolulu County.

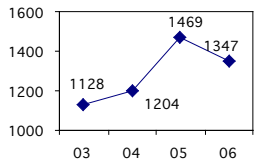
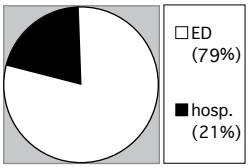
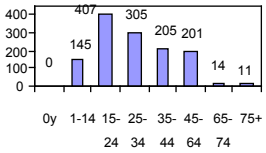
Trend: increasing Total: 147, Ave: 25/year	Age groups: 20-34y = 46%	Gender: 97% M, 3% F	County totals and 6-year rates (deaths/100,000):
			

County	Num.	Rate
Hawaii	34	21.2
Honolulu	85	9.5
Kauai	3	-
Maui	2.5	18.3

Almost half (47%) of the fatal crashes did not involve another vehicle, although that proportion was lower (33%) among the fatally injured moped riders. Only about one-third (32%) of the riders killed during the 2001 to 2005 period were wearing a helmet at the time of the crash. Nearly half (48%) of the decedents tested positive for alcohol (34%) or illicit drugs (24%). Alcohol use was most common among drivers who crashed during nighttime (46%) or on weekends (45%), or who were between 30 and 60 years of age (47%). Including all drivers involved in the crash, there was an increasing trend in the proportion of fatal motorcycle crashes (excluding moped crashes) that involved alcohol, from 18% in 2001 to 65% in 2005. More than one-third (38%) of the riders were noted to have been speeding at the time of the crash, a proportion that was higher among motorcyclists (42%) and those who crashed on Oahu (54%). There were 10 fatal crashes in each of the districts of North Shore on Oahu, Wailuku on Maui, and North Kona on the island of Hawaii.

Nonfatal injuries

There was an increasing trend in the annual number of nonfatal injuries among motorcyclists. More than 1000 were treated in EDs each year and another 273 were hospitalized. Patient age was narrowly distributed, with 55% between 15 and 34 years of age. The peak age for rates of both ED visits and hospitalizations was among 20 to 24 year-olds. Most (84%) of the patients were males.

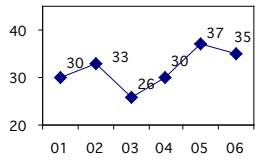
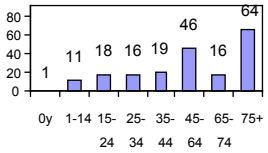
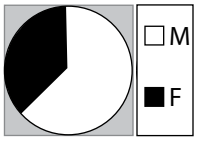
Trend: increasing Ave: 1287/year	Treatment: 1015 ED, 273 hosp.	Age groups: 15-34y = 55%	County totals, annual number and rate (/100,000):
			**County Num. Rate** Hawaii 283 175.4 Honolulu 690 77.0 Kauai 106 181.8 Maui 208 154.4

Although about half (54%) of the patients were residents of Honolulu County, residents there had significantly lower rates of nonfatal injuries than residents of any other county. Injury rates were at least twice as high among residents of Neighbor Islands. Forty-percent of the crashes did not involve a collision, but were due to loss of control by the rider. About three-fourths (72%) of the nonfatal injuries were coded as "traffic" related, or occurring on a public roadway, while 28% were in "non-traffic" environments, including off-road crashes. Nearly one-quarter (23%) of the patients who were injured in non-traffic crashes were 5 to 14 years of age. The average hospitalization was nearly 1 week in duration and resulted in over $38,000 in medical charges. About half (56%) of the hospitalized patients and one-quarter (26%) of those treated in EDs had fractures.

Motor vehicle crashes, pedestrians

Fatal injuries

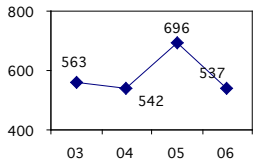
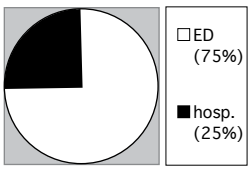
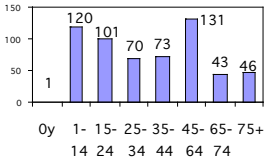
There was no statistically significant trend in the annual number of pedestrian fatalities, although the highest totals occurred in 2005 (37 deaths) and 2006 (35). Senior-aged residents comprised 42% of the victims, and the fatality rates increased dramatically across the oldest age groups. Most (69%) of the victims were hit on Oahu, but there were no significant differences in county-specific fatality rates. Almost all (83%) of the victims who were 65 years or older were hit on Oahu, and the fatality rate for Oahu seniors was significantly larger than that for seniors living on Neighbor Islands (52.3 vs. 30.5/100,000, respectively).

Trend: no trend Total: 191, Ave: 32/year	Age groups: 65y and older = 32%	Gender: 63% M, 37% F	County totals and 6-year rates (deaths/100,000):
			County / Num. / Rate Hawaii 35 21.8 Honolulu 132 14.8 Kauai 4 - Maui 20 14.6

There were 2 peak times for pedestrian fatalities: 5:30 a.m. to 7:30 a.m. (21% of the deaths), and 7:30 p.m. to 9:30 p.m. (23%). Only 20% of the victims were in a crosswalk at the time of the crash; nearly half (48%) were hit on open stretches of roadway. Among victims aged 15 years or older who were hit on public roadways, 19% tested positive for alcohol, including 15% who were legally intoxicated. Alcohol use was more common among victims hit on Neighbor Islands (29%, including 37% of those hit on the island of Hawaii), and among victims hit during nighttime (39%). More than half (53%) of the victims of traffic crashes (on public roadways) were in the roadway erroneously, most commonly from "jaywalking" (36%). About one-quarter (27%) of the drivers involved were described as "inattentive", 10% were speeding, and 10% tested positive for alcohol. There were 16 deaths in Kalihi-Palama area of Oahu, and 16 in the North Kona district of Hawaii.

Nonfatal injuries

The annual number of nonfatal injuries to pedestrians varied inconsistently from 542 to 696. One-quarter of the patients with nonfatal injuries were admitted to hospitals, the highest such proportion for any unintentional injury category. Patient age was widely distributed, but nearly one-third (32%) were in the 5 to 24 year age group. This group also had the highest rate of nonfatal injuries that were treated in EDs, while senior aged residents had the highest rates of hospitalizations.

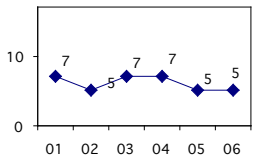
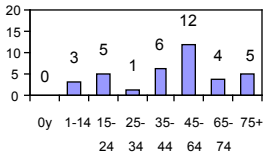
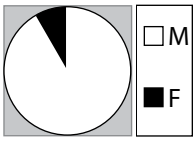
Trend: no trend. Ave: 585/year	Treatment: 440 ED, 145 hosp.	Age groups: 15-24y = 32%	County totals, annual number and rate (/100,000):
			County / Num. / Rate Hawaii 80 49.5 Honolulu 435 48.4 Kauai 24 40.5 Maui 46 32.8

The rates of both ED visits and all injuries (ED visits combined with hospitalizations) were significantly lower for Maui County residents compared to the rates for residents of Hawaii and Honolulu counties. There were no significant differences between counties for rates of injuries requiring hospitalizations. Most (85%) of the nonfatal injuries were coded as "traffic" related, or occurring on a public roadway, while 15% were in "non-traffic" environments, including private roads, driveways and parking lots. About one-third (32%) of the patients injured in non-traffic crashes were in the 1 to 14 year age group. Patients were hospitalized for an average of 8 days, with nearly $44,000 in medical charges. Hospitalizations accounted for most (73%) of total patient days and 89% of the $7.2 million in total medical charges.

Motor vehicle crashes, bicyclists

Fatal injuries

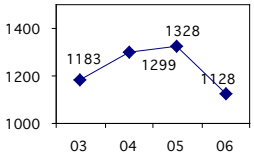
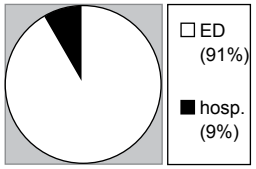
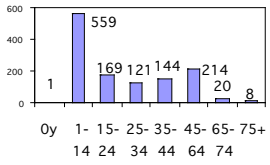
There were between 5 and 7 bicyclists killed in Hawaii each year, and about two-thirds (64%) of the deaths occurred on Oahu. There was no apparent high-risk age group. Almost all (92%) of the 36 bicyclists killed over the 6-year period were males. Most (86%) of the victims were hit by a car; 4 others died after falling off their bicycles. Only 8% of the victims of traffic crashes were wearing helmets at the time of the crash. There was no notable peak time of the day for the crashes, although this information was missing for 7 victims.

Trend: no trend Total: 36, Ave: 6/year	Age groups: widely distributed	Gender: 92% M, 8% F	County totals and 6-year rates (deaths/100,000):
			County / Num. / Rate Hawaii 5 - Honolulu 23 2.6 Kauai 3 - Maui 5 -

Most (72%) of the traffic-crashes involved cars traveling straight on the road; only 1 crash was due to a car making a turn. There were roughly equal numbers of bicyclists who were hit in intersections (9 from 2001 to 2005) and non-junction areas (10 victims). Contributing factors were noted for most (72%) of the bicyclists, and 20% of the drivers involved were described as "inattentive". There were 5 fatal crashes in the Makakilo/Kapolei area of Oahu, and 3 each in the Wailuku district of Maui and the North Kona district of Hawaii.

Nonfatal injuries

There were more than 1200 nonfatal injuries to bicyclists each year, with most (91%) being treated in EDs. Most (76%) of the patients were males, including 80% of those who were hospitalized. Nearly half (45%) of the patients were 1 to 14 years of age, and the injury rates for 5 to 14 year-olds (292 injuries/100,000 residents) were more than 4 times higher than rates for residents of other ages (69/100,000).

Trend: no trend. Ave: 1235/year	Treatment: 1123 ED, 112 hosp.	Age groups: 15-24y = 32%	County totals, annual number and rate (/100,000):
			County / Num. / Rate Hawaii 216 138.4 Honolulu 780 91.3 Kauai 110 186.7 Maui 130 94.9

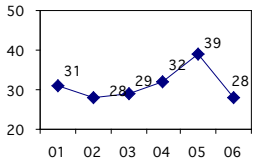
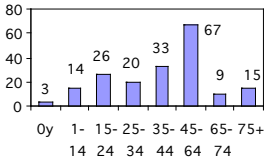
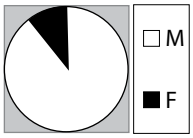
The rate for nonfatal injuries for Kauai County residents was significantly higher than the rates for any other county, and approximately double the rates for residents of Honolulu or Maui counties. The rate for Hawaii County was also significantly higher than the rates for Honolulu and Maui counties. Almost all (87%) of the injuries were coded as "non-traffic", or occurring on private roads, driveways, or off-road environments. Most of the injuries treated in EDs (84%) and requiring hospitalization (64%) were coded to indicate crashes that did not involve a collision with another

vehicle or object, but were probably due to the patient falling off of the bicycle. Although almost all (91%) of the patients were treated in EDs, hospitalizations comprised 33% of the treatment days and 67% of the total medical charges of $4.5 million/year. Most (60%) of the hospitalized patients had fractures, including 13% with skull fractures and 25% with leg fractures. Forty percent of these patients had a traumatic brain injury.

Drownings (residents only)

Fatal injuries

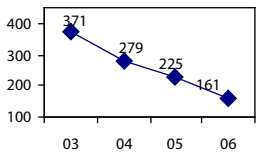
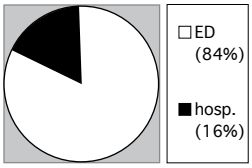
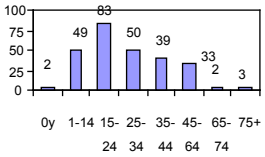
There was no significant trend in the annual number of drownings, which varied from 28 to 39 each year. The ages of the victims were widely distributed, although few (only 11%) were under 18 years of age. Almost all (88%) were males. About two-thirds (65%) of the victims drowned on Oahu, but the rate for Oahu residents was significantly lower than the rate for residents of Hawaii County. Residents of Maui County had the lowest overall rate.

Trend: no trend Total: 187, Ave: 31/year	Age groups: 35-64y = 53%	Gender: 88% M, 12% F	County totals and 6-year rates (deaths/100,000):
			**County Num. Rate** Hawaii 41 25.5 Honolulu 122 13.6 Kauai 11 18.0 Maui 13 9.5

Most (81%, or 152) of the victims drowned in the ocean or saltwater environments, almost all of whom (97%) were 18 years or older. Unintentional immersions led to 20% of these drownings, including 8 victims who were fishing from shore and 7 who were picking opihi. Other common activities were swimming (19% of victims), and free diving (16%). According to autopsy records, intrinsic or personal factors contributed to nearly two-thirds (63%) of the 91 salt-water drownings from 2001 to 2004. The most common intrinsic factor was circulatory diseases, present among 38% of the victims of all ages, and 63% of those aged 55 years and older. One-fifth of the victims tested positive for alcohol, and nearly one-third (30%) of those who drowned from unintentional immersions had been drinking. Apart from ocean drownings, there were roughly equal numbers of drownings in swimming pools (11), rivers and streams (11) and bathtubs (9). About half (55%, or 6) of the 11 victims who drowned in swimming pools were under 5 years of age, including four 1 year-olds. All 6 of the victims who drowned in streams on Oahu from 2001-2004 tested positive for alcohol, according to autopsy records.

Nonfatal injuries (near drownings)

The number of near drownings decreased consistently over the 4-year period from 371 in 2003 to less than half that (161) by 2006. This decreasing trend was evident only for near drownings treated in EDs (84% of cases), specifically among residents of Honolulu and Kauai counties. Almost all the patients (95%) were under 55 years of age, and nearly one-third (32%) were 15 to 24 years of age. Residents aged 10 to 24 years had the highest rates of ED visits, especially 15 to 19 year-olds, while the highest rates of hospitalization were computed for residents under 5 years of age. Male patients (77% of the total) outnumbered females by about three-to-one for both ED visits and hospitalizations.

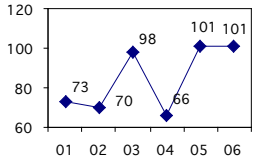
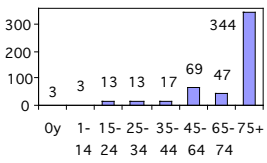
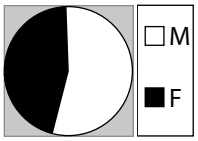
Trend: decreasing Ave: 259/year	Treatment: 219 ED, 41 hosp.	Age groups: 15-24y = 32%	County totals, annual number and rate (/100,000):
			**County** **Num.** **Rate** Hawaii 44 27.9 Honolulu 94 10.8 Kauai 14 23.9 Maui 107 79.1

The rates for both ED visits and all near drownings (ED visits and hospitalizations combined) were significantly higher for Maui County residents than for residents of any other county. Oahu residents had significantly lower rates of ED visits than any other county and the lowest rates of hospitalizations. Nearly half (44%) of the near drownings occurred on a Saturday or Sunday. Hospitalizations were of a relatively short number of days (3.5, on average), but because each hospitalization incurred over $18,000 in charges, they comprised most (78%) of the total medical charges in the state. Data on the locations of the near drownings was mostly missing (40%) or vague, due to the coding system. Only 12% of cases occurred in environments that may have included swimming pools, while 47% were in "other specified places" which included beaches and ocean environments

Falls

Fatal injuries

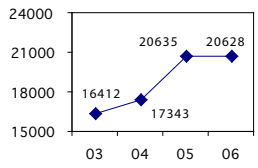
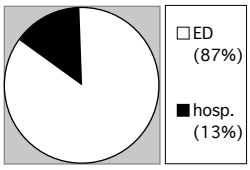
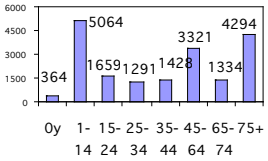
There was a significantly increasing trend in the annual rate of fatal falls, although this was apparent only among residents of Oahu. More than three-quarters (77%) of the victims were aged 65 years or older, and the risk of fatal falls increased dramatically across the senior age range. Males comprised the majority (82%) of victims under 65 years of age, while gender was equally distributed for the senior-aged victims. Honolulu County residents comprised most of the victims of all ages (78%) and those who were 65 years or older (81%). The fatality rate for senior-aged residents of Honolulu County was significantly greater than rates for any other county, and 58% higher than the Neighbor Islands seniors as a group.

Trend: sig. increasing Total: 509, Ave: 85/year	Age groups: 65y or older = 77%	Gender: 57% M, 43% F	County totals and 6-year rates (deaths/100,000):
			**County** **Num.** **Rate** Hawaii 59 36.8 Honolulu 399 44.6 Kauai 15 24.6 Maui 36 26.4

Death certificates provided little information on the causes of falls, as most were coded as "falls on the same level" with no further description (41%), or "unspecified" causes (33%). Falls from stairs or steps were the most specifically coded cause (but only 5% of the total). About two-thirds (68%) of the falls occurred at the residence of the victim, including 76% of the senior-aged victims.

Nonfatal injuries

Falls were the leading cause of nonfatal injuries among Hawaii residents, with over 16,000 ED visits and nearly 2400 hospitalizations each year. The annual number of injuries generally increased. Children aged 1 to 14 years comprised 32% of all patients, but about two-thirds (65%) of those who were hospitalized were 65 years or older. Gender was equally distributed among patients treated in EDs, but females comprised 59% of the patients that were hospitalized.

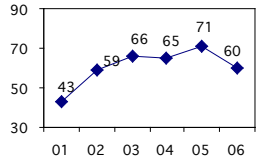
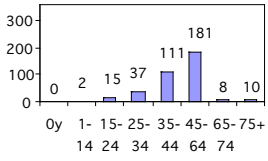
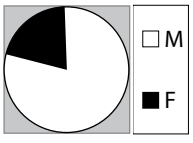
Trend: increasing Ave: 18755/year	Treatment: 16377 ED, 2377 hosp.	Age groups: 15-24y = 32%	County totals, annual number and rate (/100,000):
			**County Num. Rate** Hawaii 3727 2262.2 Honolulu 11783 1266.5 Kauai 1491 2370.0 Maui 1754 1289.4

Residents of Hawaii and Kauai counties had significantly higher rates of nonfatal injuries from falls than did residents of Honolulu and Maui counties. While the residents of Maui County had the lowest rates of ED visits, they had significantly higher rates of hospitalizations compared to any other county. Hospitalizations averaged nearly 1 week in duration and resulted in over $24,000 in medical charges, and accounted for 75% ($58 million) of the total annual charges of $77.4 million. Fractures were present in nearly three-fourths (73%) of the patients, including 30% with hip fractures. Additional data is presented for nonfatal falls specifically among senior-aged residents.

Poisonings

Fatal injuries

There was an increasing trend in the annual number of unintentional poisonings, especially over the 2001 to 2005 period. (The number of poisonings of undetermined intent also generally increased over this period.) Victim age was narrowly distributed, as 69% were in the 35 to 54 year age range, and nearly half (46%) were 40 to 50 years of age. Male victims outnumbered females by 3-to-1. Most (83%) of the victims were poisoned on Oahu, and the highest fatality rates were computed for Honolulu County residents. Inclusion of poisonings of undetermined intent eliminated any county rate differences, however, since these were more commonly coded for Neighbor Island victims. These coding issues with poisonings precluded any meaningful county fatality comparisons. Drugs caused almost all (95%) of the poisonings, including 35% from "narcotics and hallucinogens" and 27% from "sedative-hypnotic and psychotropic drugs".

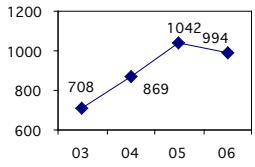
Trend: increasing Total: 509, Ave: 85/year	Age groups: 35 to 54y = 69%	Gender: 77% M, 23% F	County totals and 6-year rates* (deaths/100,000):
			**County Num. Rate** Hawaii 38 32.4 Honolulu 298 45.0 Kauai 17 38.1 Maui 7 7.0

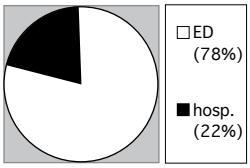
*Includes only residents aged 20 years and older.

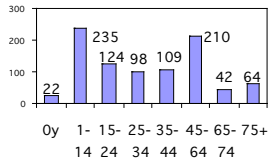
Nonfatal injuries

There was an increasing trend in the number of nonfatal poisonings, but this was evident only for ED visits among Honolulu and Maui county residents. Gender was equally distributed among patients treated in EDs, while males formed a slight majority (54%) among hospitalized patients. Patient age was broadly distributed, although one-quarter (26%) were 1 to 14 years of age. Seniors comprised only 12% of all patients, but one-fifth (20%) of those who were hospitalized. Rates of ED visits were highest by far for residents under 5 years of age, nearly 5 times higher than the rate for all other age groups.

Trend: increasing Ave: 903/year	Treatment: 704 ED, 200 hosp.	Age groups: 15-24y = 32%	County totals, annual number and rate (/100,000):







County	Num.	Rate
Hawaii	160	99.1
Honolulu	559	61.4
Kauai	52	85.2
Maui	133	96.0

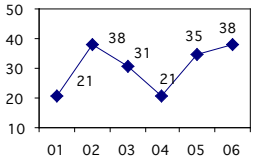
Residents of Honolulu County had significantly lower rates of both ED visits and total (ED visits combined with hospitalizations) nonfatal poisonings, compared to residents of any other county. Hospitalization rates were comparable across all counties. Patients were hospitalized for slightly over 3 days on average, with nearly $13,000 in medical charges. Most (68%) of the poisonings were caused by drugs or medicinal substances, including 87% of those that required hospitalization. Narcotics caused 16% of the hospitalizations, tranquilizers 13%, aromatic analgesics (which include acetaminophen, or Tylenol) 8%, and cardiovascular agents 8%.

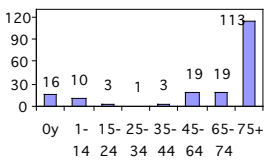
Suffocations

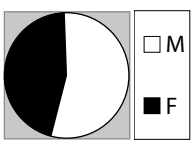
Fatal injuries

The annual number of suffocations varied inconsistently between 21 and 38 deaths, but there was an increasing trend in the number of victims aged 85 years or older, from 6 in 2001 to 19 in 2006. The age distribution was bimodal, as most (61%) victims were 75 years or older, but there were also 22 victims (12%) who were under 4 years of age. Sixteen of the victims were infants, all but 1 of whom suffocated in their beds or cradles. Most (82%) of the victims suffocated on Oahu, including 86% of those aged 65 years and older. The fatality rate for seniors on Oahu (91.2/100,000 residents) was significantly greater than the rate for seniors living on Neighbor Islands (39.2/100,000, based on only 18 deaths). The most commonly specified causes were inhalation of food (15% of suffocations) or gastric contents (8%). Most were coded as inhalation of "other objects" with little further detail available. Including deaths from SIDS and "unspecified causes of mortality" as well as infant suffocations, there was an average of 16 infant deaths a year that were sleep-related or possibly sleep-related, with no trend in the annual number.

Trend: no trend Total: 509, Ave: 85/year	Age groups: 65y or older = 77%	Gender: 58% M, 42% F	County totals and 6-year rates* (deaths/100,000):







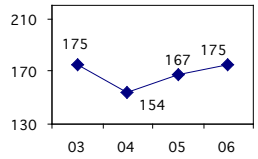
County	Num.	Rate
Hawaii	8	-
Honolulu	114	91.2
Kauai	3	-
Maui	7	-

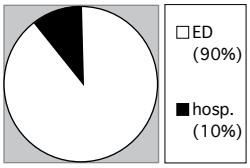
*Includes only residents aged 20 years and older.

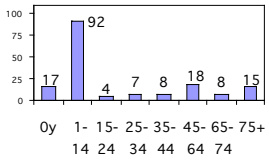
Nonfatal injuries

There was no trend in the overall number of nonfatal suffocations in the state, although the number of hospitalizations consistently increased from 3 in 2003 to 26 in 2006. More than half (57%) of the patients were under 5 years of age. Senior-aged residents comprised 25% of the patients who were hospitalized. Gender was equally distributed among patients treated in EDs, while males comprised over two-thirds (69%) of those who were hospitalized.

Trend: no trend. Ave: 168/year	Treatment: 152 ED, 16 hosp.	Age groups: 0-14y = 65%	County totals, annual number and rate (/100,000):







County	Num.	Rate
Hawaii	23	14.6
Honolulu	113	12.5
Kauai	9	14.7
Maui	23	17.2

Residents of Maui County had the highest rates of nonfatal suffocations, although there were no statistically significant differences between any counties. About half (52%) of the hospitalizations were caused by inhalation of food and somewhat less commonly (45%) by inhalation of other (non-food) objects. Non-food objects caused about two-thirds (62%) of the ED visits for nonfatal suffocations, while inhalation of foods caused 36%. Almost all (95%) the suffocations were diagnosed as "foreign body entering through orifice".

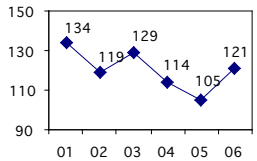
Intentional injuries

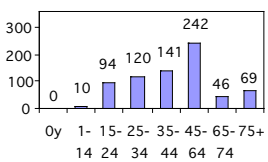
Suicides and suicide attempts

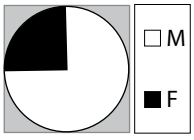
Fatal injuries

There was a decreasing trend in the number of suicides in the state and on Oahu, but a parallel increase in the number of fatal injuries of undetermined intent (i.e. possible suicides) made this difficult to interpret. Victim age was widely distributed, although almost all (93%) were 20 years or older. The highest rates were computed for residents aged 85 and older, and the 40 to 54 year age group. Male victims outnumbered females by approximately 3-to-1. Two-thirds (66%) of the victims died on Oahu, but the fatality rate for Oahu (67.1/100,000 residents aged 20 and older) was significantly lower than the rate for the combined Neighbor Islands (85.8/100,000).

Trend: decreasing Total: 722, Ave: 120/year	Age groups: 20-64y = 74%	Gender: 75% M, 25% F	County totals and 6-year rates* (deaths/100,000):







County	Num.	Rate
Hawaii	97	83.4
Honolulu	422	67.1
Kauai	41	90.7
Maui	89	87.2

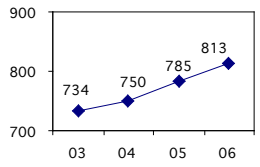
*Includes only residents aged 20 years and older.

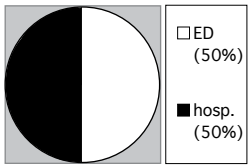
The most common mechanism was by hanging or suffocation (46% of the suicides), followed by firearm use (21%). Most (75%) of the victims had a documented history of mental illness (as variously defined), according to autopsy records from 2001 to 2004. The most common negative life events for the victims were related to intimate relationship problems (24%), usually a break-up or divorce (16%), or serious illness or medical issues (21%). About one-fifth (22%) of the victims had a history of substance abuse, 12% tested positive for alcohol and 23% for illicit drugs. Nearly one-fifth (17%) of the victims had a previous suicide attempt documented in the record, and more than one-third (41%) had mentioned wanting to commit suicide to somebody.

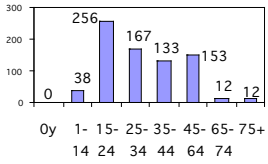
Nonfatal injuries

There was an increasing trend in the number of nonfatal suicide attempts, which was mostly evident in the annual number of injuries that were treated in EDs. The number of injuries that required hospitalization were approximately equal to the number treated in EDs, unlike any other category of injury. Most (60%) of the patients were under 35 years of age, and residents aged 15 to 19 years had the highest rates of hospitalizations and especially ED visits. The gender distribution of patients was similar for both settings, with females comprising approximately 60% of the total.

Trend: increasing Ave: 771/year	Treatment: 382 ED, 389 hosp.	Age groups: 15-24y = 32%	County totals, annual number and rate (/100,000):







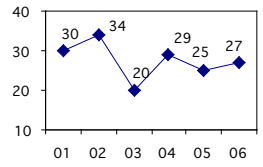
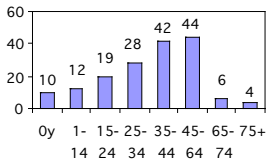
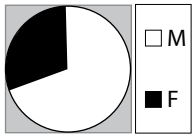
County	Num.	Rate
Hawaii	129	93.6
Honolulu	521	68.0
Kauai	56	111.8
Maui	61	51.9

Residents of Kauai and Hawaii counties had significantly higher rates of nonfatal self-inflicted injuries compared to residents of Honolulu and Maui counties. About two-thirds (64%) of the ED visits and most (84%) of the hospitalizations were caused by poisonings from drugs or medicinal substances, most commonly from the "analgesics, antipyretics, and antirheumatics" class (26% of ED visits, 33% of hospitalizations), which includes both narcotics (heroin, and other opiates), as well as aspirin and acetaminophen. Female patients were more likely to attempt by drug or medicinal poisonings (81%, vs. 66% for male patients), while injuries from cutting and piercing instruments were somewhat more common among males (16%, vs. 12% for females).

Homicides and assaults

Fatal injuries

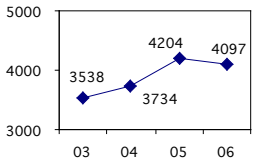
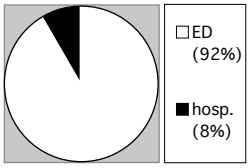
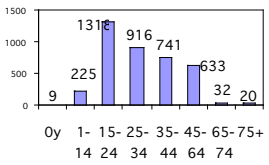
There were between 20 and 30 homicides each year in the state, with no consistent trend. Half (52%) of the victims were in the broad age range of 35 to 64 years, but there were also 17 victims (10%) who were under 5 years of age, including 10 infants. Infants had by far the highest fatality rate, 3 to 4 times the rate of any other age group. There were twice as many male victims as females. The highest fatality rate was computed for residents of Hawaii County, although the rates for most counties were statistically comparable.

Trend: no trend Total: 165, Ave: 28/year	Age groups: 35y to 64y = 52%	Gender: 68% M, 32% F	County totals and 6-year rates (deaths/100,000):
			**County** **Num.** **Rate** Hawaii 29 19.2 Honolulu 116 12.9 Kauai 9 14.8 Maui 11 7.8

The most common method was the use of firearms (30%), followed by physical force or unarmed beatings (27%) and stabbings (21%). According to Uniform Crime Reports from 2001 to 2004, most (60%) of the homicide victims knew their assailant, and only a minority (19%) were killed by strangers. Female victims were most likely to be killed by their intimate partner (52%), while males were most likely to be killed by extra-familial acquaintances (38%) or strangers (25%).

Nonfatal injuries

There were nearly 3900 nonfatal injuries from assaults among Hawaii residents each year, with a generally increasing trend over time. The increasing trend was seen only for patients treated in EDs (92% of all patients), among residents of all counties except Kauai. Males comprised two-thirds (67%) of the patients treated in EDs and an even greater proportion (87%) of those who were hospitalized. Most (58%) of the patients were 15 to 34 years of age; few (6%) were under 15 years of age, or over 65 years of age (1%). The peak age for rates of both ED visits and hospitalizations was the 15 to 29 year age group, particularly 20 to 24 year-olds.

Trend: increasing Ave: 3893/year	Treatment: 3600 ED, 293 hosp.	Age groups: 15-24y = 32%	County totals, annual number and rate (/100,000):
			**County** **Num.** **Rate** Hawaii 756 474.4 Honolulu 2516 282.5 Kauai 226 390.7 Maui 396 288.9

The injury rate for residents of Hawaii County was significantly higher than for any other county, and rates were also significantly higher among residents of Kauai County compared to rates for Honolulu and Maui county residents. Patients were hospitalized for nearly 5 days on average, with over $25,000 in charges for each admission. Unarmed beatings caused three-quarters (75%) of all injuries, and 60% of those that required hospitalization. Fractures were the most common type of injury (44%) that required hospitalization, including 35% of patients admitted with a skull fracture.

Data Sources and Methodology

The primary source of injury mortality data in Hawaii is the death certificate database of the Hawaii Department of Health. The ICD-10 underlying cause of death codes were grouped as recommended by the Centers for Disease Control and Prevention, with some exceptions.[1] For some types of injuries, the open text information on how the injury occurred was reviewed to extract information not captured by the cause of death code. Supplemental data was also used for certain injury categories. Data from the Fatal Analysis Reporting System[2] (FARS) of the National Highway Traffic Safety Administration (NHTSA) was linked to death certificate data for deaths from traffic crashes. Only FARS data from 2001 to 2005 was available at the time this report was compiled. Autopsy records from the Honolulu County Medical Examiner's (ME) office and the Coroner's office of Hawaii, Maui and Kauai counties were reviewed for details on drownings and suicides during the 2001 to 2004 period. Supplemental data on homicides was abstracted from the Uniform Crime Reports (UCR) maintained by the Crime Prevention and Justice Assistance Division of the State of Hawaii Attorney General.

Fatal injuries are described within the main intent categories of unintentional injuries (drownings, car crashes, etc.) and intentional injuries (homicides and suicides), as defined by the CDC recommended framework.[1] Unintentional injuries are described both as a total and separately within the 8 main mechanisms: motor vehicle crashes involving occupants, motorcyclists, pedestrians, and bicyclists, and falls, drownings, poisonings, and suffocations. The intent of the fatal injury could not be determined for some injuries, and these are described as a total in one of the final chapters.

One section of this document compares general injury mortality in Hawaii versus that in the rest of the United States. The national data comes from the WISQARS[3] (Web-based Injury Statistics Query and Reporting System) online database, accessed at the web site for the Centers for Disease Control and Prevention. The fatality totals from this database were adjusted for the portion of deaths among Hawaii residents. Mortality data beyond 2005 was not available. The period of 2001 to 2005 was chosen in order to allow for 5-year comparisons of injury mortality between Hawaii and the rest of the United States. FARS data was used to compare Hawaii fatality rates from traffic crashes versus the rest of the U.S., since the WISQARS data contains a high proportion of records coded as "other" or "unspecified" for victims killed in traffic crashes. FARS data is more specific in this regard, i.e. able to distinguish automobile occupants from motorcyclists from pedestrians. State comparisons with the FARS data also covered the 2001 to 2005 period.

The calculation of injury mortality rates necessitates the definition of "at risk" populations for the denominator. For the section comparing U.S. and Hawaii fatality rates, the denominator was the average annual resident population over the 2001 to 2005 period. This data was obtained from the web site for the U.S. Census Bureau.[4] Other analyses compared rate estimates of the 4 counties within Hawaii, for the 2001 to 2006 period.[5] Data from the Department of Business, Economic Development and Tourism (DBEDT) of the State of Hawaii was used to estimate annual numbers of visitors to Hawaii for the chapter on fatal injuries among non-residents.[6] Some injury rates were computed and compared for 8 ethnicities: African American, Caucasian, Chinese, Filipino, Hawaiian, Japanese, Korean and Samoan. These 8 groups comprised 91% of the total number of residents killed by injuries. Ethnicity was assigned using the first-listed ethnicity on the death certificate. Overall, for about three-fourths (72%) of the victims of these 8 main groups, only one ethnicity was listed on the death certificate, but that proportion was notably lower among Hawaiians (15%). Ethnic-specific rates were computed using resident population estimates from the 2000 U.S. Census.[7] The "alone or in any combination" enumerations were used for all 8 ethnicities, given the ethnic admixture described above. The results of these analyses were not substantially different when the "alone" enumerations were used, except for Hawaiians. Since there were too few deaths within some of the ethnicities to adjust the rates for age distribution, comparisons were made using "crude" or unadjusted rate estimates. For these reasons, the results from these ethnic-specific comparisons should be interpreted with caution. For motor vehicle crashes, the 2001 National Household Travel Survey provided an alternative to population estimates as a measure of exposure. NHTS included estimates of the number of person trips taken by different modes of transportation for over 7,100 Hawaii residents.[8]

This report includes mostly information on injuries among residents of Hawaii. This is consistent with national reporting conventions of injury mortality and allows for the comparison of fatal injury rates in Hawaii with rates for the

remainder of the country. Since age and county-specific population estimates are also available only for residents, the inclusion of injuries among non-residents would result in a slight overestimation of fatality rates. There were 430 total injury-related deaths of non-residents over the 6-year period, or about 11% of the total. As this is a considerable number of deaths, there is a separate section of the document which examines these deaths in more detail. In general, however, exclusion of deaths among non-residents does not significantly impact the description of the remaining fatal injuries in this document. Residents represented at least 92% of the victims in the major injury categories, with the exceptions of bicyclists (82% residents) and especially drownings, 52% of which occurred among non-residents. There is therefore a separate section on drowning which includes information on both resident and non-resident victims.

Also excluded from this report were 50 deaths that were due to "adverse effects" of medical treatment; injuries resulting from surgical or medical care, or adverse reactions to drugs or medicinal substances. These iatrogenic events generally occur outside of the usual public health context of injury prevention.

The source of data on nonfatal injuries was the Hawaii Health Information Corporation (HHIC), which receives abstracted data from the medical records of patients treated in all hospital-based emergency departments (EDs) and hospitals in the state. A record was defined as injury-related if the principle diagnosis was within the ICD-9CM series 800-995.85, with the following exclusions: 909.3, 909.5, 995.0-995.4, 995.6-995.7.[9] Patients who died in the hospitals or who were discharged to hospice facilities were excluded from these analyses. To prevent double-counting of injuries, patients who were transferred to another hospital at discharge were excluded. Injuries resulting from "adverse effects", as indicated by external cause of injury codes (E-codes),[10] were also excluded. E-codes were used to group nonfatal injuries into mechanisms that corresponded to the groupings for fatal injuries.[10] In this report, all nonfatal self-inflicted injuries are described as "suicide attempts", although this is not actually discernible through E-codes. This may have resulted in an overestimation of suicide attempts, but it is also possible that self-inflicted injuries in general are underreported.

Hospital and ED data from years 2003 to 2006 were used in this report, since there was a substantial increase in the proportion of records with an E-code after April of 2002. It is important to note that the extent of E-coding varied across the counties patients reside in, and over time within those counties. Table 1 shows that the records for residents of Neighbor Islands are more likely to have E-codes than records for residents of Honolulu County (on average 97.1% vs. 87.9%, respectively). The proportion of records with E-codes also generally increased for Neighbor Island residents (with the exception of hospital admission records in 2006), while there were decreasing trends for the records of Oahu residents. These variations in E-coding need to be considered when interpreting comparisons between counties and examining trends within a county over time. Statistics in this report are based only on E-coded records, and therefore underestimate the real magnitude of injuries by about 8% for those treated at EDs and about 12% for those injuries requiring hospitalizations.

Another important consideration is that the injury-related records from emergency departments are more likely to have an E-code than are hospital admission records (91.5% vs. 87.8%). E-coding also varied by age of patient, being highest among those aged 14 and younger (92.6%), followed by patients aged 15 to 64 years (91.2%), and lowest among patients aged 65 years and older (88.8%). The association between patient age and extent of E-coding was apparent for both ED and admission records. These difference should be kept in mind when interpreting age-specific rate estimates, as there is a 4% difference in E-coding between the youngest and oldest patients. There was no apparent difference in E-coding between the records of male and female patients.

Age-standardization was by the direct method, using the U.S. 2000 standard population.[11] Sixteen age groups were used for standardization across all ages, although certain calculations were restricted to more narrow age ranges. Statistical tests were conducted with t-tests for continuously distributed variables (e.g. patient age) and chi-squared tests for categorical variables (e.g. patient gender). Some trends (described as "significant" or "non-significant") were formally assessed using Poisson regression.[12] Rate differences were tested using different techniques, depending on sample size and use of age standardization.[13] All statistical significance testing was conducted at the 95% confidence level.

Table 1. Annual percentage of injury-related medical records with E-codes, by data source and county of residence of patient, 2003-2006.

County of residence	2003	2004	2005	2006	4-year average
Emergency department records					
Hawaii	94.3	97.8	98.6	98.4	97.3
Honolulu	91.6	87.0	90.3	84.9	88.3
Kauai	94.6	94.0	96.1	96.3	95.3
Maui	98.0	99.2	99.5	99.4	99.1
state	93.0	91.0	93.0	89.4	91.5
Hospital admission records					
Hawaii	93.9	94.9	97.0	92.5	94.6
Honolulu	84.0	83.0	87.2	82.8	84.3
Kauai	84.1	91.6	95.9	93.9	91.4
Maui*	97.4	96.7	98.3	96.8	97.3
state	86.9	86.9	90.5	86.7	87.8
All records					
Hawaii	94.3	97.6	98.5	98.0	97.1
Honolulu	90.8	86.7	90.1	84.7	87.9
Kauai	93.9	93.8	96.1	96.2	95.0
Maui	98.0	98.9	99.4	99.1	98.9
state	92.5	90.6	92.8	89.2	91.2

*Indicates non-significant trend.

Overview of Injuries Among Hawaii Residents

Fatal injuries

There were 3,579 injury-related deaths among the residents of Hawaii over the 6-year period. This total represented about 6.8% of the 52,805 total number of deaths that occurred among Hawaii residents during this period. Unintentional injuries were the fourth leading cause of death for all residents, and the leading cause of death for those aged 1 to 39 years (Figure 1). In fact, injuries accounted for more deaths in this age group than all other causes combined. Suicides and homicides were prominent categories of overall mortality among 9 to 39 year-olds.

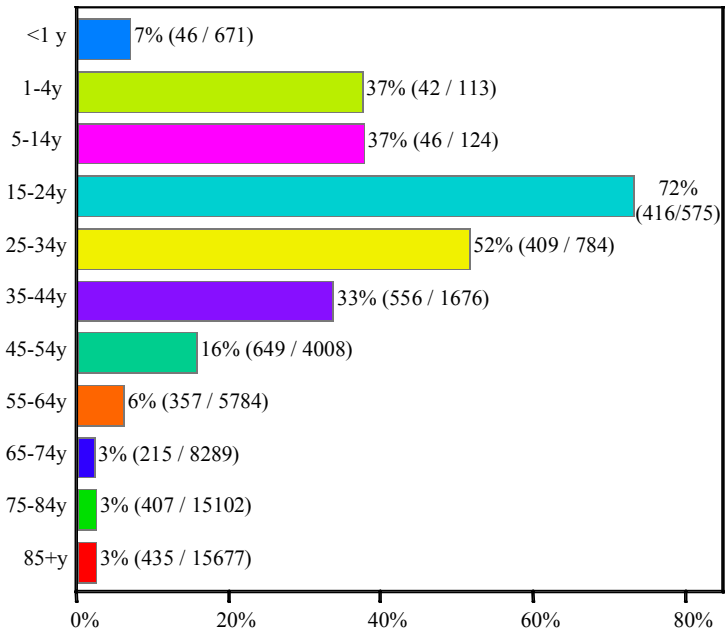
Figure 1. Five leading causes of death among Hawaii residents, by age group, 2001-2006.

Rank	infants (673)	1-9 y (162)	10-19 y (304)	20-29 y (691)	30-39 y (1,080)	40-64 y (10,827)	65+ y (39,068)	all ages (52,805)
1	perinatal conditions 358	unintent. injuries 42	unintent. injuries 144	unintent. injuries 273	unintent. injuries 265	cancer 3,559	heart diseases 11,211	heart diseases 14,059
2	congenital anomalies 97	cancer 19	suicide 53	suicide 114	cancer 173	heart diseases 2,602	cancer 8,489	cancer 12,329
3	unintent. injuries 29	congenital anomalies 11	cancer 28	cancer 61	heart diseases 163	unintent. injuries 739	CVD 3,737	CVD 4,327
4	heart diseases 14	homicide 11	congenital anomalies 12	heart diseases 51	suicide 111	CVD 537	CLRD* 1,463	unintent. injuries 2,387
5	septicemia 13	heart diseases 9	heart diseases 9	homicide 30	CVD 42	suicide 329	influenza/ pneumonia 1,262	CLRD* 1,698

*CLRD = chronic lower respiratory disease

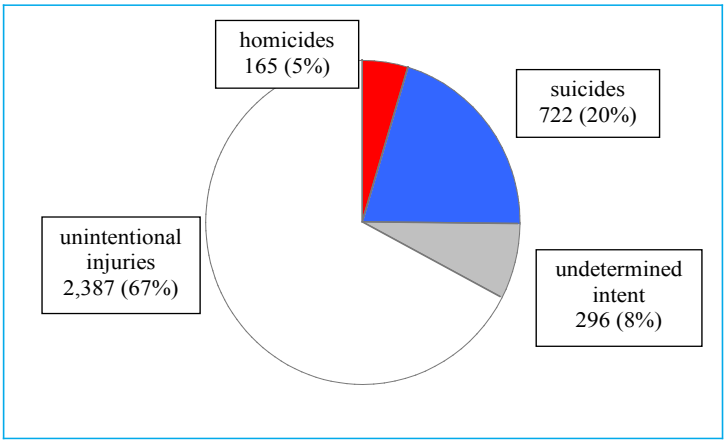
The importance of injuries as the leading cause of death among children and young adults is shown in Figure 2. Injuries accounted for more than one-third (37%) of all deaths among children aged 1 to 14 years, and almost three-fourths of those among decedents aged 15 to 24 years. Injuries also caused the majority of deaths among 25-34 year-olds, and one-third of those among 35-44 year-olds. Overall, 45% of all deaths among residents aged 1 to 44 years were injury related. Injuries were the leading cause of years of potential life lost before the age of 65 among state residents. Over the 6-year period, a total of 67,603 person years of life were lost before the age of 65 due to fatal injuries. In comparison, 44,030 years of life before age 65 were lost due to cancer, and 35,183 due to heart disease.

Figure 2. Injury deaths as a percent of all deaths among Hawaii residents, by age group, 2001-2006.



The majority (67%) of the 3,579 injury-related deaths were classified as unintentional (Figure 3). Suicides constituted 20% of the total, homicides 5%, and injuries of undetermined intent the remaining 8%. Each of these four categories of fatal injuries will be discussed in more detail in the following sections.

Figure 3. Fatal injuries among residents of Hawaii, by intent, 2001-2006.



Not shown are 9 deaths that were due to legal intervention.

Annual rates of fatal injuries are shown by the main intent categories in Figure 4. There were no statistically significant trends for any of the intent categories (including all intents) over the 6-year period. Suicides rates generally decreased over the 2001 to 2005 period, but increased in 2006. The trends for homicides and unintentional injuries were relatively flat.

Figure 5 breaks down the causes of fatal injuries into more specific groups, and shows that the leading causes vary by the age group of the victims. Suffocation was a leading cause of injury mortality in the very youngest and oldest age groups, but not in the intervening ages. Deaths among car occupants were the leading cause of injury mortality among 1 to 24 year olds, but this category decreased in rank across most of the succeeding age groups. Suicide was the leading cause of injury mortality among victims aged 25 to 64 years, although falls were a far more frequent cause in the oldest age groups. Poisonings were common only among the 25 to 64 year-old victims. The associations between age and other demographic variables will be explored more fully for each category in later sections of this report.

Figure 4. Age-standardized annual rates (/100,000) of fatal injuries among Hawaii residents, by intent, 2001-2006.

(Rates for all types of injuries are indicated by bars, including injuries of undetermined intent.)

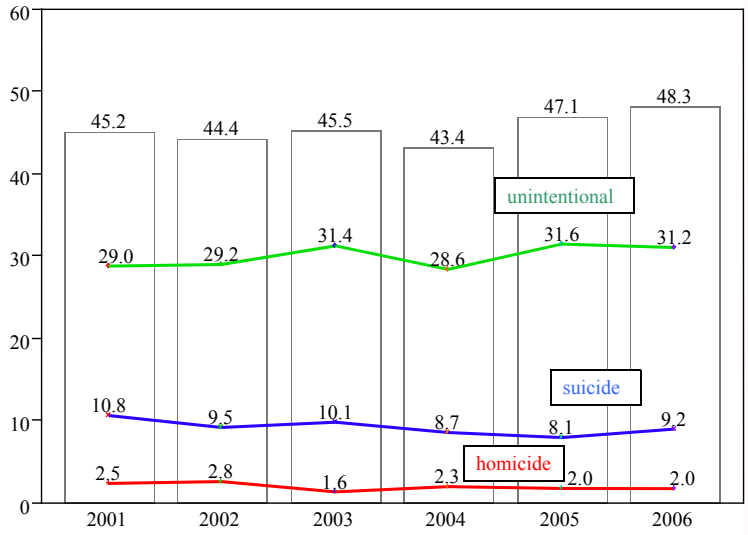


Figure 5. Five leading causes of fatal injuries among Hawaii residents, by age group, 2001-2006.

Rank	infants (45 total)	1-14 y (88)	15-24 y (416)	25-34 y (409)	35-44 y (556)	45-64 y (1008)	65-74 y (215)	75 + y (842)	total (3,579)
1	suffocation 16	drowning 14	mvc*-occupant 150	suicide 120	suicide 141	suicide 242	falls 47	falls 344	suicide 722
2	homicide 10	homicide 12	suicide 94	mvc*-occupant 87	poisoning 111	poisoning 180	suicide 46	suffocation 113	falls 509
3	unk. intent 7	mvc*-occupant 11	mvc*-motorcyclist 35	mvc*-motorcyclist 37	mvc*-occupant 73	unk. intent 141	mvc*-occupant 22	suicide 69	mvc*-occupant 470
4	mvc*-occupant 4	mvc*-pedestrian 11	drowning 26	poisoning 37	unk. intent 61	mvc*-occupant 92	suffocation 19	mvc*-pedestrian 64	poisoning 364
5	drowning/ falls 3 (each)	suffocation/ suicide 10 (each)	homicide/ unk. intent 19 (each)	homicide 28	homicide 42	falls 69	mvc*-pedestrian 16	mvc*-occupant 31	unk. intent 296

*mvc = motor vehicle crash

Nonfatal injuries

There was an annual average of 76,331 nonfatal injuries that required treatment at Hawaii hospitals over the 4-year period (Table 2). Most (92%, or 70,123) of those were treated in the ED setting, as these less severe injuries outnumbered those requiring hospital admission (6,208 per year) by an 11-to-1 ratio. There was a consistent increase in the annual number of nonfatal injuries treated in EDs across the state as a whole, and within all counties. There were statistically significant trends for ED visits for all counties in the annual rates of nonfatal injuries, after adjustment for resident population. The greatest increase was for residents of Honolulu County, among whom the annual total increased 43%, from 36,277 injuries in 2003 to 51,739 in 2006. There was no trend for the number of hospital admissions for the state, although the annual number generally increased among residents of Hawaii and Maui counties.

Table 2. Annual number of nonfatal injuries treated in Hawaii hospitals, by county of residence of patient, 2003-2006.

County of residence	2003	2004	2005	2006	4-year average
Emergency department records					
Hawaii*	13155	13689	13737	13775	13589
Honolulu*	36277	40556	50352	51739	44731
Kauai*	5407	5760	5837	6001	5751
Maui*	5322	5876	6226	6784	6052
state*	60161	65881	76152	78299	70123
Hospital admission records					
Hawaii*	767	856	946	922	873
Honolulu	4170	4160	4346	4018	4174
Kauai	359	419	368	328	369
Maui*	772	781	805	814	793
state	6068	6216	6465	6082	6208
All records					
Hawaii*	13922	14545	14683	14697	14462
Honolulu*	40447	44716	54698	55757	48905
Kauai*	5766	6179	6205	6329	6120
Maui*	6094	6657	7031	7598	6845
state*	66229	72097	82617	84381	76331

*Indicates significant trend.

Most of the injuries treated in EDs (92.2%) and requiring hospitalization (85.9%) were coded as unintentional or "accidental" (Table 3). These proportions were fairly constant across the 4 counties. Assaults constituted 5% to 6% of injuries treated in both settings, while self-inflicted or suicidal injuries comprised a much greater proportion of injuries requiring hospitalization (7.1%), compared to injuries treated in EDs (0.6%). Injuries of undetermined intent comprised less than 2% of the injuries treated in EDs or requiring hospitalization.

Table 3. Annual number of nonfatal injuries treated in Hawaii hospitals, by intent of injury and county of residence of patient, 2003-2006.

	ED visits (%*)	hospitalizations (%*)	total (%*)
Hawaii County			
assault	722 (5.5%)	34 (4.1%)	756 (5.4%)
suicide	72 (0.5%)	58 (7.0%)	130 (0.9%)
unintentional	12347 (93.6%)	725 (87.8%)	13071 (93.2%)
undetermined intent	53 (0.4%)	9 (1.1%)	62 (0.4%)
total	13559	873	14432
Honolulu County			
assault	2303 (5.9%)	213 (6.1%)	2516 (5.9%)
suicide	265 (0.7%)	258 (7.3%)	522 (1.2%)
unintentional	35942 (91.6%)	2984 (85.0%)	38926 (91.1%)
undetermined intent	727 (1.9%)	56 (1.6%)	783 (1.8%)
total	44489	4167	48656
Kauai County			
assault	214 (3.9%)	12 (3.6%)	226 (3.9%)
suicide	31 (0.6%)	26 (7.7%)	57 (1.0%)
unintentional	5207 (95.2%)	293 (87.1%)	5500 (94.7%)
undetermined intent	18 (0.3%)	6 (1.6%)	24 (0.4%)
total	5742	369	6111
Maui County			
assault	362 (6.1%)	34 (4.4%)	396 (5.9%)
suicide	14 (0.2%)	47 (6.1%)	61 (0.9%)
unintentional	5414 (90.6%)	674 (87.4%)	6088 (90.2%)
undetermined intent	186 (3.1%)	16 (2.0%)	202 (3.0%)
total	6030	792	6823

*Percent of injuries within each county. Totals do not include injuries from legal interventions, records without e-codes, or records for which the patient county of residence was not known.

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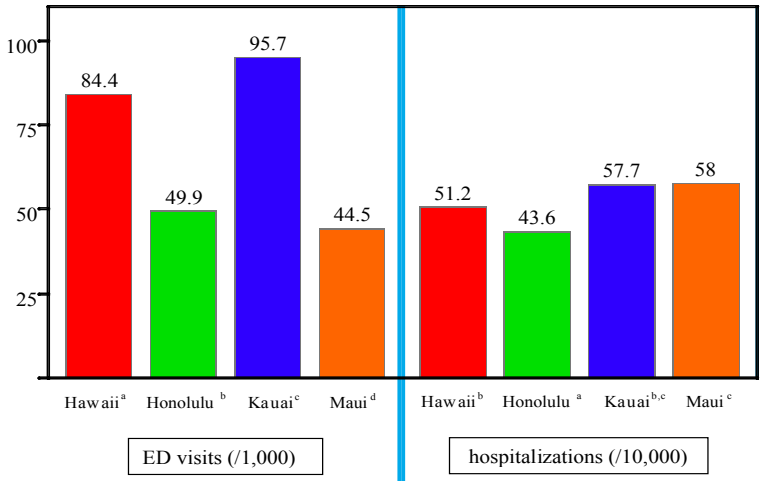
	ED visits (%*)	hospitalizations (%*)	total (%*)
state			
assault	3600 (5.6%)	293 (5.4%)	3893 (5.6%)
suicide	382 (0.6%)	389 (7.1%)	771 (1.1%)
unintentional	58908 (92.2%)	4676 (85.9%)	63584 (91.7%)
undetermined intent	984 (1.5%)	87 (1.6%)	1071 (1.5%)
total	69821	6200	76021

*Percent of injuries within each county. Totals do not include injuries from legal interventions, records without e-codes, or records for which the patient county of residence was not known.

Residents of Kauai had the highest rate of nonfatal injuries treated in EDs, approximately double the rates computed for residents of Honolulu and Maui counties (left side of Figure 6). The rate for Hawaii County residents was also significantly higher than rates for Honolulu and Maui counties, but 13% lower than the rate for Kauai County. There was a different pattern for rates of hospitalizations, as residents of Honolulu had a significantly lower rate than residents of the other 3 counties. The rates for Hawaii, Kauai and Maui counties were largely comparable, being 17% to 33% higher than the rate for residents of Honolulu County.

Figure 6. Age adjusted annual rates of nonfatal injuries requiring treatment in emergency departments and hospitalization, by county of residence of patient.

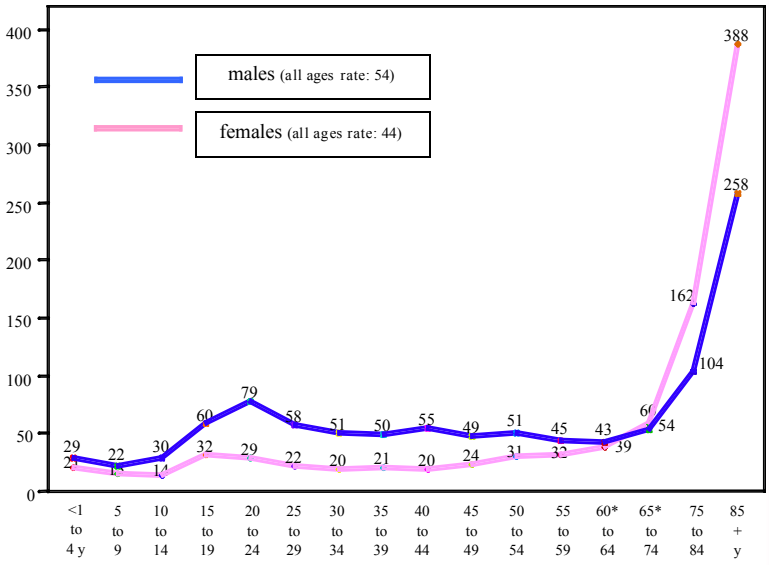
(Note scale difference for ED and hospitalization rates.)



(Counties with the same superscripted letter have statistically comparable rate estimates.)

Males comprised about 55% of Hawaii residents who were hospitalized for nonfatal injuries, and males had significantly higher (by 23%) rates of hospitalization for nonfatal injuries compared to female residents (Figure 7). Rate differences were greatest in the 20 to 24 age group, gradually narrowing over the adult age range before becoming comparable for ages 60 to 74 years. Females had significantly higher rates among residents aged 75 years and older.

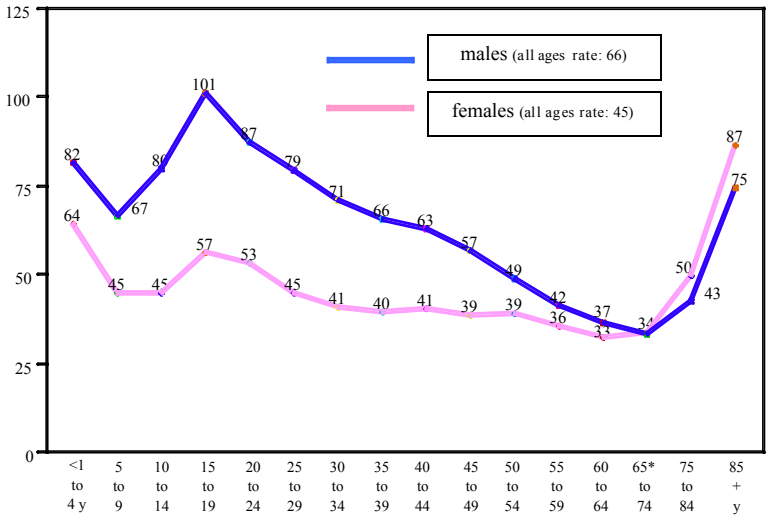
Figure 7. Average annual rates (per 10,000 residents) of hospitalization for nonfatal injuries in Hawaii, by age of patient, 2003-2006.



*Indicates non-significant difference in rates between males and females.

There was a slightly greater gender disparity for nonfatal injuries that were treated in EDs, as the rate for male residents was 47% higher than that for females (Figure 8). Male patients outnumbered females overall (59% vs. 41%), but gender distribution varied by age. Males comprised two-thirds of the patients aged 10 to 29 years, but females made up the majority (60%) of those 65 years and older. These relationships were reflected in the age-specific rate estimates, where the greatest gender differences were seen for the 10 to 29 year age group, especially among males aged 15 to 19 who had the highest rates. Rates declined in both genders over the 15 to 74 year age range, before increasing. Females aged 75 and older had significantly higher rates than male residents.

Figure 8. Average annual rate (per 1,000 residents) of ED visits for nonfatal injuries in Hawaii, by age of patient, 2003-2006.



*Indicates non-significant difference in rates between males and females.

The leading causes of nonfatal injuries differed between those requiring hospitalization (Figure 9) and those treated in EDs (Figure 10), and also differed by patient age within each of those settings. Falls were the leading cause of injuries requiring hospitalization at nearly every age group except for 15 to 34 year-old patients, among whom motor vehicle occupant injuries were the most common. Car crashes were the 2nd leading cause for most age groups, although assaults were the 2nd most common cause among infants. Suicide attempts were the 3rd leading cause from ages 25 to 64. Pedestrian injuries were prominent causes of hospitalizations for senior age groups, while assaults and motorcycle crashes were more common for patients aged 15 to 64 years.

Figure 9. Five leading causes of nonfatal injuries requiring hospitalization among Hawaii residents, by age group, 2003-2006.

Rank	infants (220 total)	1-14 y (2,002)	15-24 y (3,570)	25-34 y (2,675)	35-44 y (2,652)	45-64 y (4,916)	65-74 y (1,910)	75 + y (6,887)	total (24,832)
1	falls 69	falls 668	mvc*-occupant 842	mvc*-occupant 433	falls 423	falls 1465	falls 1052	falls 5141	falls 9509
2	assault 26	mvc*-occupant 159	suicide 424	falls 343	mvc*-occupant 372	mvc*-occupant 522	mvc*-occupant 140	mvc*-occupant 182	mvc*-occupant 2664
3	fire/burn 14	striking 157	assault 351	suicide 334	suicide 276	suicide 389	pedestrian 68	poisoning 106	suicide 1554
4	mvc*-occupant 14	mvc*-bicyclist 120	falls 348	assault 256	assault 256	poisoning 266	poisoning 57	pedestrian 88	assault 1172
5	suffocation 12	pedestrian 104	motorcycle 318	motorcycle 245	motorcycle 208	motorcycle 227	striking 49	striking 83	motorcycle 1090

*mvc = motor vehicle crash

Falls were also the leading cause of nonfatal injuries that were treated in EDs for all ages considered together and within most age groups (Figure 10). Injuries resulting from being "struck by objects or persons" were the leading cause for 15 to 34 year-olds, and the 2nd leading cause for the youngest (under 15 years of age) and oldest (75 years and older) patients. Cutting and piercing injuries were prominent, being the 2nd leading cause among 25 to 74 year-old patients. Most of these (58%) were coded as injuries from "other" objects, including broken glass and nails. Knives caused 21% of these injuries, and 5% were from powered hand tools. Car crashes were the 2nd leading cause among 15 to 24 year-olds and the 4th leading cause overall.

Figure 10. Five leading causes of nonfatal injuries requiring treatment at emergency departments among Hawaii residents, by age group, 2003-2006.

Rank	infants (2,818)	1-14 y (61,170)	15-24 y (52,379)	25-34 y (41,390)	35-44 y (37,899)	45-64 y (53,296)	65-74 y (11,330)	75 + y (20,214)	total (280,496)
1	falls 1386	falls 19587	striking[1] 9101	striking[1] 5672	falls 5290	falls 11818	falls 4283	falls 12036	falls 65509
2	striking[1] 275	striking[1] 11840	mvc*-occupant 6722	cut/pierce 5572	cut/pierce 5065	cut/pierce 6656	cut/pierce 1111	striking[1] 1170	striking[1] 39472
3	natural/environ[2] 126	cut/pierce 4125	falls 6288	falls 4821	striking[1] 4674	striking[1] 5843	striking[1] 897	cut/pierce 892	cut/pierce 29338
4	cut/pierce 85	over-exertion[3] 3312	cut/pierce 5832	over-exertion[3] 4306	over-exertion[3] 3754	mvc*-occupant 4809	mvc*-occupant 889	mvc*-occupant 783	mvc*-occupant 22362
5	fire/burn 85	natural/environ[2] 321	assault 4920	mvc*-occupant 4050	mvc*-occupant 3362	over-exertion[3] 4419	natural/environ[2] 625	natural/environ[2] 558	over-exertion[3] 21372

*mvc = motor vehicle crash

1 Most (91%) of these were coded as "struck accidentally by objects or persons", most commonly (17%) in sports. Also includes 9% that were struck by "falling object".

2 Unintentional injuries from "natural and environmental factors". Most commonly consisted of dog bites (32%), bites from wasps and bees (17%), centipedes (14%), or marine animals or plants (5%).

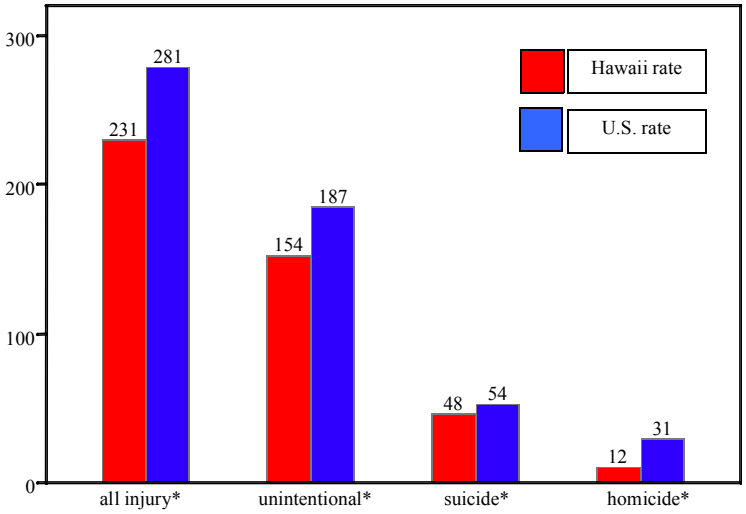
3 Unintentional injuries from "overexertion and strenuous movements", including injuries from "lifting, pulling, pushing", and "excessive physical exercise".

Comparisons with the Rest of the United States

Fatal injuries

The rate of fatal injuries in Hawaii was significantly lower (by 18%) than the rate for the rest of the U.S. Figure 11 shows there were significant differences in the rates of injuries for each type of intent. Fatal unintentional injury rates were 18% lower in Hawaii, suicide rates 11% lower in Hawaii, and homicide rates in Hawaii were less than half those for the rest of the U.S.

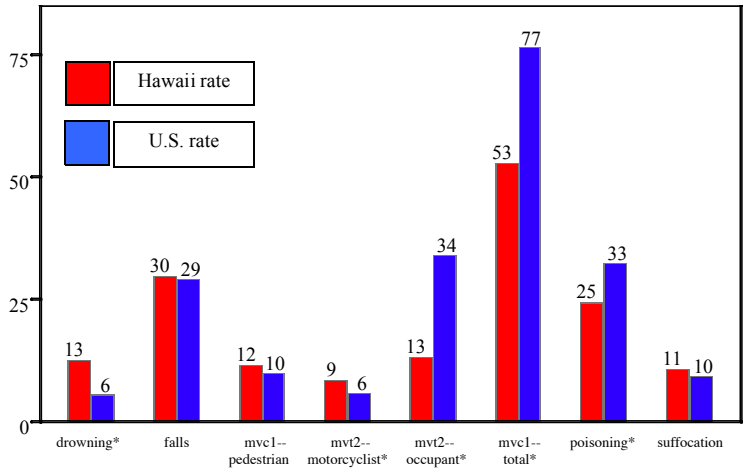
Figure 11. Age-standardized 5-year rates (/100,000) of fatal injuries among Hawaii and (non-Hawaii) U.S. residents, by intent, 2001-2005.



*Denotes statistically significant difference in rate between Hawaii and rest of U.S.

Fatality rates among car occupants were 62% lower for Hawaii residents, compared to other U.S. residents (Figure 12). This was the primary reason for the low rate of fatal unintentional injuries in Hawaii, compared to the rest of the U.S. Fatality rates for pedestrians and motorcyclists were higher for Hawaii residents, but represent a less frequent cause of death. Drowning was the only other category for which the rate in Hawaii was significantly higher than that for the rest of the U.S. Rates of fatal falls, pedestrian crashes, and suffocations were statistically comparable between Hawaii and the remaining U.S. residents, while rates of deaths from poisonings were significantly lower among Hawaii residents.

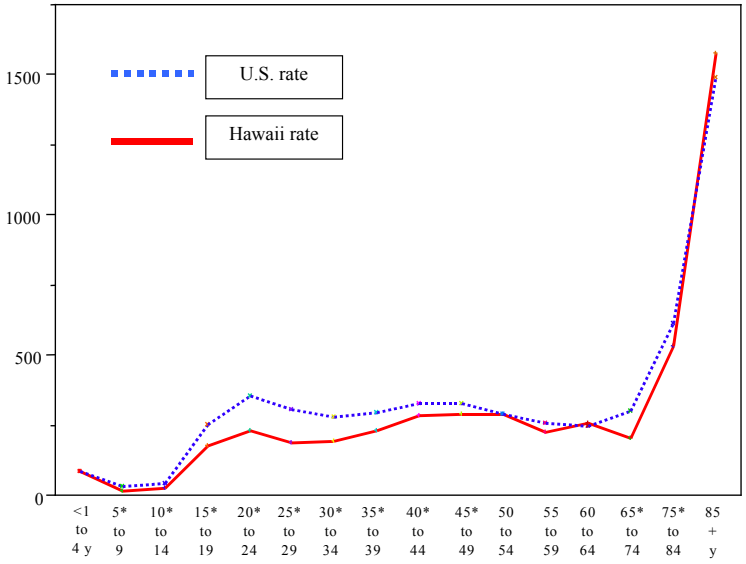
Figure 12. Age-standardized 5-year rates (/100,000) of fatal unintentional injuries among Hawaii and (non-Hawaii) U.S. residents, by category, 2001-2005.



1 mvc = motor vehicle crash. Includes non-traffic fatalities (those not occurring on public roads).
2 mvt = motor vehicle traffic. Includes only those fatalities that occurred on public roads.
*Denotes statistically significant difference in rate between Hawaii and the rest of the U.S.

Rates of fatal injuries were significantly lower in Hawaii than in the rest of the U.S. for most of the age groups shown in Figure 13. The most pronounced differences were in early adulthood (from 15 to 34 years of age). The shape of the curve in Hawaii was otherwise similar to the rest of the U.S. In Hawaii, rates were relatively low during childhood, began to rise around 15 years of age, and then leveled off until a dramatic increase at about 75 years of age.

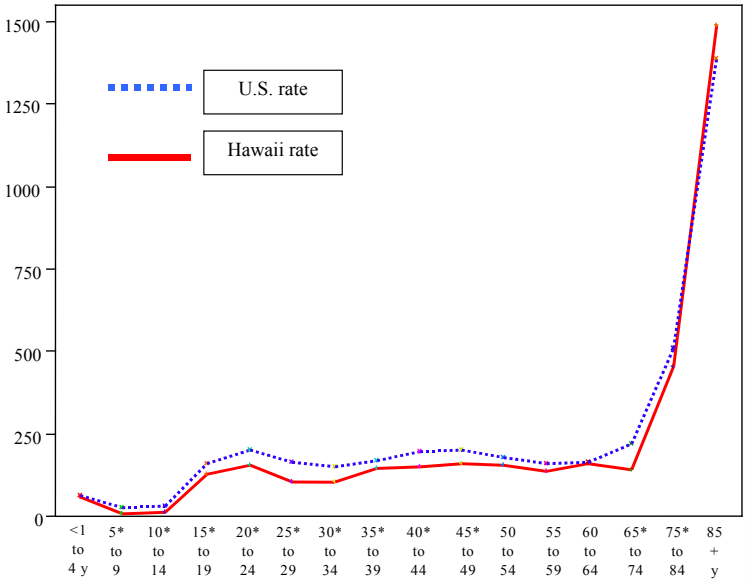
Figure 13. Five-year rates (/100,000) of fatal injuries among Hawaii and (non-Hawaii) U.S. residents, by age group, 2001-2005.



*Denotes statistically significant difference in rate between Hawaii and rest of U.S.

Rates of unintentional injuries (Figure 14) followed a similar age pattern to that for all types of injuries (Figure 13). Again, the (non-Hawaii) U.S. rate was higher than the Hawaii rate at nearly every age, except ages 85 and older. Rates were significantly lower among Hawaii residents aged 5 to 49 years of age, and 65 to 84 year-old residents.

Figure 14. Five-year rates (/100,000) of unintentional injuries among Hawaii and (non-Hawaii) U.S. residents, by age group, 2001-2005.

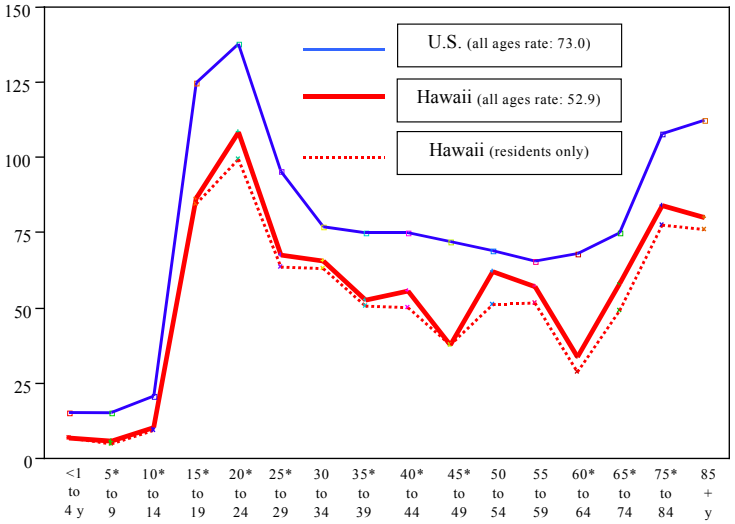


*Denotes statistically significant difference in rate between Hawaii and rest of U.S.

Fatality rates from traffic crashes were significantly lower for Hawaii compared to the rest of the United States for most age groups, and 28% lower overall (Figure 15). For both Hawaii and the rest of the U.S., the age pattern was similar: lowest rates through age 14, then rising sharply to a peak in the 15 to 24 year age group, followed by a gradual decline through age 64, before increasing again among senior-aged victims.

Figure 15. Five-year rates (/100,000) of fatal injuries from traffic crashes, Hawaii vs. rest of the U.S., by age group, 2001-2005.

(FARS data, which includes non-resident fatalities, but excludes non-traffic crashes.)

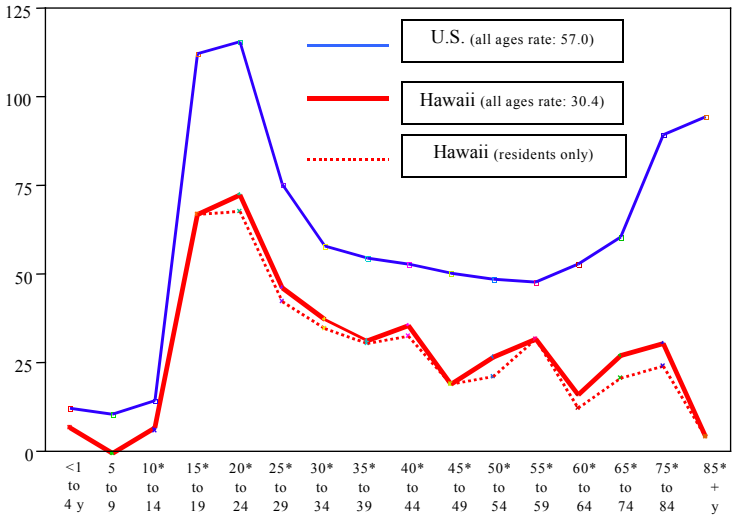


*Denotes statistically significant difference in rate between Hawaii and rest of U.S.

There was an even larger discrepancy when comparing car occupant fatality rates, as the rate for Hawaii was nearly half (46% lower) that for the rest of the U.S. (Figure 16). Statistically significant differences were noted for every age group from 10 years and older. Since car occupants comprised the majority (78%) of traffic crash fatalities for the rest of the U.S., the age pattern is similar to that for all types of traffic-related fatalities (Figure 15, above). For Hawaii, the sharp rise in rates for 15 to 24 year-olds is still evident, but the ensuing decline is consistent throughout successive age ranges; there was no increase in rates among senior aged victims (see Figure 15). Rates among those 85 and older in Hawaii are almost as low as those for children aged 14 and younger.

Figure 16. Five-year rates (/100,000) of fatal traffic injuries among car occupants, Hawaii vs. rest of the U.S., by age group, 2001-2005.

(FARS data, which includes non-resident fatalities, but excludes non-traffic crashes.)

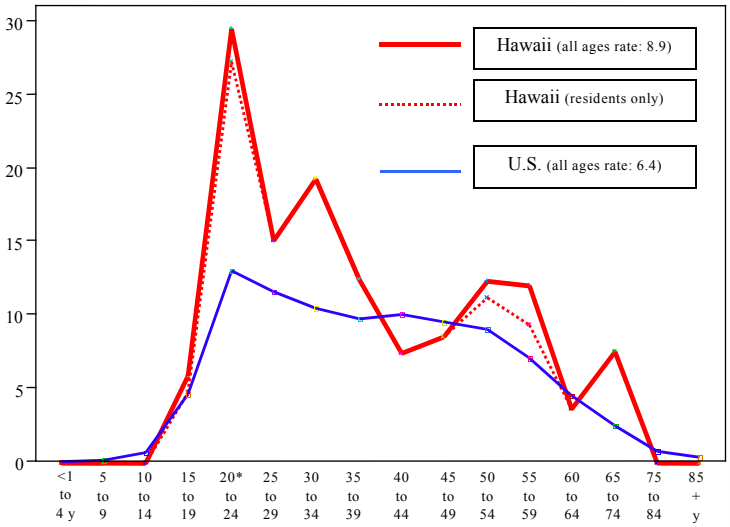


*Denotes statistically significant difference in rate between Hawaii and rest of U.S.

The age-standardized motorcyclist fatality rate for Hawaii was significantly greater than that for the rest of the U.S., and Figure 17 shows this is mostly due to elevated rates in the 20 to 34 year age groups in Hawaii. Overall, rates for Hawaii were 39% greater, but 84% higher for this age range (21.5 deaths/100,000 for Hawaii, vs. 11.7 for the rest of the U.S.). Fatality rates generally declined from the peak age of 20 to 24 years for both Hawaii and the rest of the U.S.

Figure 17. Five-year rates (/100,000) of fatal traffic injuries among motorcyclists, Hawaii vs. rest of the U.S., by age group, 2001-2005.

(FARS data, which includes non-resident fatalities, but excludes non-traffic crashes.)

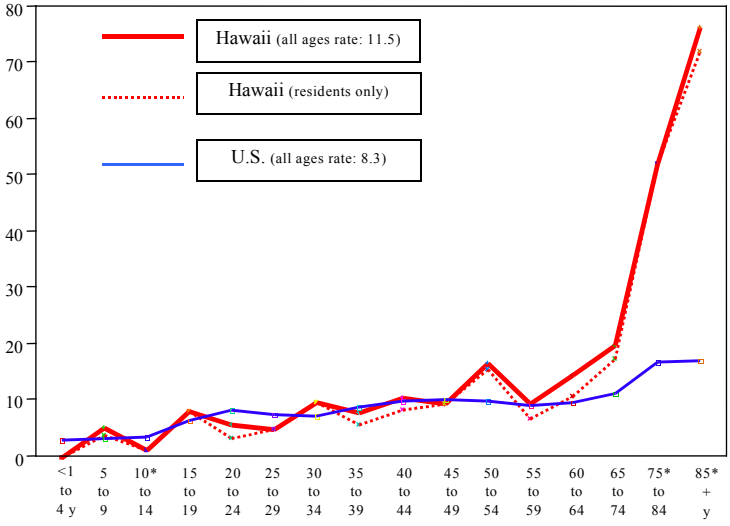


*Denotes statistically significant difference in rate between Hawaii and rest of U.S.

Hawaii also had significantly higher pedestrian fatality rates than the rest of the U.S., because of extremely high rates among those aged 75 to 84, and especially those aged 85 years and older (Figure 18). Although the highest rates for the rest of the U.S. were also seen in these latter two age groups, they were only about twice as high (221% greater) compared to younger age groups, while for Hawaii the rates for victims aged 75 years and older were almost 7 times (672%) higher than for other age groups. Fatality rates for all age groups younger than 75 years were statistically comparable between Hawaii and the rest of the U.S., with rates generally increasing with age.

Figure 18. Five-year rates (/100,000) of fatal traffic injuries among pedestrians, Hawaii vs. rest of the U.S., by age group, 2001-2005.

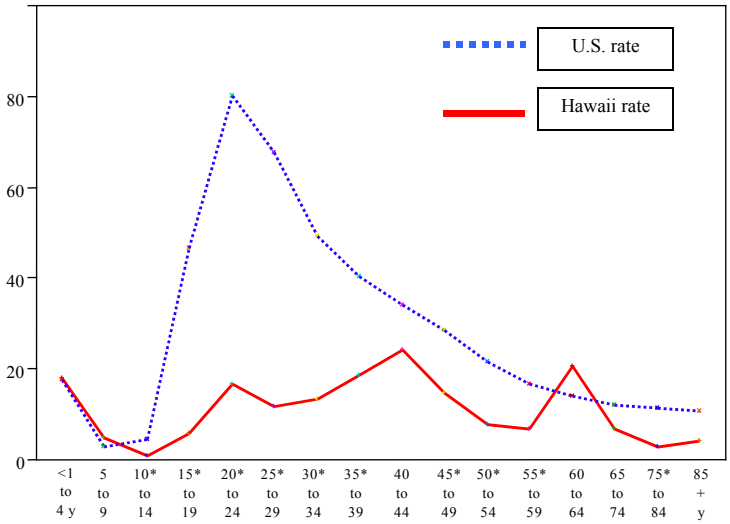
(FARS data, which includes non-resident fatalities, but excludes non-traffic crashes.)



*Denotes statistically significant difference in rate between Hawaii and rest of U.S.

Compared to the rest of the U.S., homicide rates were significantly lower in Hawaii at every age group between 10 and 59 years, except for the 40 to 44 year age group (Figure 19). There was a pronounced peak from 15 to 39 years of age in the U.S. that was largely absent among Hawaii residents.

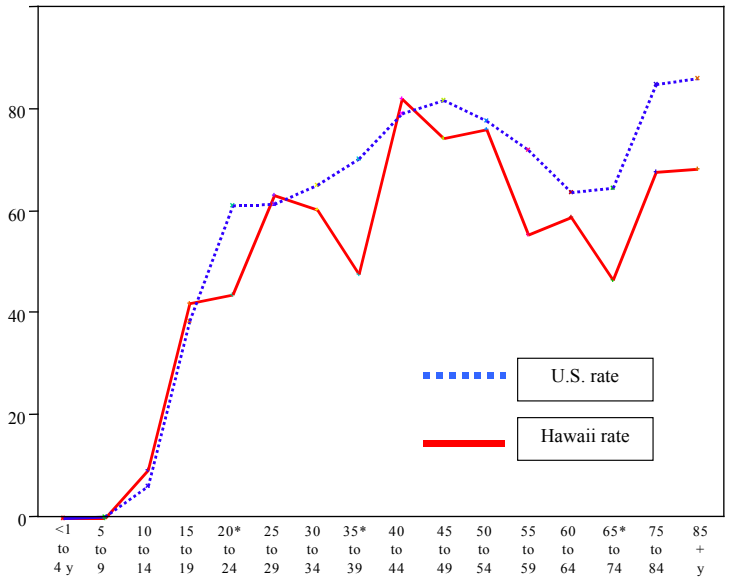
Figure 19. Five-year rates (/100,000) of homicides among Hawaii and (non-Hawaii) U.S. residents, by age group, 2001-2005.



*Denotes statistically significant difference in rate between Hawaii and rest of U.S.

Age-specific suicide rates were generally comparable between Hawaii and the rest of the U.S. (Figure 20). Rates were close to zero until the teenage years, rose sharply by age 20 and reached a peak in the 40 to 54 year age groups. Rates declined thereafter before rising sharply in old age (75 years or older). Rates in Hawaii were slightly higher in early adulthood (2 to 35 years), but lower in old age. The rates in Hawaii were somewhat lower than rates for other U.S. residents at most age groups, although there were few statistically significant differences.

Figure 20. Five-year rates (/100,000) of suicides among Hawaii and (non-Hawaii) U.S. residents, by age group, 2001-2005.

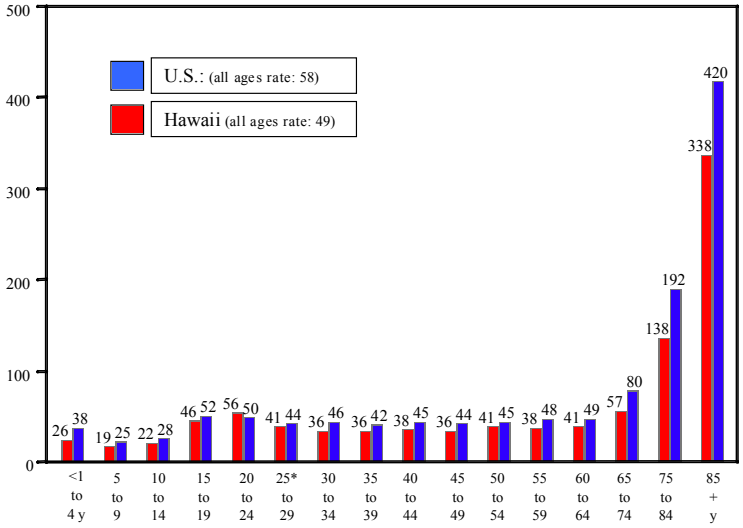


*Denotes statistically significant difference in rate between Hawaii and rest of U.S.

Nonfatal injuries

The rate of hospitalization for nonfatal injuries was significantly lower (by 18%) for Hawaii residents compared to the U.S. as a whole (Figure 21). The rate was lower for Hawaii residents at every age group except for 25 to 29 year-olds. The largest discrepancies were computed for the youngest (under 5 years) and oldest (ages 65 and older) age groups. Figure 21 also shows the association between age and rate of hospitalization was similar for Hawaii and the U.S.: rates were lowest for 5 to 14 year-olds, increased from ages 15 to 24, then stayed relatively constant until large successive increases beginning at 65 years of age. Rates for residents 75 years and older were 3 to 8 times higher than rates for most other age groups. Similar findings were noted when analyzing the hospitalization rates within each gender.

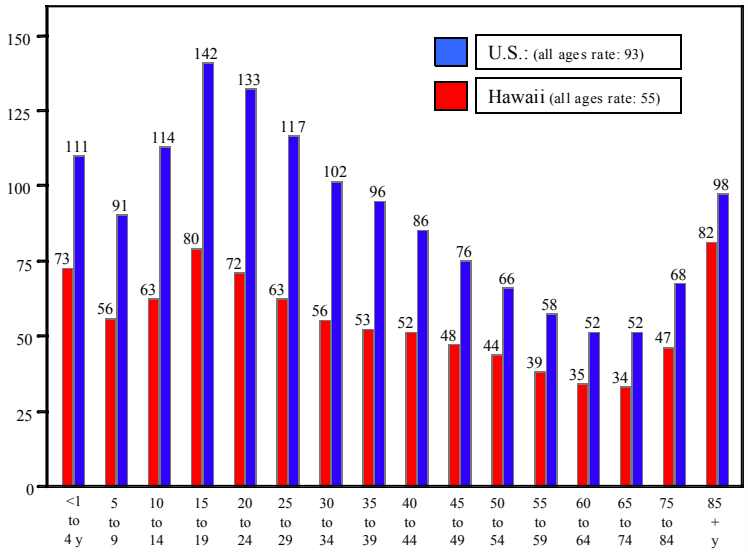
Figure 21. Average annual rates of hospitalization (per 10,000 residents) for nonfatal injuries, Hawaii residents vs. the United States, by age of patient.



*Denotes non-significant difference in rate between Hawaii and rest of U.S.

Rates of ED visits for nonfatal injuries were nearly twice as high for the U.S. as a whole compared to rates for Hawaii residents (Figure 22). There were statistically significant differences in the rates at every age group, but the biggest differences were seen for the 10 to 39 year age ranges. The relationship between age and rates of ED visits was similar for Hawaii residents and the U.S., with peak rates in the 15 to 24 year age group and the 85 and older age group. A different pattern was seen for hospitalization rates, where there was a pronounced peak in the oldest age groups (see Figure 21). Rates of ED visits generally declined over the 24 to 74 year age range in both places.

Figure 22. Average annual rates of ED visits (per 1,000 residents) for nonfatal injuries, Hawaii residents vs. the United States, by age of patient.



Unintentional Injuries Among Hawaii Residents

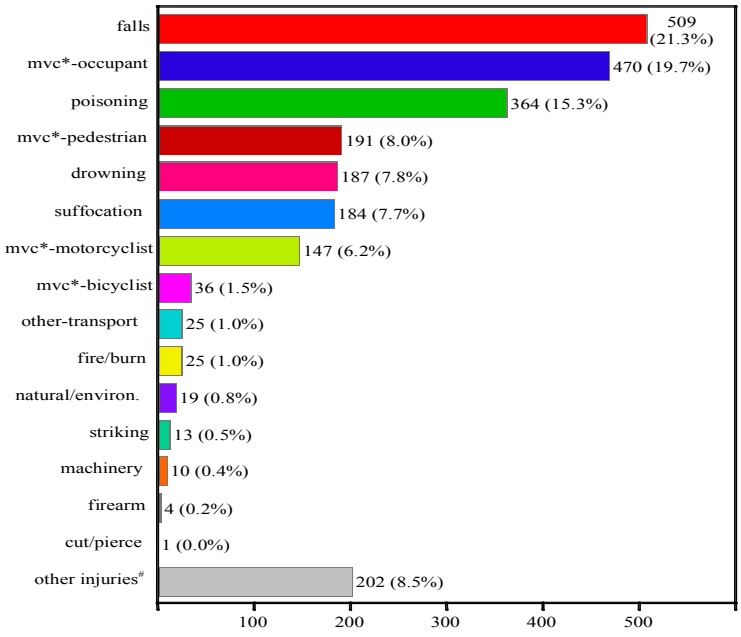
Fatal injuries

Motor vehicle traffic crashes were the dominant cause of the 2,387 unintentional injury deaths (Figure 23), although falls were the single leading cause. Deaths among drivers and occupants of motor vehicles (excluding motorcycles) accounted for nearly one-fifth of the total number of unintentional injury deaths. The 844 combined vehicular deaths accounted for 35% of the total number of unintentional injury deaths. Other common causes of unintentional injury deaths were poisonings (15.3% of all deaths), drownings (7.8%), and suffocations (7.7%). The following sections will discuss these more common unintentional injury categories in more detail.

Unintentional injury deaths occurred at all ages, but Figure 24 below shows two particularly noticeable peaks: young adults (ages 15-54) and the elderly (over 75 years). Male victims outnumber females by more than 2-to-1, as 69% (1,656) of the 2,387 victims of unintentional injuries were males, and 31% (731) were females. Figure 24 shows that this gender disparity was lowest among the youngest (ages 0 to 14) and oldest (ages 75 and older) victims, although this equality in the latter is at least partly due to the relative longevity of females.

The age distribution varied somewhat by the category of injury death. For example, while drownings and bicyclist deaths were more evenly distributed across the age range, 77% of the fall victims were 65 years of age or older. Similarly, there was some variation in the proportion of gender by the category of injury. Males formed the vast majority of victims who died in motorcycle crashes (97%), bicycle crashes (91%), drownings (88%), and poisonings (77%). Although males still represented the majority, gender was more equally distributed among victims of falls (57%), pedestrian fatalities (63%), and suffocations (58%). The age and gender distribution of victims will be examined more closely in specific injury sections.

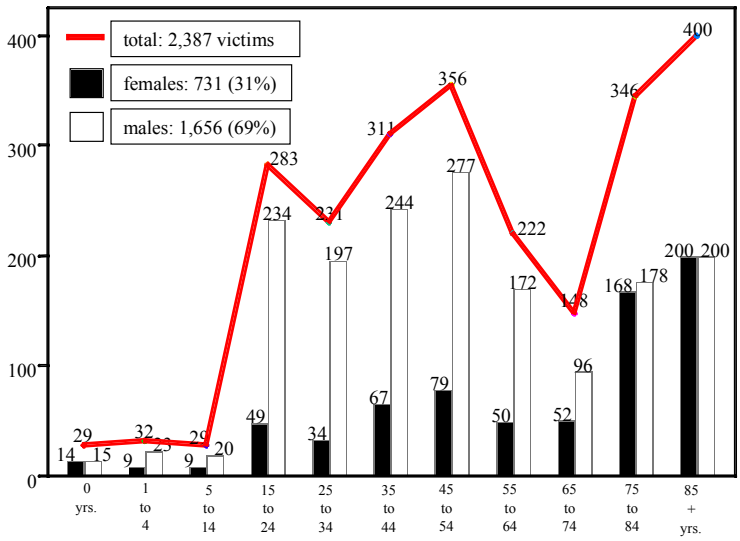
Figure 23. Fatal unintentional injuries among residents of Hawaii, by injury category, 2001-2006.



*mvc=motor vehicle crash.

Most of these (168, or 83%) were due to "exposure to unspecified factor". There were also 25 deaths due to "late effects" (more than 1 year) from car crashes and "other accidents"

Figure 24. Age and gender distribution of victims of fatal unintentional injuries in Hawaii, 2001-2006.



More than two-thirds (68%, or 1,622) of the unintentional injuries occurred in Honolulu County. Of the remaining 765 fatalities on the Neighbor Islands, more than half (55%, or 424) occurred in Hawaii County. There were 228 deaths in Maui County (10% of the state total), and 113 in Kauai County (5%).

Although the number of fatalities was by far greatest on Oahu, Figure 25 shows the rate was highest for residents of Hawaii County. Rates there were at least 47% higher than for any other county and were significantly higher than all other 3 counties. The rates for Kauai, Maui and Honolulu counties were statistically comparable.

Figure 25. Number and rate of fatal unintentional injuries in Hawaii, by county of injury, 2001-2006.

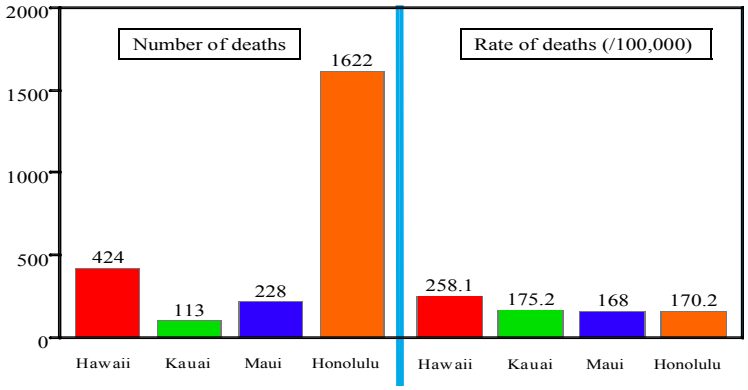
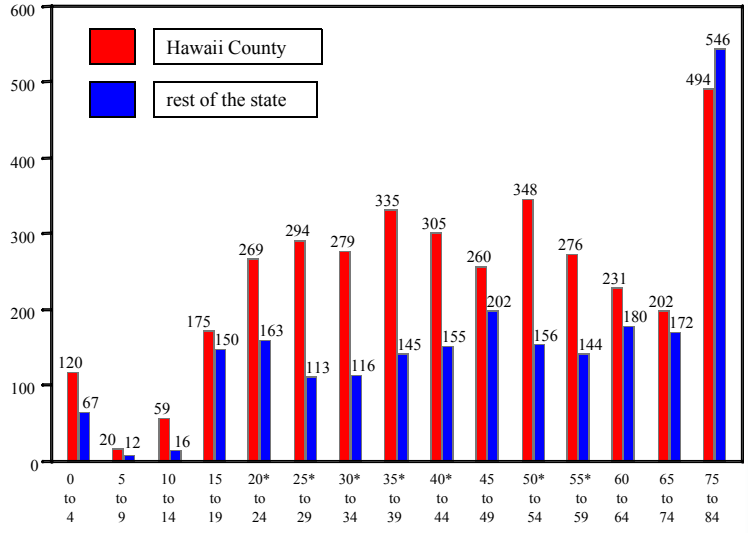


Figure 26 shows that unintentional injury rates were higher for Hawaii County residents at all ages, with the exception of the 75 to 84 year age group. (Rates among residents 85 years and older are not shown, to conserve the scale of the graph. The rate for Hawaii County residents aged 85 and older was 1574.0 deaths/100,000 residents, while the rate for the rest of the state was 1781.8/100,000 residents.) Compared to residents of other parts of the state, rates among Hawaii County residents were more than doubled for most of the age categories in the 20 to 59 year age range. Rates were more comparable across the two locales for the older victims (ages 60 and over).

Hawaii County residents comprised 30% of the victims killed in car crashes, 23% killed in motorcycle crashes, and 22% of those who drowned, although only 13% of the state population resided on the island of Hawaii over the 6-year period. These county disparities will be more fully examined in subsequent chapters.

Figure 26. Fatal unintentional injury rates (/100,000): residents Hawaii County vs. residents of other counties of Hawaii, by age group, 2001-2006.

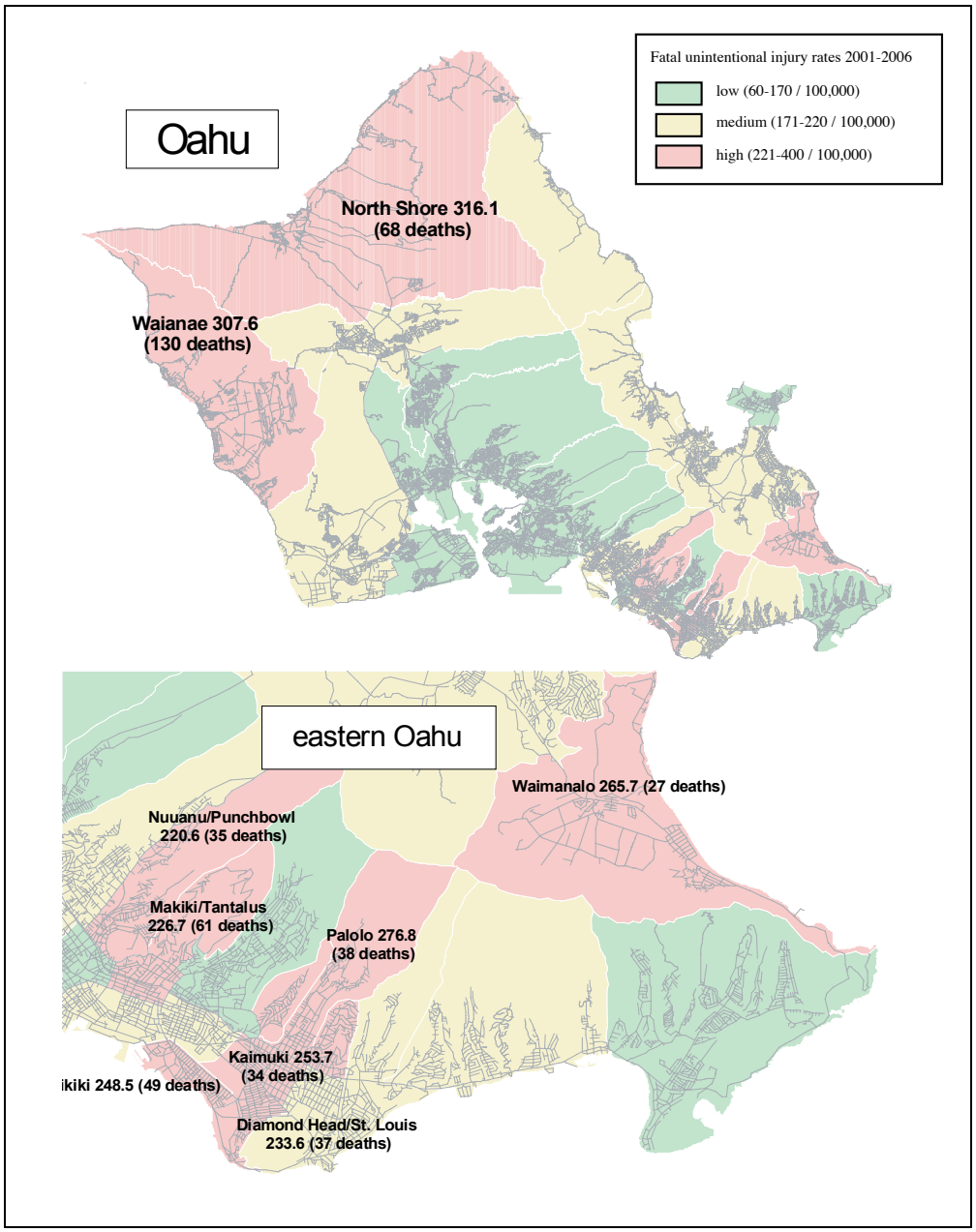


*Denotes statistically significant difference in rate between Hawaii County and the remainder of the state.

There were relatively few neighborhoods within Honolulu County with "high" unintentional injury fatality rates (Figure 27), although the North Shore and Waianae had the 3rd and 4th highest rates in the state, respectively. Most of central Oahu had "low" fatality rates (shown by green shading in Figure 27), while eastern Oahu had areas mostly in the "medium" or "high" rate categories (lower map on Figure 27). The rate for Waimanalo was the 9th highest in the state, although it was based on only 27 deaths over the 6-year period.

Figure 27. Rates of fatal unintentional injuries among Oahu residents, by area of residence, 2001-2006.

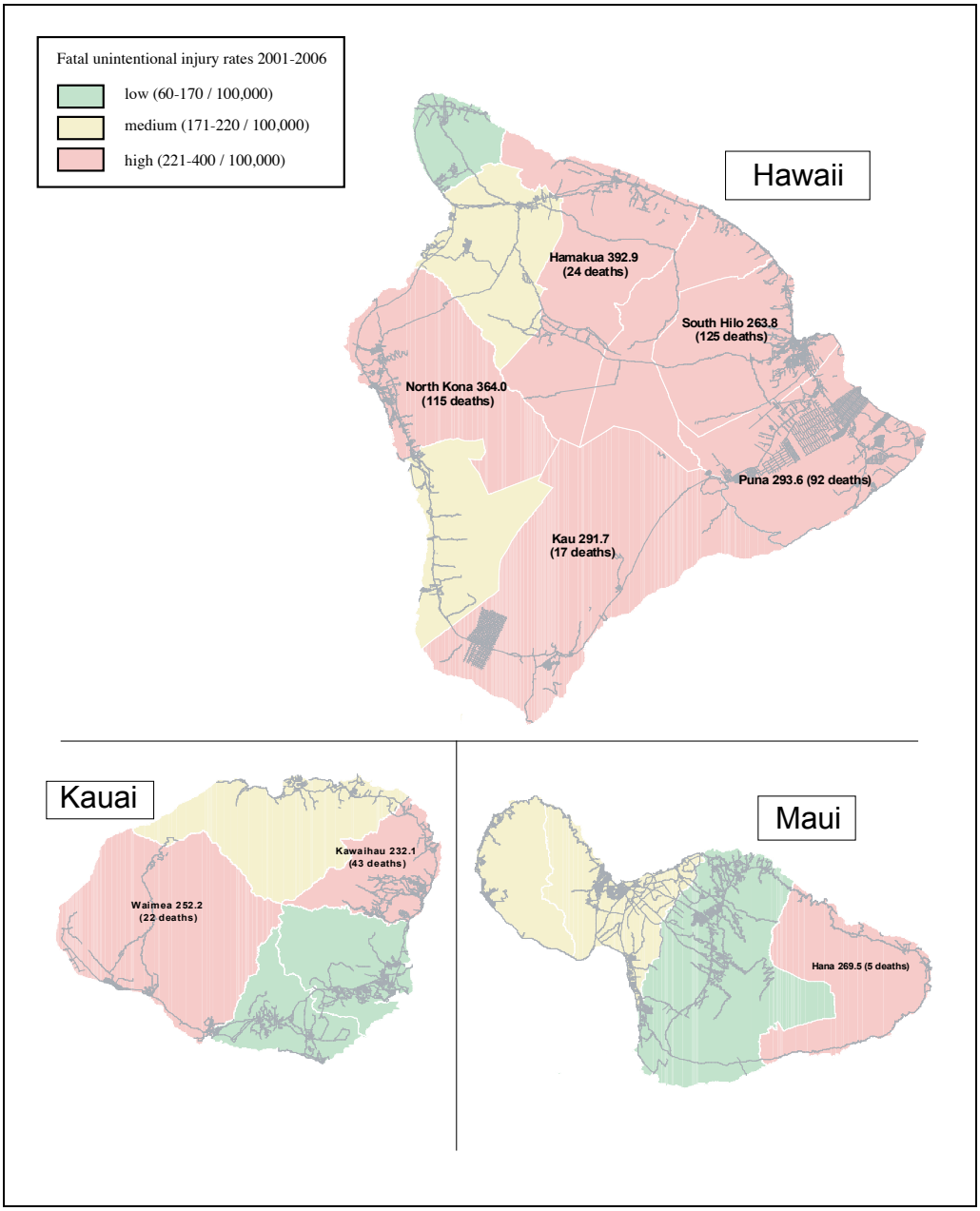
(Rate is per 100,000 residents, as estimated in 2000. Number of deaths is shown in parentheses. Rates based on 20 or fewer deaths are unreliable and should be interpreted with caution.)



Residents of nearly all parts of the island of Hawaii were at a higher risk of fatal unintentional injuries than residents of other areas of the state (Figure 28). The red shading in Figure 28 shows that 4 of the 6 highest rates were on the island of Hawaii (Hamakua, North Kona, Puna, and Kau). "High" rates were also computed for South Hilo. Other "high" risk districts on the Neighbor Islands were Waimea on Kawaihau on Kauai. (The high rate for Hana on the island of Maui is based on only 5 deaths, which is too few for a reliable rate calculation.)

Figure 28. Rates of fatal unintentional injuries among Neighbor Island residents, by area, 2001-2006.

(Rate is per 100,000 residents, as estimated in 2000. Number of deaths is shown in parentheses. Rates based on 20 or fewer deaths are unreliable and should be interpreted with caution.)



There were significant differences in the rates of fatal unintentional injuries among the 8 main ethnicities residing in Hawaii (Figure 29). Hawaiian and Japanese residents had the highest rates, significantly higher than rates for African-American, Chinese, Filipino and Korean residents. Rates for Japanese residents were also significantly higher than those for Caucasians, who had the 3rd highest rates. Chinese residents had the lowest rates, significantly lower than all other ethnic groups. The rates among African-Americans, Filipinos, Koreans, and Samoans were all statistically comparable.

Fatal unintentional injury rates were computed for different age groups within the 4 ethnicities in which there were at least 290 deaths (Figure 30). For all 4 ethnicities, the rates were lowest for the youngest residents (0 to 14 years), and then rose sharply after age 65. However, the shape of that overall rise varied between ethnicities. Hawaiians had the highest rates in all age groups between 15 and 64 years, significantly so for the 15 to 29 year age group, but relatively low rates among senior aged residents (65 years and older). Japanese residents had the highest rates in the senior age range.

Further analyses examined ethnic-specific rates for the leading unintentional categories of drowning, falls, motor vehicle occupant, and poisoning. These categories accounted for two-thirds (64%, or 1,249) of the 1,952 fatal unintentional injuries among these 4 ethnicities. Figure 31 shows that much of the excess risk among Hawaiian residents is due to higher rates of death among motor vehicle occupants, while much of the excess among Japanese residents is due to fatal falls (predominantly among victims aged 65 years or older). The drowning rates were generally comparable across the 4 ethnicities. Poisoning rates among Caucasians were significantly higher than those for the other 3 ethnicities

Figure 29: Unadjusted rates (/100,000) of fatal unintentional injuries, by ethnicity, 2001-2006.
(Number of deaths given in parentheses in bottom labels.)

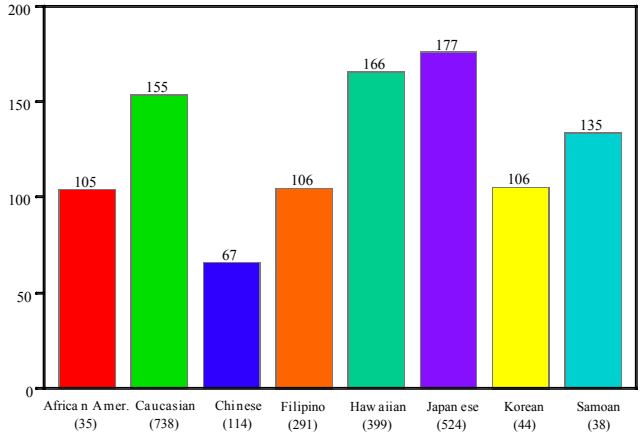


Figure 30: Unadjusted rates (per 100,000) of fatal unintentional injuries, by age group and ethnicity, 2001-2006.

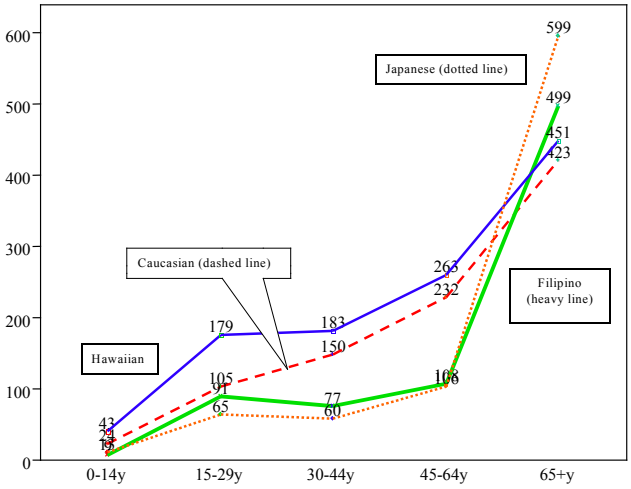
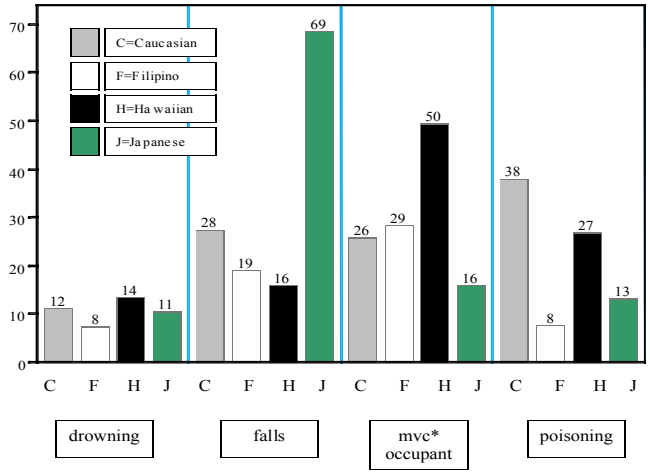


Figure 31: Unadjusted rates (per 100,000) of fatal unintentional injuries, by category and ethnicity, 2001-2006.



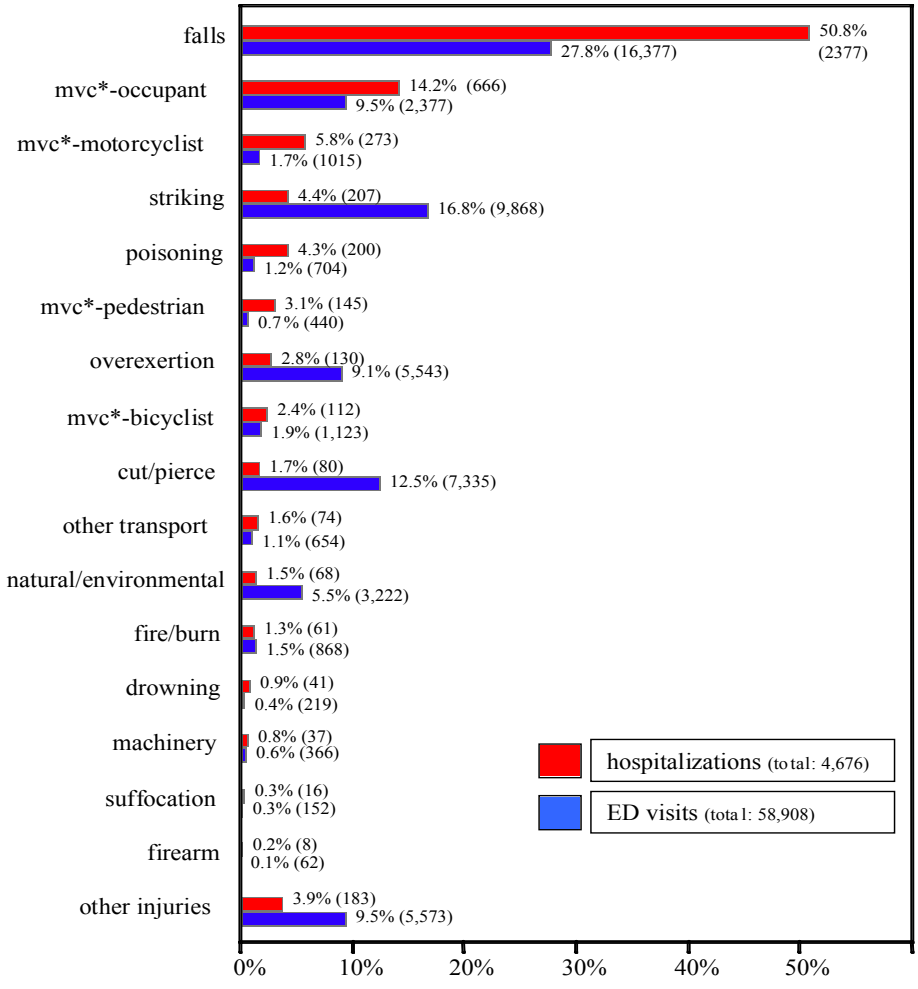
*mvc = motor vehicle crash

Nonfatal injuries

Falls were by far the leading cause of nonfatal unintentional injuries, accounting for half of those that required hospitalization, and more than one-quarter (28%) of those treated in EDs (Figure 32). About three-quarters (76%) of the injury-related hospitalizations were caused by either falls (51%) or motor vehicle crashes (26%), most commonly injuries to automobile occupants (14%). The causes of injuries that were treated in EDs were more evenly distributed, including proportionally fewer injuries from falls and motor vehicle crashes, and more injuries from being struck by objects or persons, overexertion, cutting and piercing injuries, and natural and environmental causes. Drowning and suffocation comprised negligible amounts of unintentional injuries at either level of medical care, although they were important causes of fatal injuries (see Figure 23). Unintentional injuries from fires, machinery and firearms were also relatively rare in either medical setting.

Figure 32. Causes of nonfatal unintentional injuries among Hawaii residents, by level of medical care.

(Percent of injuries by cause, average annual number listed in parenthesis.)



*mvc = motor vehicle crash

Table 4 lists the cause and average annual number of nonfatal unintentional injuries for each county of residence. The distribution of causes was generally similar across counties, with only a few exceptions. Proportionally more (53%) of injury-related hospitalizations among Honolulu County residents were due to falls compared to the other counties (45% to 47%), while automobile crashes were a less common cause among Honolulu County residents (12%, vs. 16% to 21% for other counties). Automobile crashes caused a larger proportion of injuries treated in EDs among Hawaii County residents (13%) than the other counties (8% to 10%), while Maui County had the highest proportion due to near-drownings (1.7%, vs. 0.3% or less for other counties).

Table 4. Causes of nonfatal unintentional injuries, by level of medical care and county of residence of patient.

(Average annual number of injuries, percent of county total given in parenthesis.)

	Hawaii County		Honolulu County		Kauai County		Maui County	
Injury	**ED**	**hosp.**	**ED**	**hosp.**	**ED**	**hosp.**	**ED**	**hosp.**
falls	3385 (27.4%)	342 (47.2%)	10196 (28.4%)	1587 (53.2%)	1360 (26.1%)	131 (44.7%)	1436 (26.5%)	318 (47.1%)
mvc*-occupant	1570 (12.7%)	149 (20.6%)	3085 (8.6%)	360 (12.1%)	399 (7.7%)	53 (17.9%)	537 (9.9%)	105 (15.5%)
mvc*-motorcyclist	243 (2.0%)	41 (5.6%)	523 (1.5%)	167 (5.6%)	91 (1.7%)	15 (5.2%)	159 (2.9%)	50 (7.3%)
striking	1783 (14.4%)	31 (4.2%)	6306 (17.5%)	127 (4.3%)	961 (18.4%)	18 (6.2%)	819 (15.1%)	31 (4.6%)
poisoning	137 (1.1%)	24 (3.3%)	415 (1.2%)	143 (4.8%)	40 (0.8%)	12 (3.9%)	112 (2.1%)	21 (3.1%)
mvc*-pedestrian	63 (0.5%)	16 (2.2%)	323 (0.9%)	113 (3.8%)	19 (0.4%)	5 (1.7%)	35 (0.6%)	11 (1.6%)
overexertion	1134 (9.2%)	13 (1.8%)	3221 (9.0%)	89 (3.0%)	561 (10.8%)	11 (3.8%)	427 (7.9%)	17 (2.5%)
mvc*-bicyclist	202 (1.6%)	14 (1.9%)	704 (2.0%)	76 (2.5%)	103 (2.0%)	7 (2.2%)	114 (2.1%)	16 (2.3%)
cut/pierce	1694 (13.7%)	17 (2.3%)	4288 (11.9%)	35 (1.2%)	706 (13.6%)	10 (3.2%)	647 (12.0%)	19 (2.7%)
other transport	137 (1.1%)	13 (1.8%)	348 (1.0%)	42 (1.4%)	66 (1.3%)	5 (1.8%)	104 (1.9%)	15 (2.2%)
natural/environmental	727 (5.9%)	14 (1.9%)	1880 (5.2%)	39 (1.3%)	312 (6.0%)	5 (1.5%)	304 (5.6%)	11 (1.6%)

*mvc = motor vehicle crash

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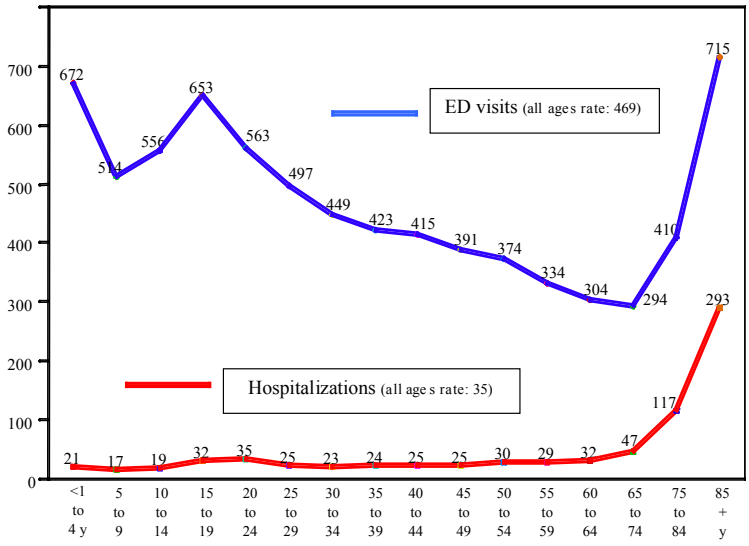
	Hawaii County		Honolulu County		Kauai County		Maui County	
Injury	**ED**	**hosp.**	**ED**	**hosp.**	**ED**	**hosp.**	**ED**	**hosp.**
fire/burn	178 (1.4%)	10 (1.4%)	516 (1.4%)	37 (1.2%)	98 (1.9%)	6 (1.9%)	76 (1.4%)	8 (1.2%)
drowning	37 (0.3%)	8 (1.1%)	76 (0.2%)	19 (0.6%)	13 (0.2%)	2 (0.5%)	94 (1.7%)	13 (1.9%)
machinery	95 (0.8%)	6 (0.8%)	199 (0.6%)	18 (0.6%)	40 (0.8%)	4 (1.4%)	33 (0.6%)	9 (1.3%)
suffocation	21 (0.2%)	2 (0.2%)	103 (0.3%)	11 (0.4%)	8 (0.2%)	1 (0.2%)	20 (0.4%)	24 (0.5%)
firearm	20 (0.2%)	2 (0.3%)	29 (0.1%)	5 (0.2%)	6 (0.1%)	1 (0.3%)	8 (0.1%)	1 (0.1%)
other injuries	924 (7.5%)	24 (3.3%)	3732 (10.4%)	119 (4.0%)	426 (8.2%)	11 (3.7%)	491 (9.1%)	29 (4.3%)
total	12347	725	35942	2984	5207	293	5414	674

*mvc = motor vehicle crash

The rate for nonfatal unintentional injuries treated in EDs (469 injuries/10,000 residents) was 13 times higher overall than rates for injuries requiring hospitalization (35/10,000) (Figure 33). This ratio varied over the age range, however, with the highest disparities for residents under age 15 (approximately 30-to-1 ratio), and lowest among those aged 85 years and older (2.4-to-1). Rates for ED visits were highest for young residents (under 25 years of age) and those 85 years and older, and were progressively lower for the intervening age groups. The pattern was different for injuries requiring hospitalizations, with lowest rates for residents under 15 years of age, followed by a peak for 15 to 24 year-olds, and a much greater peak among senior aged residents.

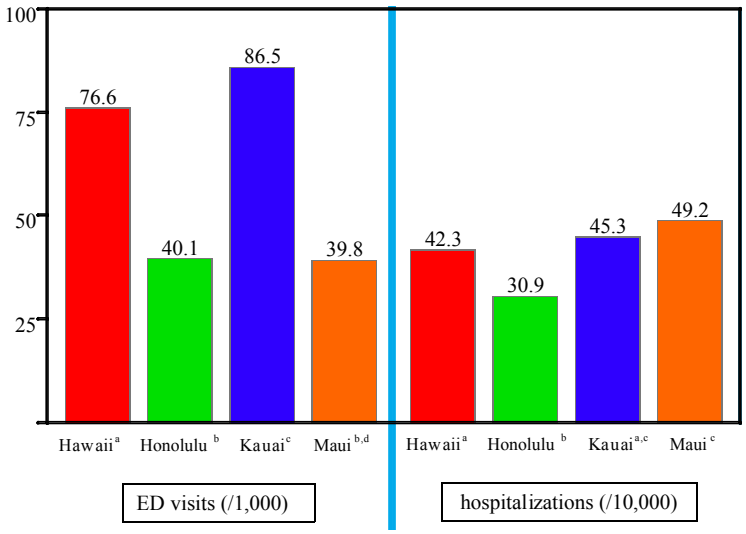
Figure 33. Average annual rates (per 10,000 residents) of hospitalizations and ED visits for nonfatal unintentional injuries in Hawaii, by age of patient.



Kauai and Hawaii counties had the highest rates of unintentional injuries that were treated in EDs, approximately double the rates for Honolulu and Maui counties (Figure 34). The rates for injuries requiring hospitalizations were more comparable across counties, although the rate for Honolulu County was significantly lower than rates for the other 3 counties.

Figure 34. Age adjusted annual rates of nonfatal unintentional injuries, by level of care and county of residence of patient.

(Note scale difference for ED and hospitalization rates.)

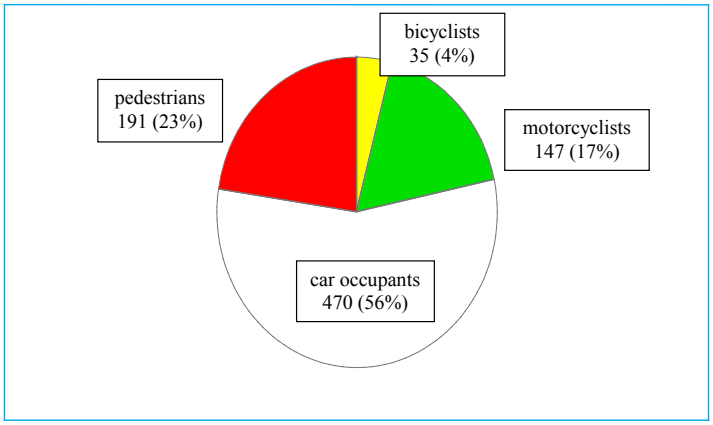


(Counties with the same superscripted letter have statistically comparable rate estimates.)

Motor Vehicle Crashes

Fatal injuries

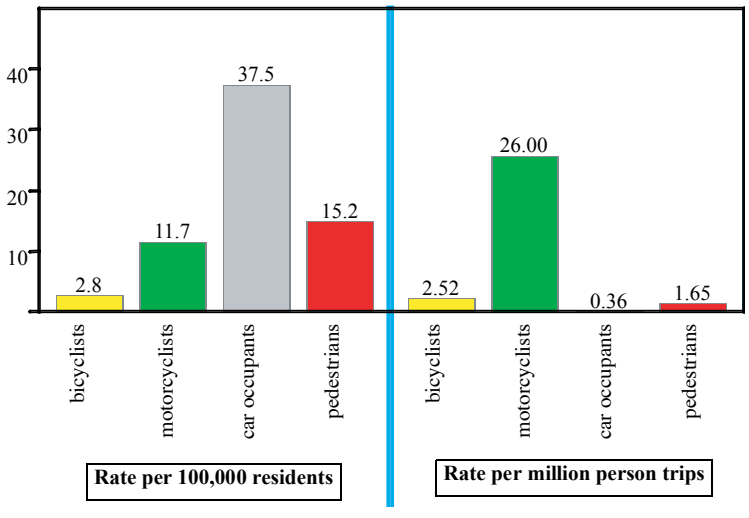
Figure 35. Hawaii residents killed in motor vehicle crashes, by person type, 2001-2006.



Deaths from motor vehicle crashes are categorized into 4 main types: those among the occupants of automobiles, motorcyclists, bicyclists and pedestrians. There is a separate chapter for each of these categories, since the demographics and risk factors are different for each. Figure 35 shows that slightly more than half (56%, or 470) of the 843 residents who died in motor vehicle crashes were car occupants. About one-quarter (23%, or 191) were pedestrians, 17% were riding motorcycles or mopeds, and the remaining 4% were bicyclists.

If fatality rates are computed the usual way, per resident population, then rates will resemble the distribution of fatalities shown in Figure 7, i.e. the fatality rate for occupants is approximately 3 times that for motorcyclists; the same ratio as the number of decedents for each type of crash. This is because the denominator used for this type of rate (resident population) is the same for each type of decedent; differences in rates are only dependent on differences in the numerator (number of deaths). Using resident population as the numerator implies that every person is potentially a car occupant, motorcyclist, pedestrian or bicyclist. This assumption is made because there is usually no alternative data to describe a person's "exposure" that is consistent across modes of transportation. We can not directly compare, for example, a fatality rate for pedestrians (adjusted for population, since most people actually are pedestrians) with a fatality rate for motorcyclists (adjusted for the number of registered motorcycles).

Figure 36. Six-year fatality rates from motor vehicle crashes in Hawaii, by person type, 2001-2006: Differences in per capita rates (left side) and rates based on person trips (right side).



Data from the National Household Travel Survey does provide common measures of exposure for different modes of travel. The NHTS was last conducted in 2001, and included data from 7,133 Hawaii residents from 3,300 households. Respondents were asked to keep a travel diary, from which the number of person trips were estimated for each mode of transportation. According to this survey, most (90.7%) trips in Hawaii were completed by passenger vehicle. Pedestrians accounted for most of the remaining trips (7.9%), followed by bicyclists (1.0%) and motorcyclists (0.4%). Figure 36 shows the relative differences in fatality rates when adjusted for population (left side of the graph) and number of person trips, using the NHTS data (right side). Car occupants clearly had the highest fatality rates for a given population, at least double the rates for pedestrians and motorcyclists, and 13 times that for bicyclists. Again, this is simply a reflection of the number of each type of fatality, as shown in Figure 35. When adjusted for the estimated number of person trips, however, motorcyclists had by far the highest fatality rate, and car occupants the lowest rate. For a given number of trips (1 million in this case), motorcyclists (26 deaths/million trips) were 72 times more likely to die in a crash compared to car occupants (0.36/million). Bicyclists and pedestrians were also significantly more likely to have been killed for a given number of person trips, compared to Hawaii residents who traveled by car. In summary, the NHTS exposure data suggests that travel by car is the safest mode in Hawaii, while motorcyclists are at the greatest risk for a given number of trips, followed by bicyclists and pedestrians.

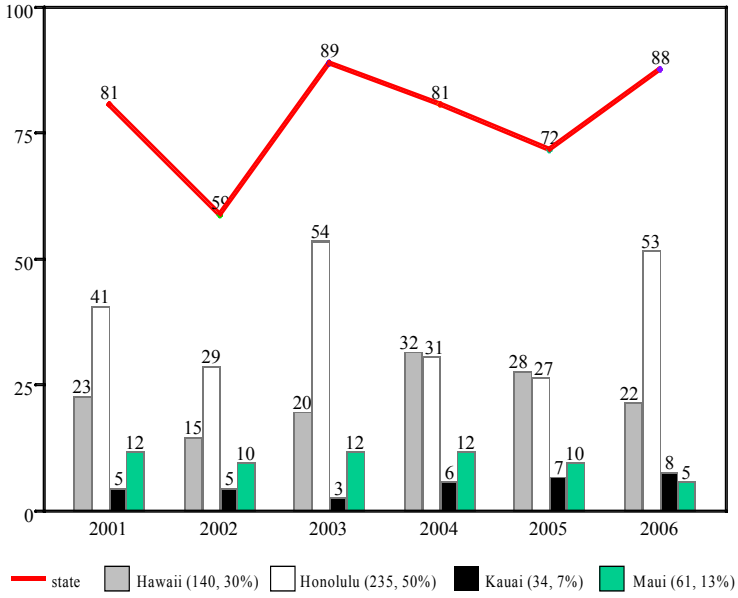
Motor Vehicle Occupants

Fatal injuries

Motor vehicle crashes were the second most frequent type of unintentional injury death in Hawaii, with 470 occupant fatalities over the 6-year period. There was no consistent trend in the annual number of such deaths (Figure 37). The 470 victims were killed in 336 separate crashes, as 373 (91%) of the crashes involved only a single fatality. There were 27 crashes with 2 victims each, 6 crashes with 3 victims each, and 5 crashes with 4 victims in each crash, and 1 crash with 5 victims.

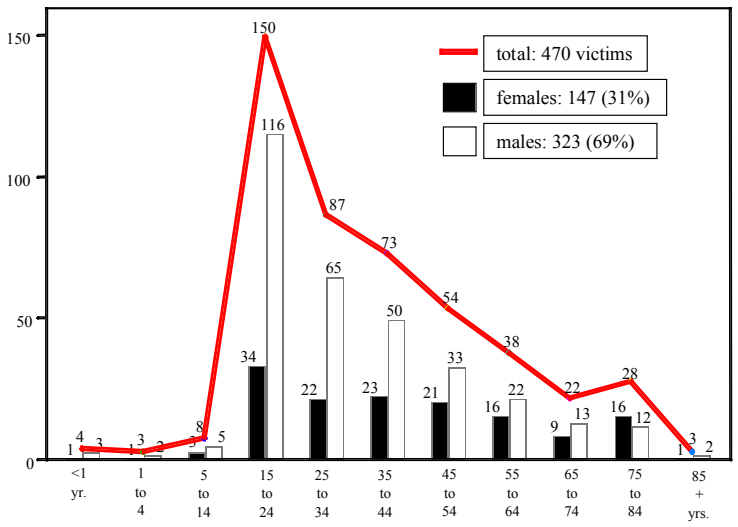
Exactly half (235, or 50%) of the victims were injured in Honolulu County. Nearly one-third (140, or 30%) were killed in Hawaii County, which is notable since only 13% of the population of the state resides in this county. The 2004 and 2005 fatality totals in Hawaii County exceeded those in Honolulu County. Maui and Kauai counties accounted for 13% and 7% of the victims, respectively. All but 3 of the 61 people who were killed in Maui County were injured on the island of Maui; 2 crashed on the island of Molokai, and 1 on Lanai.

Figure 37. Annual number of fatally injured car occupants in Hawaii, by county, 2001-2006.



The age distribution (Figure 38) showed a peak of fatalities in the 15 to 24 year age group. One-third (150, or 32%) of the 470 victims were in this age range. Another third (160, or 34%) of the victims were 25 to 44 years of age. Very few (15, or 3%) of the victims were under 15 years of age. Male victims (323) outnumbered females (147) by an more than a 2-to-1 ratio. The graph also shows that ratio was lower in the very young and very old age groups.

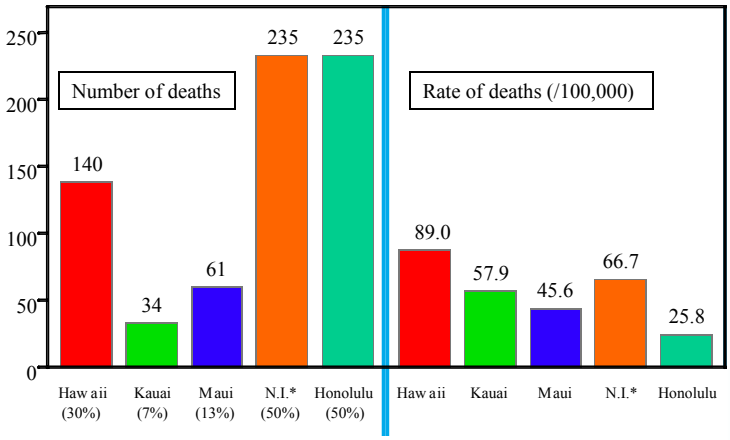
Figure 38. Age and gender distribution of fatally injured car occupants in Hawaii, 2001-2006.



Although the highest number of victims were injured on Oahu, the rate of fatal car occupant injuries was much higher among Neighbor Island residents (Figure 39). The rate for residents of Hawaii County was particularly high, more than 3 times higher than that computed for Honolulu County, and significantly higher than any other county. The rate for residents of Honolulu County was significantly lower than any other county. When considered as a whole, rates among Neighbor Island residents were two-and-a-half times higher than rates among residents of Honolulu County. The rates for Maui and Kauai counties were not significantly different from each other. (Results were similar if county-specific estimates for vehicle miles traveled were used as the rate denominator, instead of resident population.)

Figure 39. Number and rate of fatal injuries among car occupants in Hawaii, by county of injury, 2001-2006.

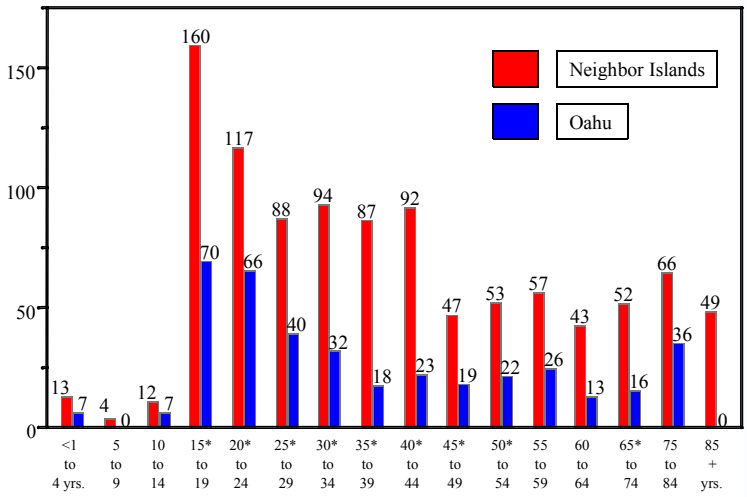
(Rate is per 100,000 residents, age adjusted to the 2000 U.S. population distribution.)



*N.I. = Neighbor Islands (combined totals for Hawai‘i, Kaua‘i, and Maui counties.)

Figure 40 shows that the pronounced rate differences between Neighbor Island residents and Oahu residents are evident in almost every age group. The main exception is among victims younger than 15 years of age, where there were relatively few fatalities. Rates for Neighbor Island residents were significantly greater than for Honolulu residents for every age group from 15 to 54 years. The graph also shows the general pattern of car occupant fatality rates: very low before the age of 15, then rising sharply to a peak in the 15 to 24 year age groups, then gradually decreasing before another rise at 75 years of age.

Figure 40. Five-year rates (/100,000) of fatal car occupant injuries among residents of Oahu (white bars), and Neighbor Islands (black bars), by age group, 2001-2006.



*Denotes statistically significant difference in rate between Neighbor Island and Honolulu residents.

There were 470 victims killed in 412 separate crashes. As many as 5 people died in a single car crash, although almost all (373, or 91%) of the 412 crashes involved only a single fatality. There was no noticeable seasonality in terms of the month of the year for the crashes. Saturdays (86 crashes, 21% of the total) and Sundays (69 crashes) were the most common days for fatal crashes. More than one-third (131, or 40%) of the crashes from 2001-2005 occurred during the 7-hour period of from 10:31 p.m. to 5:30 a.m., and more than half (198 crashes, or 60%) of the crashes occurred during nighttime hours (7:30 p.m. to 6:30 a.m.). (Crashes from 2006 are excluded from these time estimates, since they were not linked to FARS and this data was missing from 62% (41) of the 76 crashes in 2006.)

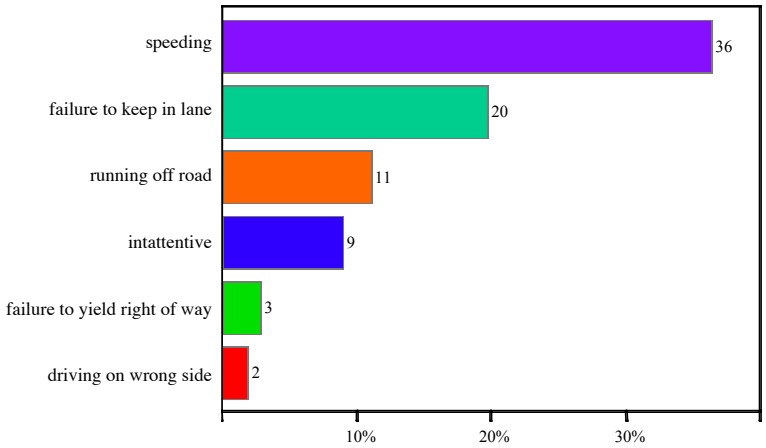
Most (351, or 92%) of the fatalities from 2001-2005 could be linked to FARS records which contain information on the involvement of alcohol, seat belt use and other risk factors in the crash. This data was available both for the crash decedents and other survivors involved in the crash. The remainder of this chapter (excluding the maps) utilizes FARS data, and is therefore restricted to the 351 victims who died in traffic crashes (i.e. those that occurred on public roadways) from 2001-2005.

Lack of restraint use was a major risk factor for occupant fatalities, as less than half of the victims were wearing seat belts at the time of the crash: 44%, or 139 of the 313 victims for whom information was available. Restraint use was lowest among passengers (47%, vs. 50% for drivers), especially back seat passengers (11%, or 3 out of 27). Restrained victims were significantly older than unrestrained victims (average age: 42 vs. 32 years). Seatbelt use was inversely associated with alcohol, as only 35% of the victims in alcohol-related crashes were restrained, compared to 55% of those in crashes not involving alcohol. This association was stronger when examined on the individual level, as only 37% of the fatally injured drivers who had been drinking were restrained, compared to 63% of the drivers who had not been drinking.

Slightly more than half (54%, or 166) of the 307 fatal crashes involved only a single vehicle, and were likely related to the driver losing control of the car. There was no annual trend in the proportion of fatal crashes that involved only a single vehicle. Kauai County had by far the highest proportion (73%, or 16 of 22 crashes) of single vehicle crashes; the proportion was 52% to 55% for the remaining 3 counties. Single vehicle crashes were significantly more likely to involve alcohol positive drivers than were crashes involving 2 or more cars (54% vs. 40%).

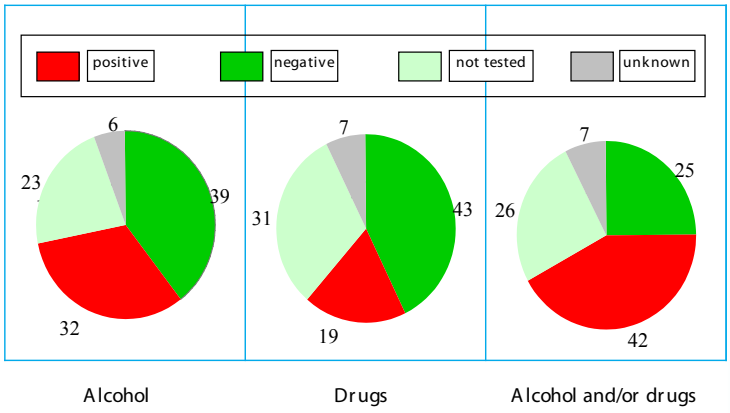
Among the 483 drivers involved in the fatal traffic crashes, the most common contributing factor was speeding, which was noted for more than one-third (36%, or 176) of the drivers (Figure 41). There was a significantly increasing trend in the annual proportion of drivers who were speeding, from 27% in 2001 to 50% by 2005. Drivers who were speeding were more likely to have a fatal injury (67%) compared to drivers who were not speeding (41%), partly because the former were much less likely to have been using seat belts (47% vs. 74%, respectively). Speeding was more common among drivers who crashed on Oahu (42%), compared to those who crashed on Neighbor Islands (31%). Another one-third (31%) of drivers crashed from losing control of their vehicles, either through failure to keep in the proper lane (20%), or running off the road (11%).

Figure 41. Contributing factors among drivers involved in fatal car crashes in Hawaii, 2001-2005.



Almost one-third (32%) of the drivers involved in fatal car crashes tested positive for alcohol, and almost one-fifth (19%) tested positive for drugs (Figure 42). Considered together, 42% of drivers tested positive for either alcohol or drugs. Most (79%, or 122 of 155) of the drivers who tested positive for alcohol had BAC levels of 0.08% or greater, including 65 drivers (42%) who had BAC levels of 0.16% or greater. There was no consistent trend in the annual proportion of drivers who were drinking, which varied from 27% to 42%. In contrast, the proportion of drug-positive drivers increased each year from 14% in 2001 to 24% by 2005. However, this positive trend may be due to a corresponding increase in drug testing over that time. If only drivers with known drug test results are considered, the proportion who tested positive was fairly constant across the 5-year period, varying only from 27% (2004) to 34% (2002). The most commonly occurring drugs were THC (61 drivers) and stimulants (38 drivers), principally methamphetamine (28 drivers) and amphetamine (18 drivers).

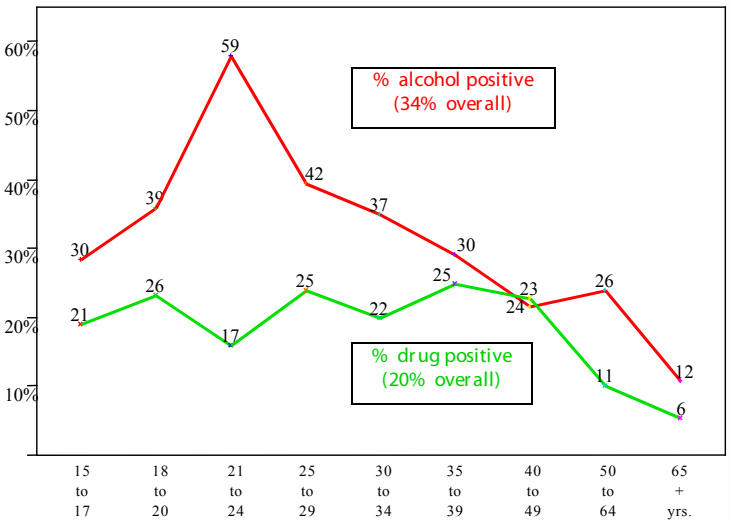
Figure 42. Alcohol and/or drug use (percent) among car drivers involved in fatal car crashes in Hawaii, 2001-2005.



The peak age of alcohol use among drivers was 21 to 24 years of age, as 59% (36 of 61) tested positive for alcohol (Figure 43). Alcohol use progressively decreased with increasing driver age after this peak, being lowest among senior aged drivers (12%). Underage drinking was highly prevalent in Hawaii. Nearly one-third of 15 to 17 year-old drivers were drinking, and the 18 to 20 year-old group had the 3rd highest proportion (39%) of alcohol positive drivers among the age groups listed. There was little association between driver age and positive drug tests, although the proportion decreased sharply by 50 years of age. The proportion varied little between from 15 to 49 years of age.

Figure 43. Alcohol and/or drug use (percent) among car drivers involved in fatal car crashes in Hawaii, by age of driver, 2001-2005.

(Drivers with unknown test status not included in percent calculation.)



Drivers who tested positive for alcohol and/or drugs were significantly different in a number of ways than drivers who were negative or not tested (Table 5). They were younger, and the drinkers were more likely to be male. They were 3 times more likely to have not been using seat belts at the time of the crash, and twice as likely to have been speeding. These behaviors contributed to elevated fatality rates among substance using drivers compared to other drivers.

Table 5. Characteristics of drivers involved in fatal car crashes in Hawaii, by category of substance use, 2001-2005.by age of driver, 2001-2005.

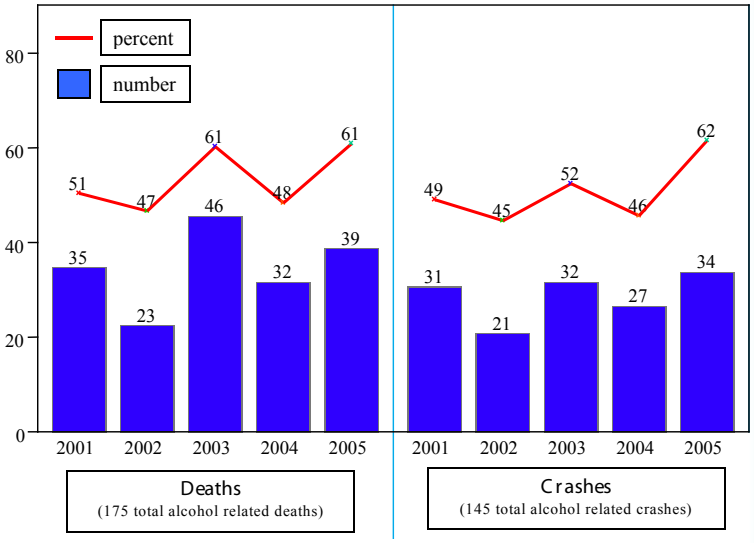
	Alcohol positive (155 drivers)	Drug positive (90 drivers)	No substances/ not tested (245 drivers)
Age			
average age	32 years*	33 years*	40 years*
ages 21 to 39 years	56%*	49%*	37%
Gender (% male)	83%*	79%	72%
Restraint use (% w/o seat belts)	58%*	58%*	16%
Speeding	57%*	46%*	22%
Previous DUI	6%	1%	3%
Previous suspension of license	12%*	5%	5%
Previous accidents	21%	21%	22%
Fatality rate	73%	66%*	35%
Weekend crash (Sat/Sunday)	42%*	29%	32%
Nighttime crash (8pm - 5am)	79%*	64%*	40%

*Indicates statistically significant difference between alcohol/drug positive drivers and drivers negative for these substances. Drivers with "unknown" values were excluded from these comparisons.

More than half of the fatal car crashes (51%) and resulting deaths (54%) were related to alcohol consumption among at least one driver (Figure 44). (All of the statistics in this section exclude crashes for which the alcohol status was unknown.) Although there were no consistent annual trends, the highest proportion of alcohol-related deaths and crashes occurred in 2005. Each year there was an average of 29 fatal crashes that involved alcohol, resulting in the deaths of 35 resident occupants. Alcohol involvement was greater when only nighttime (those occurring between 8 pm and 5 am) crashes are considered: 68% of the 162 crashes and 70% of the 189 resulting fatalities were alcohol-related. There was also an increasing (although not statistically significant) trend in the proportion of nighttime crashes that were related to alcohol, from 56% in 2001 to 84% (26 of 31 crashes) in 2005. Alcohol was involved in 58% of the 107 crashes on weekends (Saturday and Sunday), and this proportion generally increased from 50% in 2001 to 72% in 2005.

Figure 44. Annual number and percentage of alcohol related deaths (left side) and car crashes (right side) in Hawaii, 2001-2005.

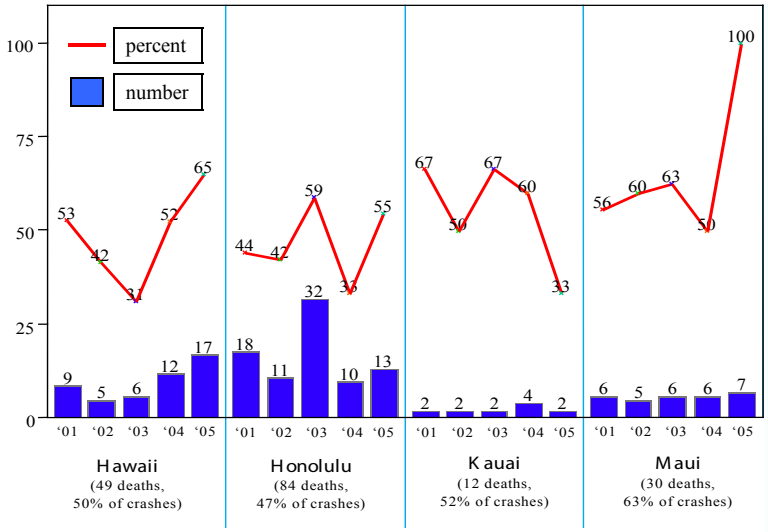
(Totals do not include 27 deaths and 22 crashes for which alcohol status was unknown.)



There were no consistent trends in the annual proportion of fatal car crashes involving alcohol or resulting number of resident deaths within any of the counties (Figure 45). There was an increase in the number of deaths in Hawaii County over the 2002-2005 period, however, and the number of alcohol-related deaths in Hawaii County exceeded that for Honolulu County for years 2004 and 2005. All of the 7 fatal car crashes in Maui County in 2005 were alcohol-related.

Figure 45. Annual number of alcohol related deaths (bars) and proportion of fatal car crashes related to alcohol (lines) in Hawaii, by county, 2001-2005.

(Totals do not include 27 deaths and 22 crashes for which alcohol status was unknown.)



Figures 46 and 47 show the approximate locations of the fatal crashes within each county, and the number of occupant fatalities by district. The alcohol status for the crash is color coded, although this was not available for 127 (31%) of the 412 crashes, including all 76 crashes in 2006. The districts with the 5 highest fatality totals were North Kona (35 deaths) and Puna (29) in Hawaii County, Wailuku (31) on Maui, and Makakilo/Kapolei (30) and North Shore (29) on Oahu. All of the 9 districts on Hawaii had at least 4 deaths, including 6 districts with 10 or more deaths. Only about one-quarter (55 of 230, or 24%) of the fatal crashes on Oahu were on the eastern end of the island (Figure 46).

Figure 46. Approximate location of fatal car crashes on Oahu and eastern Oahu (bottom map), by alcohol status, 2001-2006.

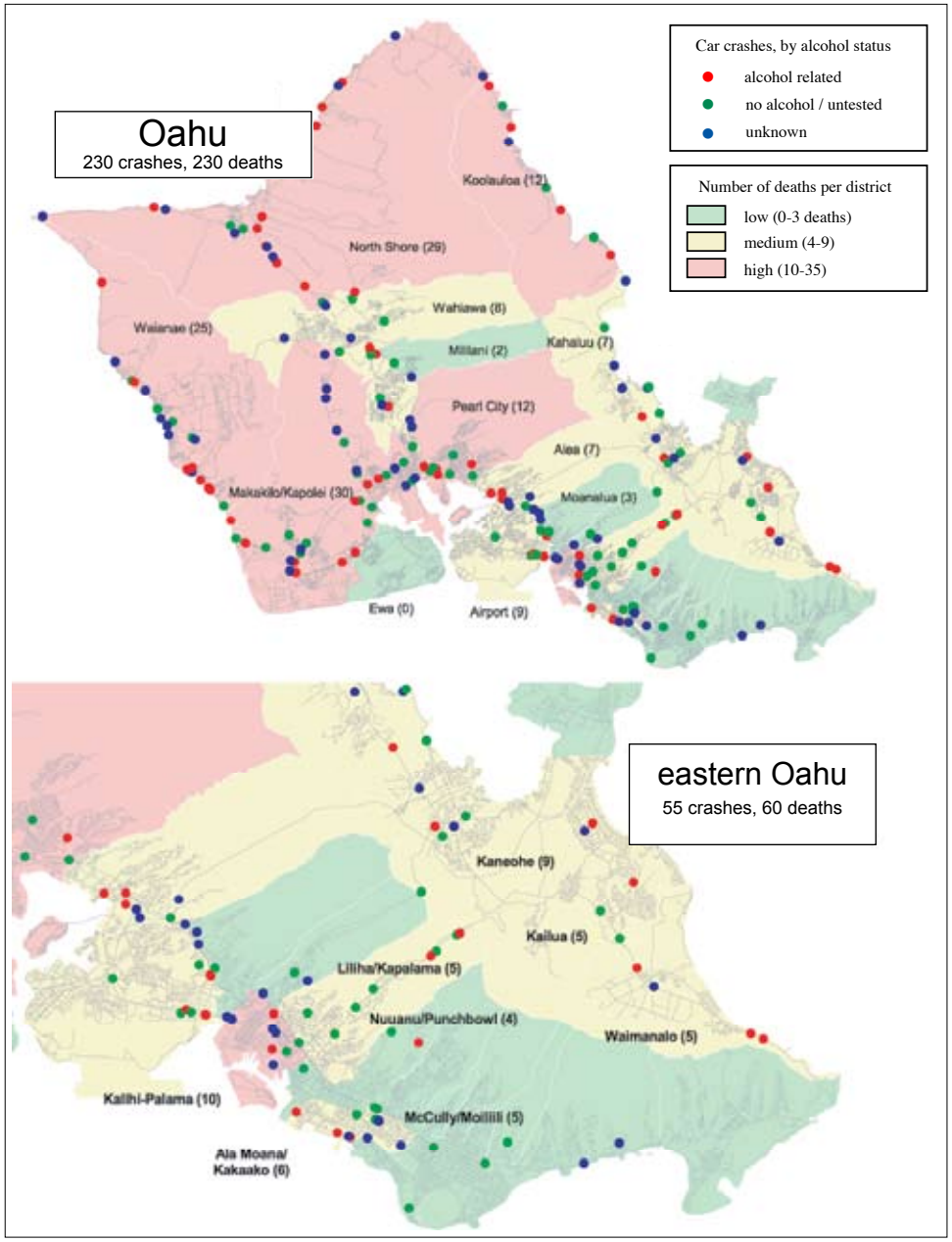
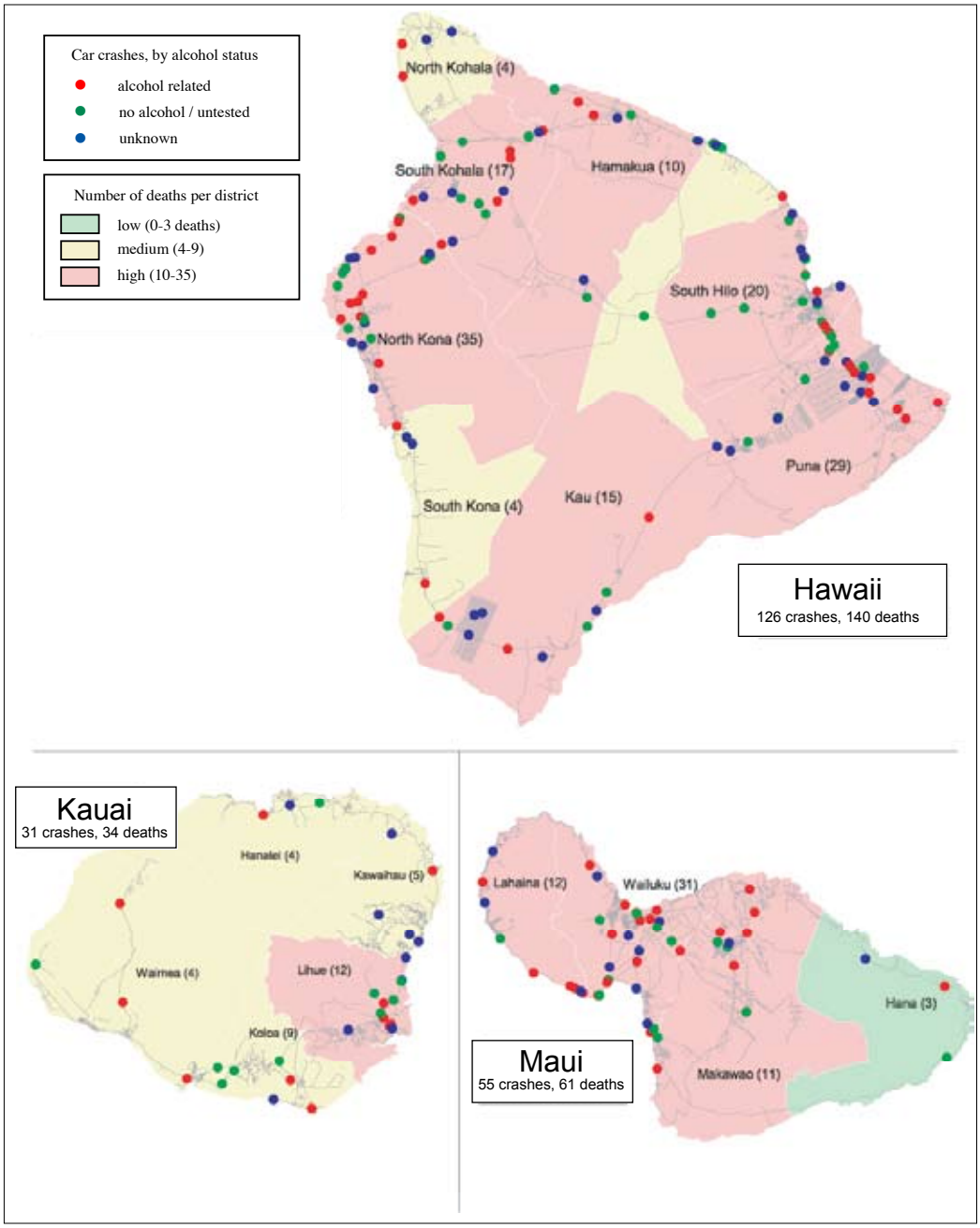


Figure 47. Approximate location of fatal car crashes on Neighbor Islands, by alcohol status, 2001-2006.



Nonfatal injuries

There were no trends in the annual number of nonfatal injuries among automobile occupants, either for those treated in EDs or requiring hospitalization (Table 6). Most (89%) of the injuries were treated in EDs. Gender was nearly equally distributed (51% females, 49% males) overall, but males comprised nearly two-thirds (62%) of those who were hospitalized. Patient age was widely distributed, although about one-third of those who were treated in EDs (30%) or hospitalized (32%) were in the 15 to 24 year age range. Relatively few (7%) were younger than 15 (7%) or

older than 65 years of age (8%). Slightly more than half (55%) of the patients were residents of Oahu, although 71% of the state's population resided on that island. In contrast, 27% of the patients were residents of Hawaii County, which comprised only 13% of the population.

Table 6. Demographic characteristics* of Hawaii residents with nonfatal injuries from automobile crashes.

	ED visits	hospitalizations	total
Year of admission			
2003	5469	680	6149
2004	5486	701	6187
2005	6030	670	6700
2006	5377	613	5990
average annual total	5591	666	6257
Patient gender			
Female	2928 (52%)	255 (38%)	3183 (51%)
Male	2663 (48%)	411 (62%)	3073 (49%)
Patient age			
Infants	14 (0%)	4 (1%)	18 (0%)
1-4 y	85 (2%)	7 (1%)	92 (1%)
5-14 y	338 (6%)	33 (5%)	370 (6%)
15-24 y	1681 (30%)	211 (32%)	1891 (30%)
25-34 y	1013 (18%)	108 (16%)	1121 (18%)
35-44 y	841 (15%)	93 (14%)	934 (15%)
45-54 y	31 (0.6%)	26 (7.7%)	57 (1.0%)
55-64 y	448 (8%)	50 (8%)	498 (8%)
65-74 y	222 (4%)	35 (5%)	257 (4%)
75-84 y	155 (3%)	32 (5%)	187 (3%)
85 + y	41 (1%)	14 (2%)	55 (1%)
County of residence of patient			
Hawaii	1570 (28%)	1449 (22%)	1719 (27%)
Honolulu	3085 (55%)	360 (54%)	3445 (55%)
Kauai	399 (7%)	53 (8%)	451 (7%)
Maui	537 (10%)	105 (16%)	642 (10%)

*Statistics are annual averages over the 2003-2006 period.

The peak age for rates of both ED visits and hospitalizations was among 15 to 24 year-old residents (Figure 48). For either type of injury low rates were found for residents under 15 years of age, with lowest rates among those under 5 years. Rates of ED visits declined progressively from the peak among 15 to 19 year-olds, while hospitalizations generally declined over the 25 to 74 year age range, before increasing among older age groups.

All counties differed significantly from each other in rates of nonfatal injuries treated in EDs and all injuries combined, with highest rates computed for residents of Hawaii County, followed by Kauai, Maui and Honolulu counties (Figure 49). Rates of ED visits among residents of Hawaii County were nearly 3 times the rate for Honolulu County residents. Residents of Honolulu County also had the lowest rates of hospitalizations, significantly lower than any other county. Hospitalization rates among Neighbor Islands were statistically comparable.

Almost all (96%) of the injuries were coded as "traffic", or occurring on public roads. The proportion of injuries from non-traffic crashes (those on private roads, driveways and parking lots) was nearly twice as high among patients from Neighbor Islands (5%) compared to those from Oahu (3%). Three-quarters (76%) of the injuries resulted from collisions with other vehicles (60%) or other objects such as abutments or traffic signs (140%). About one-fifth (19%) of the crashes did not involve collisions with other vehicles or objects, but were due to loss of control in a single vehicle crash. (Collision status of the crash was unspecified for the remaining 6% of passengers.) Residents of Honolulu County were somewhat more likely to be injured in a crash involving collision with another vehicle or object (78% of patients), compared to residents of Neighbor Islands (70%).

Figure 48. Average annual rates (per 100,000 residents) of hospitalizations and ED visits for nonfatal injuries from automobile crashes in Hawaii, by age of patient.

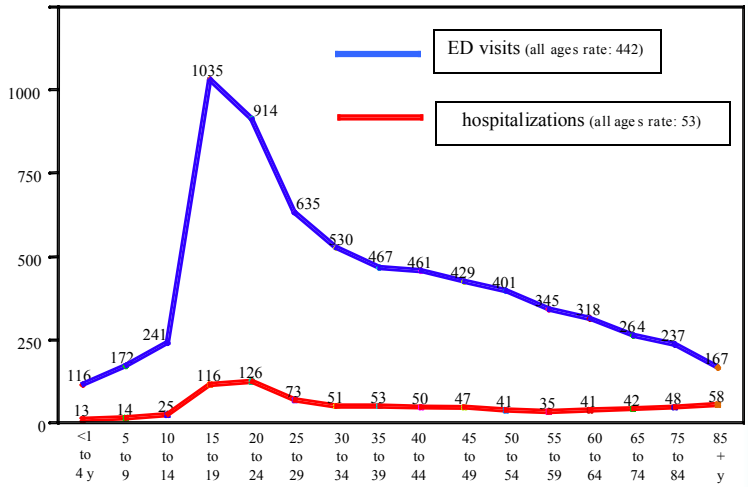
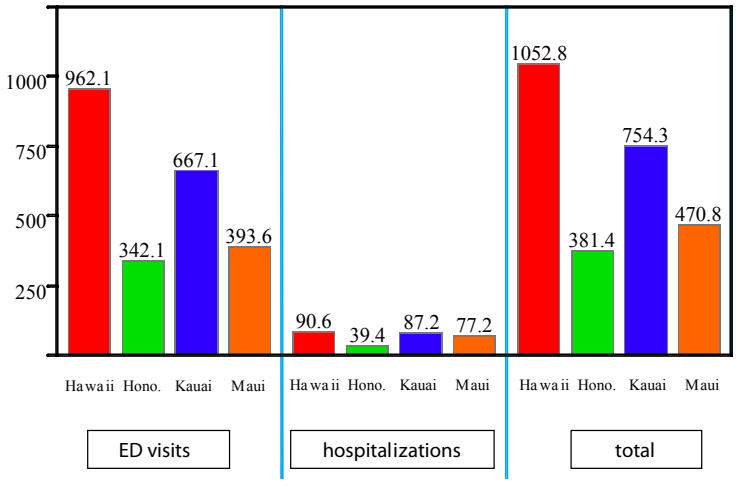


Figure 49. Age adjusted annual rates (per 100,000 residents) of nonfatal injuries from automobile crashes, by level of care and county of residence of patient.



Patients were hospitalized for an average of nearly 6 days, with nearly $35,000 in average medical charges per patient (Table 7). Hospitalizations comprised most of the annual total of $31.9 million in medical charges in the state. The average ED visit resulted in over $1,550 in medical charges. Most (60%) of the hospitalized patients had internal injuries (32%) or fractures (43%), which were widely distributed throughout the body. Patients who were treated in EDs were more likely to have less severe injuries such as sprains and strains (44%) or contusions and superficial injuries (32%). The prevalence of traumatic brain injury was also much higher among the hospitalized patients (41%) compared to those treated in EDs (10%).

Table 7. Clinical characteristics* of Hawaii residents with nonfatal injuries from automobile crashes.

	ED visits	hospitalizations	total
Length of care and financial charges			
Ave. length of stay (days)	1.0	5.7	1.5
Total number of days	5591	3789	9380
Average charge	$1,556	$34,763	$5,025
Total charges	$8.7 million	$23.2 million	$31.9 million
Primary injury diagnosis			
fractures	271 (5%)	289 (43%)	560 (9%)
fracture of skull	27 (0%)	54 (8%)	80 (1%)
vertebral column	32 (1%)	48 (7%)	80 (1%)
ribs, pelvis or trunk	75 (1%)	61 (9%)	136 (2%)
humerus	12 (0%)	13 (2%)	24 (0%)
lower arm or hand	75 (1%)	22 (3%)	97 (2%)
femur	4 (0%)	45 (7%)	49 (1%)
lower leg or foot	47 (1%)	47 (7%)	94 (2%)
sprains and strains	2487 (44%)	14 (2%)	2501 (40%)
internal injuries	162 (3%)	213 (32%)	375 (6%)
open wounds	420 (8%)	33 (5%)	452 (7%)
contusion/superficial	1800 (32%)	36 (5%)	1836 (29%)
other/unspecified	451 (8%)	82 (12%)	533 (9%)
traumatic brain injury (any priority diagnosis)	544 (10%)	275 (41%)	819 (13%)

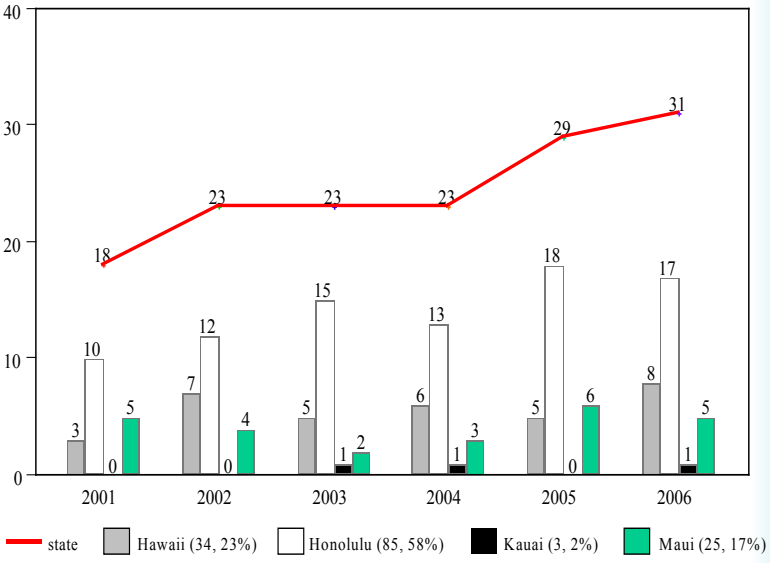
*Statistics are annual averages over the 2003-2006 period.

Motorcyclists

Fatal injuries

Deaths among motorcyclists were the 7th leading cause of fatal unintentional injuries in the state, accounting for 147 total deaths from 2001 to 2006. Figure 50 shows there were anywhere from 18 to 31 such fatalities each year, with a generally increasing trend over time of "borderline" statistical significance (p=0.074). The 147 fatalities resulted from 146 crashes, as only 1 crash involved more than 1 victim. Only 2 of the victims were passengers; the rest were drivers of the motorcycle or moped. Almost one-quarter (23%, or 34) of the victims were killed in Hawaii County, although only 13% of the population resides there and only 14% of all motorcycles are registered in this county. More than half (58%, or 85) were killed on the island of Oahu, and only 3 died on Kauai over the 6-year period.

Figure 50. Annual number of fatally injured motorcyclists in Hawaii, by county, 2001-2006.



One-fifth (30, or 20%) of the 147 victims were killed while riding a moped. Most (23, or 77%) of the moped riders were killed on Oahu, which had the highest proportion of victims who were moped riders (27%, vs. 12% for both Hawaii and Maui counties). None of the 3 victims killed on Kauai were on mopeds. There was no clear trend in the annual number of deaths among moped riders although half were killed in the 2005 to 2006 period (Figure 51). Almost all (95%, or 140) of the victims were killed in traffic crashes which occurred on public roadways. Two victims each were killed on private roads, military installations or community parks, and 1 died on a motocross track.

Figure 51. Annual number of fatally injured motorcyclists, by type of vehicle, 2001-2006.

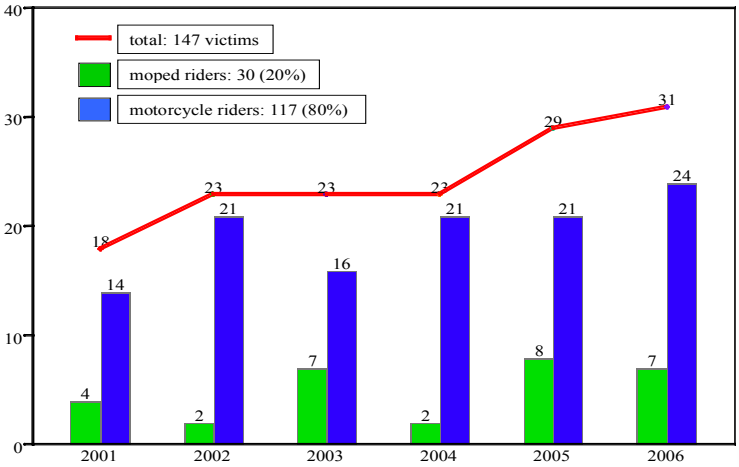
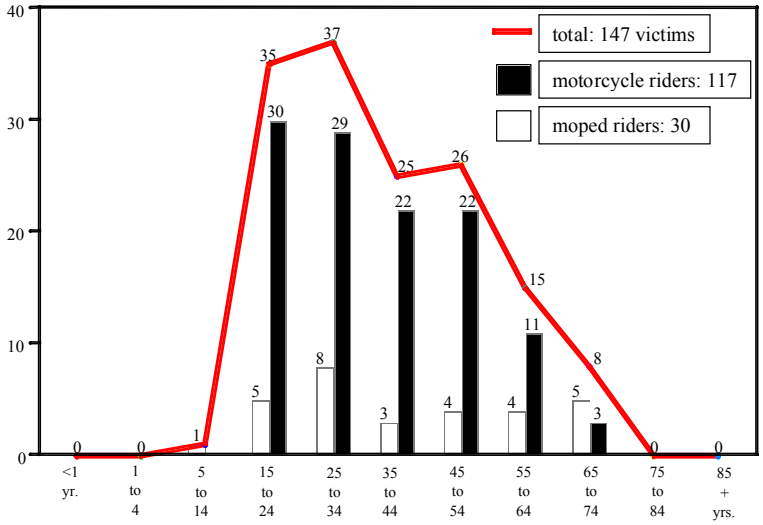


Figure 52 shows that these victims were generally young to middle-aged adults; most (81%, or 119) were between the ages of 20 and 55 years. Only 4 of the victims were younger than 19 years of age. The peak age was 20 to 34 years, which included nearly half (46%, or 67) of the victims. Age was more broadly distributed for the moped riders as only 37% (11 of 30) were in this age range. Only 4 of the victims (3%) were females, including the 2 victims who were not drivers.

Figure 52. Age distribution of fatally injured motorcyclists in Hawaii, by vehicle type, 2001-2006.



The 147 victims were killed in 146 separate crashes, as only 1 crash involved more than a single fatality (driver and passenger). There was no noticeable seasonality in terms of the month of the year for the crashes. Saturdays (33 crashes, 23% of the total) and Sundays (30 crashes) were the most common days for fatal crashes. About one-third (32%, or 37) of the 115 crashes from 2001-2005 occurred during the 5-hour period of from 6:31 p.m. to 11:29 p.m., and about half (45%, or 52 crashes) of the crashes occurred during nighttime hours (7:30 p.m. to 6:30 a.m.). (Crashes from 2006 are excluded from these time estimates, since they were not linked to FARS and this data was missing from 90% (28) of the 31 crashes in 2006.)

Most (92%, or 107) of the 116 fatalities from 2001-2005 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 107 victims who died in traffic crashes (i.e. those that occurred on public roadways) from 2001-2005.

More than two-thirds of the victims (68%, or 73) were not wearing a helmet at the time of the crash. (Helmet status was not known for 1 victim.) None of the 21 moped riders were wearing a helmet. Among motorcycle riders (excluding moped riders), non-use of helmets was a more common risk factors for those killed on Hawaii (70%) and Maui (78%), compared to those killed on Oahu (52%). (Both motorcyclists killed on Kauai were wearing helmets.) Helmeted riders were significantly younger than victims not wearing helmets (average age: 30 vs. 39 years). Helmeted drivers were significantly less likely to have tested positive for alcohol than were non-helmeted drivers (24% vs. 47%).

Almost half (47%, or 50) of the 106 crashes involved only a single motorcycle, and were likely related to the driver losing control of the motorcycle. The proportion of single vehicle crashes was lower (33%) among the 21 victims who were riding mopeds. Exactly half (43) of the 86 fatalities among motorcyclists did not involve another vehicle.

Among the 106 drivers killed in traffic crashes, the most common contributing factor was speeding, which was noted for more than one-third (38%, or 40) of the drivers (Figure 53). This proportion was twice as high among motorcycle drivers (42%), compared to moped drivers (19%). More than half (54%, or 27) of the 50 single vehicle crashes involved speeding. Drivers who were speeding were significantly younger than those who were not (30 vs. 42 years), but were more likely to have been wearing a helmet (48% vs. 21%). About half (48%) of the 63 crashes on Oahu involved a speeding rider. Speeding was a less prevalent factor among riders killed in Hawaii (28%) or Maui (11%) counties. Other contributing factors included failure to keep in proper lane, inattentive riders, and running off the road, although the latter was evident only among motorcycle drivers.

About one-third (34%) of the fatally injured motorcycle drivers tested positive for alcohol, and almost one-quarter (24%) tested positive for drugs (Figure 54). Considered together, nearly half (48%) of the 106 drivers tested positive for either alcohol or drugs. Most (72%, or 26) of 36 of the drivers who tested positive for alcohol had BAC levels of 0.08% or greater, including 15 drivers (42%) who had BAC levels of 0.16% or greater. Alcohol use was particularly prevalent among drivers who crashed during nighttime (46%) or on weekends (45%). Unlike drivers of cars (Figure 43, above), the peak age for alcohol use among motorcycle drivers was 30 to 60 years; 47% of drivers of this age range tested positive vs. 16% for 21 to 24 year-old drivers. There was a significantly increasing trend in the annual proportion of drivers who were drinking, from 19% in 2001 to 43% in 2005. (These statistics omit the 4 decedents with unknown alcohol levels.) The proportion of drug-positive drivers varied inconsistently from 15% to 29%. The most commonly occurring drugs were methamphetamine (11 drivers), amphetamine (7), cannabinoids (including THC) (10), and narcotics (4). Motorcycle drivers were significantly more likely to have been positive for alcohol compared to moped drivers (40% vs. 10%). The two groups were comparable in terms of drug test results (24% positive for both groups).

Figure 53. Contributing factors among motorcycle drivers killed in traffic crashes in Hawaii, by vehicle type, 2001-2005.

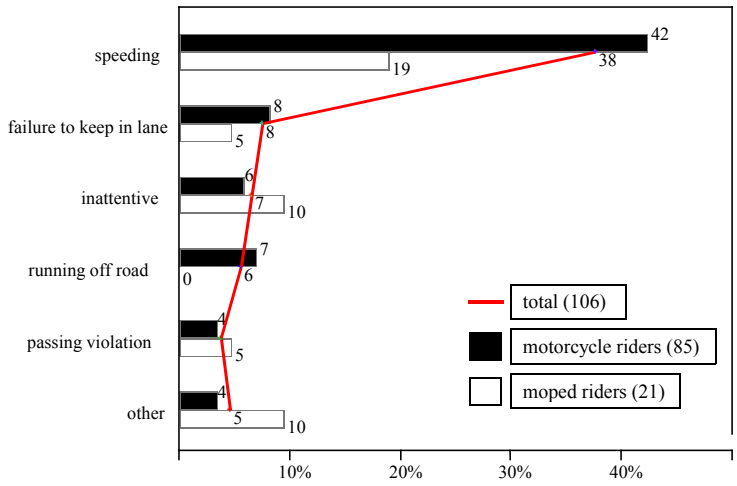
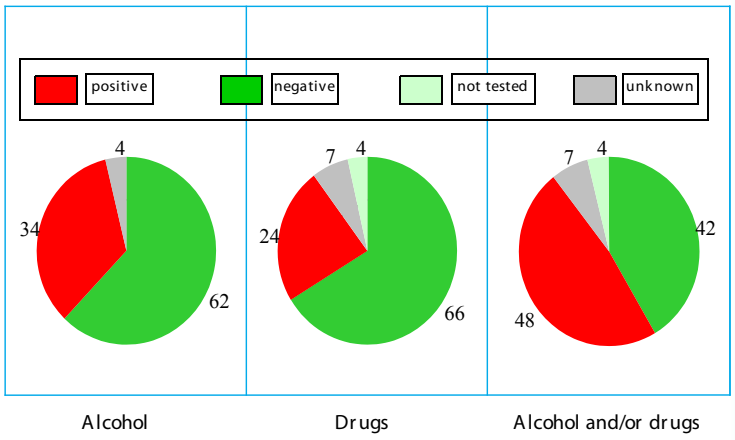


Figure 54. Alcohol and/or drug use (percent) among motorcycle drivers killed in Hawaii, 2001-2005.



Motorcycle drivers who tested positive for alcohol or drugs were generally comparable to drivers who were negative for these substances (Table 8.) However, alcohol positive drivers were significantly more likely to have had a previous DUI (14%) or suspension of license (19%), and were more likely to have crashed during the nighttime hours (64%). The only significant difference between drug positive and negative drivers was the proportion who had a previous license suspension (30% vs. 2%).

Table 8. Characteristics of motorcycle drivers killed in crashes in Hawaii, by category of substance use, 2001-2005.

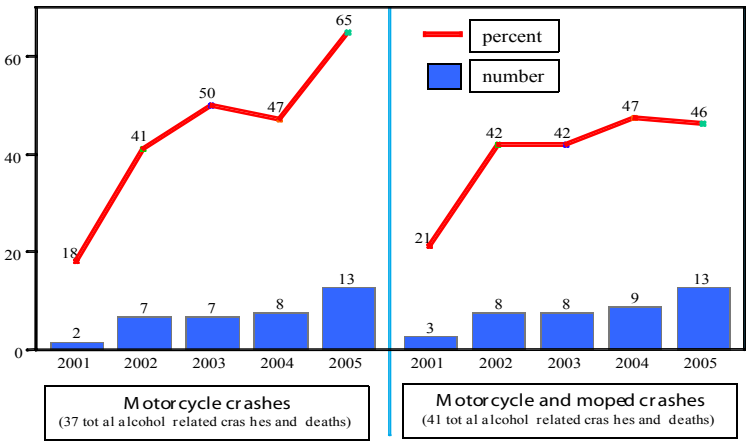
	Alcohol positive (36 drivers)	Drug positive (25 drivers)	No substances/ not tested (48 drivers)
Average age	40 years	33 years	36 years
Helmet use	23%	24%	38%
Speeding	36%	28%	42%
Previous DUI	14%*	9%	2%
Previous suspension of license	19%*	30%*	2%
Previous accidents	9%	17%	19%
Single vehicle crash	50%	32%	48%
Weekend crash (Sat/Sunday)	53%	24%	35%
Nighttime crash (8pm - 5am)	64%*	48%	38%

*Indicates statistically significant difference between alcohol/drug positive drivers and drivers negative for these substances. Drivers with "unknown" values were excluded from these comparisons.

Forty-one percent of the 99 fatal motorcycle traffic crashes and the 100 resulting deaths were related to alcohol consumption among at least one driver (Figure 55). (All of the statistics in this section exclude crashes for which the alcohol status was unknown.) Most (83%, or 34) of the 41 crashes that were alcohol related involved drinking only on the part of the fatally injured motorcycle driver. Another 5 motorcyclists (12%) who had not been drinking were hit by a car driven by someone who tested positive for alcohol, and the 2 remaining deaths (5%) involved drinking on the parts of both the motorcyclists and car drivers. There was an increasing trend in the proportion of fatal motorcycle crashes (excluding moped crashes) that involved alcohol, from 18% in 2001 to 65% in 2005 (Figure 55, left side). The corresponding

Figure 55. Annual number and percentage of alcohol related motorcycle (left side) and motorcycle and moped crashes (right side) in Hawaii, 2001-2005.

(Totals do not include 7 deaths and 7 crashes for which alcohol status was unknown.)



number of crashes increased annually from 2 in 2001 to 13 in 2005. (The number and proportion of alcohol-related crashes equals the number of deaths in these analyses.) This trend was somewhat attenuated with the addition of moped crashes, although nearly half of the crashes and deaths involved alcohol by years 2004 and 2005 (Figure 55, right side). Each year there was an average of 8 fatal crashes and 8 deaths among motorcyclists that involved alcohol. Alcohol involvement was greater when only nighttime (those occurring between 8 pm and 5 am) crashes are considered: 62% of the 42 crashes involved alcohol, a proportion which increased to 67% (22 of 33 crashes) if moped crashes are excluded.

Figures 56 and 57 show the approximate geographic location of the fatal motorcycle crashes. There were 10 crashes in the North Shore district, 7 in the Airport area and 6 in Waianae. There were 10 crashes in the Wailuku district of Maui, and 10 in North Kona. There were 7 crashes each in the Makawao district of Maui, and South Hilo and Puna on Hawaii County (Figure 57).

Figure 56. Approximate location of fatal motorcycle crashes on Oahu and eastern Oahu (bottom map), by alcohol status, 2001-2006.

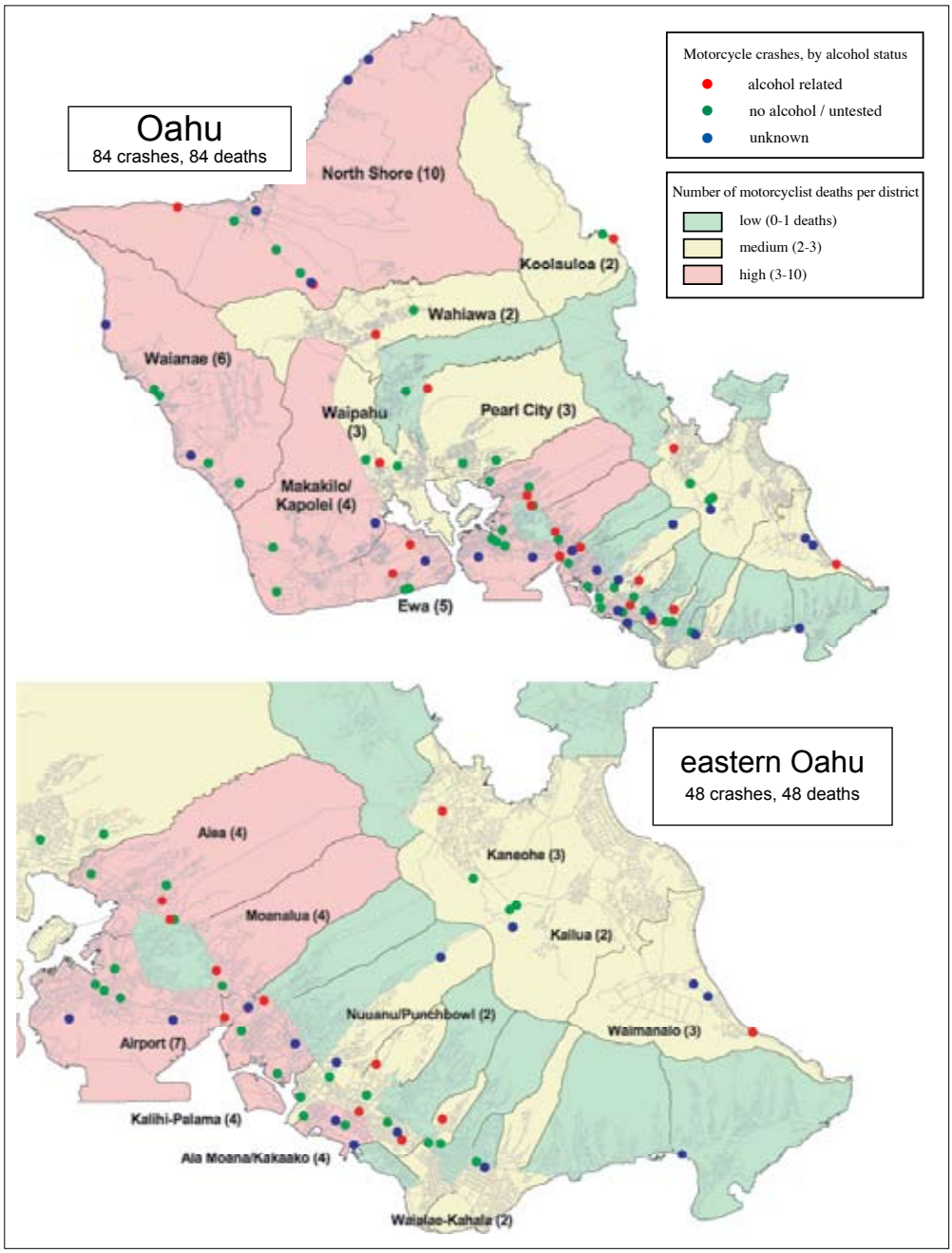
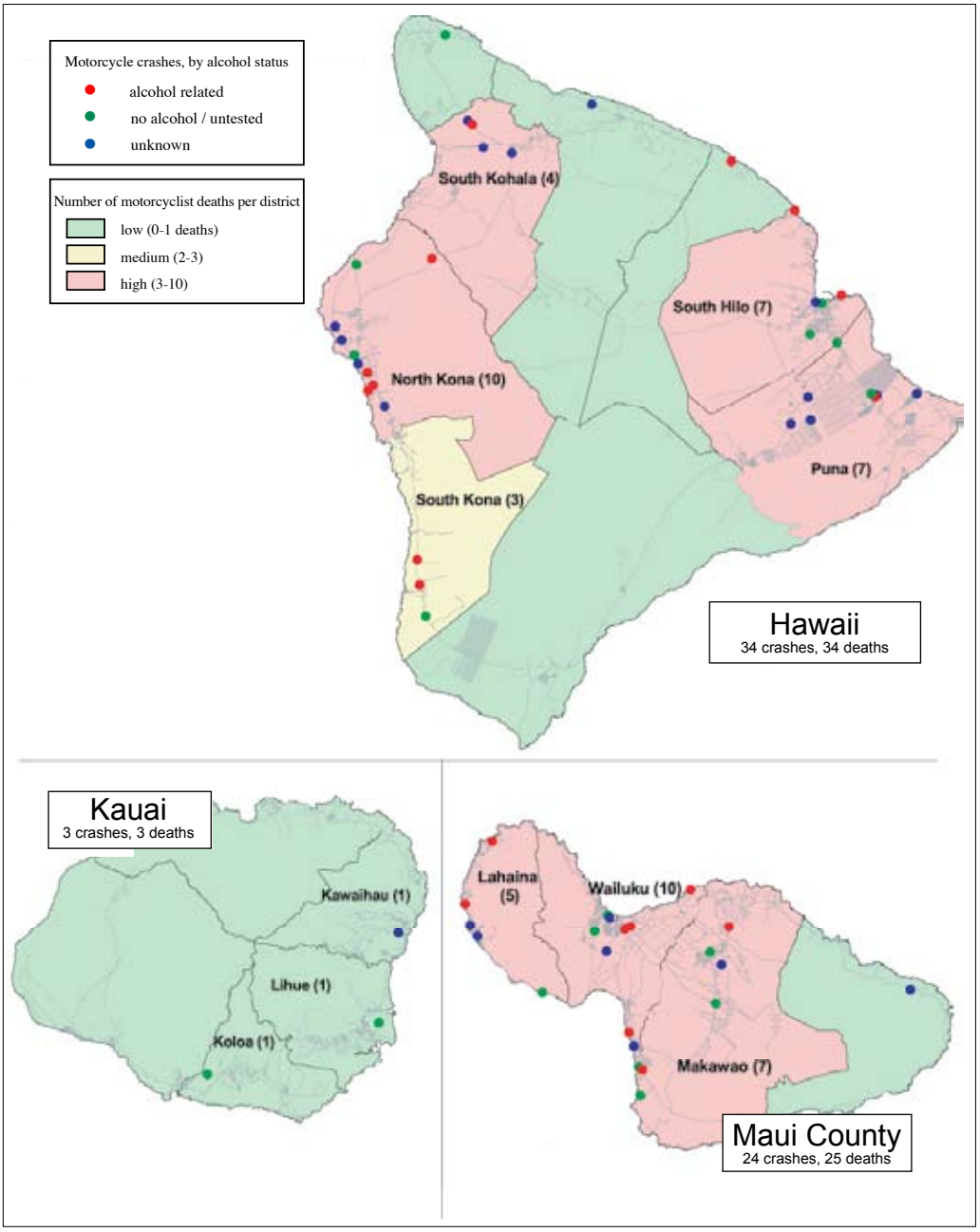


Figure 57. Approximate location of fatal car motorcycle crashes on Neighbor Islands, by alcohol status, 2001-2006.



Nonfatal injuries

There was an increasing trend in the annual number of nonfatal injuries among motorcyclists treated in EDs over the 2003-2005 period, although the total decreased from 2005 to 2006 (Table 9). Consistently increasing trends were seen for ED patients from Hawaii and Maui counties over the total 4-year period. There were no trends in the number of hospitalizations over this period, which comprised about one-fifth (21%) of the nonfatal injuries to motorcyclists. Most (84%) of the patients were males, and this distribution was consistent across counties. Patient age was narrowly distributed, as

about half (55%) 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, including 61% of those who were hospitalized. Almost all (95%) of the patients were motorcycle drivers; only 5% were passengers.

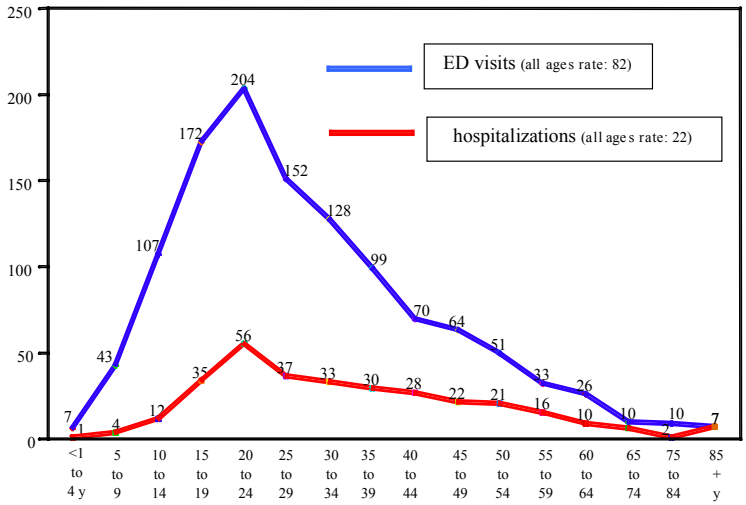
Table 9. Demographic characteristics* of Hawaii residents with nonfatal injuries from motorcycle crashes.

	ED visits	hospitalizations	total
Year of admission			
2003	866	262	1128
2004	940	264	1204
2005	1173	296	1469
2006	1079	268	1347
average annual total	1015	273	1287
Patient gender			
Female	173 (17%)	36 (13%)	209 (16%)
Male	842 (83%)	237 (87%)	1078 (84%)
Patient age			
Infants	0 (0%)	0 (0%)	0 (0%)
1-4 y	6 (1%)	1 (0%)	7 (1%)
5-14 y	125 (12%)	14 (5%)	138 (11%)
15-24 y	327 (32%)	80 (29%)	407 (32%)
25-34 y	243 (24%)	61 (22%)	305 (24%)
35-44 y	153 (15%)	52 (19%)	205 (16%)
45-54 y	104 (10%)	39 (14%)	143 (11%)
55-64 y	40 (4%)	18 (7%)	58 (5%)
65-74 y	9 (1%)	6 (2%)	14 (1%)
75-84 y	6 (1%)	1 (0%)	7 (1%)
85 + y	2 (0%)	2 (1%)	4 (0%)
County of residence of patient			
Hawaii	243 (24%)	41 (15%)	283 (22%)
Honolulu	523 (52%)	167 (61%)	690 (54%)
Kauai	91 (9%)	15 (6%)	106 (8%)
Maui	159 (16%)	50 (18%)	208 (16%)

*Statistics are annual averages over the 2003-2006 period.

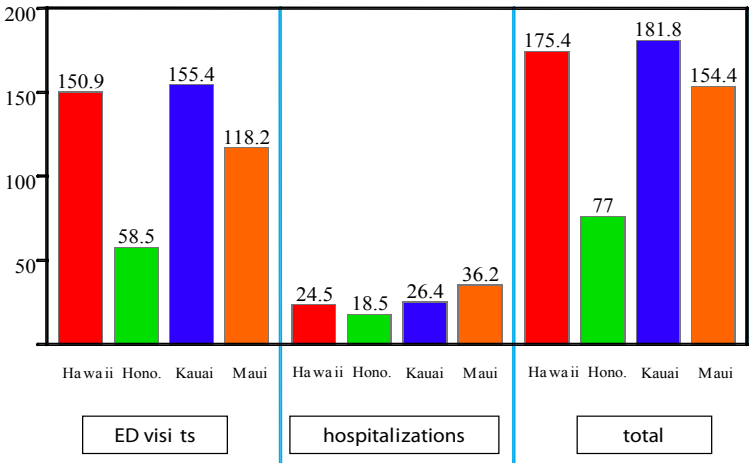
The peak age for rates of both ED visits and hospitalizations was among 15 to 29 year-old residents, particularly 20 to 24 year-olds (Figure 58). Rates of either type of injury declined steadily from the 20 to 24 year-old peak, more sharply in the case of ED visits.

Figure 58. Average annual rates (per 100,000 residents) of hospitalizations and ED visits for nonfatal injuries from motorcycle crashes in Hawaii, by age of patient.



Most of the counties differed significantly from each other in rates of nonfatal injuries treated in EDs, although rates for residents of Hawaii and Kauai counties were statistically comparable (Figure 59). The rate of ED visits for residents of Honolulu County was significantly lower, by 2 or 3 times, than the rate for any other county. The lowest rate of hospitalizations were also computed for Honolulu County residents, although it differed significantly only from the rate for Maui County residents.

Figure 59. Age adjusted annual rates (per 100,000 residents) of nonfatal injuries from motorcycle crashes, by level of care and county of residence of patient.

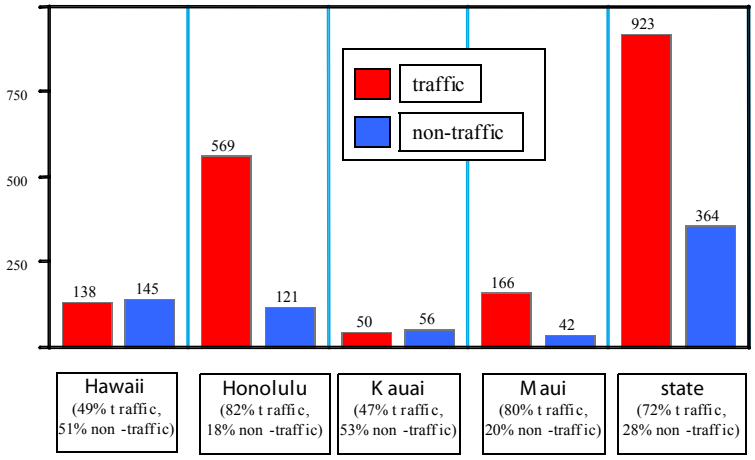


Only about half (48%) of the injuries resulted from crashes that involved a collision, most commonly another motor vehicle (39%). Forty-percent of the crashes did not involve a collision, but were due to loss of control by the rider. (This status was not known for the remaining 12% of crashes.) The distribution of crash type was similar for injuries treated in EDs and those that required hospitalization.

About three-fourths (72%) of the nonfatal injuries were coded as "traffic" related, or occurring on a public roadway, while 28% were in "non-traffic" environments, including private roads, driveways and parking lots (Figure 60). That proportion varied by the county of residence of the patients, being

highest for residents of Honolulu (82%) and Maui (80%) counties, and lowest for residents of Hawaii (49%) and Kauai (47%) counties. Injuries that required hospitalization were significantly more likely to be from traffic crashes, compared to those that were treated in EDs (83% vs. 69%, respectively). Patients who were injured from non-traffic crashes were significantly younger on average than those involved in traffic crashes (26 vs. 32 years, respectively). Nearly one-quarter (23%) of the patients who were injured in non-traffic crashes were 5 to 14 years of age, compared to only 6% of those who were injured in traffic crashes. More than half (54%) of the traffic-related crashes did not involve a collision with another motor vehicle or object, compared to only 4% of the non-traffic crashes.

Figure 60. Average annual number of nonfatal injuries from motorcycle crashes in Hawaii, by type of crash and county of residence of patient.



Because patients were hospitalized for an average of nearly 1 week, the total number of days of care was greater for hospitalizations than ED visits (Table 10). Hospitalizations also comprised most (84%) of the annual total of $12.4 million in medical charges in the state. The average hospitalization resulted in over $38,000 in medical charges, compared to about $1,950 for each ED visit.

About half (56%) of the hospitalized patients and one-quarter (26%) 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 (27%) among hospitalized patients, while open wounds (16%) and contusions and superficial injuries (30%) were more common among those treated in EDs. Almost one-fifth (18%) of the patients had a traumatic brain injury, including 39% of those who were hospitalized.

Table 10. 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	6.5	2.2
Total number of days	1015	1775	2789
Average charge	$1,943	$38,170	$9,198
Total charges	$2.0 million	$10.4 million	$12.4 million
Primary injury diagnosis			
fractures	264 (26%)	153 (56%)	417 (32%)
fracture of skull	9 (1%)	28 (10%)	37 (3%)
vertebral column	10 (1%)	13 (5%)	23 (2%)
ribs, pelvis or trunk	80 (8%)	20 (7%)	99 (8%)
humerus	15 (2%)	6 (2%)	21 (2%)
lower arm or hand	84 (8%)	16 (6%)	100 (8%)
femur	1 (0%)	18 (6%)	18 (1%)
lower leg or foot	67 (7%)	52 (19%)	119 (9%)
dislocations	33 (3%)	4 (1%)	37 (3%)
sprains and strains	113 (11%)	4 (2%)	118 (9%)
internal injuries	51 (5%)	73 (27%)	124 (10%)
open wounds	165 (16%)	16 (6%)	181 (14%)
contusion/superficial	301 (30%)	7 (3%)	308 (24%)
other/unspecified	87 (9%)	16 (6%)	103 (8%)
traumatic brain injury (any priority diagnosis)	128 (13%)	107 (39%)	235 (18%)

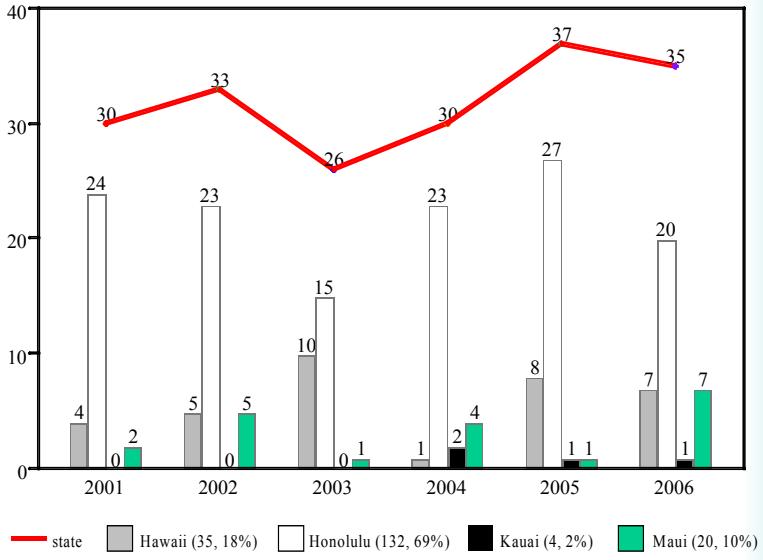
*Statistics are annual averages over the 2003-2006 period.

Pedestrians

Fatal injuries

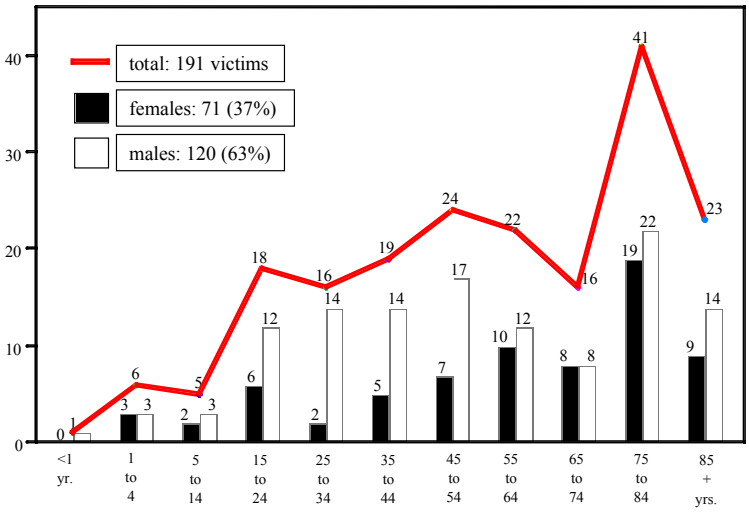
Death among pedestrians was the 2nd most common type of motor vehicle death (after occupant fatalities), and the 4th leading cause of fatal unintentional injuries, as 191 pedestrians were killed in Hawaii over the 6-year period. The annual number of deaths varied inconsistently, but the highest totals occurred in 2005 and 2006 (Figure 61). The deaths were caused by 188 separate crashes, as only 3 pedestrian crashes involved more than 1 victim. About two-thirds of the victims (69%, or 132) were struck on Oahu. Another 35 were struck on the island of Hawaii, 20 in Maui County (all on the island of Maui), and only 4 on Kauai. The unadjusted 6-year mortality rates were comparable across all counties with 20 or more deaths. The rates for Honolulu (14.8/100,000) and Maui counties (14.6/100,000) were very similar, while Hawaii County had the highest rate (21.8 deaths/100,000 residents).

Figure 61. Annual number of pedestrian fatalities among Hawaii residents, by county, 2001-2006.



The ages of the victims ranged broadly from infancy to 94 years, although 80 (42%) were 65 years or older (Figure 62). Most (83%, or 66) of the senior-aged victims were struck on Oahu. The 6-year pedestrian fatality rate for senior residents on Oahu (52.8/100,000) was significantly higher than that computed for Neighbor Island senior residents (30.1/100,000). Of the very young victims, 7 were between the ages of 1 and 4 years. All 7 of the victims that were under 5 years of age were struck in the driveway of a house. The majority of victims (63%, or 120) were males, although this proportion was lower in the youngest and oldest age groups. The 23 deaths among residents aged 85 years and older translated into extremely high fatality rate estimates among both males (26 deaths/100,000) and females (11/100,000). The pedestrian fatality rate was higher for male residents than female residents for nearly every age group.

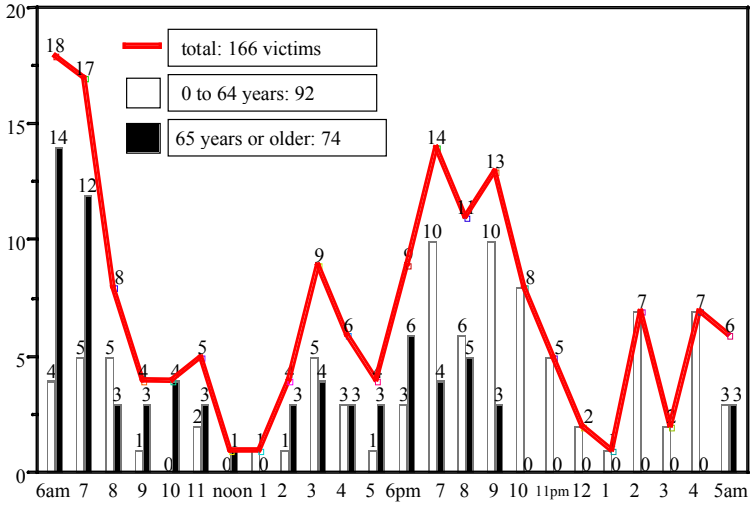
Figure 62. Age and gender distribution of fatally injured pedestrians in Hawaii, 2001-2006.



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 preponderance of pedestrian fatalities on weekends. The lowest totals were seen for Wednesdays (22 deaths), Saturdays (23) and Sundays (24), with totals varying between 28 and 35 deaths for the other days of the week. The crashes occurred at all hours of the day, but there were two noticeable peak periods: 35 deaths (21% of the total) occurred between 5:31 a.m. and 7:29 a.m., and 38 (23%) took place between 7:31 p.m. and 9:29 p.m. (Figure 63). (These statistics exclude 25 deaths (13% 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 26 of 35) of the victims during the morning peak were 65 years of age or older, while most (68%, or 26 of 38) of those struck during the 7:31 p.m. to 9:29 p.m. peak were under 65 years of age. Most (85%) of the senior-aged victims (85%) and those under age 15 (89%) were struck during daylight hours (5:31 a.m. to 7:29 p.m.). In contrast, most (69%) 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.

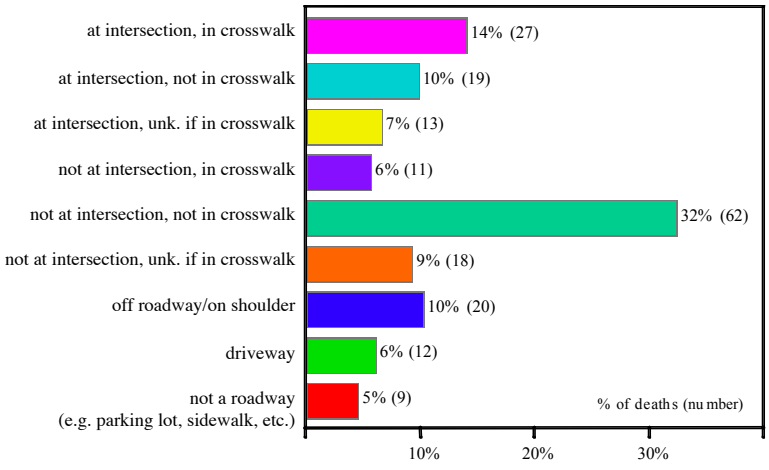
Figure 63. Number of pedestrian fatalities among Hawaii residents, by hour of crash and age of victim, 2001-2006.

(Does not include 25 victims for whom time of crash was not known.)



Only about one-fifth of the victims (20%, or 38) were known to have been in a crosswalk at the time of the crash, usually at an intersection (14% of victims) (Figure 64). (This calculation includes 31 victims (16%) for whom the presence of a crosswalk was not known.) Half of the victims (48%, or 91) were hit on open stretches of roadway, one-third (31%) at intersections, 10% were off the road or on the shoulder, and 6% were hit in driveways. The most common environment for fatal pedestrian crashes was at a non-intersection area with no crosswalk (32%). The environment was generally similar for both senior-aged victims and those under 65 years of age, although the former were more likely to be hit in a crosswalk at an intersection (23% vs. 8%), while younger victims were likely to be hit in driveways (10% vs. 1% for senior-aged victims). Victims hit on Oahu were more likely to have been in a crosswalk than those hit on Neighbor Islands (22% vs. 8%).

Figure 64. Number of pedestrian fatalities among Hawaii residents, by location on roadway, 2001-2006.

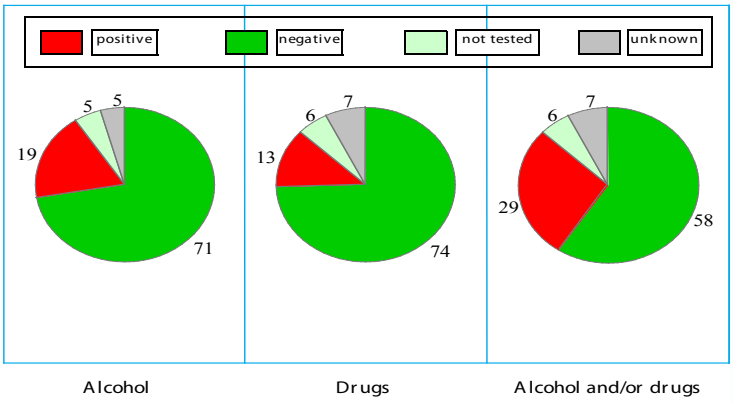


Only 72% (137) of the fatalities could be matched to FARS records, since this only includes pedestrians hit on public roadways, and also excludes those who died more than one month after the crash. FARS data contains information on alcohol involvement in the crash, and contributing factors for both pedestrians and drivers involved in the crashes. The rest of this section (excluding the maps) will utilize only the data from the 137 pedestrian deaths (from 136 crashes) that were linked to FARS records.

The most common speed zone for the 136 crashes was 25 miles per hour (43%, or 59 crashes). Another third (32%, or 44 crashes) were in 30 to 35 mph zones; only 16% (22) 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 (56% vs. 30%). Two-thirds (67%) of the senior-aged victims were hit in 25 mph or slower zones, compared to 35% of pedestrians under the age of 65 years. All but 4 of the crashes occurred on roads with two-way traffic, usually (74%) with undivided lanes. About three-quarters (76%, or 104) of the crashes involved a vehicle going straight. Most of the remaining crashes (12%, or 16) involved a vehicle making a left turn. Very few crashes involved vehicles changing lanes or merging (3 crashes), making a right turn (3), backing up (2), or negotiating a curve (1). Crashes on Hawaii (90%) and Maui (83%) counties were more likely to involve cars going straight, as were nighttime crashes (89%).

The analyses related to alcohol and drug use were restricted to the 133 victims linked to FARS records who were aged 15 years and older. Nearly one-fifth (19%) of the fatally injured pedestrians tested positive for alcohol, and 15% had BAC levels of 0.11% or higher (Figure 65). Alcohol use was significantly higher among male victims (26%) compared to females (8%). Drinkers were also significantly younger on average than those who tested negative for alcohol (44 vs. 64 years). The highest prevalence of alcohol use was seen among victims in the 21 to 34 year age group (53%, or 8 of 15), and the 35 to 54 year age group (35%, or 12 of 34). Only 5% (3 of 66) of the senior-aged victims tested positive for alcohol. Alcohol use was roughly twice as prevalent among victims hit in the Neighbor Islands (29%) compared to those hit on Oahu (15%). In particular, more than one-third (37%, or 7 of 19) of victims struck on Hawaii tested positive for alcohol. 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. (39%, or 21 of 54), compared to those struck during the daylight hours (5%, or 4 of 79).

Figure 65. Alcohol and/or drug use (percent) among pedestrians killed in Hawaii, 2001-2005.



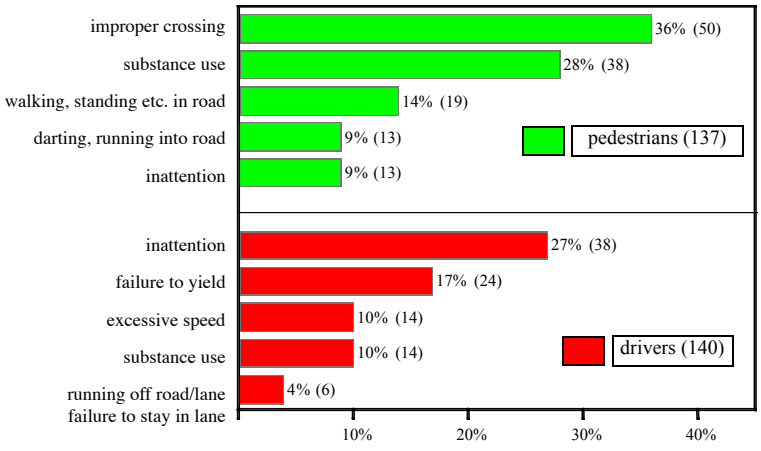
Alcohol was actually involved in 24% of these 133 fatalities, as 7 pedestrians who tested negative for alcohol were hit by drivers who had been drinking. (None of the 4 pedestrian victims who were under 15 years of age were struck by a driver who had been drinking.) Overall, 7% (10) of the 140 drivers involved in the crash tested positive for alcohol, including 6% who had BAC of 0.08% or higher.

Methamphetamine (8%), cannabinoids (6%), and amphetamine were the most commonly identified drugs detected among the 133 victims. The profile of drug users was similar to that for pedestrians who tested positive for alcohol: drug users were younger, more likely to be males, and were more likely to have been hit at nighttime and on Neighbor Islands, particularly Hawaii. Overall, nearly one-third (29%) of the victims were possibly impaired by alcohol and/or drugs. This proportion was particularly high among younger victims (61% for those 24 to 54 years of age), those hit on the island of Hawaii (53%), and those hit during nighttime (54%).

According to FARS data, more than half (53%, or 73) of the pedestrian victims were in the roadway erroneously, most commonly by "improper crossing of roadway or intersection", including jaywalking (36%, or 50 victims) (Figure 66). Including the 28% of victims who tested positive for alcohol or drugs, nearly two-thirds (65%, or 89) of the pedestrians made an error that contributed to the crash. Pedestrians who tested positive for alcohol were significantly more likely to have been in the roadway illegally, usually while crossing, than were the other victims (72% vs. 48%).

Approximately half (48%, or 67) of the 140 drivers made an error which contributed to the crash. Most commonly, they were described as "inattentive" (27%), or failed to yield the right of way (17%). Ten percent were speeding and 10% tested positive for alcohol or drugs. There were no significant associations between the time or county of the crash and the likelihood of driver errors.

Figure 66. Contributing factors for fatal pedestrian crashes in Hawaii, by person type, 2001-2005.



The approximate location of the pedestrian crashes for Oahu and the Neighbor Islands are shown in the following maps. The areas of Kalihi-Palama (16 deaths), Waianae (11), North Shore (8), Makakilo/Kapolei (8) and Aiea (8) had the highest totals on Oahu (Figure 67). The highest numbers of crashes on the Neighbor Islands were generally in the urbanized parts of Maui and Hawaii, with 16 deaths in North Kona, 11 in Wailuku, and 7 each in South Hilo and Puna district (Figure 68).

Figure 67. Approximate location of fatal pedestrian crashes on Oahu and eastern Oahu (bottom map), by age group of victim, 2001-2006.

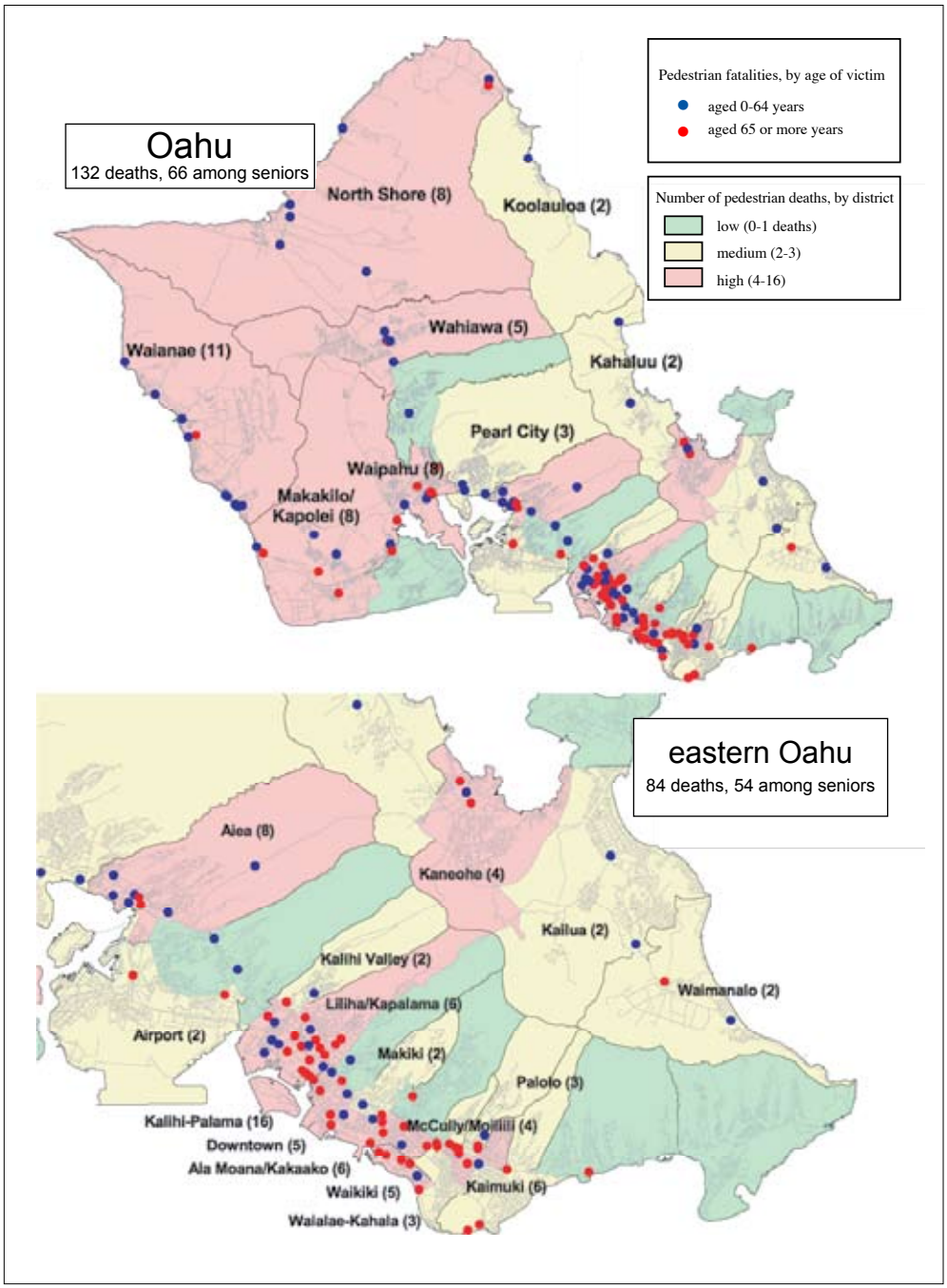
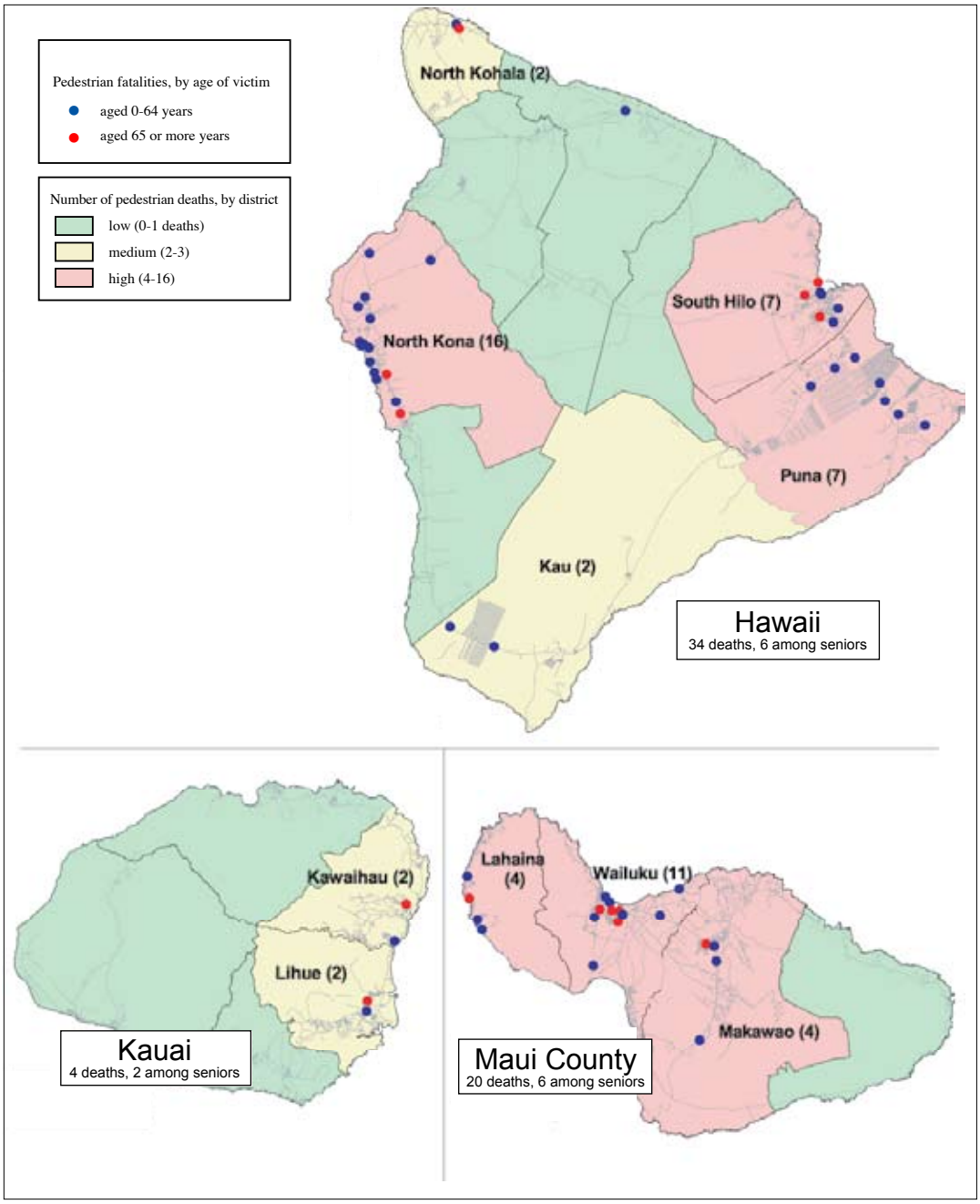


Figure 68. Approximate location of fatal pedestrian crashes on Neighbor Islands, by age group of victim, 2001-2006.



Nonfatal injuries

There was no trend in the annual number of nonfatal injuries among pedestrians, for either ED visits or hospitalizations (Table 11). There was an average of 585 injuries each year, most (75%, or 440) of which required treatment in EDs. 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 55% were female and 45% were male. Patient age was widely distributed, but nearly 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 11% of patients who were treated in EDs. About three-fourths (74%) of the patients were residents of Honolulu County, including 78% of those who were admitted to hospitals.

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

	ED visits	hospitalizations	total
Year of admission			
2003	422	141	563
2004	395	147	542
2005	540	156	696
2006	402	135	537
average annual total	440	145	585
Patient gender			
Female	197 (45%)	64 (44%)	261 (45%)
Male	243 (55%)	81 (56%)	324 (55%)
Patient age			
Infants	0 (0%)	0 (0%)	1 (0%)
1-4 y	21 (5%)	10 (7%)	31 (5%)
5-14 y	74 (17%)	16 (11%)	90 (15%)
15-24 y	85 (19%)	16 (11%)	101 (17%)
25-34 y	56 (13%)	14 (9%)	70 (12%)
35-44 y	57 (13%)	17 (11%)	73 (13%)
45-54 y	54 (12%)	18 (13%)	72 (12%)
55-64 y	43 (10%)	16 (11%)	59 (10%)
65-74 y	26 (6%)	17 (12%)	43 (7%)
75-84 y	19 (4%)	16 (11%)	35 (6%)
85 + y	5 (1%)	7 (4%)	12 (2%)
County of residence of patient			
Hawaii	63 (14%)	16 (11%)	80 (14%)
Honolulu	323 (73%)	113 (78%)	435 (74%)
Kauai	19 (4%)	5 (3%)	24 (4%)
Maui	35 (8%)	11 (8%)	46 (8%)

*Statistics are annual averages over the 2003-2006 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 69). 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 (57 injuries/100,000 residents), and 60 years and older (51/100,000).

Residents of Maui County had the lowest rates of both ED visits and hospitalizations, while highest rates were computed for residents of Hawaii and Honolulu counties (Figure 70). Rates for either type of injury (ED visits combined with hospitalizations) were significantly lower, by 33%, lower for Maui County residents (32.8/100,000) compared to Hawaii or Honolulu County residents (49.5 and 48.4/100,000, respectively). There were no significant differences between counties for rates of injuries requiring hospitalizations.

Most (85%) of the nonfatal injuries were coded as "traffic" related, or occurring on a public roadway, while 15% were in "non-traffic" environments, including private roads, driveways and parking lots (Figure 71). That proportion varied by the county of residence of the patients, however, and was significantly higher for patients from Oahu (89%) compared to those from Neighbor Islands (71%). Proportionally more of the injuries treated in EDs were from non-traffic crashes compared to those requiring hospitalization (18% 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 (31 vs. 38 years, respectively), as there were more young patients (ages 1 to 14 years) among those who were injured in non-traffic crashes (32% vs. 18%, respectively).

Figure 69. Average annual rates (per 100,000 residents) of hospitalizations and ED visits for nonfatal injuries from pedestrian crashes in Hawaii, by age of patient.

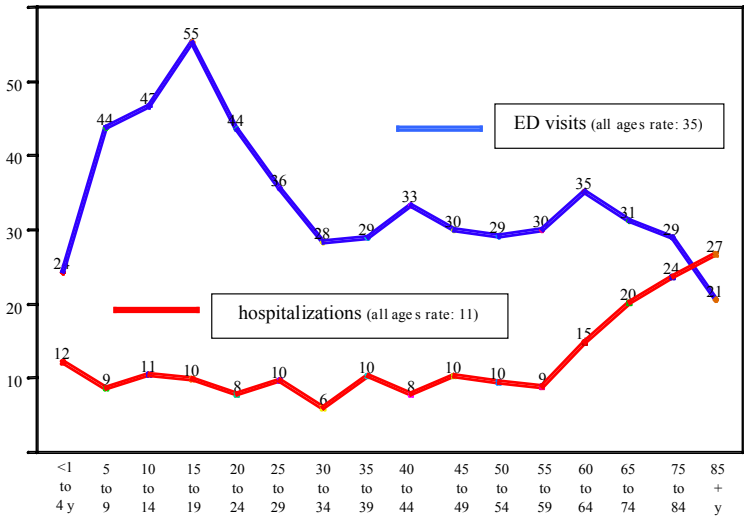


Figure 70. Age adjusted annual rates (per 100,000 residents) of nonfatal injuries from pedestrian crashes, by level of care and county of residence of patient.

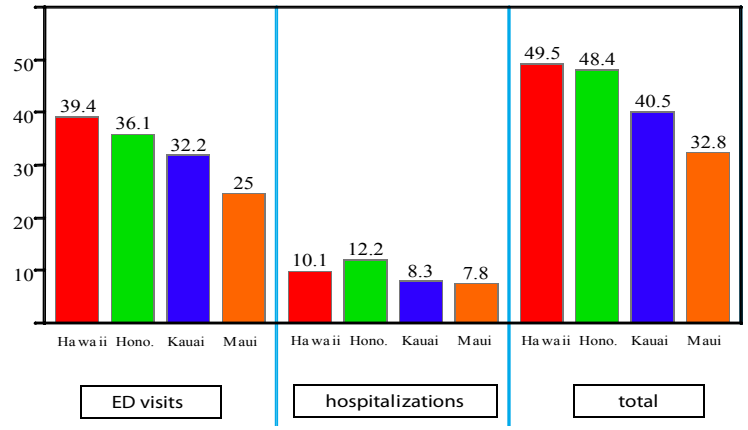
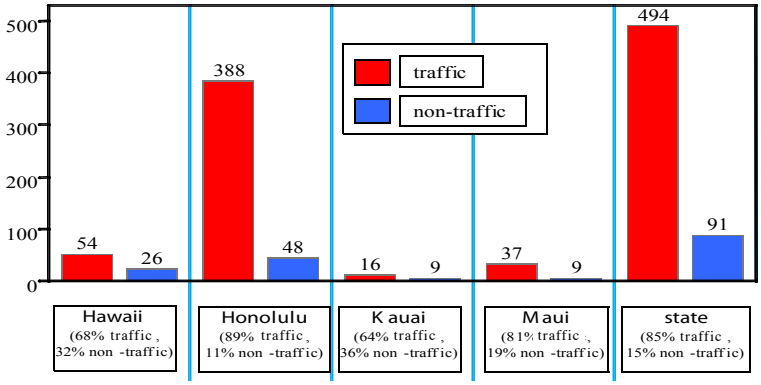


Figure 71. Average annual number of nonfatal injuries from pedestrian crashes in Hawaii, by type of crash and county of residence of patient.



Patients were hospitalized for over 8 days on average, and hospitalizations comprised most (73%) of the total days of care from nonfatal injuries to pedestrians and 89% of the associated medical charges (Table 12). More than half (58%) of the hospitalized patients had fractures, most commonly leg fractures (28%), and one-quarter (25%) had internal injuries. Nearly half of these patients (44%) had a traumatic brain injury. Fractures (12%) and internal injuries (4%) were much less common among the pedestrians treated in EDs, of whom about half (52%) were treated for contusions or superficial injuries.

Table 12. 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	8.2	2.8
Total number of days	440	1193	1163
Average charge	$1,960	$43,778	$12,266
Total charges	$0.9 million	$6.3 million	$7.2 million
Primary injury diagnosis			
fractures	55 (12%)	84 (58%)	139 (24%)
fracture of skull	3 (0.6%)	13 (9.2%)	16 (2.7%)
vertebral column	2 (0.5%)	5 (3.6%)	7 (1.2%)
ribs, pelvis or trunk	4 (1.0%)	18 (12.1%)	22 (3.7%)
humerus	3 (0.6%)	3 (1.9%)	5 (0.9%)
lower arm or hand	10 (2.3%)	5 (3.6%)	15 (2.6%)
femur	1 (0.2%)	12 (8.5%)	13 (2.2%)
lower leg or foot	33 (7.4%)	28 (19.2%)	60 (10.3%)
sprains and strains	46 (11%)	0 (0%)	47 (8%)
internal injuries	17 (4%)	36 (25%)	53 (9%)
open wounds	33 (8%)	5 (4%)	38 (7%)
contusion/superficial	230 (52%)	6 (4%)	236 (40%)
other/unspecified	59 (13%)	14 (9%)	73 (12%)
traumatic brain injury (any priority diagnosis)	55 (13%)	64 (44%)	119 (20%)

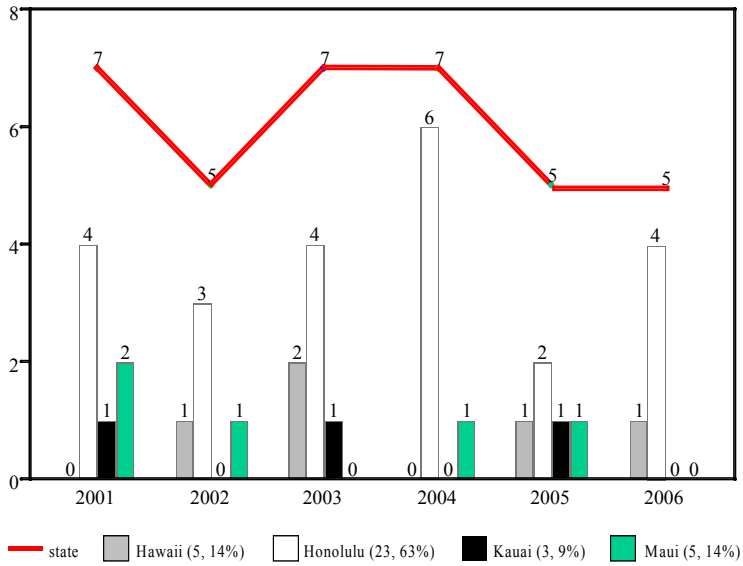
*Statistics are annual averages over the 2003-2006 period.

Bicyclists

Fatal injuries

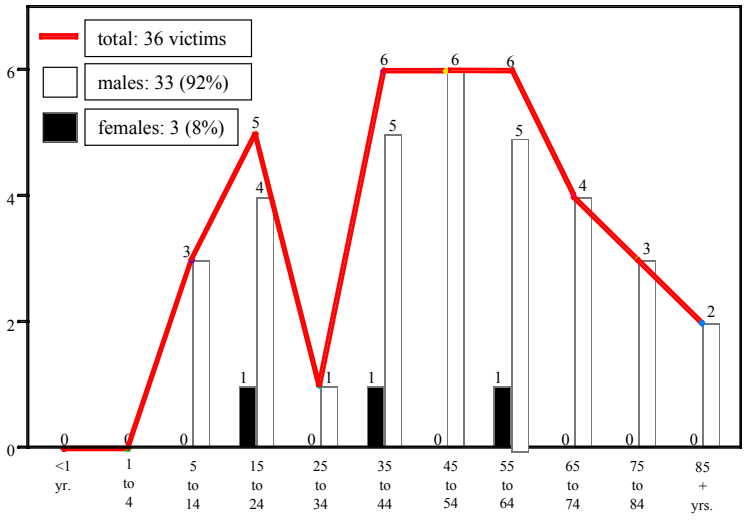
Fatalities among bicyclists were the least common type of fatality from motor vehicle crashes. There were 36 fatalities among resident bicyclists in Hawaii, with the annual total varying between 7 and 5 (Figure 72). About two-thirds (64%, or 23) of the victims were injured on Oahu, 5 each in Hawaii and Maui counties (all on the island of Maui), and 3 on the island of Kauai.

Figure 72. Annual number of bicyclist fatalities among Hawaii residents, by county, 2001-2006.



The age of the victims was broadly distributed over the range of 9 to 87 years (Figure 73). Almost all (92%, or 33) of the victims were males. There were no patterns regarding the month of the crash or the day of the week. About two-thirds (69%, or 20 of 29) of the crashes occurred during daylight hours, but there were no notable peak times. (This information was missing for 7 crashes.)

Figure 73. Age and gender distribution of fatally injured bicyclists in Hawaii, 2001-2006.



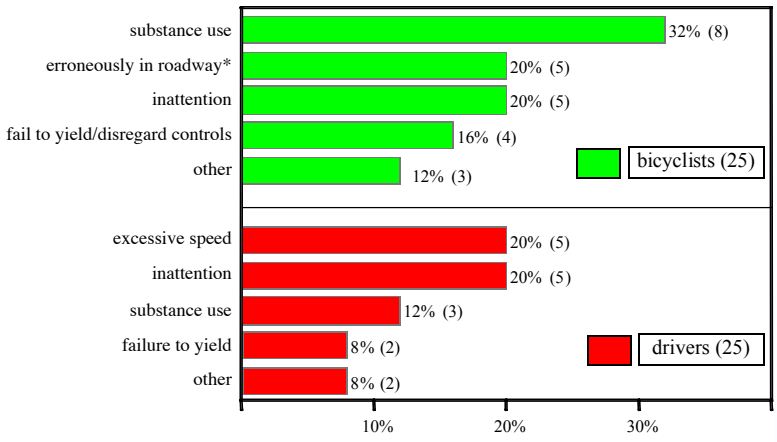
Almost all (31, or 86%) of the victims were struck by a motor vehicle. The other 4 died as a result of falling off their bicycles. (This status was unknown for 1 victim.) Of the 31 fatal crashes from 2001 to 2005, 25 (81%) were linked to FARS records. Four of the unlinked records did not involve a collision with a car, and the remaining 2 victims survived more than 1 month after the crash. The rest of this section (excluding the maps) will utilize only the data from the 25 bicyclist deaths that were linked to FARS records.

According to FARS records, only 2 (8%) of the 25 victims were wearing a helmet at the time of the crash, and both of those victims were over 60 years of age. The crashes were widely distributed across various speed zones: 36% (9 crashes) were in 25 mph or slower zones, 44% (11) in 30 to 35 mph zones, and the remaining 20% (5) in 40 to 50 mph zones. Almost all (96%, or 24) of the crashes occurred on roads with two-way traffic, usually (64%) with two undivided lanes. Most (76%, or 19) of the cyclists were hit while on the roadway, with about equal numbers of those hit at intersections (9 victims) and non-junction areas (10). Five other bicyclists were hit on the shoulder of the road in non-junction areas. (This location data was missing for 1 victim.) Most (72%, or 18) of the vehicles involved in the crashes were going straight on the road; only 1 vehicle was making a turn. (Maneuver information missing for 3 crashes.)

Only 3 (12%) of the bicyclists tested positive for alcohol, including 2 who were over the 0.08% limit. All 3 of those victims were 50 years of age or older. About one-quarter (24%, or 6) tested positive for drugs: 3 for cannabinoids, and 3 others for amphetamine/methamphetamine. All but 1 of these drug-positive victims were 40 years of age or older. Overall, about one-third (32%, or 8) of the victims tested positive for either alcohol or drugs. The prevalence of alcohol use among the 25 drivers involved in the crashes was similar: 3 drivers (12%) had BAC levels of 0.10% or greater. One of those drivers was also positive for cannabinoids, so 12% of the 25 drivers were potentially impaired by alcohol or drugs. Ten (40%) of the 25 crashes involved substance use on either the part of the bicyclist or driver, including 5 (56%) of the 9 crashes that occurred during nighttime hours.

Contributing factors were noted for most (72%, or 18) of the bicyclists, including the 32% who tested positive for alcohol or drugs (Figure 74). Five were erroneously in the roadway for vague reasons, and 4 either failed to yield the right of way or failed to "obey traffic signs, traffic control devices or traffic officers". Inattention was noted among 5 bicyclists. Almost half (44%, or 11) of the 25 drivers made an error which contributed to the crash. Most commonly, they were speeding (20%) or described as "inattentive" (20%).

Figure 74. Contributing factors for fatal bicyclist crashes in Hawaii, by person type, 2001-2005.



*Includes 2 bicyclists who "darted" into the roadway, and 3 who were "riding with or against traffic...in roadway".

The Makakilo/Kapolei area had the highest number (5) of fatal crashes on Oahu (Figure 75). There were 13 other crashes, widely distributed around the eastern part of the island. More than half (62%, or 8) of the 13 crashes on Neighbor Islands were in the areas of Wailuku and Lahaina on Maui, and the North Kona area of Hawaii (Figure 76).

Figure 75. Approximate location of fatal bicyclist crashes on Oahu and eastern Oahu (bottom map), 2001-2006.

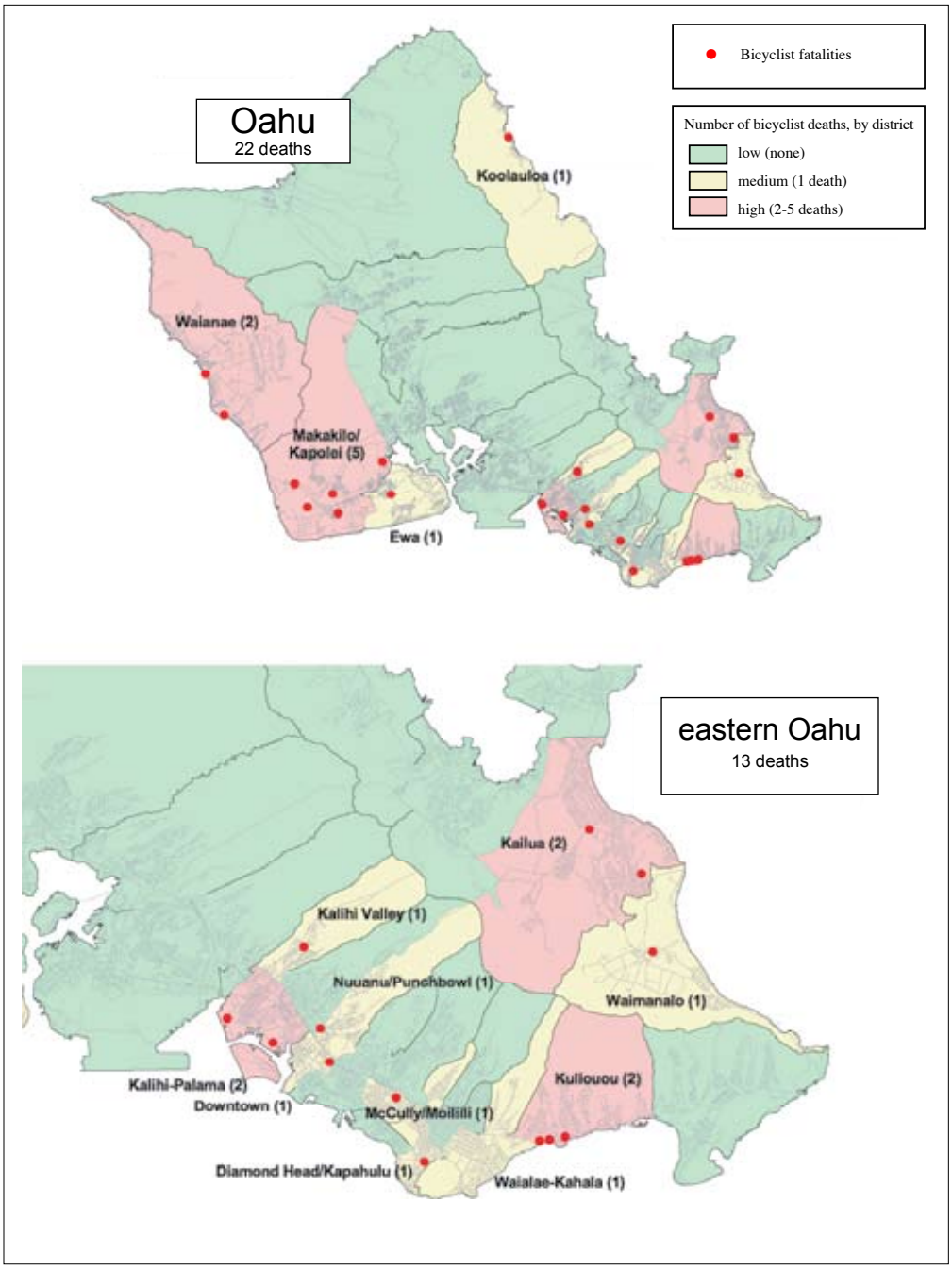
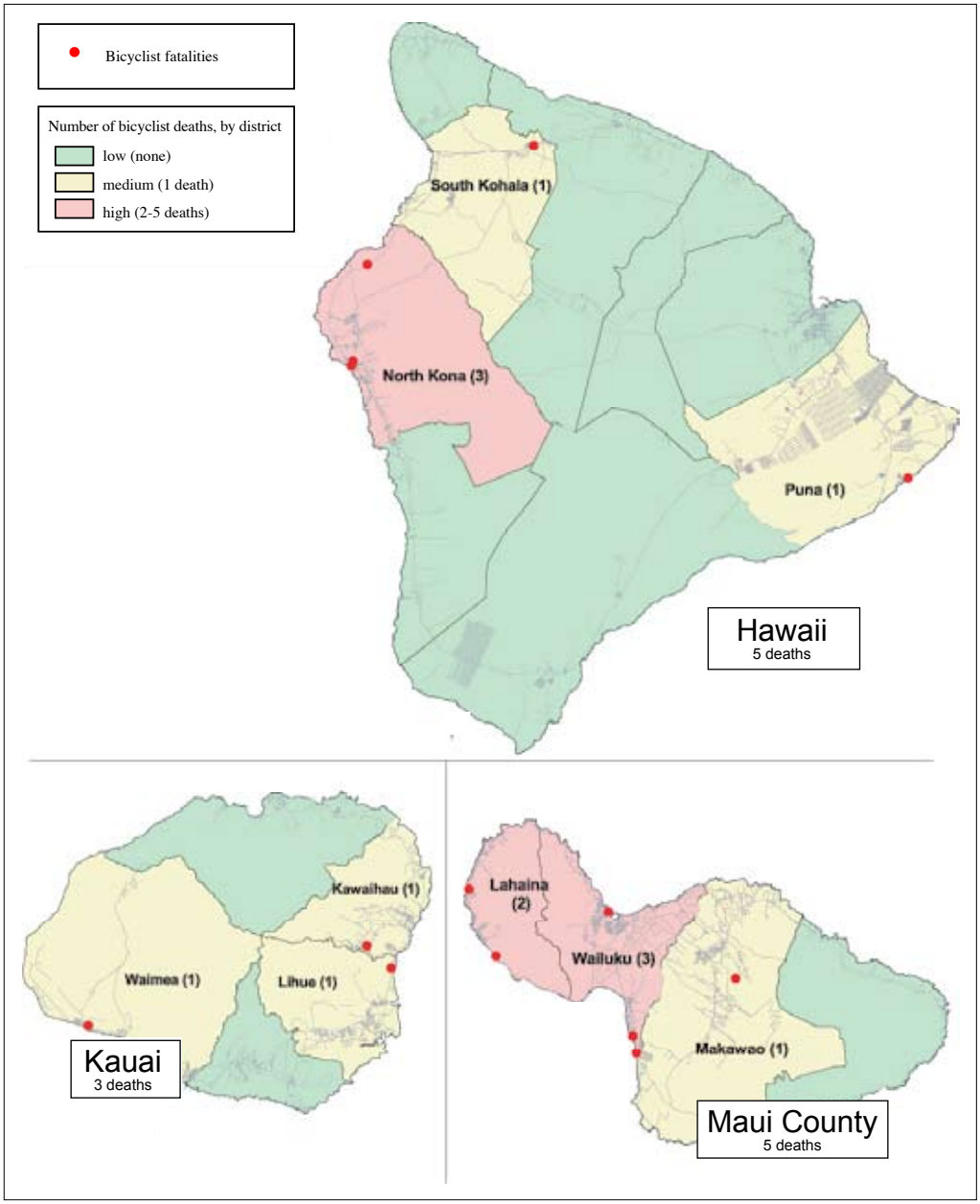


Figure 76. Approximate location of fatal bicyclist crashes on Neighbor Islands, 2001-2006.



Nonfatal injuries

There was no trend in the annual number of nonfatal injuries among bicyclists, as the total increased over the 2003 to 2005 period, but decreased to the lowest levels in 2006 (Table 13). The number of injuries treated in EDs outnumbered those requiring hospitalization by a 10-to-1 ratio. Most (76%) of the patients were males, including 80% of those who were hospitalized. Patients who were treated in EDs were significantly younger than those who were hospitalized (average age 24 vs. 35 years, respectively). Forty percent of those who were treated in EDs were between 5 and 14 years of age, compared to 25% of those who were hospitalized. Senior residents comprised only about 2% of the patients overall. About two-thirds (63%) of the patients were residents of Honolulu County.

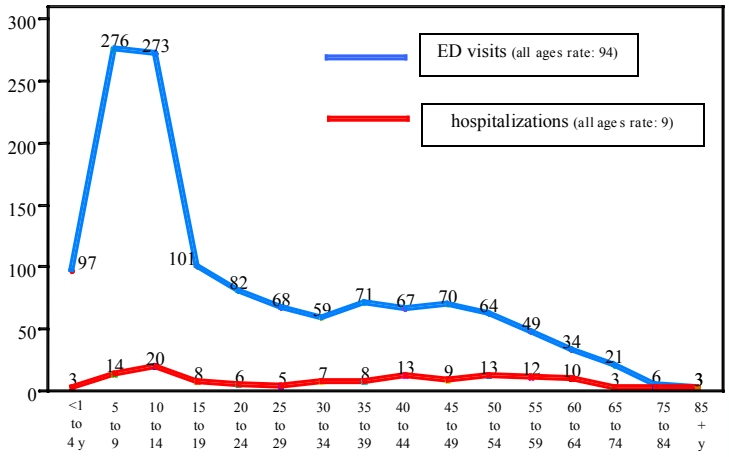
Table 13. Demographic characteristics* of Hawaii residents with nonfatal injuries from bicycle crashes.

	ED visits	hospitalizations	total
Year of admission			
2003	1074	109	1183
2004	1170	129	1299
2005	1222	106	1328
2006	1025	103	1128
average annual total	1123	112	1235
Patient gender			
Female	279 (25%)	23 (20%)	302 (24%)
Male	844 (75%)	89 (80%)	933 (76%)
Patient age			
Infants	1 (0%)	0 (0%)	1 (0%)
1-4 y	83 (7%)	2 (2%)	85 (7%)
5-14 y	446 (40%)	28 (25%)	474 (38%)
15-24 y	157 (14%)	12 (11%)	169 (14%)
25-34 y	110 (10%)	11 (10%)	121 (10%)
35-44 y	125 (11%)	19 (17%)	144 (12%)
45-54 y	122 (11%)	20 (18%)	142 (11%)
55-64 y	57 (5%)	15 (13%)	72 (6%)
65-74 y	18 (2%)	2 (2%)	20 (2%)
75-84 y	4 (0%)	2 (2%)	6 (1%)
85 + y	1 (0%)	1 (1%)	2 (0%)
County of residence of patient			
Hawaii	202 (18%)	14 (13%)	216 (17%)
Honolulu	704 (63%)	76 (68%)	780 (63%)
Kauai	103 (9%)	7 (6%)	110 (9%)
Maui	114 (10%)	16 (14%)	130 (10%)

*Statistics are annual averages over the 2003-2006 period.

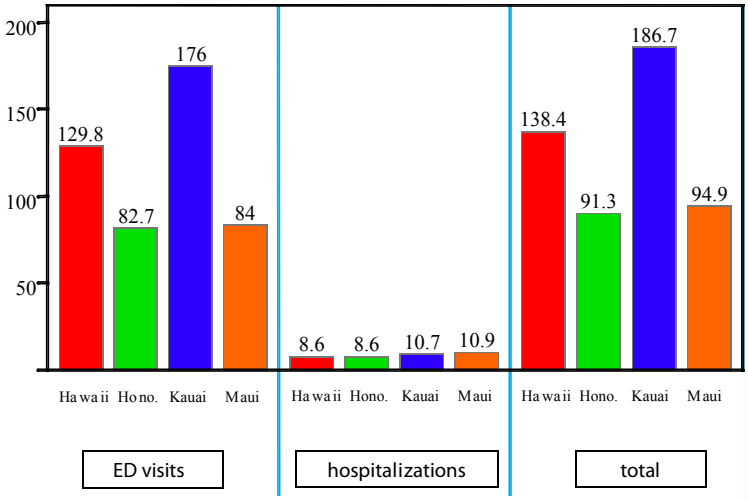
Children aged 5 to 14 years had the highest rates both for injuries treated in EDs and those that required hospitalizations (Figure 77). Combining both types of injuries, rates for 5 to 14 year-olds (292 injuries/100,000 residents) were more than 4 times higher than rates for residents of other ages (69/100,000). Rates for both types of injuries generally declined among residents aged 40 years and older, most consistently for injuries treated in EDs.

Figure 77. Average annual rates (per 100,000 residents) of hospitalizations and ED visits for nonfatal injuries from bicycle crashes in Hawaii, by age of patient.



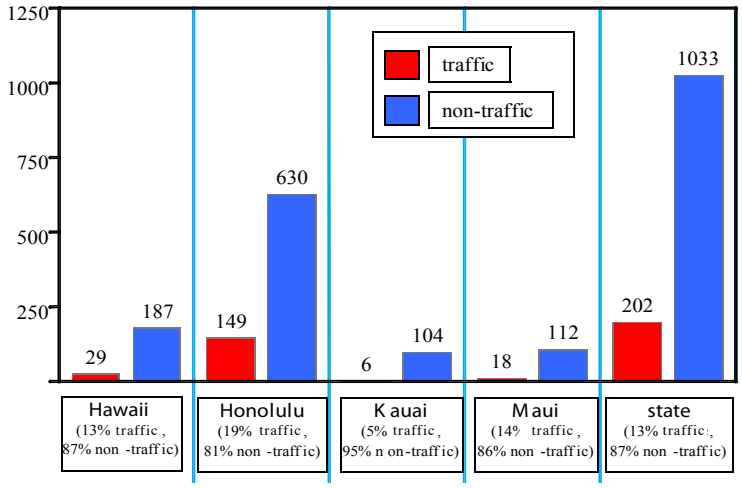
The rate for ED visits for Kauai County residents was significantly higher than the rates for any other county, and more than double the rates for residents of Honolulu or Maui counties (Figure 78). The rate for Hawaii County was also significantly higher than the rates for Honolulu and Maui counties, although 26% lower than the rate for residents of Kauai County. Similar relationships were found when comparing rates of all types of injuries (those treated in EDs combined with those requiring hospitalization). There were no significant differences in hospitalization rates between counties.

Figure 78. Age adjusted annual rates (per 100,000 residents) of nonfatal injuries from bicycle crashes, by level of care and county of residence of patient.



Almost all (87%) of the injuries were coded as "non-traffic", or occurring on private roads, driveways and parking lots (Figure 79). That proportion was significantly lower among Honolulu County residents compared to Neighbor Island residents (81% vs. 88%). As for nonfatal pedestrian injuries, proportionally more of the injuries treated in EDs were from non-traffic crashes compared to those requiring hospitalization (85% vs. 66%), perhaps reflecting greater injury severity from higher speeds among the latter types of crashes. Half (50%) of the patients who were injured from non-traffic crashes were in the 1 to 14 year age group, compared to about one-quarter (23%) of those who were in a traffic-related crash. Overall, only 3% of the injuries resulted from collisions with motor vehicles, although these crashes accounted for about one-quarter (24%) of the injuries that required hospitalization. Most of the injuries treated in EDs (84%) and requiring hospitalization (64%) were coded to indicate crashes that did not involve a collision with another vehicle or object, but were probably due to the patient falling off of the bicycle.

Figure 79. Average annual number of nonfatal injuries from bicycle crashes in Hawaii, by type of crash and county of residence of patient.



Although almost all (91%) of the patients were treated in EDs, hospitalizations comprised 33% of the treatment days and 67% of the total medical charges (Table 14). The average hospitalization lasted about 5 days and generated nearly $28,000 in medical charges. Most (60%) of the hospitalized patients had fractures, including 13% with skull fractures and 25% with leg fractures. Forty percent of these patients had a traumatic brain injury, compared to 12% of those treated in EDs. Contusions and superficial injuries (29%) and open wounds (27%) were the most common types of injuries among patients treated in EDs, followed by fractures (22%), most commonly of the arms (12%).

Table 14. Clinical characteristics* of Hawaii residents with nonfatal injuries from bicycle crashes.

	ED visits	hospitalizations	total
Length of care and financial charges			
Ave. length of stay (days)	1.0	4.9	1.4
Total number of days	1123	548	1671
Average charge	$1,289	$27,883	$3,578
Total charges	$1.4 million	$3.1 million	$4.5 million
Primary injury diagnosis			
fractures	243 (22%)	67 (60%)	310 (25%)
fracture of skull	12 (1%)	14 (13%)	26 (2%)
vertebral column	4 (0%)	4 (4%)	8 (1%)
ribs, pelvis or trunk	57 (5%)	8 (7%)	65 (5%)
humerus	22 (2%)	5 (4%)	27 (2%)
lower arm or hand	112 (10%)	8 (7%)	120 (10%)
femur	2 (0%)	15 (13%)	17 (1%)
lower leg or foot	35 (3%)	13 (12%)	48 (4%)
dislocations	29 (3%)	1 (1%)	30 (2%)
sprains and strains	91 (8%)	1 (1%)	92 (7%)
open wounds	299 (27%)	3 (2%)	302 (24%)
contusion/superficial	326 (29%)	2 (2%)	328 (27%)
other/unspecified	135 (12%)	37 (33%)	172 (14%)
traumatic brain injury (any priority diagnosis)	130 (12%)	44 (40%)	175 (14%)

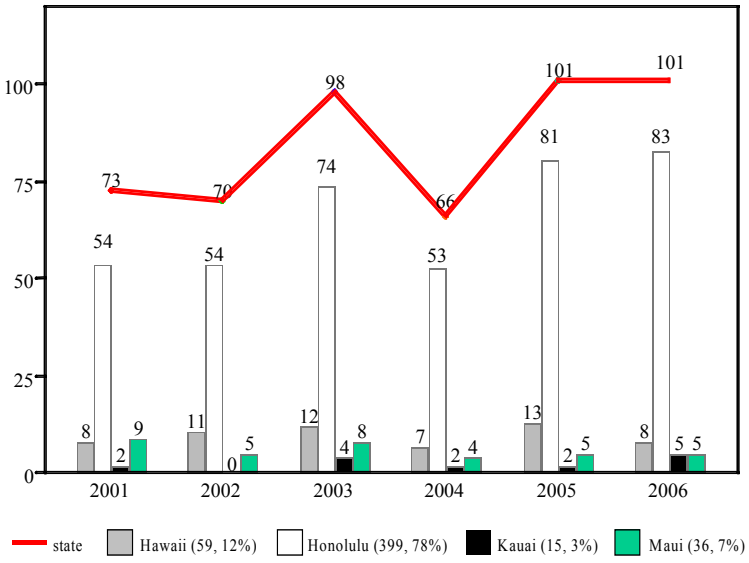
*Statistics are annual averages over the 2003-2006 period.

Falls

Fatal injuries

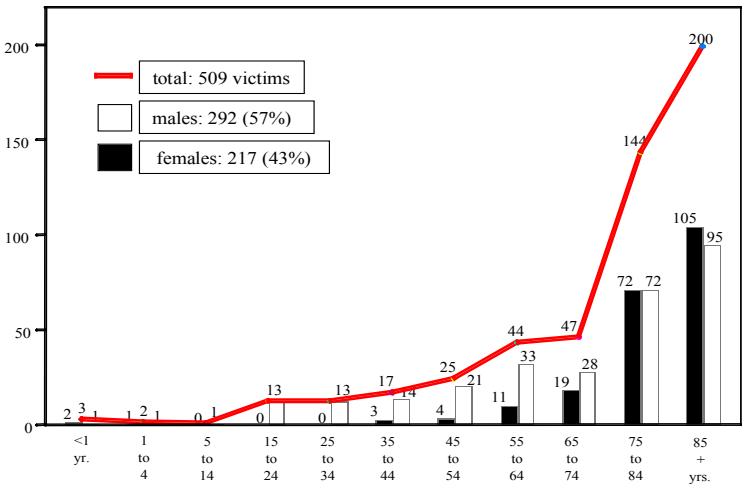
Falls were the most common type of fatal unintentional injury in the state, with the 509 deaths accounting for 21% of the total. There was a significantly increasing trend in the annual number of deaths in the state, with the highest totals were recorded in years 2005 and 2006 (101 deaths in each year) (Figure 80). The most consistent increases were seen for deaths on Oahu, from 54 in 2001 to 83 in 2006. More than three-fourths (78%, or 399) of the injuries occurred on Oahu. About half (53%, or 59) of the 110 fatalities on the Neighbor Islands occurred on the island of Hawaii.

Figure 80. Annual number of fatal falls among Hawaii residents, by county, 2001-2006.



More than three-fourths (77%, or 391) of the fall victims were aged 65 years or older, and nearly two-thirds (68%, or 344) were 75 or older (Figure 81). Male victims outnumbered females overall (57% vs. 43%), but gender was equally distributed among senior-aged victims (195 males and 196 females). In contrast, 82% (97 of 118) of the victims under 65 years of age were males.

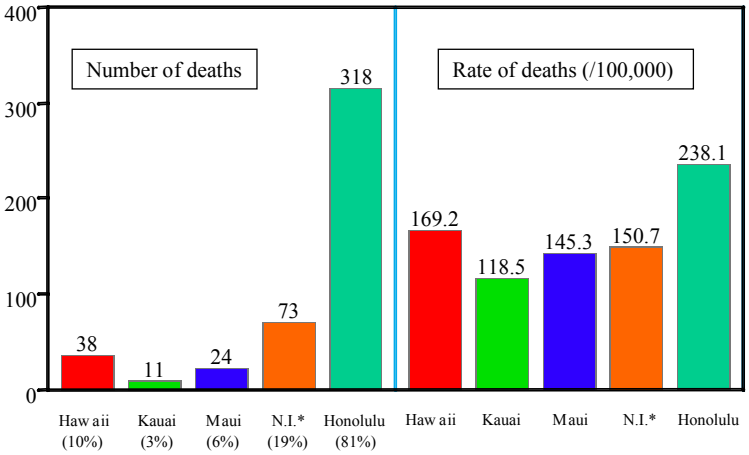
Figure 81. Age and gender distribution of victims of fatal falls in Hawaii, 2001-2006.



Most (81%, or 318) of the 391 senior-aged victims of falls were residents of Honolulu County (Figure 82). The fall fatality rate estimates for senior-aged residents of Honolulu County was significantly higher than rates for any other county, and 58% higher than the Neighbor Islands considered as a whole. Hawaii County residents had the highest rates among the Neighbor Islands, although there were no significant differences among these counties. However, these rate estimates are based on low numbers of deaths, which limits the reliability of statistical comparisons between Neighbor Islands.

Figure 82. Number and rate of fatal falls among senior-aged residents in Hawaii, by county of injury, 2001-2006.

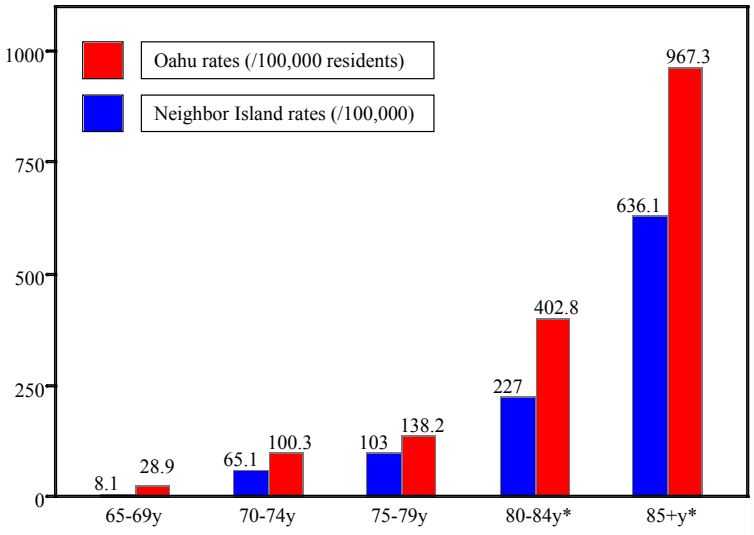
(Rate is per 100,000 senior-aged residents, age adjusted to the 2000 U.S. population distribution.)



*N.I. = Neighbor Islands (combined totals for Hawai'i, Kaua'i, and Maui counties.)

The rate of fatal falls among senior-aged residents increased dramatically with age. For example, the rate for those aged 85 years or older (878/100,000 residents) was 38 times higher than the rate among 65 to 69 year-olds (23/100,000). The increasing risk across age groups was apparent for senior-aged residents of both Oahu and the Neighbor Islands (Figure 83). However, rates were consistently higher among Oahu residents, including significant differences for two oldest age groups. Among all state residents aged 85 years and older, males had significantly higher fall fatality rates compared to females (1065.4 deaths/100,000 population vs. 757.6/100,000).

Figure 83. Six-year rates of fatal falls among senior-aged residents of Oahu, and Neighbor Islands, by age group, 2001-2006.

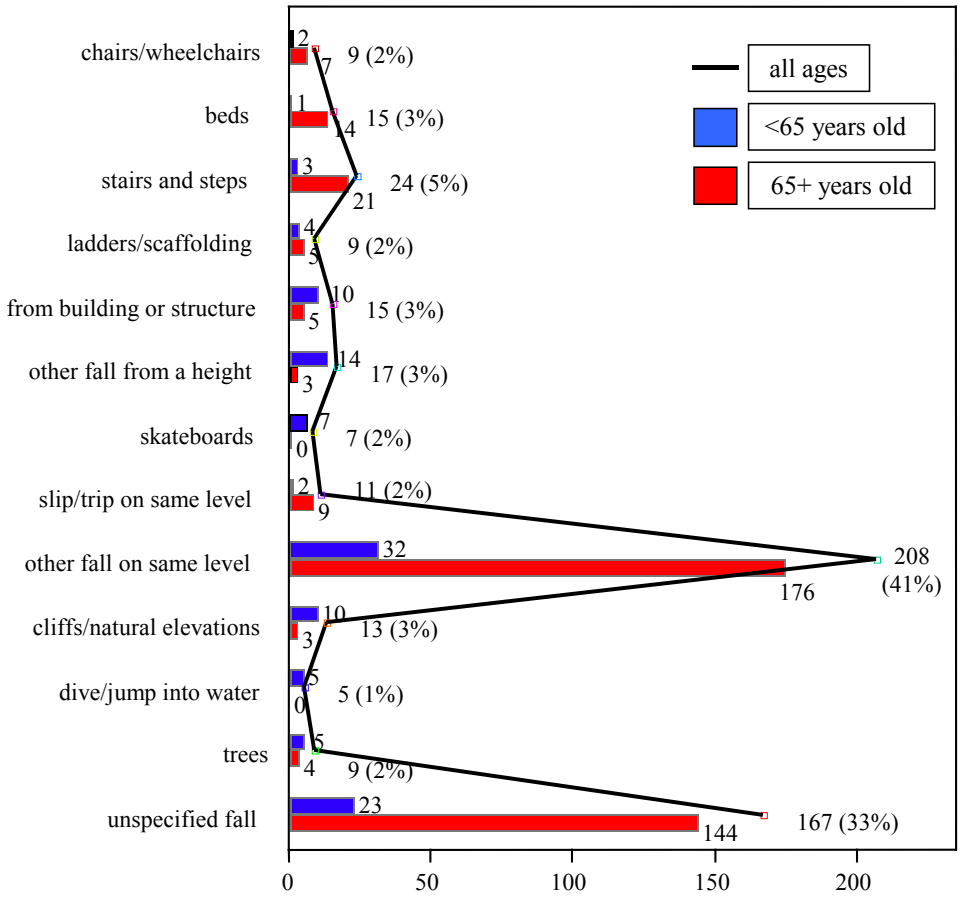


*Indicates statistically significant difference in rate between residents of Oahu and Neighbor Islands.

Figure 84 shows the types of fatal falls, as indicated by coding or the short description from the death certificate. Although there are some specific types of falls listed, the most common causes were vague, including 41% from falls "on the same level" with no further description, and "unspecified" falls (33%). All but 1 of the 15 victims who died from falls involving beds were 78 years or older; the other victim was an infant. Similarly, seniors comprised most of the victims who fell from chairs or wheelchairs (78%), or on stairs or steps (88%), or who fell on the same level from a slip or trip (82%). Most of the victims of falls from buildings (67%), skateboards (100%), cliffs or natural elevations (77%), or who were fatally injured from jumps or dives into water (100%) were under 65 years of age. The 7 victims who fell while skateboarding were between the ages of 17 and 32 years, and all were males. There was only 1 toddler-aged victim among the 15 who fell from buildings.

About two-thirds of the 509 falls (68% or 345) occurred in the home of the victim (315 falls) or their residential institution (30 falls). This proportion was higher among the senior-aged victims (76%), compared to those under the age of 65 (39%). Information on the time of the injury was available for 272 of the 408 (67%) fatal falls from 2001 to 2005. (This information was available for only 24% of the 2006 deaths.) Although falls occurred at all hours of the day, most (67%) occurred during daylight hours, between 7:00 a.m. and 6:00 p.m. The falls occurred fairly evenly over the days of the week. There were also no clear trends across the months of the year, although the highest number (60 falls) took place in December. (Monthly totals varied between 31 (March) and 45 (February) over the rest of the year.) These temporal descriptions were similar when based only on fatal falls among victims aged 65 years and older.

Figure 84. Fatal falls among Hawaii residents, by type of fall and age of victim, 2001-2006.



Nonfatal injuries

There was an increasing trend in the number of nonfatal injuries from falls that were treated in EDs, but no clear trend in the annual number of hospitalizations (Table 15). There was an average of more than 16,000 of the former and nearly 2400 of the latter types of injuries each year among Hawaii residents. Gender was equally distributed among patients treated in EDs, but females comprised 59% of the patients that were hospitalized. About two-thirds (65%) of the patients who were hospitalized were 65 years or older, compared to only 25% for those who were discharged from EDs. About two-thirds of the patients treated in EDs (62%) and admitted to hospitals (67%) were residents of Honolulu County. There were twice as many Hawaii residents who were treated in EDs compared to Maui and Kauai counties, but the number of hospitalizations were nearly equal between Hawaii and Maui County residents.

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

	ED visits	hospitalizations	total
Year of admission			
2003	14172	2240	16412
2004	15016	2327	17343
2005	18034	2601	20635
2006	18287	2341	20628
average annual total	16377	2377	18755
Patient gender			
Female	8083 (49%)	1404 (59%)	9487 (51%)
Male	8294 (51%)	973 (41%)	9267 (49%)
Patient age			
Infants	347 (2%)	17 (1%)	364 (2%)
1-4 y	2098 (13%)	49 (2%)	2147 (11%)
5-14 y	2799 (17%)	118 (5%)	2917 (16%)
15-24 y	1572 (10%)	87 (4%)	1659 (9%)
25-34 y	1205 (7%)	86 (4%)	1291 (7%)
35-44 y	1323 (8%)	106 (4%)	1428 (8%)
45-54 y	1617 (10%)	174 (7%)	1791 (10%)
55-64 y	1338 (8%)	192 (8%)	1530 (8%)
65-74 y	1071 (7%)	263 (11%)	1334 (7%)
75-84 y	1675 (10%)	642 (27%)	2317 (12%)
85 + y	1334 (8%)	644 (27%)	1978 (11%)

*Statistics are annual averages over the 2003-2006 period.

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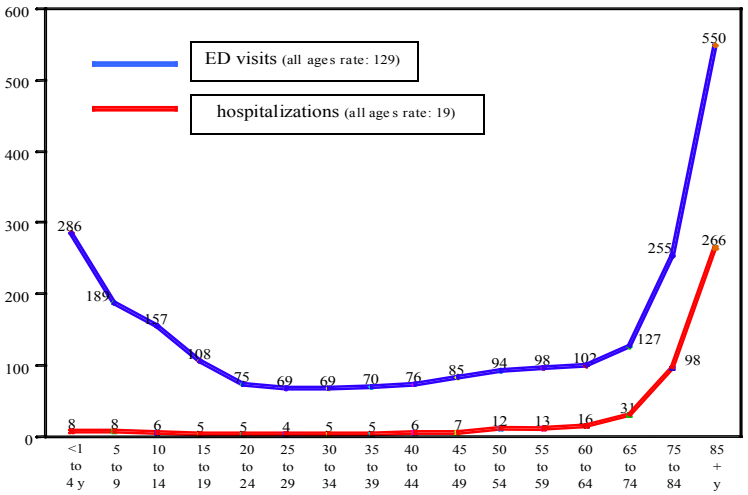
	ED visits	hospitalizations	total
County of residence of patient			
Hawaii	3385 (21%)	342 (14%)	3727 (20%)
Honolulu	10196 (62%)	1587 (67%)	11783 (63%)
Kauai	1360 (8%)	131 (6%)	1491 (8%)
Maui	1436 (9%)	318 (13%)	1754 (9%)

*Statistics are annual averages over the 2003-2006 period.

The youngest (ages 14 and younger) and oldest (65 and older) Hawaii residents had the highest rates of nonfatal injuries from falls (Figure 85). Rates for ED visits decreased progressively from residents aged 4 years and younger to 20 to 24 year-olds, then rose gradually over the 25 to 64 year age range before increasing dramatically at ages 65 and older. Rates for residents aged 85 and older were 4 times those for 65 to 74 year-olds, and 5 to 8 times higher than rates for other adult-aged residents. There was no peak in hospitalization rates for young children, although children under 10 years of age had the highest rates over the infant to 49 year age range. Rates again increased greatly among senior-aged residents, being at least 16 times higher among those aged 85 years or older compared to residents aged 64 years or younger. Hospitalization rates also increased sharply across the senior age range, approximately tripling across the age groups listed in Figure 85.

Rates of ED visits among residents of Hawaii and Kauai counties were roughly double the rates computed for Honolulu and Maui county residents (Figure 86). While the residents of Maui County had the lowest rates of ED visits, they had significantly higher rates of hospitalizations compared to any other county. Residents of Honolulu County had the lowest rates of hospitalizations, significantly lower than the rate computed for residents of Hawaii County.

Figure 85. Average annual rates (per 10,000 residents) of hospitalizations and ED visits for nonfatal injuries from falls in Hawaii, by age of patient.



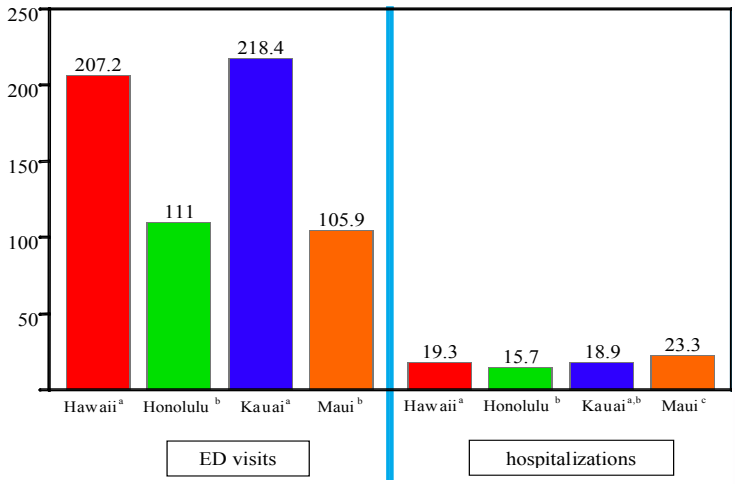
The causes of the nonfatal falls are shown in figure 87. The distribution of the causes was generally similar for injuries treated in EDs and those that required hospitalization, with somewhat vague causes ("falls on same level", and "other/unspecified") being the most common. There were a few exceptions, as falls from ladders/scaffolding and buildings/structures comprised proportionally more falls requiring hospitalization, and while falls from playground equipment and skateboards were more common among those treated in EDs.

More than half of the records from ED visits (62%) or hospitalizations (56%) contained no information on where the injury occurred. The most commonly documented places were in the home (19% of ED records, 30% of hospitalizations). About 5% of the ED records were coded for injuries in public buildings, and 4% in recreational sites, while 3% of hospital admission records were coded for injuries in residential institutions and public buildings.

Although ED visits for nonfatal falls outnumbered hospitalizations by nearly 7-to-1, the total number of patient days were nearly equal between the two levels of care (Table 16). This was because many of the hospitalizations involved long stays; one-third (33%) of the patients were hospitalized for 1 week or longer, and 9% for 2 weeks or more. Long stays also increased the average charge per hospitalization to over $24,000, and the total costs to $58 million per year, roughly 3 times the cost of ED visits ($19.3 million).

Fractures were by far the most common type of injury among residents hospitalized from nonfatal falls, present in nearly three-fourths (73%) of the patients. One-third (33%) had fractures of the femur (including 30% with hip fractures), and 11% fractures of the lower leg or foot. Most of the other patients were hospitalized for internal injuries (17%). There was a different pattern for injuries treated in EDs, as about half were contusions or superficial injuries (26%), or open wounds (22%). About a quarter (23%) of the patients had fractures, most commonly the lower arm or hand (10%). About one-fifth (21%) of the hospitalized patients had TBI, compared to 12% among those treated in EDs. (TBI counts included diagnoses of any priority.)

Figure 86. Age adjusted annual rates (per 10,000 residents) of nonfatal injuries from falls, by level of care and county of residence of patient.



(Counties with the same superscripted letter have statistically comparable rate estimates.)

Figure 87. Causes of nonfatal falls among Hawaii residents, by level of care.

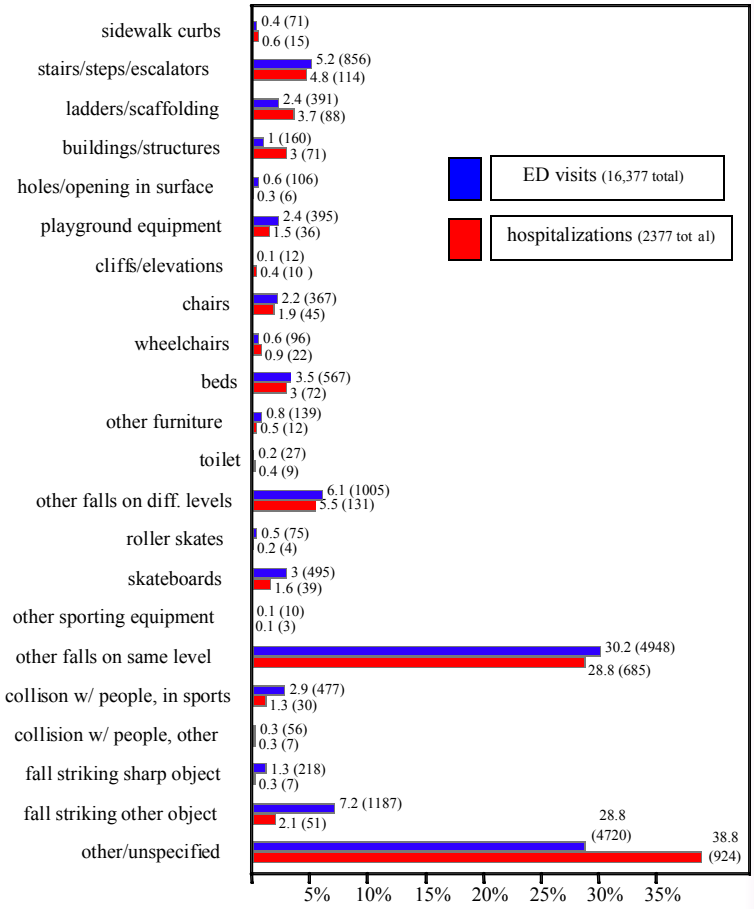


Table 16. Clinical characteristics* of Hawaii residents with nonfatal injuries from falls.

	ED visits	hospitalizations	total
Length of care and financial charges			
Ave. length of stay (days)	1.0	6.7	1.7
Total number of days	16377	15891	32268
Average charge	$1,176	$24,422	$4,048
Total charges	$19.3 million	$58.1 million	$77.4 million
Primary injury diagnosis			
fractures	3801 (23.2%)	1736 (73.0%)	5537 (29.5%)
fracture of skull	135 (0.8%)	98 (4.1%)	233 (1.2%)
vertebral column	175 (1.1%)	174 (7.3%)	349 (1.9%)
ribs, pelvis or trunk	537 (3.3%)	161 (6.8%)	698 (3.7%)
humerus	483 (3.0%)	133 (5.6%)	616 (3.3%)
lower arm or hand	1634 (10.0%)	120 (5.0%)	1754 (9.4%)
femur	43 (0.3%)	789 (33.2%)	832 (4.4%)
lower leg or foot	794 (4.8%)	261 (11.0%)	1055 (5.6%)
other/unspec. fractures	1 (0.0%)	0 (0.0%)	2 (0.0%)
dislocations	370 (2.3%)	16 (0.7%)	385 (2.1%)
sprains and strains	2130 (13.0%)	46 (1.9%)	2176 (11.6%)
internal injuries	441 (2.7%)	410 (17.3%)	851 (4.5%)
open wounds	3636 (22.2%)	41 (1.7%)	3676 (19.6%)
contusion/superficial	4249 (25.9%)	62 (2.6%)	4311 (23.0%)
other/unspecified	1751 (10.7%)	67 (2.8%)	1818 (9.7%)
traumatic brain injury (any priority diagnosis)	1927 (11.8%)	500 (21.0%)	2427 (12.9%)

*Statistics are annual averages over the 2003-2006 period.

The remainder of this chapter will describe nonfatal injuries from falls among senior-aged residents. As per residents of all ages, there was a generally increasing trend in the annual number of falls among seniors, and this was most evident for falls treated in EDs as there was an increase of 39% over the 4-year period (Table 17). Females comprised two-thirds of the patients treated in EDs and 70% of those who required hospitalization. More than one-third (35%) of the patients were 85 years or older, and this proportion was highest among patients who were hospitalized (42%). The annual number of falls increased consistently across the age groups listed in Table 17. Most (70%) of the patients were residents of Honolulu County, and residents of Hawaii County comprised about half of the remainder (15% overall). While there were nearly equal numbers of patients from Kauai and Maui counties overall, the number of Maui County residents who were hospitalized was more than double the number from Kauai County (177 vs. 76 patients).

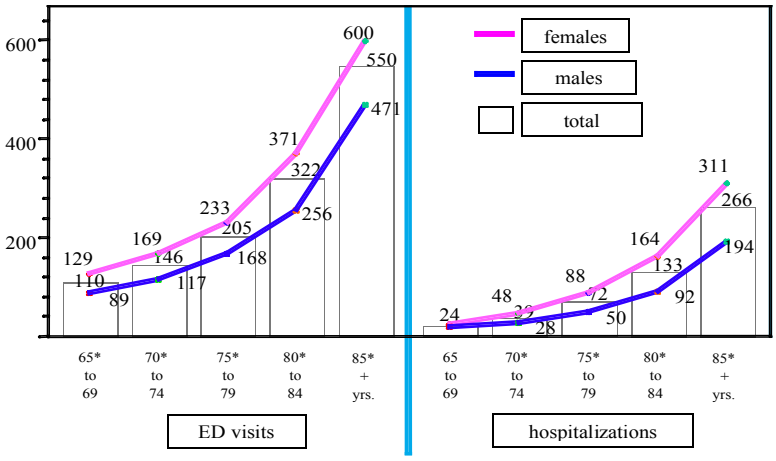
Table 17. Demographic characteristics* of senior-aged Hawaii residents with nonfatal injuries from falls.

	ED visits	hospitalizations	total
Year of admission			
2003	3344	1455	4799
2004	3625	1553	5178
2005	4708	1671	6379
2006	4642	1514	6156
average annual total	4080	1548	5628
Patient gender			
Female	2672 (65%)	1086 (70%)	3758 (67%)
Male	1407 (35%)	462 (30%)	1870 (33%)
Patient age			
65-69 y	485 (11%)	107 (7%)	592 (11%)
70-74 y	586 (14%)	156 (10%)	742 (13%)
75-79 y	769 (19%)	268 (17%)	1037 (18%)
80-84 y	906 (22%)	374 (24%)	1280 (23%)
85 + y	1334 (33%)	644 (42%)	1978 (35%)
County of residence of patient			
Hawaii	645 (16%)	209 (14%)	854 (15%)
Honolulu	2876 (70%)	1087 (70%)	3962 (70%)
Kauai	300 (7%)	76 (5%)	376 (7%)
Maui	260 (6%)	177 (11%)	437 (8%)

*Statistics are annual averages over the 2003-2006 period.

The increasing number of injuries from falls across the senior age range translated into extremely high rates for the oldest residents, for both injuries treated at EDs and those requiring hospitalization (Figure 88). Rates of ED visits among residents aged 85 years and older were 5 times higher than rates among 65 to 69 year-olds, while hospitalization rates were 11 times higher for the oldest group compared to the youngest. Female residents had significantly higher rates of both kinds of injuries at every age group listed, with the exception of hospitalizations among 65 to 69 year-olds. Rates for ED visits were 38% higher among females than males (272 patients/10,000 residents vs. 187/10,000), while hospitalization rates were 81% higher among females (111/10,000 vs. 61/10,000), and these differences were generally consistent over the age groups shown in Figure 88. Similar relationships between age and gender and nonfatal injury rates were seen within each of the 4 counties.

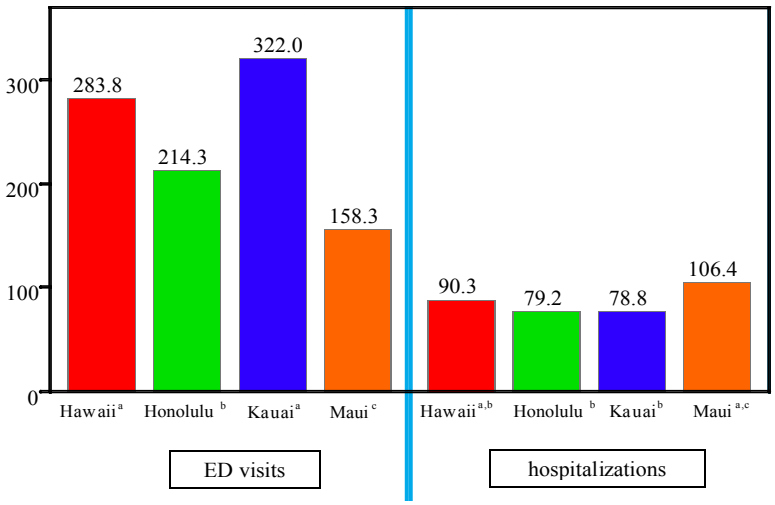
Figure 88. Rates (per 10,000 residents) of nonfatal injuries from falls among senior residents of Hawaii, by gender and level of care.



*Indicates statistically significant difference in rate between males and females of that age group.

Comparison of county-specific rate estimates for senior residents (Figure 89) was similar to that for residents of all ages (see Figure 86): the highest rates for ED visits were computed for residents of Hawaii and Kauai counties, significantly higher than the other two counties. While rates for ED visits for Maui County residents were significantly lower than for any other county, Maui residents had the rates for hospitalizations. These patterns were similar when county-specific rates were computed separately for each gender.

Figure 89. Age adjusted* annual rates (per 10,000 residents) of nonfatal injuries from falls among seniors, by level of care and county of residence of patient.



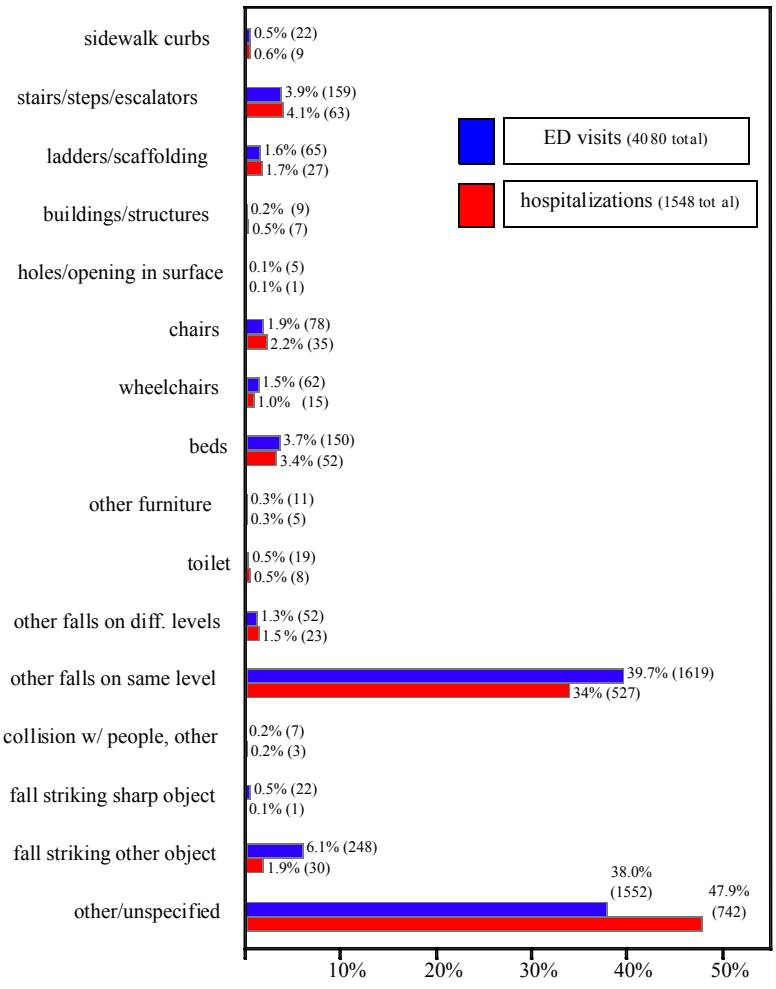
(Counties with the same superscripted letter have statistically comparable rate estimates.)

*Adjusted using the 6 age groups shown in figure 88, above.

There was little information on the cause of falls among seniors, as most of the injuries treated in EDs (78%) and requiring hospitalization (82%) were coded as "falls on same level" or due to "other and unspecified" causes (Figure 90). This lack of specificity may reflect either poor documentation in the medical records, or simply less involvement of the external environment as a cause of falls among seniors. The proportion of records with these vague causes increased progressively across the age range of patients, from 73% among 65 to 69 year-old patients to 81% among those 85 years and older. The distribution of the other, more specific, causes was similar between ED visits and hospitalizations, with stairs and steps and beds being the most commonly mentioned causes (about 4%).

There was no information on the location of the injury for about two-thirds (67%) of the ED records and more than half (56%) of the hospitalization records. The most specifically coded injury location was the home, for both ED (25%) and hospitalization records (37%). The proportion of falls in the home increased across the age range from 25% for patients aged 65 to 69 years to 31% for those 85 years and older.

Figure 90. Causes of nonfatal falls among senior-aged Hawaii residents, by level of care.



Because hospitalizations among seniors injured by falls were long (nearly 8 days on average), the total number of patient days for hospitalizations was nearly 3 times greater than the number patient days in EDs (Table 18). Among the patients hospitalized, 41% stayed for 1 week or longer, and 11% for 2 weeks or more. These long stays also resulted in a high average charge per hospitalization (over $26,000), with total annual charges being 6 times higher than the charges for ED visits ($39.7 vs. $6.5 million).

The distribution of injuries among hospitalized seniors was similar to that for patients of all ages (see Table 16): three-fourths (75%) had fractures, and 17% had internal injuries. Proportionally more of the fractures among seniors were femur fractures, however (45% vs. 33% for patients of all ages). Almost all (95%) of the femur fractures among seniors were fractures of the neck of the femur, or hip fractures. About one-third (32%) of the injuries treated in EDs were contusions or superficial injuries, a quarter (24%) were open wounds, and another quarter (24%) were fractures, most commonly fractures of the lower arm or hand (7%). One-fifth (20%) of the hospitalized patients had TBI, compared to 14% among those treated in EDs. (TBI counts included diagnoses of any priority.)

Table 18. Clinical characteristics* of Hawaii senior residents with nonfatal injuries from falls.

	ED visits	hospitalizations	total
Length of care and financial charges			
Ave. length of stay (days)	1.0	7.7	1.7
Total number of days	4080	11958	16038
Average charge	$1,598	$25,627	$8,233
Total charges	$6.5 million	$39.7 million	$46.2 million
Primary injury diagnosis			
fractures	967 (23.7%)	1161 (75.0%)	2128 (37.8%)
fracture of skull	62 (1.5%)	38 (2.4%)	100 (1.8%)
vertebral column	105 (2.6%)	126 (8.1%)	231 (4.1%)
ribs, pelvis or trunk	198 (4.9%)	126 (8.2%)	325 (5.8%)
humerus	157 (3.8%)	60 (3.9%)	217 (3.9%)
lower arm or hand	279 (6.8%)	35 (2.2%)	313 (5.6%)
femur	28 (0.7%)	698 (45.1%)	726 (12.9%)
lower leg or foot	137 (3.4%)	80 (5.1%)	217 (3.9%)
other/unspec. fractures	1 (0.0%)	0 (0.0%)	1 (0.0%)
dislocations	56 (1.4%)	4 (0.3%)	61 (1.1%)
sprains and strains	279 (6.8%)	18 (1.2%)	298 (5.3%)
internal injuries	111 (2.7%)	269 (17.4%)	380 (6.8%)
open wounds	997 (24.4%)	20 (1.3%)	1017 (18.1%)
contusion/superficial	1297 (31.8%)	46 (2.9%)	1342 (23.8%)
other/unspecified	373 (9.1%)	30 (1.9%)	403 (7.2%)
traumatic brain injury (any priority diagnosis)	570 (14.0%)	309 (20.0%)	880 (15.6%)

*Statistics are annual averages over the 2003-2006 period.

Drownings and Near Drownings

Fatal injuries

Drownings were the 5th leading cause of unintentional injury fatalities, with 187 fatalities over the 6-year period. There were anywhere from 28 to 39 drownings per year among state residents over the 2001-2006 period, with an increasing number from 2002 to 2005, followed by a decrease to 28 in 2006 (Figure 91). About two-thirds of the drownings (65%, or 122) occurred on the island of Oahu, 41 (22%) on Hawaii, 13 (7%) in Maui County (10 on the island of Maui, and 3 on Molokai), and 11 (6%) on Kauai. There was an increasing trend in the annual number of drownings on Oahu from 2001-2005, but the total decreased to 18 in 2006. No other trends were noticed for the other counties.

Drownings occurred at every age but were least common among children and residents aged 65 years or older (Figure 92). Seventy-eight percent (146) of the victims were between the ages of 15 and 64 years. The figure also shows that most (88%, or 164) of the victims were males. The proportion of female victims was greatest in the youngest and oldest age ranges.

More than three quarters (81%, or 152) of the victims drowned in the ocean or other saltwater environments such as canals or harbors (Figure 93). Eleven others drowned in bodies of freshwater (streams, ponds, waterfalls), eleven in swimming pools, nine in bathtubs, and 4 in other types of environments (e.g. drainage canal). Almost all of the drownings on Kauai (73%, or 8 of 11) and Maui counties (100% of 13) occurred in the ocean. The distribution of victim age and sex differed by the environment of the drowning. The 9 bathtub drowning victims were either under 2 years of age (4 victims), or 63 years or older (5). Gender was almost equally divided (5 males, 4 females). Half (55%, or 6 of 11) of the pool drowning victims were under 5 years of age, including four 1 year-olds. In contrast, only 2 of the 152 victims who drowned in the ocean were

Figure 91. Annual number of drownings among Hawaii residents, by county, 2001-2006.

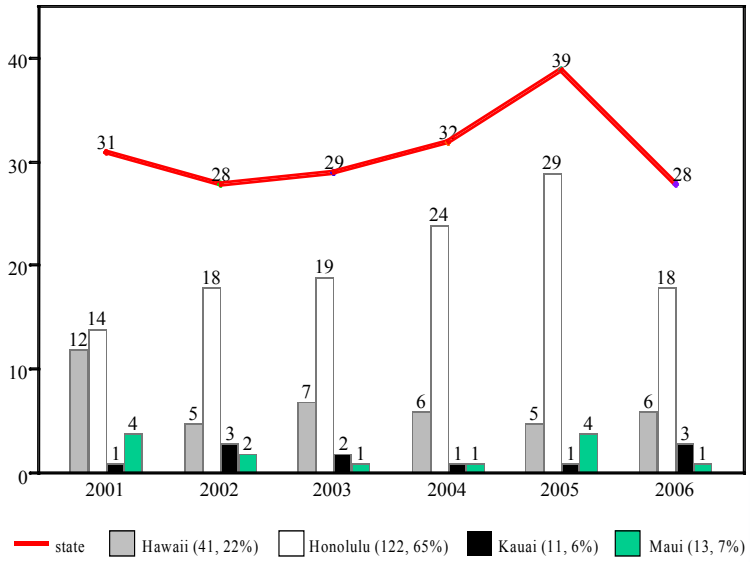
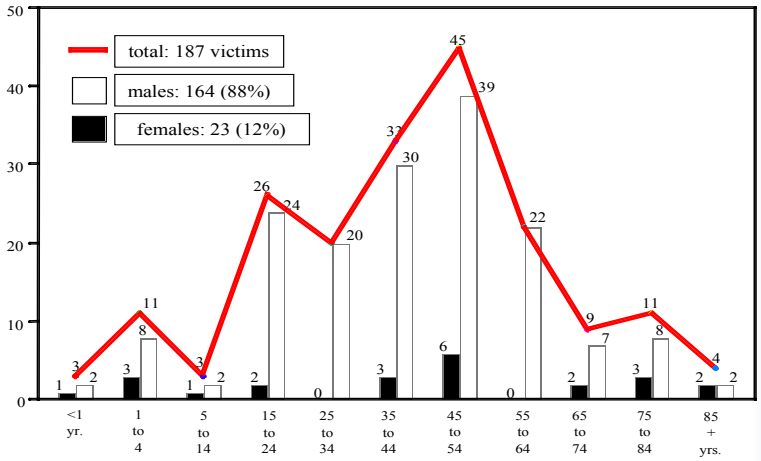


Figure 92. Age and gender distribution of resident drowning victims in Hawaii, 2001-2006.



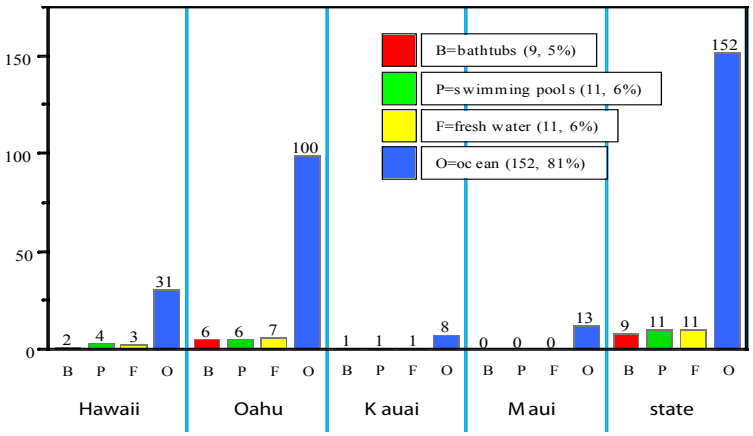
under 5 years of age, and only 5 (3%) were under age 18. About half of these victims (49%, or 74) were in the 35 to 54 year age group. Most (92%) were males.

Although the majority of the drownings occurred in Honolulu County, Figure 94 shows that the rates of both all types of drownings and saltwater drownings were highest among Hawaii County residents. Residents of Maui County had the lowest rates of both types of drownings; significantly lower than those computed for residents of Hawaii County. Drowning rates were also significantly lower for residents of Honolulu County compared to Hawaii County. Note that the saltwater drowning rates for Honolulu and Kauai counties were basically the same (11.1 vs. 11.4, respectively), but only the former was statistically different from the rate for Hawaii County. This was probably due to the low number of such drownings on Kauai County (8 drownings, compared to 100 for Honolulu), which resulted in a relatively imprecise rate estimate and less power to detect a "significant" difference between the 2 counties.

Six of the pool drownings were at a single family residence, including 5 children under 4 years of age. There were also 3 pool drownings at apartment buildings and 1 each in a community center and a hotel. Autopsy records were available for 8 of the 9 victims who drowned in pools over the 2001-2004 period. Five of those 8 victims were under 5 years of age. Intrinsic factors were noted for all 3 of the remaining victims, who were 16 years or older: 1 had seizure disorders, 1 had a heart attack prior to drowning, and 2 were legally intoxicated.

About half (5 of 11) of the drownings in freshwater environments occurred in Nuuanu Stream, including 3 in the downtown Honolulu area (Figure 95). There were also 2 drownings in the Wailuku River in Hilo. All 6 of the victims who drowned on Oahu from 2001-2004 tested positive for alcohol, according to autopsy records. Only 2 of the drownings were known to have resulted from unintentional immersions; 5 of the victims were swimming, 1 entered from a rope swing and 1 jumped from a height.

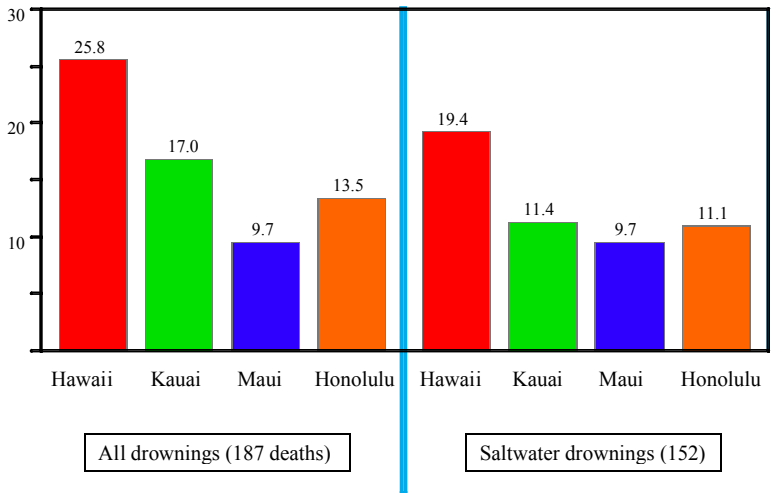
Figure 93. Drownings of Hawaii residents, by environment and county, 2001-2006.



Not shown are 4 drownings in "other" environments: 3 on Oahu, 1 on Hawaii.

Figure 94. Rate of all types of drownings (left side) and saltwater drownings (right side) among Hawaii residents, by county of injury, 2001-2006.

(Rate is per 100,000 residents, age-standardized to the 2000 U.S. population distribution.)



Figures 95 and 96 also show the approximate location of the 152 ocean drownings on Oahu and the Neighbor Islands, respectively. About half (55%, or 55) of the 100 drownings on Oahu were on the eastern part of the island, including 13 near Ala Moana Beach Park, 4 near the Ala Moana Yacht Harbor, 5 along Waikiki Beach, 4 near Kapiolani Park, and 4 in Makapuu Bay. There were also 16 drownings along the Waianae coast, and 5 on the North Shore, from Haleiwa to Sunset Beach.

Most of the 31 ocean drownings on the island of Hawaii were on the Kona coast (10 from Kailua south to Hookena Beach), or on the eastern side of the island (3 in the Hilo area, and 9 along the Puna coast) (Figure 69). There were also 6 drownings on the southern part of the island from Milolii to Punaluu Beach. Ocean drownings were widely dispersed for Kauai and Maui counties, although there were 3 in the Kuau area (Paia) on the island of Maui.

Figure 95. Approximate locations of drownings on Oahu among Hawaii residents, by environment, 2001-2006.

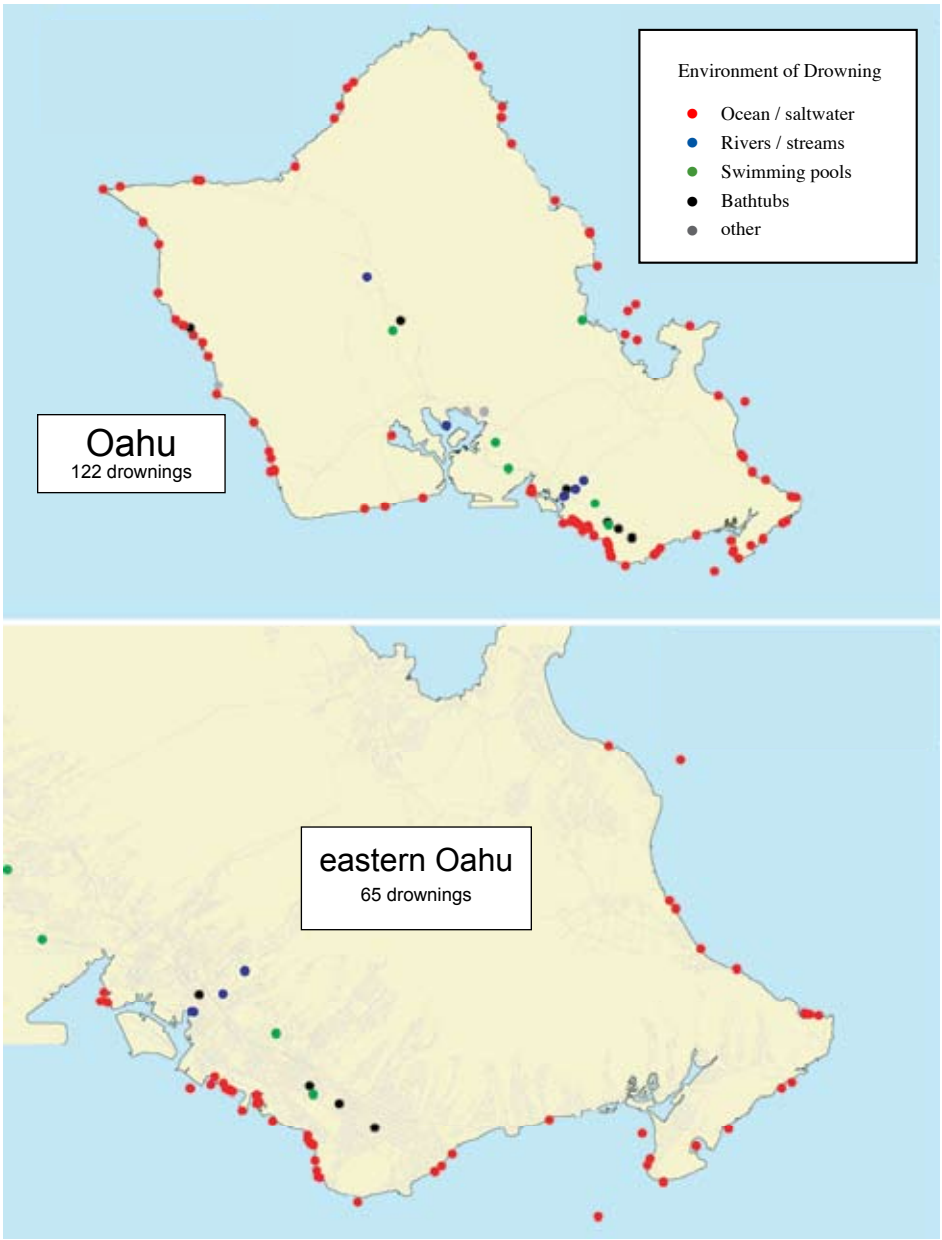
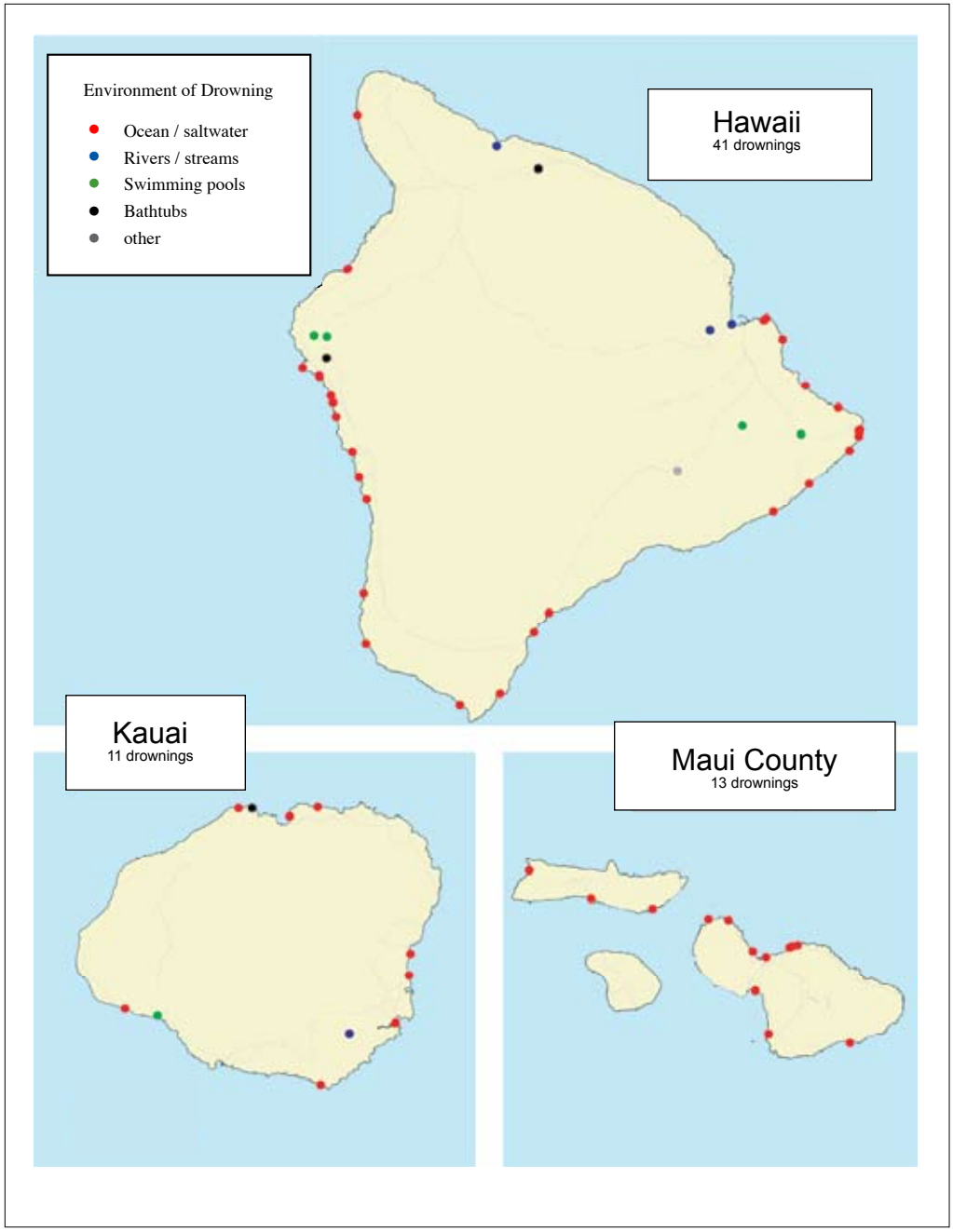


Figure 96. Approximate locations of drownings on Neighbor Islands among Hawaii residents, by environment, 2001-2006.



Unintentional immersions were responsible for one-fifth of the 152 drownings in the ocean or other saltwater environments (Figure 97). Eleven of these 31 victims fell in or were swept in from shore while not engaged in any specific activity, 8 were fishing from shore, 7 were picking opihi, and another 5 drowned after boat accidents. All but 1 of the 7 opihi pickers drowned on Neighbor Islands, including 4 on Hawaii and 2 on the island of Maui. Swimming was the single most common activity among the victims (29 drownings). Twenty-eight of the drownings were diving-related, and

most of those (89%, or 25) were among "free" divers (i.e. those not using scuba equipment). The "other water sports" in Figure 97 includes 6 drownings after jumps or dives into the ocean, and 2 drownings related to kayaking.

A number of personal factors were identified from autopsy records which at least partially contributed to the 91 saltwater drownings from 2001-2004. (All but 1 of the 91 deaths were linked to autopsy records.) These are factors which had nothing to do with the environment in which the person drowned, and are therefore referred to as intrinsic factors: circulatory diseases, alcohol and drug use, seizure disorders, and traumatic injuries.

Intrinsic factors were involved in nearly two thirds (63%, or 57) of the 91 saltwater drownings in the state over this period (Figure 98). The most common intrinsic factor was circulatory diseases, which contributed to 38% of the drownings. Most of these victims were noted to have ischemic heart disease or atherosclerosis. Two victims had cerebral infarctions, and 2 others had congenital conditions. Circulatory diseases were noted as possible cause in over half (63%, or 15) of the 24 drownings among victims aged 55 years or older. Half (9) of the 18 victims who tested positive for alcohol had BAC of 0.08% or higher, including 4 with BAC of 0.20% or higher. Alcohol use was most common (30%, or 7) among the 23 victims who had an unintentional immersion. Drug use was less prevalent, as only two of the victims tested positive for methamphetamine and 1 for cocaine. Three of the drownings were related to seizure disorders, and 5 other victims sustained traumatic injuries which led to their drownings.

Figure 97. Saltwater drownings among Hawaii residents, by activity of victim, 2001-2006.

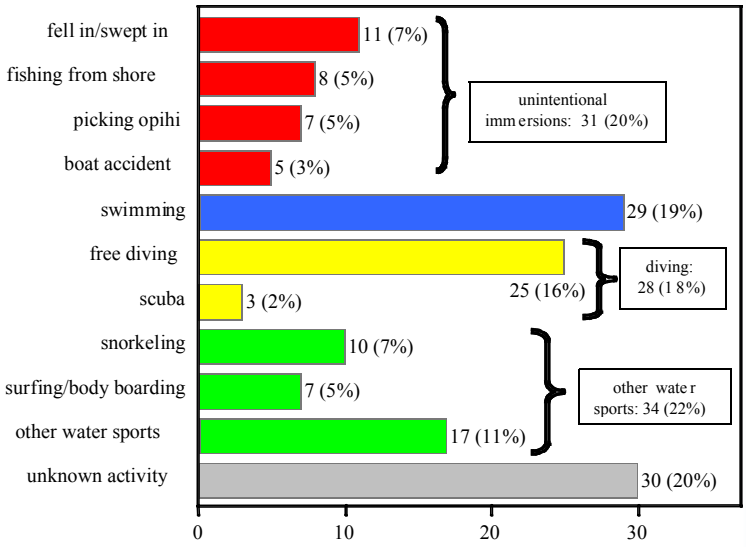
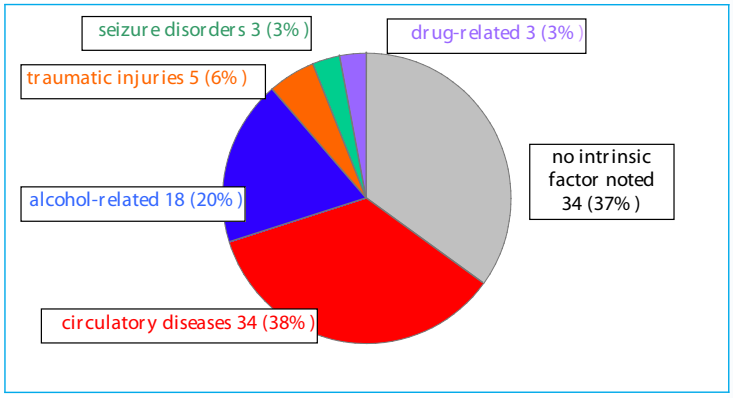


Figure 98. Prevalence of intrinsic factors in saltwater drownings of Hawaii residents, 2001-2004.



*Percents do not add to 100 because some victims had more than 1 intrinsic factor.

Nonfatal injuries

The number of near drownings that were treated in EDs decreased consistently over the 4-year period from 327 in 2003 to less than half that (128) by 2006 (Table 19). The decreases were most consistent for residents of Honolulu and Kauai counties. Male patients (77% of the total) outnumbered females by about three-to-one for both ED visits and hospitalizations. Almost all the patients (95%) were under 55 years of age, and nearly one-third (32%) were 15 to 24 years of age. Nearly one-fifth (18%) of the hospitalized patients were under 5 years of age, compared to only 3% of those who were treated in EDs. Only about one-third (36%) of the patients were residents on Honolulu County, while 41% were residents of Maui County.

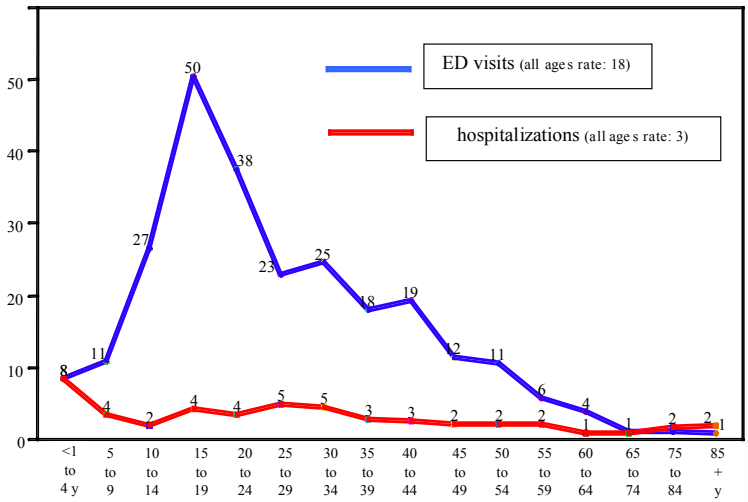
Table 19. Demographic characteristics* of Hawaii residents with nonfatal injuries from near drownings.

	ED visits	hospitalizations	total
Year of admission			
2003	327	44	371
2004	240	39	279
2005	179	46	225
2006	128	33	161
average annual total	219	41	259
Patient gender			
Female	50 (23%)	10 (25%)	60 (23%)
Male	168 (77%)	31 (75%)	199 (77%)
Patient age			
Infants	1 (0%)	1 (2%)	2 (1%)
1-4 y	7 (3%)	6 (15%)	13 (5%)
5-14 y	31 (14%)	5 (11%)	36 (14%)
15-24 y	76 (35%)	7 (17%)	83 (32%)
25-34 y	42 (19%)	8 (20%)	50 (19%)
35-44 y	34 (16%)	5 (12%)	39 (15%)
45-54 y	20 (9%)	4 (10%)	24 (9%)
55-64 y	7 (3%)	2 (6%)	9 (3%)
65-74 y	1 (0%)	1 (2%)	2 (1%)
75-84 y	1 (0%)	1 (3%)	2 (1%)
85 + y	0 (0%)	1 (1%)	1 (0%)
County of residence of patient			
Hawaii	37 (17%)	8 (19%)	44 (17%)
Honolulu	76 (35%)	19 (46%)	94 (36%)
Kauai	13 (6%)	2 (4%)	14 (5%)
Maui	94 (43%)	13 (31%)	107 (41%)

*Statistics are annual averages over the 2003-2006 period.

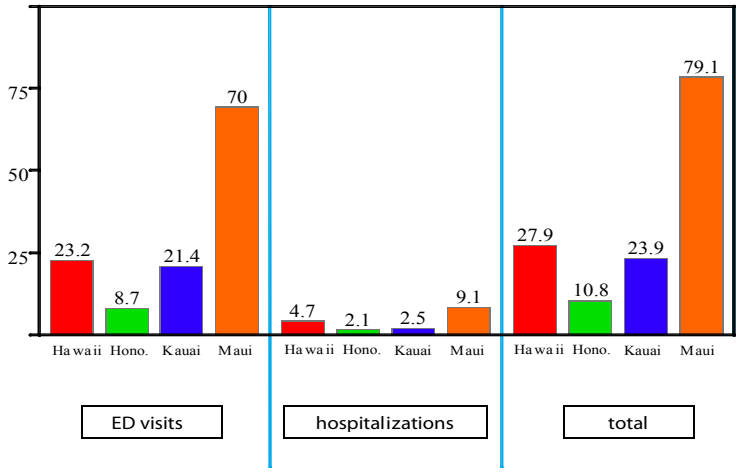
Residents aged 10 to 24 years had the highest rates of ED visits, especially 15 to 19 year-olds (Figure 99). Rates of ED visits decreased progressively among residents 20 years and older. The highest rates of hospitalization were computed for residents under 5 years of age. Hospitalization rates generally decreased over the age range, although much less abruptly than ED rates. Rates of ED visits and hospitalizations were the same for the youngest (under 5 years) and oldest (75 years and older) residents of the state.

Figure 99. Average annual rates (per 100,000 residents) of hospitalizations and ED visits for near drownings in Hawaii, by age of patient.



Residents of Maui County had by far the highest rates of ED visits, at least 3 times higher than the rates for residents of any other county (Figure 100). The rates for both ED visits and all near drownings (ED visits and hospitalizations combined) were significantly higher for Maui County residents than any other county. Hospitalization rates were also highest for residents of Maui County, significantly higher than the rates computed for residents of Honolulu or Kauai counties. Oahu residents had significantly lower rates of ED visits than any other county and the lowest rates of hospitalizations. All rates for residents of Hawaii and Kauai counties were statistically comparable.

Figure 100. Age adjusted annual rates (per 100,000 residents) of near drownings, by level of care and county of residence of patient.



Most (87%) of the near-drownings were related to "recreational activity without diving equipment". Two-percent involved use of diving equipment, and 2% were related to unintentional immersions from water transport accidents. Circumstances were "unknown" for the remaining 7% of the near drownings. Nearly half (44%) of the near drownings occurred on a Saturday or Sunday. There were no apparent seasonal trends, although the largest number of near drownings occurred in January (33 on average, compared to 15 to 24 for other months).

Hospitalizations were of a relatively short number of days (3.5, on average), so the total number of days of care was greater for ED visits than hospitalizations (Table 20). Because each hospitalization incurred over $18,000 in charges, however, they comprised most (78%) of the total medical charges in the state. Besides the ICD-9CM code for "drowning and nonfatal submersion", patients were commonly hospitalized for fractures (28%), including 10% with fractures of the vertebral column. Principal diagnoses for ED visits included open wounds (39%), sprains and strains (13%), fractures (12%) and contusions and superficial injuries (12%).

Table 20. Clinical characteristics* of Hawaii residents with nonfatal injuries from near drownings.

	ED visits	hospitalizations	total
Length of care and financial charges			
Ave. length of stay (days)	1.0	3.5	1.4
Total number of days	219	144	362
Average charge	$1,136	$18,473	$3,978
Total charges	$0.2 million	$0.7 million	$0.9 million
Location			
recreation area, incl. public pool	26 (12%)	3 (8%)	29 (11%)
home, incl. swimming pools	2 (1%)	2 (4%)	4 (1%)
public building	0 (0%)	1 (2%)	1 (0%)
other places, incl. beach and sea	103 (47%)	19 (46%)	122 (47%)
other/unspecified	88 (40%)	16 (40%)	104 (40%)
Primary injury diagnosis			
drowning and submersion	18 (8%)	20 (49%)	38 (14%)
fractures	26 (12%)	11 (28%)	37 (14%)
fracture of skull	2 (1%)	2 (4%)	4 (2%)
vertebral column	2 (1%)	4 (10%)	6 (2%)
ribs, pelvis or trunk	7 (3%)	1 (2%)	8 (3%)
humerus	3 (1%)	0 (1%)	3 (1%)
lower arm or hand	5 (2%)	1 (1%)	5 (2%)
femur	0 (0%)	1 (2%)	1 (0%)
lower leg or foot	8 (4%)	3 (7%)	11 (4%)
dislocations	15 (7%)	1 (1%)	15 (6%)
sprains and strains	29 (13%)	1 (1%)	29 (11%)
open wounds	86 (39%)	1 (3%)	87 (34%)
contusion/superficial	26 (12%)	0 (1%)	26 (10%)
other/unspecified	20 (9%)	7 (17%)	27 (10%)
traumatic brain injury (any priority diagnosis)	13 (6%)	4 (9%)	16 (6%)

*Statistics are annual averages over the 2003-2006 period.

Poisonings

Fatal injuries

Poisonings were the 3rd leading cause of unintentional injury fatalities in the state, with 364 over the 6-year period, or an average of 61 deaths each year (Figure 101). There was a generally increasing trend in the annual number of poisonings from 2001 to 2005, but the total decreased to 60 deaths in 2006. However, trends are difficult to examine because poisonings make up a large proportion of injury deaths where the intent could not be established (see Figure 135), or they can also be classified as suicides. However, the number of poisonings of undetermined intent also generally increased over this period, so the observed trend in unintentional poisonings was probably not due to disparities in coding. It is also difficult to know the accuracy with which the intent was determined over the various years and across the 4 different counties. Most (83%) of the poisonings that were coded as unintentional occurred on Oahu. However, if poisonings of undetermined intent are also included, that proportion drops to 66% because proportionally more of the poisonings on Neighbor Islands were coded as undermined intent. Most of the poisonings on Hawaii (60%, or 57 of 95) and Maui counties (89%, or 55 of 62) were coded as undetermined intent, compared to only 19% (68 of 365) of those on Oahu.

Compared to most injury categories, the age distribution of poisoning victim was narrowly distributed, with a peak among 35 to 54 year-old victims (Figure 102). More than two-thirds (69%, or 252) of the victims were in this 20-year age group. Only 3 of the victims were under 18 years of age. Figure 102 also shows that most (77%, or 281) of the poisoning victims were male.

Figure 101. Annual number of fatal poisonings among Hawaii residents, by county, 2001-2006.

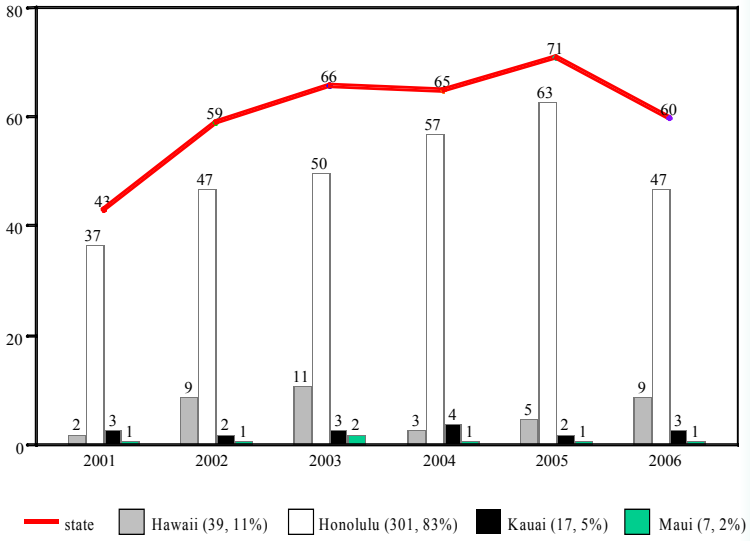


Figure 102. Age and gender distribution of poisoning victims in Hawaii, 2001-2006.

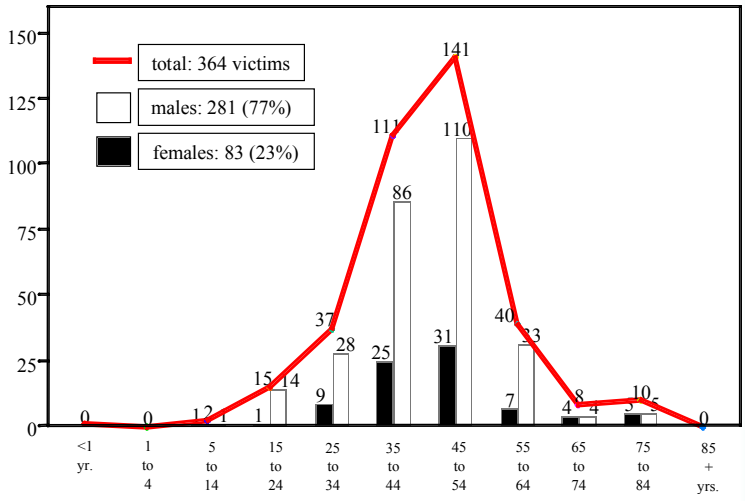
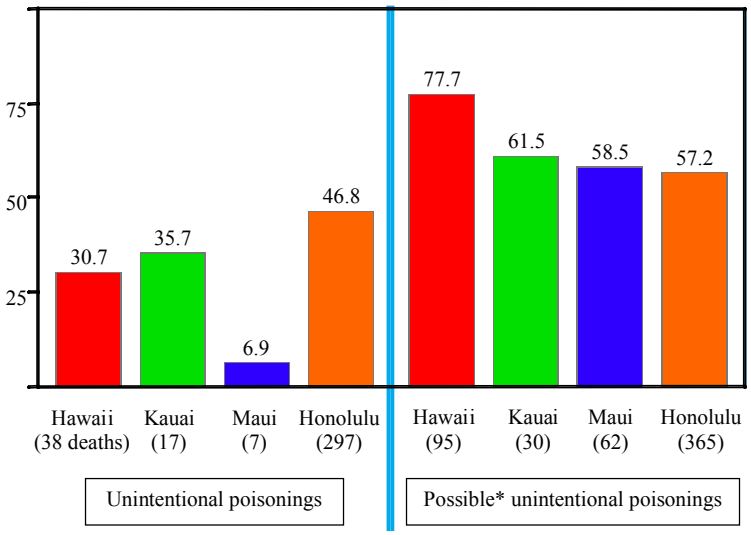


Figure 103 shows the uncertainty of comparing poison fatality rates across the counties of Hawaii, given the differences in the coding of intent. If only those poisonings that were coded as unintentional are considered, than Maui had significantly lower rates than all other counties, while Honolulu County had the highest rates (left side of Figure 103). However, if poisonings of undetermined intent are also included (right side of Figure 103), then rates across counties are largely comparable. Rates for Kauai, Maui and Honolulu counties were nearly the same; the only statistically significant difference was found between Hawaii and Honolulu counties.

Figure 103. Six-year rates (/100,000) of unintentional poisonings and possible* unintentional poisonings, by county, 2001-2006.

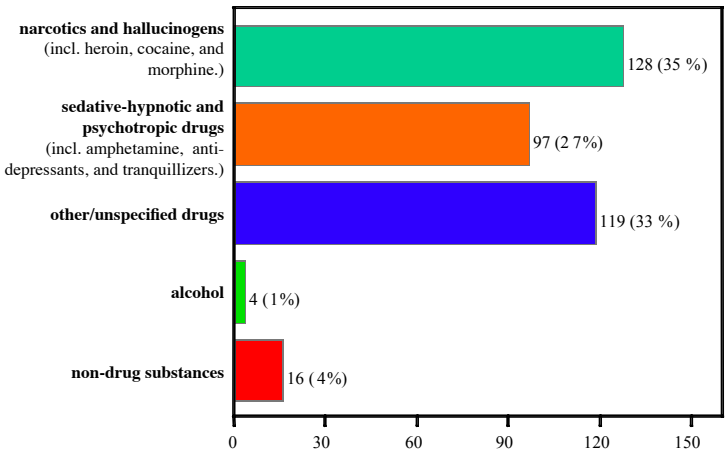
(Includes residents aged 20 years and older. Rates are age-standardized to the 2000 U.S. population distribution)



*Sum of poisonings of unintentional and undetermined intent.

Almost all (95%, or 344) of the 364 unintentional poisonings were drug-related (Figure 104). One-third (119 deaths) were classified as "other" or "unspecified" drugs, but there were two other major categories: 1) narcotics, and 2) sedative-hypnotic and psychotropic drugs. The former category includes most of the illicit substances, like heroin, cocaine, and morphine. The latter category includes amphetamine, antidepressants, barbiturates, and tranquillizers.

Figure 104. Fatal poisonings among Hawaii residents, by type, 2001-2006.



Nonfatal injuries

There was an increasing trend in the number of nonfatal poisonings in the state, but only among patients who were treated in EDs (Table 21). (There was a decrease from 2005 to 2006, but this was within the range of decreases in E-codes over that 2 year-period (see Table 1).) The increasing trend was evident among patients from Honolulu and Maui counties treated in EDs; there was no noticeable trend among patients from Hawaii and Kauai counties. Gender was equally distributed among patients treated in EDs, while males formed a slight majority (54%) among hospitalized patients. Patients who were hospitalized were significantly older than those who were treated in EDs (mean age: 44 vs. 30 years,

respectively). About one-quarter (26%) of those who were treated in EDs were under 5 years of age (compared to 11% of hospitalized patients), and only 10% were in the senior age range. Age was more broadly distributed among hospitalized patients, although there was also a peak in the toddler age range; 9% were 1 to 3 years of age. Honolulu County residents comprised almost three-fourths (73%) of the hospitalized patients.

Table 21. Demographic characteristics* of Hawaii residents with nonfatal poisonings.

	ED visits	hospitalizations	total
Year of admission			
2003	510	198	708
2004	645	224	869
2005	843	199	1042
2006	817	177	994
average annual total	704	200	903
Patient gender			
Female	360 (51%)	93 (46%)	453 (50%)
Male	344 (49%)	107 (54%)	451 (50%)
Patient age			
Infants	21 (3%)	2 (1%)	22 (2%)
1-4 y	162 (23%)	20 (10%)	182 (20%)
5-14 y	48 (7%)	5 (3%)	53 (6%)
15-24 y	100 (14%)	24 (12%)	124 (14%)
25-34 y	82 (12%)	17 (8%)	98 (11%)
35-44 y	84 (12%)	25 (13%)	109 (12%)
45-54 y	99 (14%)	41 (20%)	140 (15%)
55-64 y	44 (6%)	26 (13%	70 (8%)
65-74 y	28 (4%)	14 (7%)	42 (5%)
75-84 y	25 (4%)	19 (10%)	44 (5%)
85 + y	12 (2%)	8 (4%)	20 (2%)
County of residence of patient			
Hawaii	137 (19%)	24 (12%)	160 (18%)
Honolulu	415 (59%)	143 (72%)	559 (62%)
Kauai	40 (6%)	12 (6%)	52 (6%)
Maui	112 (16%)	21 (11%)	133 (15%)

*Statistics are annual averages over the 2003-2006 period.

Rates of ED visits were highest by far for residents under 5 years of age, nearly 5 times higher than the rate for all other age groups (Figure 105). Rates were low among residents 5 to 14 years of age, then increased across the 15 to 54 year age group, before decreasing to low rates among 60 to 64 year-olds and increasing among older residents. Residents aged 5 to 14 years also had the lowest rates of hospitalizations, which generally increased among succeeding age groups.

Residents of Honolulu County had significantly lower rates of both ED visits and total (ED visits combined with hospitalizations) nonfatal poisonings, compared to residents of any other county (Figure 106). The ED visit rate for Oahu residents was over 40% lower than those for residents of Maui and Hawaii counties, and 32% lower than the rate for residents of Kauai County. There were no significant differences in the rates between Neighbor Island residents for any outcome. Hospitalization rates were comparable across all counties.

Patients were hospitalized for slightly over 3 days on average, and hospitalizations comprised 47% of the total number of days of care (Table 22). The average charge for a hospitalization was nearly $13,000, however, over 11 times the average charge for an ED visit. Hospitalizations therefore comprised most (82%) of the total annual charges of $3.2 million. Most (68%) of the poisonings were caused by drugs or medicinal substances, including 87% of those that required hospitalization. Poisonings from drugs or medicinal substances were particularly common among senior-aged patients (85%). Narcotics caused 16% of the hospitalizations, tranquilizers 13%, aromatic analgesics (which include acetaminophen, or Tylenol) 8%, and cardiovascular agents 8%. The type of drug was more widely distributed among the ED visits, although aromatic analgesics (6%), tranquilizers (5%), and narcotics (6%) were among the most commonly coded.

Figure 105. Average annual rates (per 100,000 residents) of hospitalizations and ED visits for nonfatal poisonings in Hawaii, by age of patient.

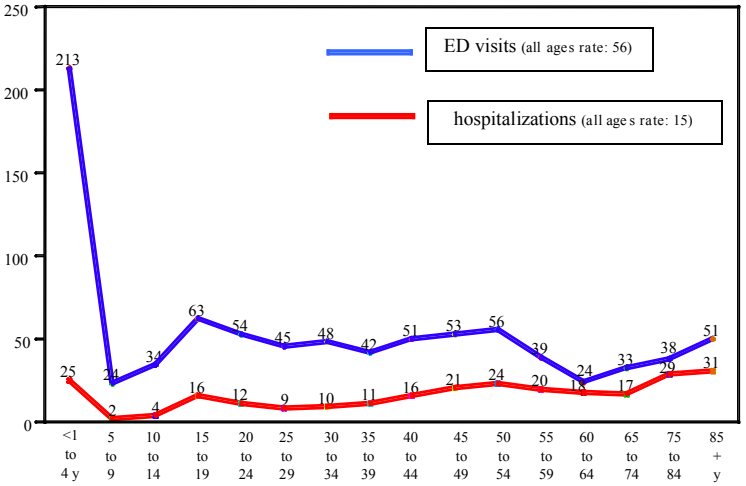


Figure 106. Age adjusted annual rates (per 100,000 residents) of nonfatal poisonings, by level of care and county of residence of patient.

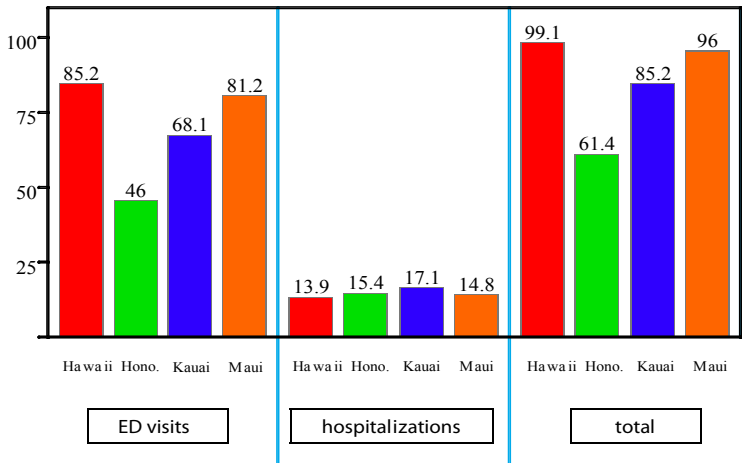


Table 22. Clinical characteristics* of Hawaii residents with nonfatal poisonings.

	ED visits	hospitalizations	total
Length of care and financial charges			
Ave. length of stay (days)	1.0	3.1	1.5
Total number of days	704	620	1323
Average charge	$1,140	$12,959	$3,547
Total charges	$0.8 million	$2.6 million	$3.2 million
E-code classifications			
Drugs and medicinal substances			
heroin	6 (1%)	2 (1%)	8 (1%)
methadone	5 (1%)	6 (3%)	10 (1%)
other opitates & related narcotics	29 (4%)	25 (13%)	54 (6%)
salicylates (incl. aspirin)	11 (2%)	5 (3%)	16 (2%)
aromatic analgesics (incl. acetominophen)	39 (6%)	15 (8%)	54 (6%)
other analgesics/antipyretics	35 (5%)	6 (3%)	41 (4%)
sedatives and hypnotics	20 (3%)	8 (4%)	27 (3%)
tranquilizers	37 (5%)	26 (13%)	63 (7%)
other psychotropic agents	36 (5%)	15 (8%)	51 (6%)
anticonvulsants	12 (2%)	6 (3%)	18 (2%)
other depressants	12 (2%)	4 (2%)	16 (2%)
anaesthetics (incl. cocaine)	2 (0%)	0 (0%)	2 (0%)
antibiotics	11 (1%)	1 (1%)	12 (1%)
hormones and synthetics	16 (2%)	12 (6%)	28 (3%)
cardiovascular agents	29 (4%)	17 (8%)	46 (5%)
other drugs/medical substances	146 (21%)	26 (13%)	172 (19%)
Non-medicinal substances			
alcohol	27 (4%)	8 (4%)	34 (4%)
cleaners and paints	21 (3%)	1 (1%)	22 (2%)
petroleum products	13 (2%)	2 (1%)	15 (2%)
insecticides/animal poisons	26 (4%)	2 (1%)	28 (3%)
other non-medicinal substances	65 (9%)	5 (3%)	71 (8%)
toxic foods	43 (6%)	6 (3%)	49 (5%)
gases and vapors	66 (9%)	3 (1%)	69 (8%)

*Statistics are annual averages over the 2003-2006 period.

Suffocations

Fatal injuries

There were 184 suffocations between 2001 and 2006, with the annual total varying between 21 and 38 deaths (Figure 107). There was an increasing trend in the number of victims aged 85 years or older, generally increasing from 6 in 2001 to 19 in 2006. Most (82%, or 150) of these injuries occurred on Oahu, 15 on Hawaii, 14 in Maui County, and 5 on Kauai. Most (86%, or 114) of the 132 deaths among senior-aged victims also occurred on Oahu. Both the all-ages and senior-aged fatality rates were significantly greater for Oahu residents compared to residents of the Neighbor Islands.

Figure 107. Annual number of fatal suffocations among Hawaii residents, by county, 2001-2006.

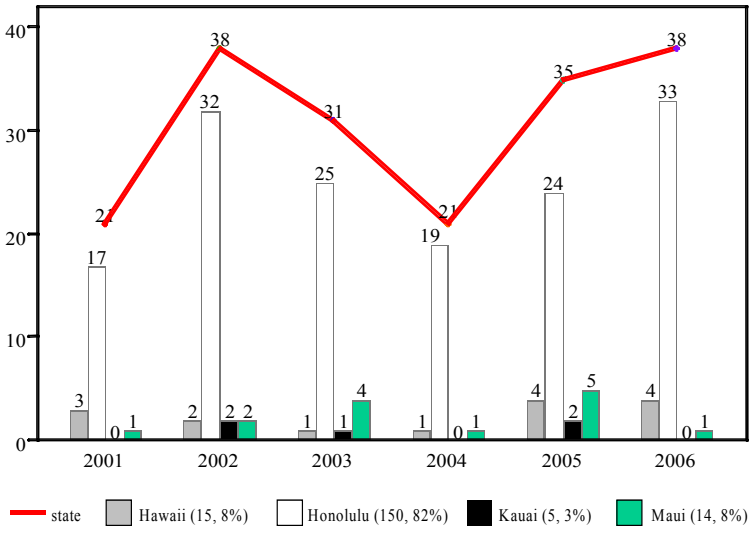
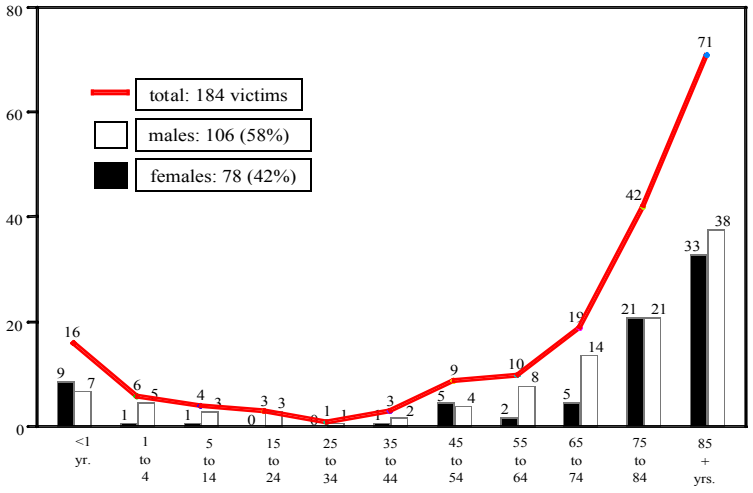


Figure 108 shows there were two predominant age groups among the suffocation victims: infants and those over age 65. Twenty-two (12%) of the victims were either infants (16 victims) or 1 to 3 year-olds (6 victims), and 132 (72%) were 65 years of age or older, including 71 (38%) who were 85 years or older. The gender distribution was more equal than for most other injury outcomes: 58% male and 42% female.

Figure 108. Age and gender distribution of victims of suffocation in Hawaii, 2001-2006.



About one-fourth (24%) of the suffocations were caused by the inhalation of food (15% of deaths) or gastric contents (9%) (Figure 109). There was little additional detail on what types of foods were involved in the deaths. Most (72% or 31) of these 43 victims were 65 years or older. More than half (60%, or 111) of all suffocations were caused by the inhalation of "other" objects, again, with little additional information. Almost all (88%, or 98) of these 111 victims were seniors, including half (53%, or 59) who were 85 years or older. All but two of the 17 victims who suffocated in a bed or cradle were infants. Fifteen of the 16 infant victims suffocated in a bed or cradle. Among the 6 toddler-aged (1 to 3 years) victims, 1 suffocated in a bed, 1 under a fallen dresser, and the other 4 choked on pennies, gum, finger cots, and a rock.

Because infant suffocations can be coded as Sudden Infant Death Syndrome (SIDS), or "other ill-defined and unspecified causes of mortality" (code R99), annual trends for all 3 types of infant deaths were examined (Figure 110). (Cases coded as R99 were included only if there was nothing in the record to indicate the death did not occur in the infants sleep environment.) Deaths coded as SIDS (40) and "unspecified causes" (38) outnumbered those coded as suffocations in bed or cradle (15). There were no consistent trends in the annual number of these potentially sleep-related deaths among infants, which varied inconsistently from 11 to 19. SIDS was more commonly coded over the 2001-2003 period, while "unspecified causes" predominated from 2005-2006.

Figure 109. Suffocations among Hawaii residents, by type, 2001-2006.

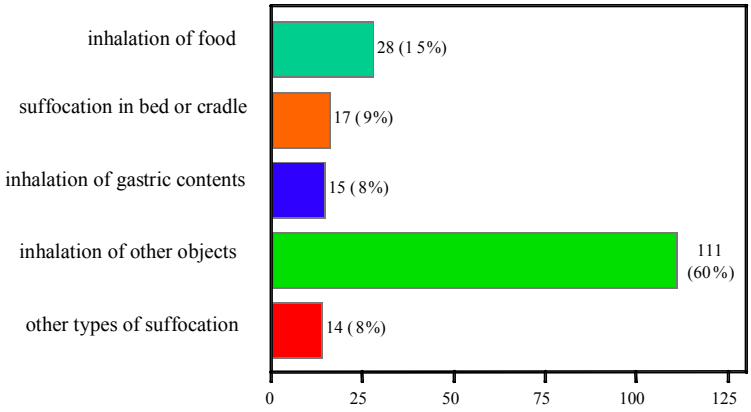
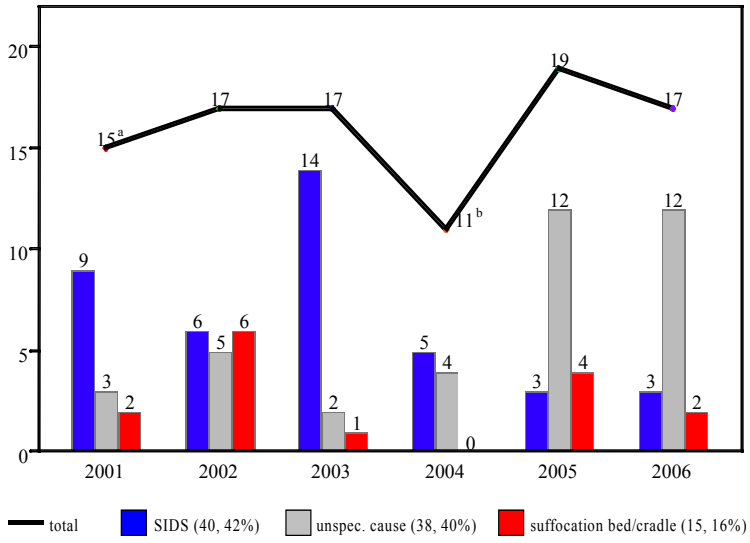


Figure 110. Annual number of sleep-related or possibly sleep-related deaths among infant residents of Hawaii, by type, 2001-2006.



a Includes 1 suffocation death of undetermined intent (possible homicide).

b Includes 1 suffocation death of undetermined intent (possible homicide),and 1 unintentional suffocation that may not have been in a bed or cradle.

Nonfatal injuries

There was no trend in the overall number of nonfatal suffocations in the state, although the number of hospitalizations consistently increased (Table 23). The total number of cases generally decreased among Oahu residents (from 125 in 2003, to 103 in 2006), but this was offset by an increase in patients from Maui County (from 20 in 2003, to 46 in 2006). Gender was equally distributed among patients treated in EDs, while males comprised over two-thirds (69%) of those who were hospitalized. A large proportion (10%) of patients were infants, including nearly one-fifth (18%) of

those who were hospitalized. Residents 1 to 4 years of age comprised nearly half (49%) of the patients treated in EDs and nearly one-quarter (23%) of those who were hospitalized. Seniors also made up a large portion (25%) of hospitalized patients. Oahu residents comprised about two-thirds s of the patients, while 22% of those hospitalized were residents of Maui County. There were equal numbers of patients from Maui and Hawaii counties, despite a lower population in the former county.

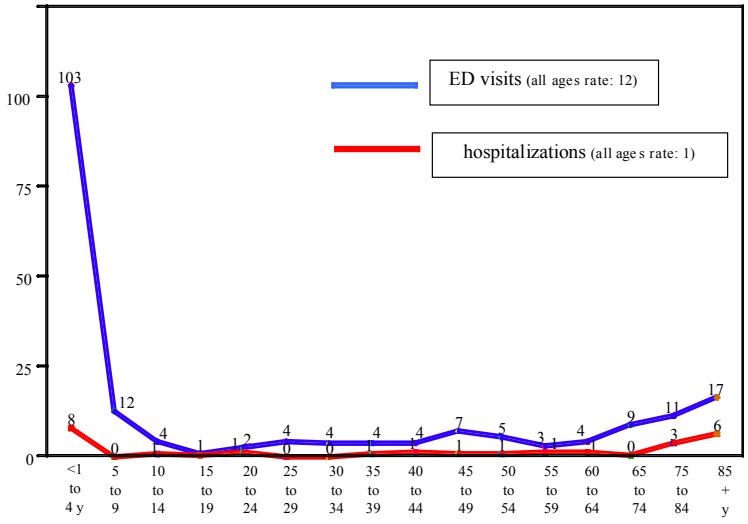
Table 23. Demographic characteristics* of Hawaii residents with nonfatal suffocations.

	ED visits	hospitalizations	total
Year of admission			
2003	172	3	175
2004	141	13	154
2005	144	23	167
2006	149	26	175
average annual total	152	16	168
Patient gender			
Female	77 (51%)	5 (31%)	82 (49%)
Male	74 (49%)	11 (69%)	86 (51%)
Patient age			
Infants	14 (9%)	3 (18%)	17 (10%)
1-4 y	74 (49%)	4 (23%)	78 (46%)
5-14 y	13 (9%)	1 (3%)	14 (8%)
15-24 y	3 (2%)	1 (8%)	4 (2%)
25-34 y	7 (4%)	0 (0%)	7 (4%)
35-44 y	7 (4%)	2 (9%)	8 (5%)
45-54 y	11 (7%)	1 (6%)	12 (7%)
55-64 y	5 (3%)	1 (8%)	6 (3%)
65-74 y	7 (5%)	0 (2%)	8 (4%)
75-84 y	7 (5%)	2 (14%)	10 (6%)
85 + y	4 (3%)	2 (9%)	6 (3%)
County of residence of patient			
Hawaii	21 (14%)	2 (11%)	23 (14%)
Honolulu	103 (68%)	11 (65%)	113 (68%)
Kauai	8 (5%)	1 (3%)	9 (5%)
Maui	20 (13%)	4 (22%)	23 (14%)

*Statistics are annual averages over the 2003-2006 period.

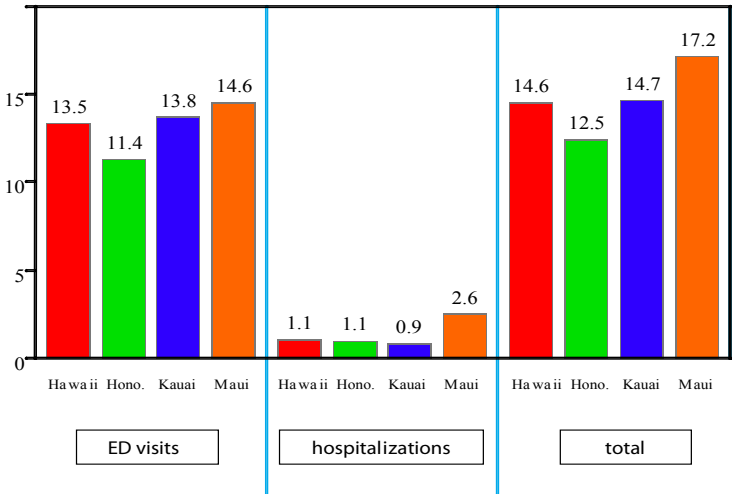
Rates of ED visits and hospitalizations were highest for the youngest (under 10 years) and oldest (ages 65 and older) residents of the state (Figure 111). Children under 5 years of age had the highest rates; rates of ED visits were particularly high for this group, at least 6 times higher than for any other age group. Apart from these extreme age ranges, there was little association between age and rates of either ED visits or hospitalizations.

Figure 111. Average annual rates (per 100,000 residents) of hospitalizations and ED visits for nonfatal suffocations in Hawaii, by age of patient.



Residents of Maui County had the highest rates of both ED visits and hospitalizations for nonfatal suffocations; the hospitalization rate was more than twice as high as any other county (Figure 112). Nevertheless, there were no statistically significant differences between any counties for either rate. All counties were also statistically comparable in rates of ED visits and hospitalization among residents under 5 years of age, although these comparisons were limited by the small sample sizes: 12 cases or less per year for Neighbor Island residents.

Figure 112. Age adjusted annual rates (per 100,000 residents) of nonfatal suffocations, by level of care and county of residence of patient.



Most (72%) of the total days of care were comprised of ED visits, as hospitalizations were only for 3.6 days on average (Table 24). However, the average medical charge for each hospitalization was nearly $18,000, so hospitalizations contributed $0.3 million (75%) of the annual total of $0.4 million in charges. According to E-codes, about half (52%) of the hospitalizations were caused by inhalation of food and somewhat less commonly (45%) by inhalation of other (non-food) objects. Non-food objects caused about two-thirds (62%) of the ED visits for nonfatal suffocations, while inhalation of foods caused 36%. Almost all (95%) the suffocations were diagnosed as "foreign body entering through orifice". The nose (46%) was the most common entry point for suffocations treated in EDs, while the pharynx and larynx were the most common (40%) for suffocations requiring hospitalizations. Suffocations from foods were usually (68%) located in the pharynx and larynx, while most (71%) non-food suffocations were located in the nose.

Table 24. Clinical characteristics* of Hawaii residents with injuries from nonfatal suffocations.

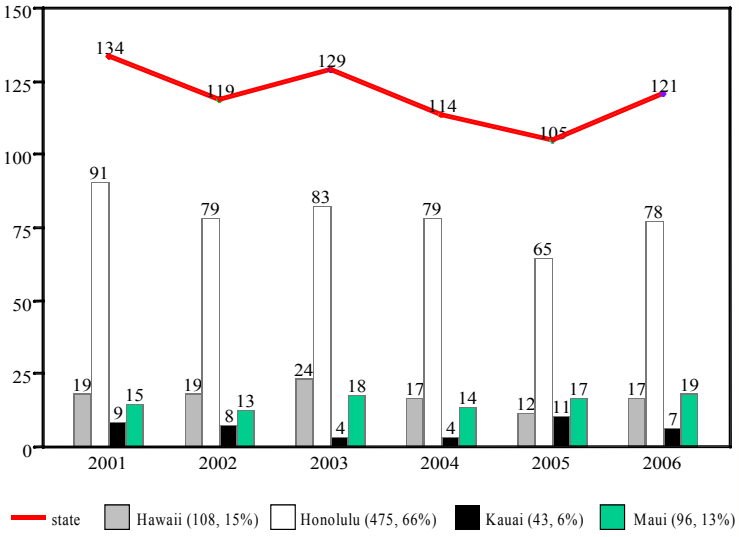
	ED visits	hospitalizations	total
Length of care and financial charges			
Ave. length of stay (days)	1.0	3.6	1.3
Total number of days	152	58	210
Average charge	$693	$17,894	$2,245
Total charges	$0.1 million	$0.3 million	$0.4 million
E-code classifications			
inhalation of food	55 (36%)	9 (52%)	63 (38%)
inhalation of other objects	94 (62%)	7 (45%)	101 (60%)
suffocation in bed/cradle	1 (1%)	0 (2%)	2 (1%)
suffocation by plastic bag	1 (0%)	0 (0%)	1 (0%)
other/unspecified	1 (1%)	0 (2%)	2 (1%)
Primary injury diagnosis			
foreign body	145 (96%)	15 (91%)	160 (95%)
esophagus	15 (10%)	5 (28%)	19 (11%)
mouth	2 (1%)	0 (2%)	2 (1%)
nose	70 (46%)	0 (0%)	70 (42%)
pharynx and larynx	50 (33%)	7 (40%)	57 (34%)
respiratory tree	3 (2%)	3 (20%)	6 (4%)
stomach	1 (0%)	0 (0%)	1 (0%)
toxic foods	5 (3%)	0 (2%)	5 (3%)
unspecified body area	7 (4%)	2 (9%)	8 (5%)

*Statistics are annual averages over the 2003-2006 period.

Fatal injuries

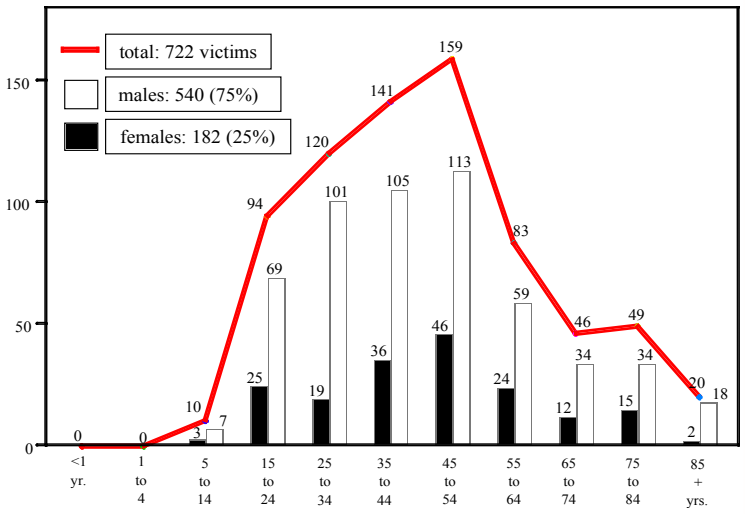
Suicide was the single leading cause of fatal injuries among state residents, accounting for one-fifth of the total number of victims. There were 722 suicides among state residents over the 6-year period, with a decreasing trend in the annual number (Figure 113). Two-thirds (66%, or 475) of the suicides occurred on Oahu, where there was a decreasing trend over the 2001-2005 period. There were no trends in the annual number of suicides in Neighbor Islands, although there were at least 4 deaths a year in each county. The interpretation of annual trends for both the state and Honolulu County were complicated by a parallel increase in the number of fatal injuries of undetermined intent (i.e. possible suicides, or less commonly, possible homicides) (Figure 133).

Figure 113. Annual number of suicides among Hawaii residents, by county, 2001-2006.



The youngest aged victims were 10 years old, but almost all (95%, or 685) were 19 years or older (Figure 114). About two-thirds (67%, or 482) were between 25 and 60 years of age, including one-third (34%, or 246) in the 40 to 54 year age group. The figure also shows that male victims (540) outnumbered females (182) by a 3-to-1 ratio. That ratio was fairly constant across the age ranges, although only 2 of the 18 (10%) victims aged 85 years or older were females. Rates were highest for 40 to 54 year olds and residents aged 85 years and older (see Figure 20).

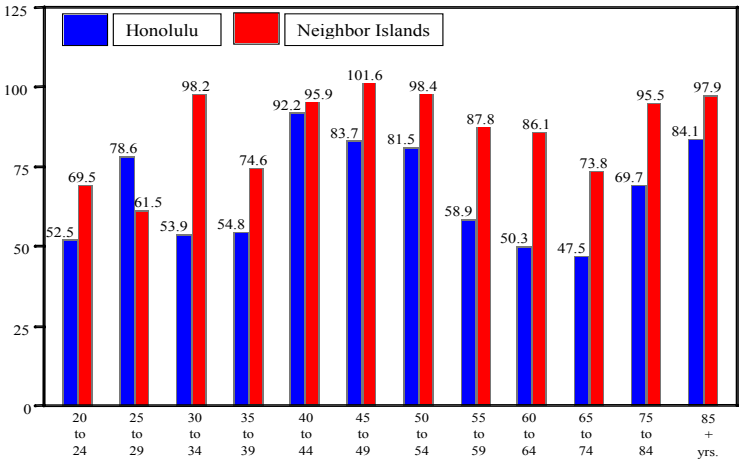
Figure 114. Age and gender distribution of victims of suicides in Hawaii, 2001-2006.



Although two-thirds of the victims were residents of Oahu, the overall age adjusted rate there (67.1 suicides/100,000) was 22% lower compared to that for residents of the Neighbor Islands (85.8). The rates for each of the other 3 counties were statistically comparable, ranging only from 83.4/100,000 (Hawaii County) to 90.7 (Kauai County). (The rate for Maui County was 87.2/100,000 residents.) Figure 115 shows that suicide rates for Neighbor Island residents were higher than those for Oahu residents for most age groups, particularly for 55 to 84 year-olds. The only exception was the 25 to 29 year age group, where the rate for Oahu residents was 28% higher than that for Neighbor Island residents of the same age. However, none of these age-specific rates were significantly different when comparing Oahu to the Neighbor Islands.

Figure 115. Six-year rates (/100,000) of suicide among residents of Oahu (black bars), and Neighbor Islands (white bars), by age group, 2001-2006.

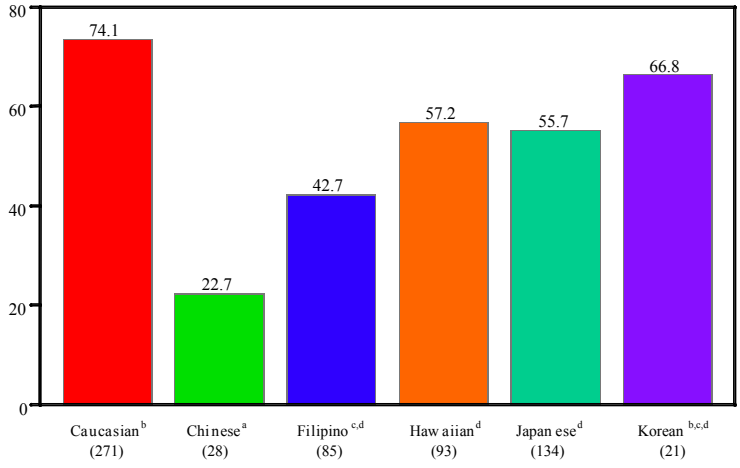
(Includes those residents aged 20 years and older.)



Caucasian residents had the highest suicide rates among the 6 main ethnicities (Figure 116). A comparably high rate was calculated for Koreans, but that was based on a low number of 21 suicides. The rate for Caucasians was significantly greater than that for the other 4 ethnicities. The rate for Chinese residents was significantly lower than any other ethnicity. The rates among Filipino, Hawaiian, Japanese and Korean residents were all statistically comparable, although lowest among the Filipino residents, and highest among the Korean residents.

Figure 116: Unadjusted rates (per 100,000) of suicides, by ethnicity, 2001-2006.

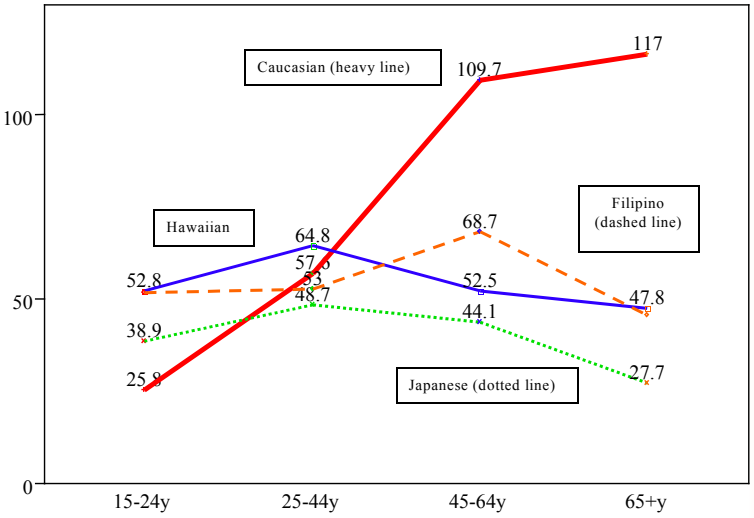
(Number of suicides given in parentheses in bottom labels.)



The rates among groups with same letters are not statistically different ($p > 0.05$).

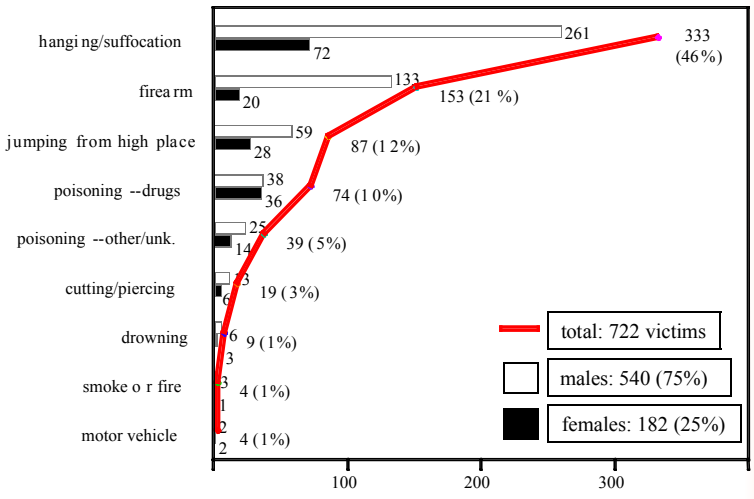
Suicide rates were computed for different age groups within the 4 ethnicities with at least 85 deaths (Figure 117). Caucasians had the lowest rate for 15 to 24 year-old residents (significantly lower than that for Hawaiians), but the highest rates among 45 to 64 year-olds, and senior-aged residents. Rates for Caucasians in these latter two age groups were significantly higher than rates for any of the other 3 ethnicities. Hawaiians and Japanese had generally similar patterns with peak rates in the 25 to 44 year age group, and lower rates for older age groups. However, rates were higher among Hawaiian residents at every age group, compared to Japanese residents. The curve for Filipino residents was essentially flat, except for a peak in the 45 to 64 year age group.

Figure 117: Suicide rates (per 100,000) among residents of Hawaii, by age group and ethnicity, 2001-2006.



The most common mechanism of suicide was by hanging or suffocation, which accounted for 46% of the deaths (Figure 118). Use of firearms was the second most common method, although it accounted for a much higher proportion of the suicides among males (25%), than among females (11%). Other major mechanisms included jumps from high places (12%), and poisoning from medicinal substances (10%). Besides firearms, male victims were more likely to die by hangings/suffocations (48%), compared to female victims (40%), while females were more likely than males to use medicinal substances (20% vs. 7%, respectively). Firearms were more commonly used among Neighbor Island victims (28%) than those on Oahu (18%), while the latter were more likely to have jumped from a high place (17% vs. 3% for Neighbor Island victims). Victims of hangings or suffocations (mean age 41 years) or jumps from high places (46 years) were somewhat younger than most of the other victims (49 to 53 years of age, on average).

Figure 118. Suicides among male and female residents of Hawaii, by mechanism, 2001-2006.



Autopsy records were located for 494 of the 496 suicides that occurred in the state during the 2001-2004 period. According to these records, mental illness was highly prevalent, depending on the criteria used for its definition. Figure 119 shows that almost one-third (31%) had a documented history of mental illness, most commonly mood disorders (116 victims, 23%), psychoses (44, 9%), or anxiety disorders (21, 4%). (These percentages add to more than 31% because 26 victims had more than 1 type of mental illness.) Apart from these 116 victims with documented mental illness, there were 39 others (8%) who tested positive for psychiatric drugs, including benzodiazepines (18 victims) and anti-depressants (15). Overall, 19% of the victims tested positive for these substances. Nearly half (45%) of the victims were described by survivors as "depressed" before the suicide, 43% had verbally threatened suicide, and nearly one-fifth (18%) had made a previous attempt. If "mental illness" is ascribed using the 5 criteria in the order they appear in Figure 119, then mental illness was documented in 77% (380) of the cases. That is, 31% had a mental illness history or diagnosis, another 8% tested positive for psychiatric drugs, another 23% were described as depressed, and another 15% had made a suicide threat or attempt. (Note: it is possible that the drugs labeled for "psychiatric" uses in this report, were actually prescribed for other purposes, e.g. as anti-convulsants, or muscle relaxants. However, even if that criteria is not utilized, the prevalence of mental illness changes only slightly to 74% (366 victims), based on the remaining 4 criteria.)

Figure 119. Prevalence of "mental illness" among suicide victims in Hawaii, 2001-2004.

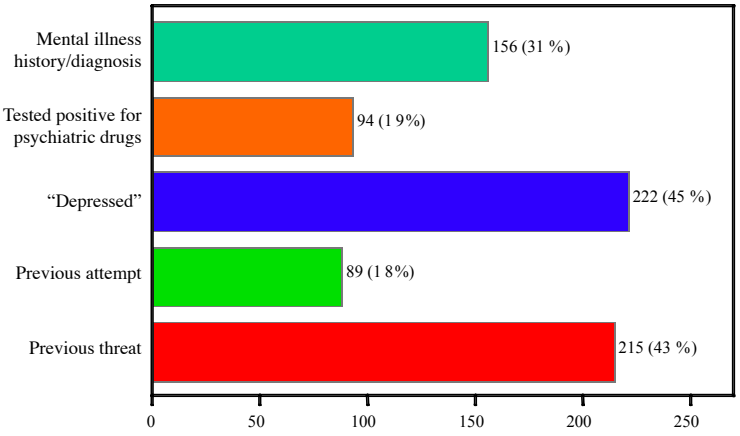
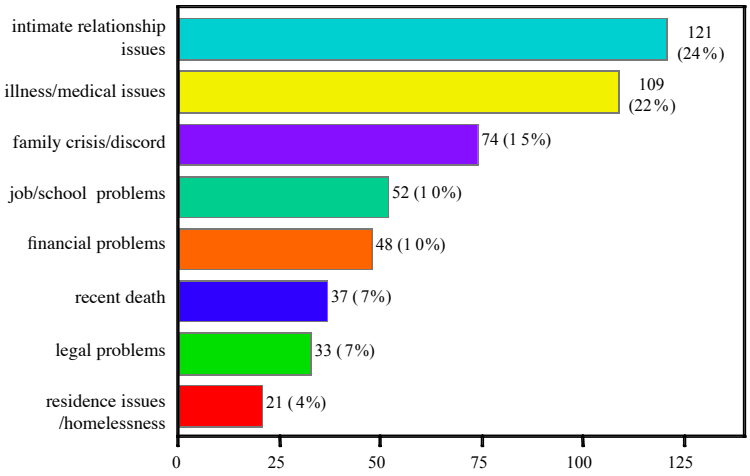


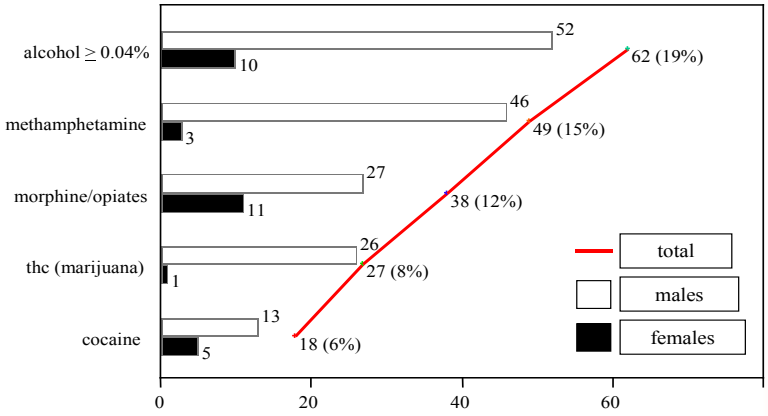
Figure 120. Negative life events documented in the autopsy records of suicide victims in Hawaii, 2001-2004.



At least one negative life event was documented in the autopsy records of about two-thirds (69%, or 340) of the 496 victims (Figure 120). The most common negative events were relationship ship problems (77 victims, 15%) and endings of relationships (46, 9%). (These are combined under "intimate relationship issues" (121 victims, or 24%) in Figure 120.) Relationship issues were most common among victims aged 20 to 39 years of age (44%, or 66 of 150 victims). Serious illness was documented for one-fifth (22%) of the victims overall, and one-half (51%, or 41 of 81 victims) of senior-aged victims. Family discord, problems at work or school and financial problems were documented for 15 to 10% of the victims. Among the 36 victims under the age of 20, the most prevalent negative life events were family problems (15 victims, or 42%), school problems (7, 19%), or intimate relationship issues (6, 17%). There was no significant difference in the overall proportion of male victims with a documented negative event, compared to female victims (68% vs. 71%). Male victims, however, were more likely to have had legal problems (8% vs. 3% for females) or the loss of a job (10% vs. 5%) as negative events, and females were more likely to have had a serious illness (29% vs. 20% for males).

The toxicology results from autopsy records from 2002-2004 are summarized in Figure 121. (These percentages exclude 39 (11% of 362) victims who were not tested or for whom test results were not available.) About one-fifth (19%) of the victims had BAC of 0.04% or greater, including 44 (14%) with BAC of 0.08% or greater, the level used to indicate inebriation among drivers in Hawaii. (These proportions were similar if only victims aged 21 years and older are considered: 20% and 14%, respectively.) About 7% (22) of the victims had BAC levels of 0.16% or greater (i.e. twice the legal limit). Male victims were more likely to have BAC levels of 0.04% or greater (21% vs. 13% for females), and the proportion who were legally intoxicated was significantly higher among male compared to female victims (16% vs. 6%).

Figure 121. Presence of alcohol or illicit drugs in the blood of suicide victims of Hawaii, by gender, 2002-2004.



Toxicologic exams identified illicit drugs in the blood of about one-third (34%, or 110) of the victims. (The term "illicit" here includes drugs such as morphine and opiates, which also have medicinal uses.) This proportion was significantly higher among male victims (37%) compared to female victims (23%). Almost all of the victims who tested positive for methamphetamine (94%) or marijuana (96%) were males, while the presence of morphine and opiates was slightly higher among females victims (14% vs. 11% for males). The most commonly identified drug was methamphetamine, present in 15% (49) of the victims, followed by morphine/opiates (12%) and marijuana (8%). Twenty-two (7%) of the victims tested positive for more than one of the drug groups at the time of autopsy. The average age of victims who had used drugs was significantly younger than that of those who had not (39 vs. 49 years, respectively), although there was a wide age distribution (standard deviation 14 years) among the drug users. There were no significant associations between alcohol use and the prevalence of illicit drugs, which was 35% for both victims who were negative for alcohol, and for those with a BAC of 0.04% or higher. (This proportion was 28% for the 36 victims with a BAC between 0.01% and 0.03%.)

Apart from the toxicology results, about one-fifth (22%, or 72) of the 323 victims had a documented history of substance abuse. The most commonly abused substances were methamphetamine (10%, or 31 victims) and alcohol (8%, or 26 victims). Substance abusers were significantly younger than the other victims (mean age: 39 vs. 47 years).

Nonfatal injuries

There was an increasing trend in the number of nonfatal suicide attempts, which was mostly evident in the annual number of injuries that were treated in EDs (Table 25). This increase was probably not due to coding shifts from injuries of undetermined intent, since there was also a generally increasing trend in the latter (Table 29). The number of injuries that required hospitalization were approximately equal to the number treated in EDs, unlike most any other category of injury. The gender distribution of patients was similar for both settings, with females comprising approximately 60% of the total. Most (60%) of the patients were under 35 years of age, compared to only 31% of those who died from suicide over the 2001 to 2006 period. Proportionally more of the patients treated in EDs were in the 15 to 24 year age group, while there were more patients aged 45 years and older among those who were hospitalized (30%, vs. 16% of ED patients). About two-thirds (68%) of the patients were residents of Honolulu County. There were 3 times as many Maui County residents who were hospitalized for nonfatal injuries, compared to the number who were treated in EDs.

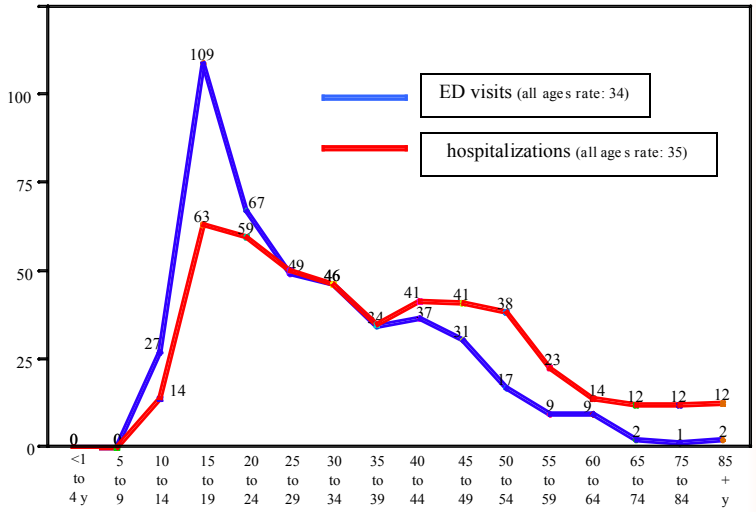
Table 25. Demographic characteristics* of Hawaii residents with nonfatal injuries from suicide attempts.

	ED visits	hospitalizations	total
Year of admission			
2003	312	420	732
2004	365	385	750
2005	442	340	782
2006	397	408	805
average annual total	379	388	767
Patient gender			
Female	226 (60%)	226 (58%)	451 (59%)
Male	154 (40%)	163 (442%)	316 (41%)
Patient age			
Infants	0 (0%)	0 (0%)	0 (0%)
1-4 y	0 (0%)	0 (0%)	0 (0%)
5-14 y	23 (6%)	12 (3%)	34 (4%)
15-24 y	150 (40%)	106 (27%)	256 (33%)
25-34 y	83 (22%)	84 (22%)	167 (22%)
35-44 y	64 (17%)	69 (18%)	133 (17%)
45-54 y	43 (11%)	72 (19%)	115 (15%)
55-64 y	13 (3%)	25 (7%)	38 (5%)
65-74 y	2 (0%)	10 (3%)	12 (2%)
75-84 y	1 (0%)	8 (2%)	9 (1%)
85 + y	1 (0%)	3 (1%)	4 (0%)
County of residence of patient			
Hawaii	71 (19%)	58 (15%)	129 (17%)
Honolulu	264 (70%)	257 (66%)	521 (68%)
Kauai	30 (8%)	26 (7%)	56 (7%)
Maui	14 (4%)	47 (12%)	61 (8%)

*Statistics are annual averages over the 2003-2006 period.

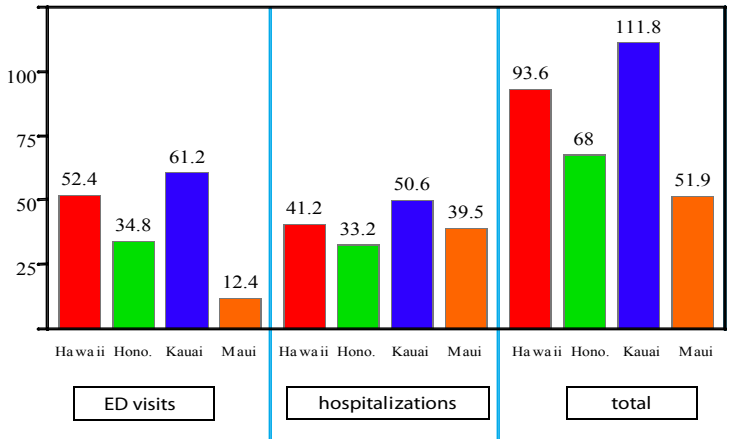
Residents aged 15 to 19 years had the highest rates of hospitalizations and especially ED visits (Figure 122). Rates of both ED visits and hospitalizations gradually declined from age 20 before leveling off among senior-aged residents. Residents aged 40 years and older were more likely to be hospitalized for nonfatal attempts than to be treated in ED settings. Female residents had significantly higher rates of both ED visits (41/100,000 residents) and hospitalizations (41/100,000) than male residents (28 and 30/100,000, respectively). However, these gender differences were only significant for the 10 to 14 and 15 to 19 year age groups; male and female resident rate estimates were statistically comparable for all other age groups. Rates for females were higher, although not to a significant degree, for the 20 to 39 year age range, with few differences among the older age groups.

Figure 122. Average annual rates (per 100,000 residents) of hospitalizations and ED visits for nonfatal injuries from suicide attempts in Hawaii, by age of patient.



Residents of Kauai and Hawaii counties had significantly higher rates of ED visits for nonfatal suicide attempts, compared to residents of Honolulu and Maui counties (Figure 123). These two counties also had the highest rates of hospital admissions, although all counties were statistically comparable. The total rate (ED visits and hospitalizations combined) for residents of Kauai County was 64% higher than that for Oahu residents, and more than double that for residents of Maui County. The total rate for Hawaii County residents was also significantly higher than the rates for residents of Honolulu and Maui counties, but comparable to the rate for Kauai County.

Figure 123. Age adjusted annual rates (per 100,000 residents) of nonfatal injuries from suicide attempts, by level of care and county of residence of patient.

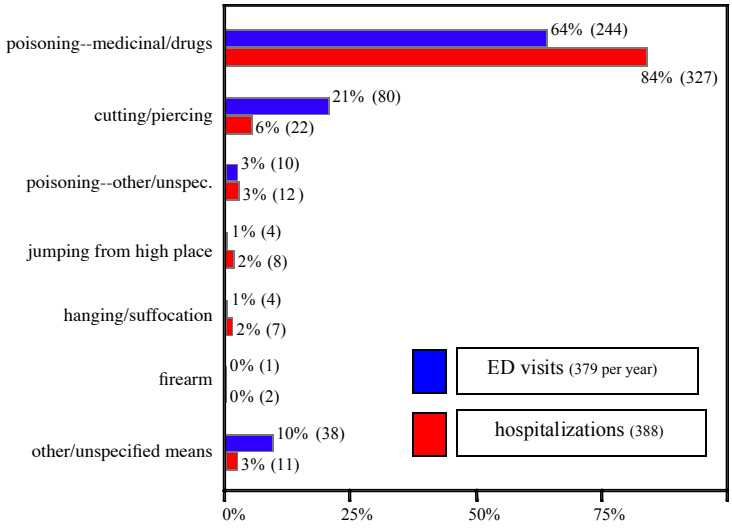


*Includes only residents aged 10 years and older.

About two-thirds (64%) of the ED visits and most (84%) of the hospitalizations were caused by poisonings from drugs or medicinal substances (Figure 124). The most common poisonings were from the "analgesics, antipyretics, and antirheumatics" class (26% of ED visits, 33% of hospitalizations), which includes both narcotics (heroin, and other opiates), as

well as aspirin and acetaminophen. Poisonings from "tranquilizers and other psychotropic agents" were also common, accounting for 18% of the ED visits and 29% of the hospital admissions. Injuries from cutting or piercing instruments comprised 13% of the attempts overall, including 21% of those treated in EDs. Very few of these nonfatal attempts were from hangings or use of firearms, perhaps reflecting the lethality of these mechanisms. Female patients were more likely to attempt by drug or medicinal poisonings (81%, vs. 66% for male patients), while injuries from cutting and piercing instruments were somewhat more common among males (16%, vs. 12% for females). There were few differences in mechanism across the county of residence of the patients.

Figure 124. Mechanism of nonfatal suicide attempts among Hawaii residents, by level of care.



Annual number of injuries shown in parentheses.

Patients were hospitalized for an average of 4.2 days, so admissions constituted the majority (81%) of days of patient care and total medical charges (Table 26). As described by mechanism, most (78%) of the injuries were from poisonings, particularly for hospital admissions (88%). (These proportions do not exactly match those shown in Figure 124 because the former are based on E-codes, while these values are derived from diagnosis codes.) Open wounds and contusions or superficial injuries constituted most of the remaining ED visits.

Table 26. Clinical characteristics* of Hawaii residents with nonfatal injuries from falls.

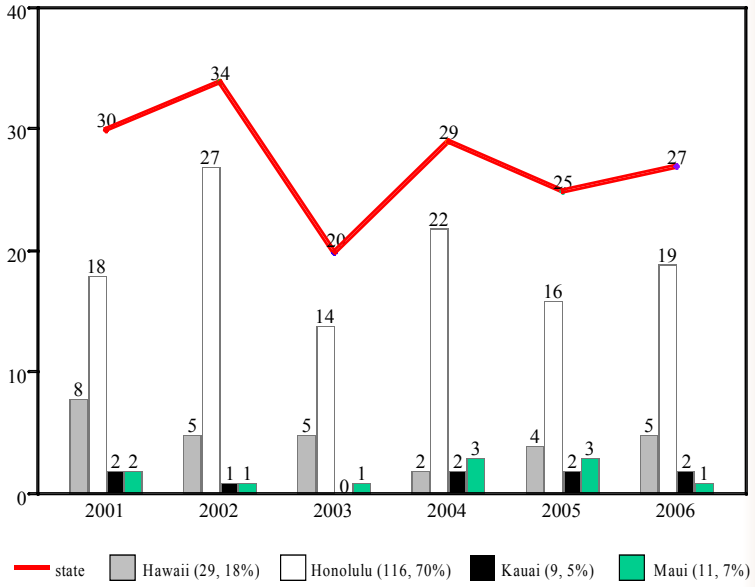
	ED visits	hospitalizations	total
Length of care and financial charges			
Ave. length of stay (days)	1.0	4.2	2.6
Total number of days	379	1623	2002
Average charge	$1,930	$17,308	$9,225
Total charges	$0.73 million	$6.72 million	$7.08 million
Primary injury diagnosis			
fractures	13 (3.3%)	8 (1.9%)	20 (2.6%)
open wounds	72 (18.9%)	16 (4.1%)	88 (11.4%)
contusion/superficial	26 (6.7%)	1 (0.3%)	27 (3.5%)
poisonings	255 (67.3%)	341 (87.8%)	596 (77.7%)
other/unspecified	14 (0.8%)	23 (0.8%)	37 (0.6%)

*Statistics are annual averages over the 2003-2006 period.

Fatal injuries

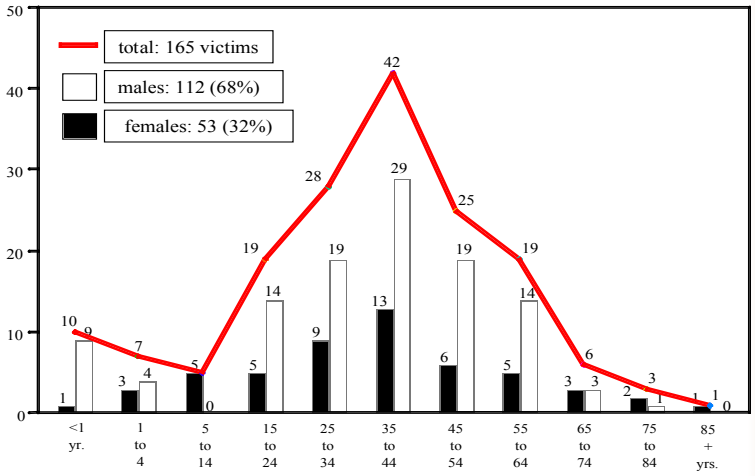
There were 165 victims of homicide over the 2001 to 2006 period, with no consistent trend in the annual number of victims (Figure 125). The 165 victims died in 158 separate incidents, as 13 were killed in multiple murders, including a triple murder in 2006. The figure shows that the majority of victims (70%, or 116) were killed on the island of Oahu. More than half (59%, or 29) of the remaining 49 victims were killed on Hawaii, 11 in Maui County (2 on Molokai, the other 9 on the island of Maui), and 9 on Kauai. The 6-year age standardized fatality rates were statistically comparable across most counties. The only significant difference was between rates for residents of Hawaii (19.2 deaths/100,000 residents), and Maui counties (7.8/100,00). (The rates were 12.9 and 14.8/100,000 for Honolulu and Kauai counties, respectively.)

Figure 125. Annual number of homicides among Hawaii residents, by county, 2001-2006.



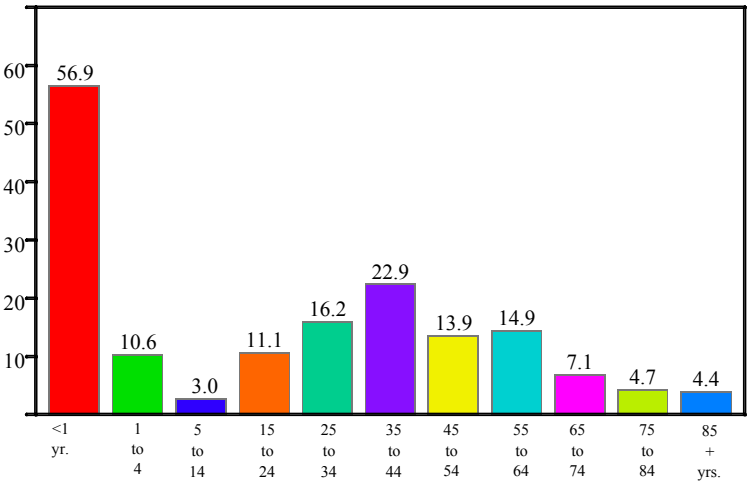
Most (74%, or 122) of the victims were between 18 and 61 years of age, with a peak in the 35 to 44 year age group (Figure 126). However, there were also 10 infant victims and another 7 who were under 5 years of age. Male victims (112, or 68%) outnumbered females (53, or 32%) by a 2-to-1 ratio.

Figure 126. Age and gender distribution of homicide victims in Hawaii, 2001-2006.



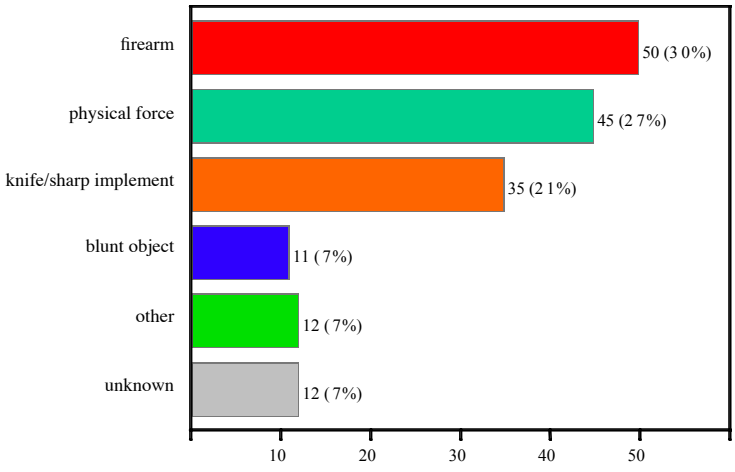
The 10 infant homicides translated into by far the highest fatality rates, significantly higher than any other age group except for 35 to 44 year-olds (Figure 127). Homicide rates for infants were 3 to 4 times higher than most other age groups. The elevated rate for infants is even more notable considering there were another 7 deaths among infant residents which were possible homicides (see Figure 134). The rate for 35 to 44 year-olds was also significantly higher than most of the other age groups, except for 25 to 35 year-olds and 55 to 64 year-olds.

Figure 127. Rates (/100,000 residents) of homicide in Hawaii, by age of victim, 2001-2006.



Firearms were the most common means of homicide (30% of victims, followed by physical force or unarmed beatings (27%) (Figure 128). About one-fifth (21%) of the murders were committed by stabbings with knives or other sharp implements. The mechanism of homicide was similar for residents of Oahu and residents of Neighbor Islands. Male victims were more likely to be killed by firearms (35%) or physical force (30%), compared to female victims (21% for each mechanism).

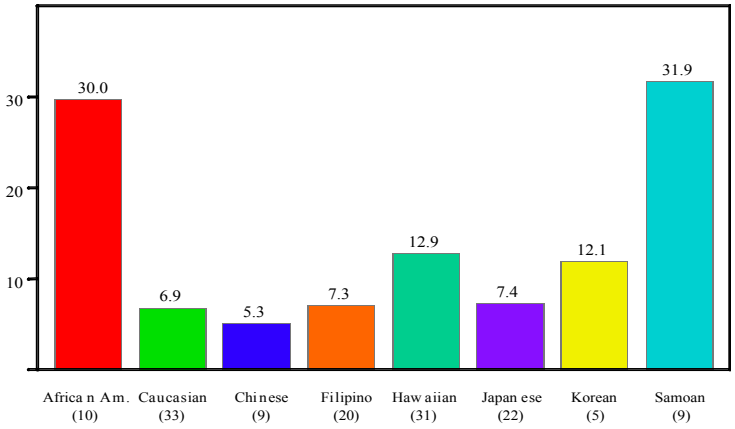
Figure 128. Homicides among residents of Hawaii, by mechanism, 2001-2006.



Homicide rates for the 8 main ethnicities are summarized in Figure 129. The highest homicide rates were computed for victims of African-American or Samoan ancestry, although both estimates are based on small numbers of deaths (10 and 9, respectively). The rates for both African-Americans and Samoans were significantly higher than rates for Caucasians, Chinese, Filipino and Japanese residents. Homicide fatality rates were intermediate for Hawaiian and Korean residents. Ethnic fatality rate comparisons were similar if only victims who had a single ethnicity listed on the death certificate were included: rates among African-American and Samoan residents were 2 to 3 times higher than rates for other ethnicities. Hawaiians were an exception to this, however, since only 1 of the 31 (3%) Hawaiian victims had only 1 ethnicity listed on the death certificate.

Figure 129: Unadjusted rates (per 100,000) of homicides, by victim ethnicity, 2001-2006.

(Number of victims given in parentheses in bottom labels.)



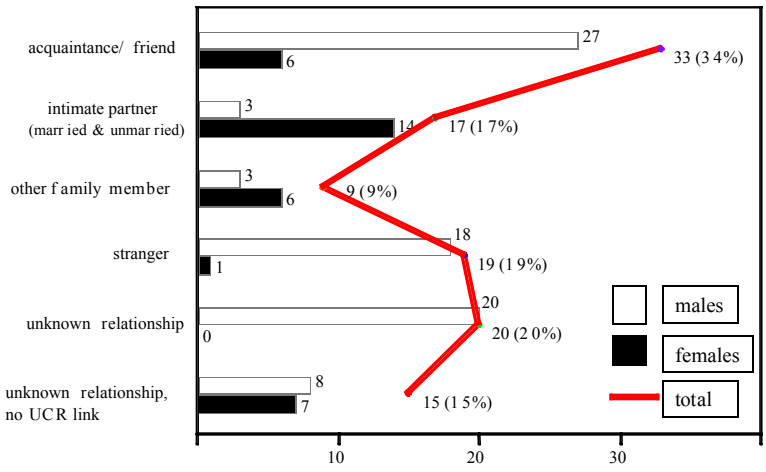
Most (87%, or 98) of the 113 homicides from 2001 to 2004 were linked to Uniform Crime Reports (UCR) to provide additional data on the incident. The following statistics therefore refer only to those 98 deaths that were linked to the UCR data. The proportion of linked records was highest for homicides in Hawaii and Kauai Counties (100%), and lowest for Honolulu (85%) and Maui counties (57%, or 4 of 7 deaths).

According to UCR data, most (60%, or 59) of the 98 victims knew their assailants; only 19% were killed by strangers. (The victim-perpetrator relationship was not known in 20% of the homicides linked to UCR.) Victims were most commonly killed by someone known to them outside of their families (33, or 34%) (Figure 130). Most (58%, or 19) of these 33 victims were killed by someone described as an "acquaintance". Four were killed by neighbors, 2 by co-workers, and 3 by "friends". Seventeen of the victims were intimate partners of the assailant, including 7 spouses (6 wives, 1 husband), 8 girlfriends, and 2 boyfriends. Two of the female victims were described as "ex-girlfriends", and 1 of the wives was "estranged". Almost all (82%, or 14 of 17) of the victims killed by intimate partners were women. Most (7) of the 9 victims who were killed by other family members were the children of the assailants. All 7 were 8 years or younger, including 3 infants and a 1 year-old. Only 2 of the 12 victims who were 8 years or younger were known to be killed by someone outside of the immediate family. One was killed by a neighbor and the other by the mother's boyfriend.

Figure 130 also shows that female victims were more likely to be killed by their intimate partners (52%), or other family members (22%) than were male victims (4% and 4%, respectively). Male victims were more likely to be killed by extra-familial acquaintances (38%) or strangers (25%). Victims killed on Neighbor Islands were more likely to have been acquaintances of the assailants (45%, vs. 29% for Oahu victims), while Oahu victims were more likely to have been killed by a stranger (25%, vs. 7% for Neighbor Island victims).

Nine (27%) of the 33 victims killed by acquaintances died as a result of an "argument", with no further details available. Eight (24%) were killed over conflicts of money or property, and 6 (18%) of these homicides involved disputes over drugs. Non-specific arguments were also the cause of about half (47%, or 9) of the 19 homicides committed by strangers. Four (21%) of these homicides were related to robberies.

Figure 130. Victim-to-assailant relationship for homicides among Hawaii residents, by gender, 2001-2004.



Nonfatal injuries

There was an increasing trend in the number of nonfatal injuries from assaults in the state, but only among patients who were treated in EDs (Table 27). (There was a decrease from 2005 to 2006, but this was within the range of decreases in E-codes over that 2 year-period (see Table 1).) The increasing trend was evident among patients from all counties except Kauai. Males comprised two-thirds (67%) of the patients treated in EDs and an even greater proportion (87%) of those who were hospitalized. Very few of the patients under 5 years of age and most (95%) were 15 years or older. More than half (58%) were 15 to 34 years of age. Only 1% were in the senior age range. Honolulu County residents comprised nearly two-thirds (64%) of the patients treated in EDs, and almost three-fourths (73%) of those who were hospitalized.

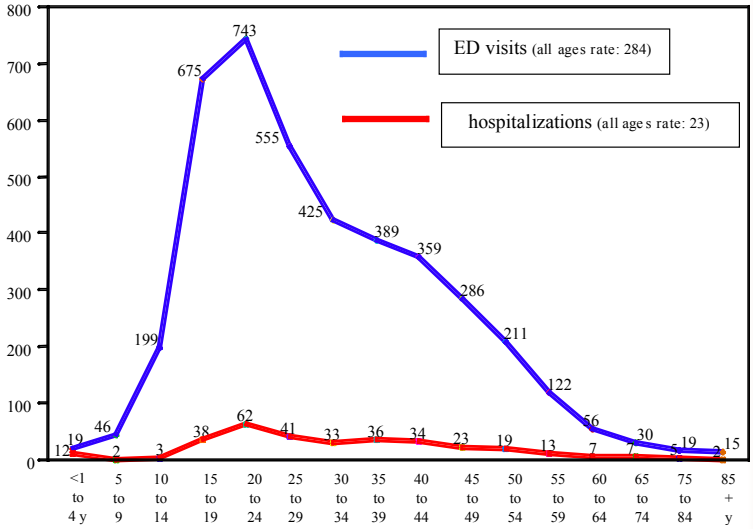
Table 27. Demographic characteristics* of Hawaii residents with nonfatal injuries from assaults.

	ED visits	hospitalizations	total
Year of admission			
2003	3251	287	3538
2004	3459	275	3734
2005	3872	332	4204
2006	3819	278	4097
average annual total	3600	293	3893
Patient gender			
Female	1182 (33%)	39 (13%)	1221 (31%)
Male	2418 (67%)	254 (87%)	2672 (69%)
Patient age			
Infants	3 (0%)	7 (2%)	9 (0%)
1-4 y	14 (0%)	4 (1%)	18 (0%)
5-14 y	204 (6%)	4 (1%)	208 (5%)
15-24 y	1230 (34%)	88 (30%)	1318 (34%)
25-34 y	852 (24%)	64 (22%)	916 (24%)
35-44 y	677 (19%)	64 (22%)	741 (19%)
45-54 y	454 (13%)	39 (13%)	492 (13%)
55-64 y	126 (4%)	14 (5%)	141 (4%)
65-74 y	26 (1%)	6 (2%)	32 (1%)
75-84 y	12 (0%)	3 (1%)	16 (0%)
85 + y	4 (0%)	1 (0%)	4 (0%)
County of residence of patient			
Hawaii	722 (20%)	34 (12%)	756 (19%)
Honolulu	2303 (64%)	213 (73%)	2516 (65%)
Kauai	214 (6%)	12 (4%)	226 (6%)
Maui	362 (10%)	34 (12%)	396 (10%)

*Statistics are annual averages over the 2003-2006 period.

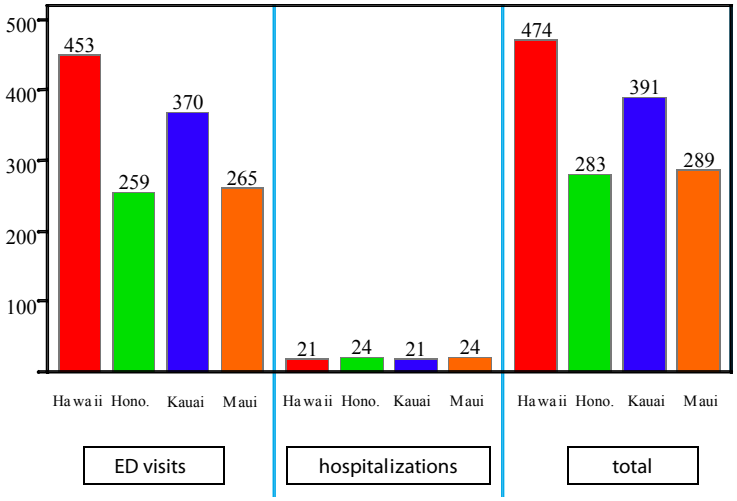
The peak age for rates of both ED visits and hospitalizations was the 15 to 29 year age group, particularly 20 to 24 year-olds (Figure 131). The rates for both types of injuries gradually decreased from this peak over the succeeding age groups. Rates of nonfatal injuries treated in EDs were lowest for the youngest (under 5 years of age) and oldest (75 years and older) residents. Hospitalization rates were slightly elevated among residents under 5 years of age compared to rates for 5 to 14 year-olds (12 vs. 3 hospitalizations/10,000 residents, respectively).

Figure 131. Average annual rates (per 100,000 residents) of hospitalizations and ED visits for nonfatal injuries from assaults in Hawaii, by age of patient.



The rate for ED visits for residents of Hawaii County was significantly higher than for any other county (Figure 132). The rate for Hawaii County was 22% higher than that computed for residents of Kauai County and nearly twice the rates computed for residents of Honolulu and Maui counties. Rates of ED visits were also significantly higher among residents of Kauai County compared to rates for Honolulu and Maui county residents. These county differences were also true for all types of injuries (combining both ED visits and hospitalizations), while there were no significant differences among counties in the rate of injuries that required hospitalization.

Figure 132. Age adjusted annual rates (per 100,000 residents) of nonfatal injuries from assaults, by level of care and county of residence of patient.



Patients were hospitalized for nearly 5 days on average, with over $25,000 in charges for each admission (Table 28). Unarmed beatings caused three-quarters (75%) of all injuries, and 60% of those that required hospitalization. Injuries from stabbings (14%) and beatings from blunt objects (12%) were more common among patients who were hospitalized compared to those who were treated in EDs (4% and 6%, respectively), perhaps reflecting a greater severity of those mechanisms. Firearms comprised only a small proportion (2% or less) of either type of injury.

Fractures were the most common type of injury that required hospitalization. More than one-third (35%) of patients admitted to hospitals had a skull fracture. Internal injuries were also common (30%) among hospitalized patients. Injuries treated in EDs were most commonly contusions or superficial injuries (37%) or open wounds (25%).

Table 28. Clinical characteristics* of Hawaii residents with nonfatal injuries from assaults.

	ED visits	hospitalizations	total
Length of care and financial charges			
Ave. length of stay (days)	1.0	4.7	1.3
Total number of days	3600	1363	4963
Average charge	$1537	$25,670	$3,262
Total charges	$5.5 million	$7.5 million	$13.1 million
E-code classifications			
firearms	3 (0%)	6 (2%)	8 (0%)
stabbing/piercing	138 (4%)	40 (14%)	179 (5%)
struck by object	222 (6%)	34 (12%)	256 (7%)
unarmed fight or assault	2728 (76%)	176 (60%)	2904 (75%)
other/unspecified	510 (14%)	37 (13%)	547 (14%)
Primary injury diagnosis			
fractures	538 (15%)	130 (44%)	668 (17%)
fracture of skull	342 (9%)	103 (35%)	444 (11%)
vertebral column	5 (0%)	3 (1%)	8 (0%)
ribs, pelvis or trunk	46 (1%)	6 (2%)	51 (1%)
humerus	4 (0%)	2 (1%)	6 (0%)
lower arm or hand	124 (3%)	7 (2%)	131 (3%)
femur	0 (0%)	4 (1%)	4 (0%)
lower leg or foot	18 (0%)	6 (2%)	24 (1%)
dislocations	26 (1%)	2 (1%)	28 (1%)
sprains and strains	190 (5%)	1 (0%)	191 (5%)
internal injuries	213 (6%)	87 (30%)	300 (8%)
open wound	885 (25%)	41 (14%)	926 (24%)
contusion/superficial	1323 (37%)	6 (2%)	1329 (34%)
other/unspecified	426 (12%)	27 (9%)	453 (12%)

*Statistics are annual averages over the 2003-2006 period.

Injuries of Undetermined Intent

Fatal injuries

This is a vague but important category to explore, since there were 296 fatal injuries over the 6-year period for which the intent could not be defined. Figure 133 shows that the annual number of such deaths increased dramatically over this period, especially during 2005 to 2006. This is important to note since it makes trends in suicides and (to a lesser extent) homicides difficult to interpret. About half (46%, or 136) of these injuries occurred on Oahu, 24% on Hawaii, 22% on Maui, and 7% on Kauai. The undetermined intent designation was therefore more likely to be assigned to injury-related deaths that occurred on Neighbor Islands (from 11% for deaths on Hawaii County to 16% for Maui County), than for those that occurred on Oahu (6% of all injury-related deaths).

The age distribution of these victims (Figure 134) was very similar to that for victims of unintentional poisonings (see Figure 102). There was a peak age of 45 to 54 years (36%, or 107 victims), and two-thirds (66%, or 194) were 35 to 60 years of age. There were also 10 victims (possible homicides) under the age of 5 years, including 7 infants. As for most categories of injuries, there were nearly twice as many male victims (185) as female victims (111).

Figure 135 shows that most (65%, or 193) of these fatal injuries were due to poisonings, specifically poisonings due to medicinal substances (44%, or 133). Most (86%, or 166) of the 193 poisonings were among 35 to 64 year-olds, similar to the age distribution of unintentional poisonings (see Figure 102). Only one third (35%, or 68) of these deaths occurred on Oahu; there were comparable numbers of deaths on Hawaii (57) and Maui counties (55). In contrast, most (79%, or 23) of the fatal falls occurred on Oahu. Almost all (79%, or 30) of the 38 deaths from "unknown causes" occurred in 2006. This category had a high proportion (55%, or 21 victims) of senior-aged victims, including 10 (26%) who were 85 years or older.

Figure 133. Annual number of fatal injuries of undetermined intent among Hawaii residents, by county, 2001-2006.

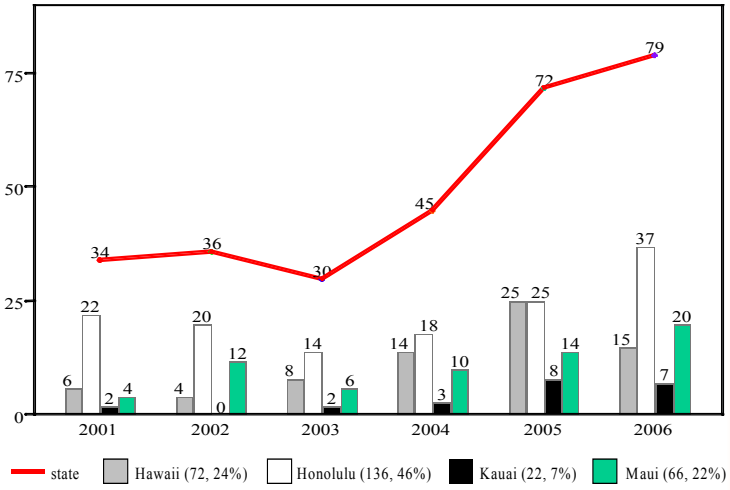


Figure 134. Age and gender distribution of victims of fatal injuries of undetermined intent in Hawaii, 2001-2006.

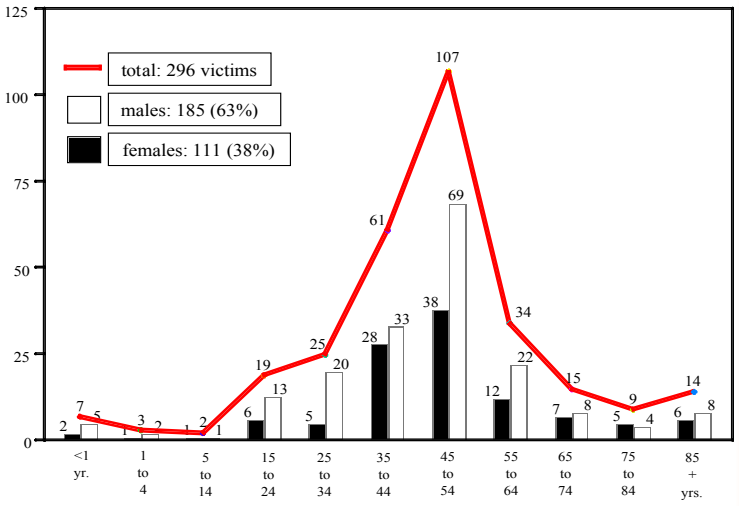
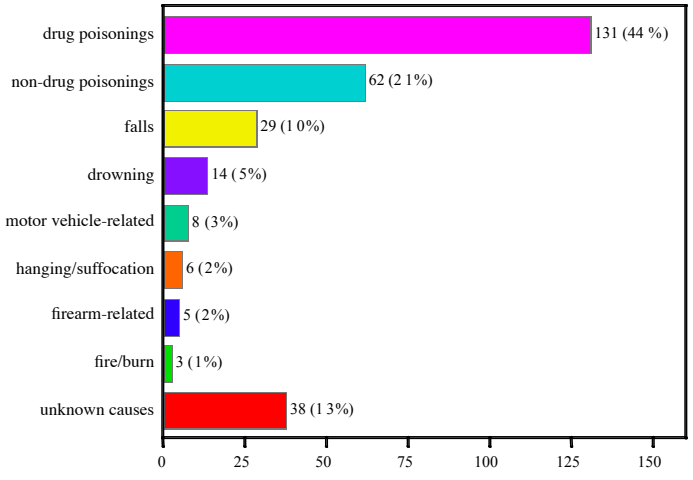


Figure 135. Fatal injuries of undetermined intent among residents of Hawaii, by injury category, 2001-2006.



Nonfatal injuries

There were no trends in the annual number of injuries of undetermined intent, either for those treated at EDs or those that required hospitalization (Table 29). Male patients (58% of the total) slightly outnumbered females (42%). Patients who were hospitalized were significantly older than those who were treated in EDs (mean age: 43 vs. 37 years, respectively), but age was widely distributed in both groups. Oahu residents comprised about three-quarters (74%) of the patients treated in EDs, but only about two-thirds (65%) of those who were hospitalized. About one-fifth of each type of patient was a resident of Maui County.

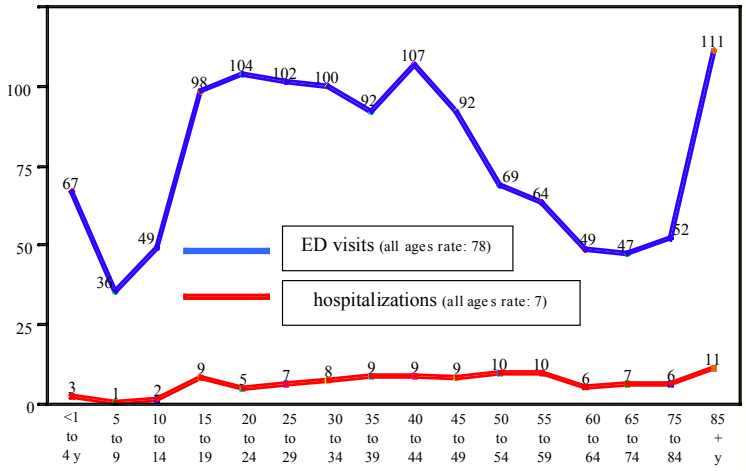
Table 29. Demographic characteristics* of Hawaii residents with nonfatal injuries of undetermined intent.

	ED visits	hospitalizations	total
Year of admission			
2003	868	89	957
2004	1025	79	1104
2005	1077	86	1163
2006	967	92	1059
average annual total	984	87	1071
Patient gender			
Female	409 (42%)	37 (43%)	447 (42%)
Male	575 (58%)	49 (57%)	624 (58%)
Patient age			
Infants	8 (1%)	2 (2%)	10 (1%)
1-4 y	50 (5%)	0 (0%)	50 (5%)
5-14 y	70 (7%)	2 (3%)	72 (7%)
15-24 y	176 (18%)	12 (14%)	187 (17%)
25-34 y	176 (18%)	13 (14%)	188 (18%)
35-44 y	181 (18%)	17 (19%)	198 (18%)
45-54 y	147 (15%)	17 (20%)	165 (15%)
55-64 y	77 (8%)	11 (13%)	88 (8%)
65-74 y	40 (4%)	6 (6%)	45 (4%)
75-84 y	34 (3%)	4 (5%)	39 (4%)
85 + y	27 (3%)	3 (3%)	30 (3%)
County of residence of patient			
Hawaii	53 (5%)	9 (11%)	62 (6%)
Honolulu	727 (74%)	56 (65%)	783 (73%)
Kauai	18 (2%)	6 (6%)	24 (2%)
Maui	186 (19%)	16 (18%)	202 (19%)

*Statistics are annual averages over the 2003-2006 period.

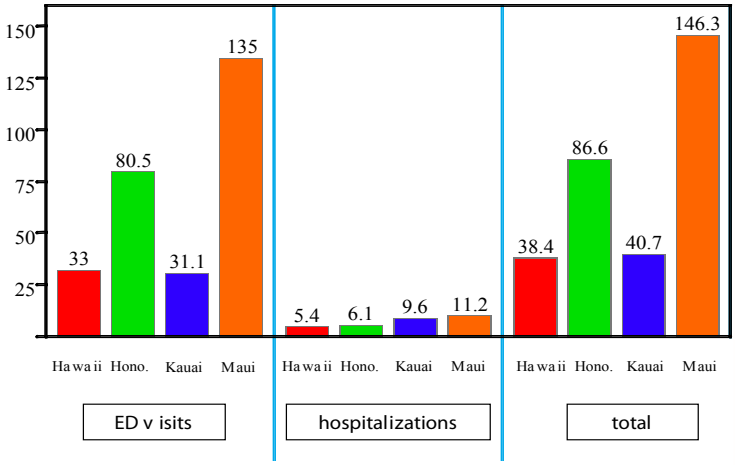
Rates of ED visits were low during childhood until a sharp increase among 15 to 19 year-old residents (Figure 136). Rates remained high over the 15 to 49 year age range before decreasing steadily until increasing to the highest levels among residents 85 years and older. A similar pattern was seen for rates of hospitalizations for injuries of undetermined intent, with generally high rates among 15 to 59 year-old residents and those 85 years and older.

Figure 136. Average annual rates (per 100,000 residents) of hospitalizations and ED visits for nonfatal injuries of undetermined intent in Hawaii, by age of patient.



Residents of Maui County had significantly higher rates of both ED visits and total (ED visits combined with hospitalizations) injuries of undetermined intent, compared to residents of any other county (Figure 137). The ED visit rate for Maui County residents was 68% higher than the rate for residents of Honolulu County, and 4 times higher than rates for residents of Hawaii and Kauai counties. The ED visit rate for residents of Honolulu County was more than double the rates for Hawaii and Kauai counties. Rates of hospitalizations from injuries of undetermined intent were also highest among residents of Maui County, although there were no significant differences in the rates between any of the counties.

Figure 137. Age adjusted annual rates (per 100,000 residents) of nonfatal injuries of undetermined intent, by level of care and county of residence of patient.



Patients were hospitalized for nearly 5 days on average, and hospitalizations comprised 30% of the total number of days of care (Table 30). The average charge for a hospitalization was nearly $21,000, however, and hospitalizations comprised 64% of the total annual charges of $2.8 million. The E-codes for most (83%) of the injuries treated in EDs indicated "other" or "unspecified" mechanisms of injury. The most commonly specified type of injury was poisoning (12% of ED visits), specifically from drugs or medicinal substances (10%). More specific E-codes were provided for hospitalizations, two-thirds (67%) of which were caused by poisonings, usually (60%) from drugs or medicinal substances. The most common types of injuries treated in EDs were sprains and strains (28%), contusions and superficial injuries (24%), and open wounds (16%). Apart from the poisonings, there was a wide distribution of injury types among hospitalized patients, with fractures (12%) being the most common.

Table 30. Clinical characteristics* of Hawaii residents with nonfatal injuries of undetermined intent.

	ED visits	hospitalizations	total
Length of care and financial charges			
Ave. length of stay (days)	1.0	4.9	1.3
Total number of days	984	422	1406
Average charge	$1,106	$20,947	$2,600
Total charges	$1.1 million	$1.8 million	$2.8 million
E-code classifications			
cutting/piercing	17 (2%)	2 (2%)	18 (2%)
falls	22 (2%)	4 (4%)	26 (2%)
firearms	12 (1%)	3 (3%)	15 (1%)
hanging/suffocation	3 (0%)	1 (1%)	4 (0%)
poisoning, drugs/meds	99 (10%)	52 (60%)	151 (14%)
poisoning, other types	17 (2%)	6 (7%)	23 (2%)
other/unspecified means	815 (83%)	19 (22%)	835 (78%)
Primary injury diagnosis			
fractures	89 (9%)	11 (12%)	100 (9%)
fracture of skull	5 (1%)	2 (3%)	8 (1%)
vertebral column	11 (1%)	2 (2%)	13 (1%)
ribs, pelvis or trunk	11 (1%)	1 (1%)	12 (1%)
humerus	5 (0%)	1 (1%)	6 (1%)
lower arm or hand	31 (3%)	1 (1%)	32 (3%)
femur	1 (0%)	2 (2%)	3 (0%)
lower leg or foot	25 (3%)	2 (3%)	27 (3%)
dislocations	31 (3%)	1 (1%)	32 (3%)
sprains and strains	274 (28%)	4 (5%)	278 (26%)
internal injuries	8 (1%)	3 (4%)	11 (1%)
open wounds	157 (16%)	5 (6%)	162 (15%)
contusion/superficial	241 (24%)	3 (3%)	244 (23%)
poisonings	114 (12%)	57 (66%)	172 (16%)
other/unspecified	70 (7%)	3 (3%)	73 (7%)

*Statistics are annual averages over the 2003-2006 period.

Injuries Among Non-residents

Fatal injuries

Up to this point, this report has included only information on fatal injuries among Hawaii residents. However, a total of 430 non-residents also died of injuries in Hawaii over the 2001 to 2006 period. There was a generally increasing trend in both the number of non-resident deaths and the number of incidents that caused the fatalities (Figure 138). (Incidents are described separately because a relatively large proportion of non-resident deaths were caused by aircraft or automobile crashes which claimed more than 1 victim.) About half (47%, or 202) of the victims were killed on the island of Oahu, with relatively equal numbers among the remaining counties; 81 on Hawaii, 75 in Maui County, and 72 on Kauai. There were no clear trends in the annual number of deaths within any county. About two-thirds (68%, or 292) of the victims were residents of other U.S. states, and the remaining 32% (138) were residents of foreign countries. Among the foreign residents, Japanese was by far the most common ethnicity listed on the death certificates (60 victims, or 43% of the total). (Note that only information on victim ethnicity was available, not country of residence.)

Figure 139 shows that fatal injuries occurred among non-residents of all ages. However, half (50%, or 215) of the victims were between the ages of 35 and 64 years, and most (86%, or 370) were 15 to 74 years of age. In general, the age distribution of the non-resident victims was similar to that among resident victims, except there were proportionally fewer older victims (ages 75 and older) in the former (11% vs. 24%, respectively), and more victims in the 55 to 74 year age range (26% vs. 16%, respectively). About two-thirds (69%, or 297) of the non-resident victims were males, similar to the proportion for resident victims of fatal injuries (70%).

Figure 138. Annual number of fatal injuries among non-residents in Hawaii, by county, 2001-2006.

(Annual number of incidents shown in parentheses.)

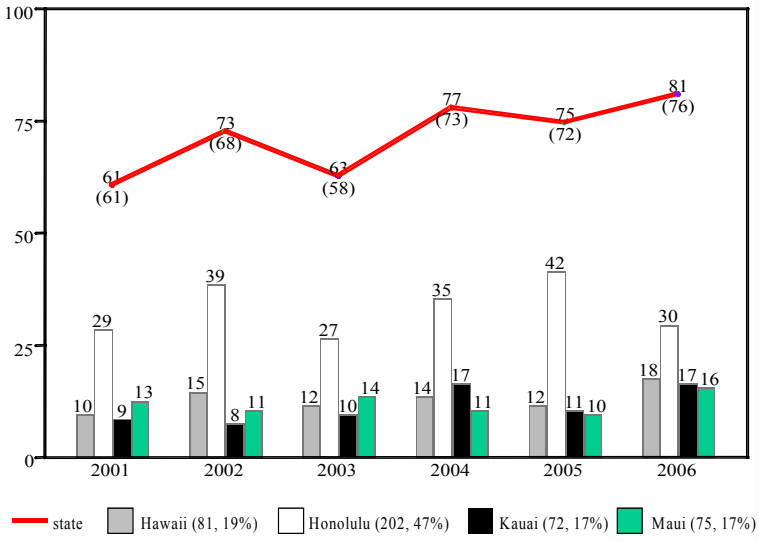
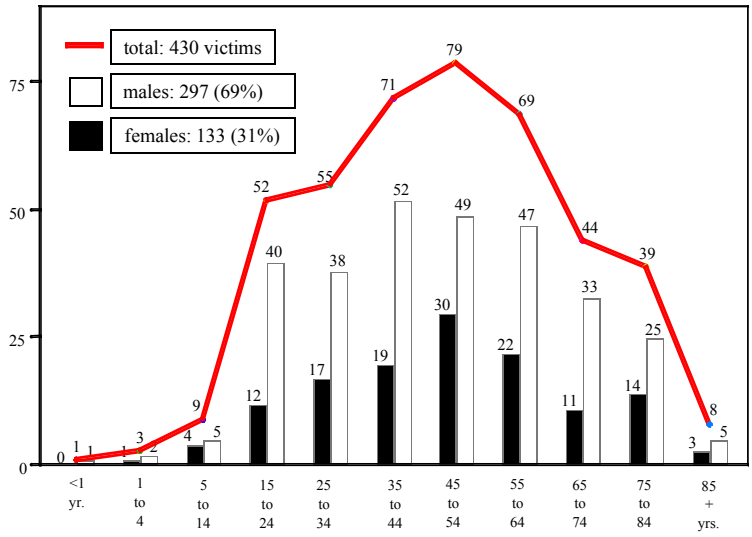


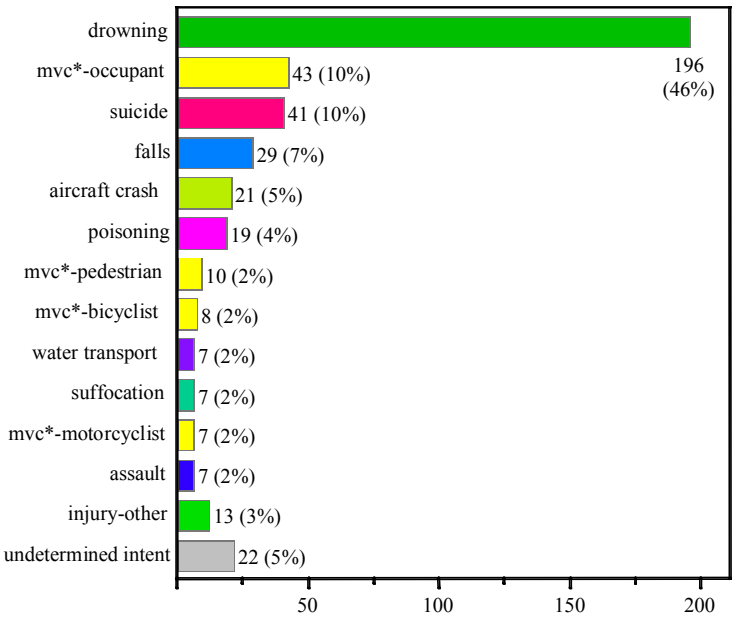
Figure 139. Age and gender distribution of non-resident victims of fatal injuries in Hawaii, 2001-2006.



The causes of the 430 deaths are shown in Figure 140. Most (84%, or 360) of the deaths were due to unintentional injuries. Drowning was by far the leading cause, accounting for nearly half (46%, or 196) of all deaths, and more than all other unintentional causes combined. These deaths are discussed in more detail in the following chapter on drownings. Motor vehicle crashes accounted for 16% (68) of the deaths, including 43 deaths among car occupants. The third leading cause was suicide, which included nearly equal numbers of residents of other U.S. states (21) and foreign countries (20). Only 38% (11) of the 29 falls occurred among senior-aged non-residents; this proportion was much higher (77%) among Hawaii residents who were killed by falls. Most (81%, or 17) of the 21 victims who died in aircraft crashes were killed in 5 separate crashes, including 4 that involved helicopters. All 5 of these crashes occurred on Neighbor Islands: 3 on Kauai, and 1 each on Hawaii and Maui. Altogether, aircraft crashes on Kauai accounted for more than half (57%, or 12) of the 21 fatalities. Almost all (95%, or 18 of 19) of the poisonings were from drugs and medicinal substances. Similar to Hawaii residents (see Figure 135), poisonings killed most (55%, or 12) of the 19 victims of injuries of undetermined intent.

There was somewhat of an increasing trend in the number of non-residents killed by injuries, mostly evident among decedents from the U.S. mainland, and particularly in 2006 (Figure 141). Visitor statistics compiled by DBEDT were used to compute fatal injury rates of non-residents, adjusting for the number of visitor days for each year. There was no consistent trend in the annual fatal rate among all non-residents (right side of Figure 141). The rates among residents of foreign countries was higher than that for resident of other U.S. states for every year except 2003. The 6-year crude mortality estimates were significantly higher (58% higher) among visitors from other countries compared to visitors from other States (350 vs. 221 deaths/100,000 visitor years). (Visitor years is the number of visitor days divided by 365.25.)

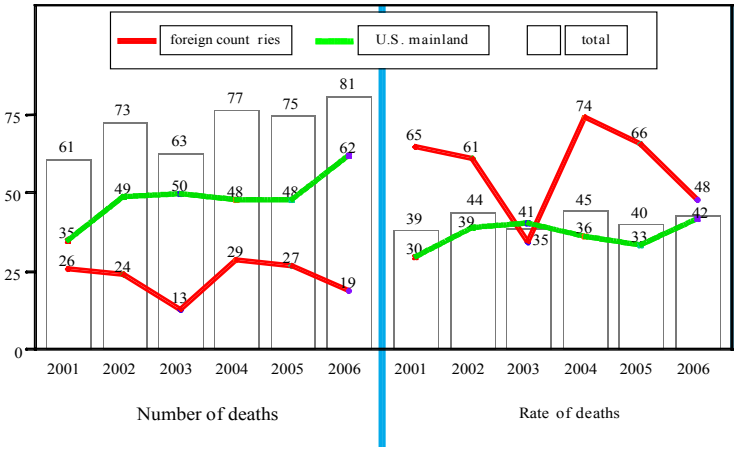
Figure 140. Fatal unintentional injuries among non-residents of Hawaii, by injury category, 2001-2006.



*mvc = motor vehicle crash

Figure 141. Annual number and rate of fatal injuries among non-residents in Hawaii, by nation of origin, 2001-2006.

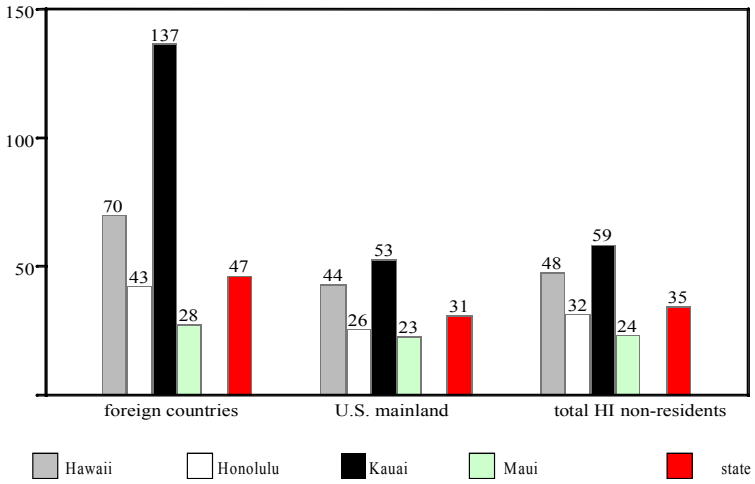
(Rates are deaths per 100,000 visitor years.)



Kauai had the highest unintentional injury fatality rates among visitors, particularly among visitors from foreign countries (Figure 142). Rates for Kauai were significantly higher than rates for visitors to Honolulu and Maui counties, for both residents of other United States and foreign countries. (Note that the rate estimates for residents of foreign countries were based on fewer than 20 deaths for each of the Neighbor Islands and are therefore unreliable estimates.) Hawaii County had the second highest rates, significantly higher than rates for Maui County (for either group of non-residents) and Honolulu County (U.S. mainland residents only). There were no significant differences between the rates for injuries on Maui and Honolulu counties. There were comparable results when the number of incidents (as opposed to number of deaths) was used to calculate rates, suggesting these findings were not due to the 3 aircraft crashes on Kauai that resulted in multiple casualties.

Figure 142. Average annual rate of fatal unintentional injuries among non-residents of Hawaii, by county of injury, 2001-2006.

(Rates are deaths per 100,000 visitor years.)



Nonfatal injuries

There were no trends in the annual number of injuries of undetermined intent, either for those treated at EDs or those that required hospitalization (Table 31). Male patients (58% of the total) slightly outnumbered females (42%). Patients who were hospitalized were significantly older than those who were treated in EDs (mean age: 43 vs. 37 years, respectively), but age was widely distributed in both groups.

Table 31. Demographic characteristics* of non-residents with nonfatal injuries.

	ED visits	hospitalizations	total
Year of admission			
2003	6296	697	6993
2004	6818	688	7506
2005	8005	690	8695
2006	8022	595	8617
average annual total	7286	668	7953
Patient gender			
Female	3556 (49%)	292 (44%)	3847 (48%)
Male	3729 (51%)	376 (56%)	4105 (52%)

*Statistics are annual averages over the 2003-2006 period.

continued on next page

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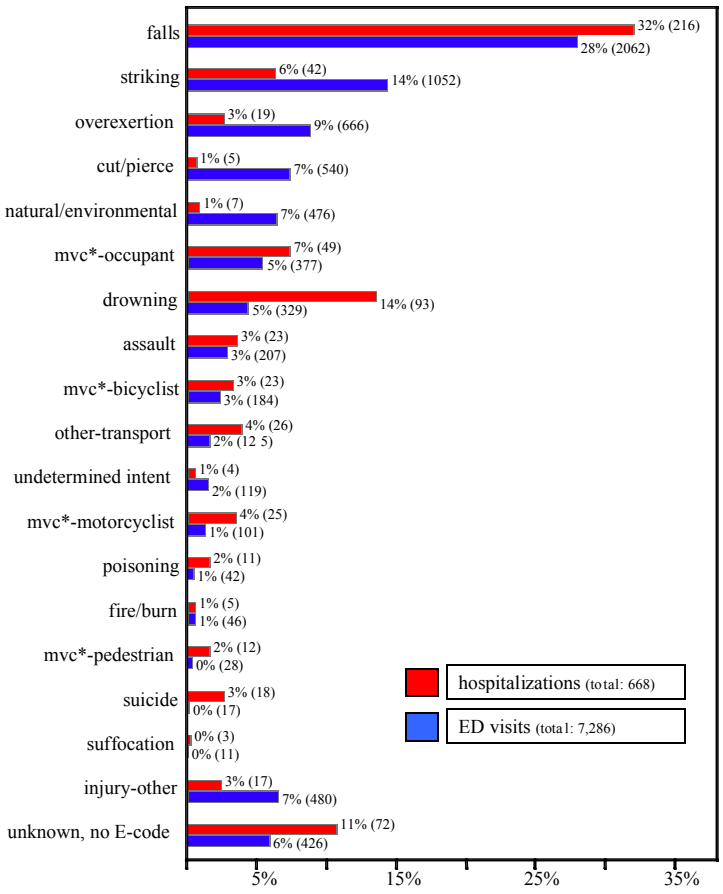
	ED visits	hospitalizations	total
Patient age			
Infants	31 (0%)	2 (0%)	33 (0%)
1-4 y	299 (4%)	12 (2%)	311 (4%)
5-14 y	567 (8%)	17 (3%)	584 (7%)
15-24 y	1127 (15%)	92 (14%)	1219 (15%)
25-34 y	1131 (16%)	81 (12%)	1212 (15%)
35-44 y	1087 (15%)	85 (13%)	1172 (15%)
45-54 y	1196 (16%)	106 (16%)	1302 (16%)
55-64 y	923 (13%)	101 (15%)	1024 (13%)
65-74 y	539 (7%)	75 (11%)	614 (8%)
75-84 y	307 (4%)	75 (11%)	379 (5%)
85 + y	78 (1%)	26 (4%)	104 (1%)

*Statistics are annual averages over the 2003-2006 period.

Falls were by far the leading cause of nonfatal injuries among non-residents who were treated in EDs (28% of patients) or who were hospitalized (32%) (Figure 143). Otherwise, the main causes of injury were different between the two types of patients. Near drownings (14%), and car crashes (7%) were the next most common causes of injuries requiring hospitalization, while injuries from being struck by falling objects or by persons (14%), from overexertion (9%), cutting and piercing injuries (7%) and injuries from natural or environmental factors (7%) were more common among patients treated in EDs.

Figure 143. Causes of nonfatal unintentional injuries among non-residents in Hawaii, by level of medical care.

(Percent of injuries by cause, annual number listed in parenthesis.)



*mvc = motor vehicle crash

Medical charges for nonfatal injuries among non-residents totaled nearly $24 million each year (Table 32). Hospitalizations accounted for most (73%) of that total, with an average of nearly $26,000 in medical charges per hospitalization. About half (55%) of the hospitalized patients had a fracture, with a wide distribution in the anatomical locations of the fractures. Internal injuries were also relatively common (14%) among hospitalized patients. Open wounds (28%), contusions and superficial injuries (21%), sprains and strains (17%) and fractures (17%) were the most common types of injuries among non-residents who were treated in EDs.

Table 22. Clinical characteristics* of Hawaii residents with nonfatal poisonings.

	ED visits	hospitalizations	total
Length of care and financial charges			
Ave. length of stay (days)	1.0	5.0	1.3
Total number of days	7285	3327	10612
Average charge	$1,115	$25,803	$2,980
Total charges	$8.1 million	$17.2 million	$23.7 million
Primary injury diagnosis			
fractures	1252 (17%)	365 (55%)	1616 (20%)
fracture of skull	86 (1%)	39 (6%)	125 (5%)
vertebral column	48 (1%)	54 (8%)	102 (1%)
ribs, pelvis or trunk	163 (2%)	33 (5%)	196 (2%)
humerus	105 (1%)	15 (2%)	120 (2%)
lower arm or hand	411 (6%)	32 (5%)	442 (6%)
femur	11 (0%)	95 (14%)	106 (1%)
lower leg or foot	429 (6%)	96 (14%)	525 (7%)
dislocations	251 (3%)	7 (1%)	257 (3%)
sprains and strains	1221 (17%)	17 (3%)	1238 (16%)
internal injuries	129 (2%)	93 (14%)	223 (3%)
open wounds	2032 (28%)	31 (5%)	2063 (26%)
contusion/superficial	1532 (21%)	12 (2%)	1544 (19%)
poisonings	211 (3%)	32 (5%)	243 (3%)
other/unspecified	658 (9%)	112 (17%)	770 (10%)

*Statistics are annual averages over the 2003-2006 period.

Drownings and Near Drownings (Residents and Non-residents)

Fatal injuries

The previous chapter on drownings included only information on victims who were residents of Hawaii; this chapter also incorporates information from drownings among non-residents. (Data from the 8 victims of the Ehime Maru incident on February 2, 2001 were excluded, since this represented an extraordinary event relatively far from the shore.) There were 382 drownings over the 6-year period, and the annual number of victims generally increased over the 2001-2005 period (Figure 144). Although there was a decrease from 77 victims in 2005 to 66 in 2006, the latter was the 3rd highest total over the 6-year period. Figure 144 also shows most of the increasing trend from 2001-2005 was due to drownings on Oahu, where 56% of the drownings occurred. There were more drownings on Kauai (53) than on Maui County (42), despite the latter having more than twice the population of Kauai County. Fourteen percent of the victims drowned on Kauai, which was the largest proportion from that county for any injury category; only 2% to 8% of other types of fatal injuries occurred on Kauai. There were 38 drownings on the island of Maui, 4 on Molokai, and none on the island of Lanai. The 382 drownings included nearly equal numbers of Hawaii residents (187, or 49% of the total) and non-residents (195, or 51%). Most of the non-residents (67%, or 131) were from other U.S. states, with the remainder (33%, or 64) being residents of foreign countries. There was an increasing trend in the number of victims from other U.S. states, from 9 in 2001 to 20 in 2003 to 29 victims in 2006.

Figure 144. Annual number of drownings (including non-residents) in Hawaii, by county, 2001-2006.

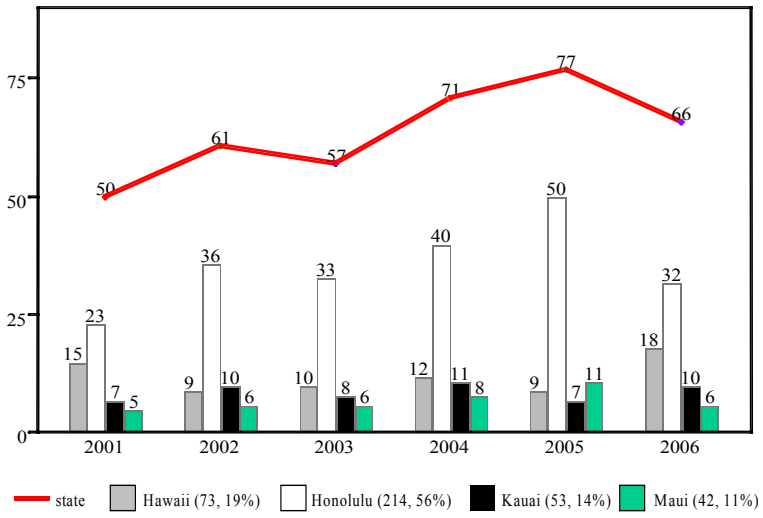
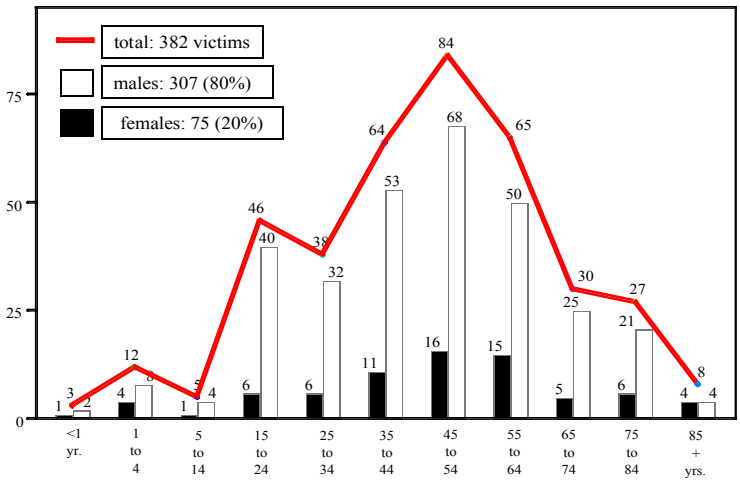


Figure 145. Age and gender distribution of drowning victims (including non-residents) in Hawaii, 2001-2006.



Drownings occurred among victims of all ages, with a large peak of victims in the 35 to 64 year age range (56%, or 213 of the victims) (Figure 145). The age distribution was generally similar between resident and non-resident victims, although there were proportionally more 55 to 74 year-old victims among the latter (33% vs. 17% among resident victims). This was especially true among the 64 victims who were residents of foreign countries, of whom 42% (27) were 55 to 74 years of age. Only 75 of the victims (20%) were females; males outnumbered females by a 4-to-1 ratio. That gender ratio was closer among the very young and very old victims. The proportion of victims who were males was significantly higher among Hawaii residents (88%) compared to non-residents (73%).

Overall, 85% (323) of the drownings occurred in the ocean or other saltwater environments (Figure 146), although that proportion was slightly higher for non-resident victims (88%), compared to residents (81%). Drownings in swimming pools (7%, or 26), and rivers and other freshwater bodies (4%, or 17) made up most of the remaining drownings. There were also 12 victims who drowned in bathtubs and 4 in "other" environments.

Seven (27%) of the 26 victims who drowned in swimming pools were under 5 years of age, and 6 were residents of Hawaii. There was at least 1 such death in each county, in contrast to earlier periods; 7 of the 9 toddler pool drownings from 1996 to 2000 occurred on Oahu. Five of these 7 drownings occurred at single family homes, and the other 2 at apartment complexes. While half (55%, or 6) of the 11 resident victims were under 5 years of age, non-resident victims were mostly (67%, or 10 of 15 victims) 48 years or older. Ten of the non-resident drownings were in hotel pools, including 7 on Oahu.

Almost all the 17 freshwater drowning victims were young to middle-aged adults; 15 (88%) were 19 to 59 years of age or older. The locations of the 11 resident drownings were shown in Figures 95 and 96, in an earlier chapter. The remaining 6 victims were from other U.S. states. Three drowned on Kauai and 1 on each of the other counties. At least 4 of those 6 non-resident victims had unintentional immersions, including all 3 who drowned on Kauai. (The activity status was not known for 1 victim.) The 12 victims who drowned in bathtubs included 4 (33%) who were under 2 years of age (all of whom were Hawaii residents), and 12 (67%) who were 57 years or older. All but 1 of the older victims drowned on Oahu, including 3 non-residents who drowned in hotel bathtubs. (The saltwater drownings will be discussed in more detail, including data that was linked to autopsy records from 2001-2004.)

Figure 146. Drownings in Hawaii, by environment and residency, 2001-2006.

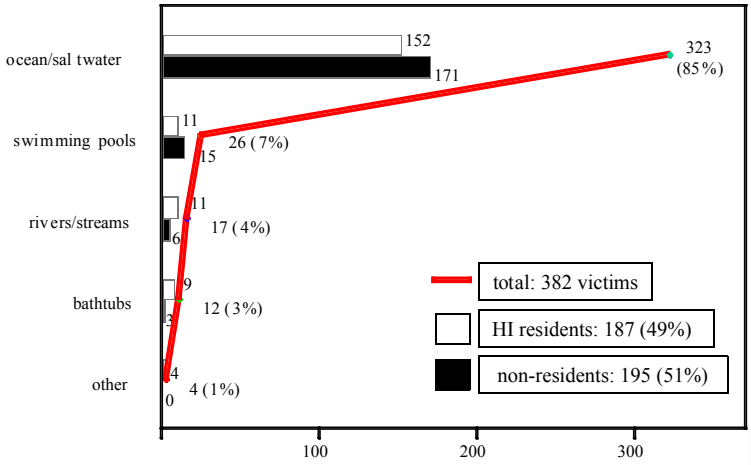
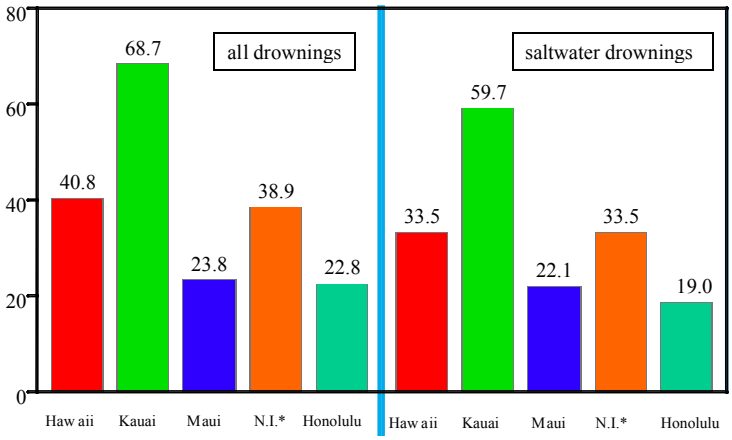


Figure 147. Rate for all types of drownings (left side) and for saltwater drownings (right side) in Hawaii, by county of injury, 2001-2006.

(Rate is per 100,000 de facto population.
Crude rates are shown, unadjusted for age distribution.)



*N.I. = Neighbor Islands (combined totals for Hawaii, Kauai, and Maui counties.)

Drowning rates were lowest for Honolulu County, for all drownings as well as for those that occurred in saltwater environments (Figure 147). The highest rates were computed for Kauai, which had significantly higher rates than any other county. The rates in Kauai County were 3 times the rates for Honolulu and Maui counties. Hawaii County also had significantly higher rates than Honolulu and Maui counties. If all the Neighbor Islands are considered together, the rates of drownings (both total and saltwater) are significantly higher than the rates for Honolulu County.

The most common activity among the 323 victims of saltwater drownings was swimming, accounting for almost one quarter (73, or 23%) of the total (Figure 148). Most of these victims (60%, or 44) were non-residents. Snorkeling was the next most common activity (20%, or 66 victims) overall, and the most common activity among non-residents who drowned (56 victims, or 33% of the 171 total non-resident victims). There were 44 drownings resulting from unintentional immersions including people who fell in or were swept in (23), fishing (9) or gathering (7) from shore, or who drowned after boat accidents (5). Most (70%, or 31) of those 44 victims were residents. Almost all (89%, or 25) of the 28 victims who were free diving were residents, while the majority (75%, or 9) of those who were scuba diving were non-residents. There was a large group of victims (59, or 18%) whose activity at the time of drowning was not documented.

Autopsy records were reviewed for almost all (95%, or 186) of the 196 ocean drownings that occurred over the 2001-2004 period. About half (51%, or 95) of the 186 ocean drownings were at least somewhat related to intrinsic or personal factors among victims (Figure 149). Intrinsic or personal factors were significantly more common among resident victims than non-residents (63% vs. 40%), and Figure 149 shows this difference is mostly due to higher rates of alcohol use among resident victims (20%, vs. 2% among non-resident victims). Half (50%, or 7) of the resident victims who tested positive for alcohol drowned after unintentional immersions into the ocean. (This excludes 4 drownings for which the activity of the victim was not known.) Circulatory diseases were the most common type of intrinsic factor, contributing to at least one-third of drownings among both residents and non-residents. Circulatory diseases were documented for about half (53%, or 46 of 86) of victims aged 50 and older, and for nearly two-thirds (63%, or 19 of 30) of the senior-aged victims. There were no significant differences in these proportions between resident and non-resident victims. The prevalence of intrinsic factors was statistically comparable across counties, and major activity categories. There was also no difference in the prevalence of intrinsic factors among victims from other U.S. states (40%), compared to those from foreign countries (39%).

Figure 148. Ocean drownings in Hawaii, by activity and residency of victim, 2001-2006.

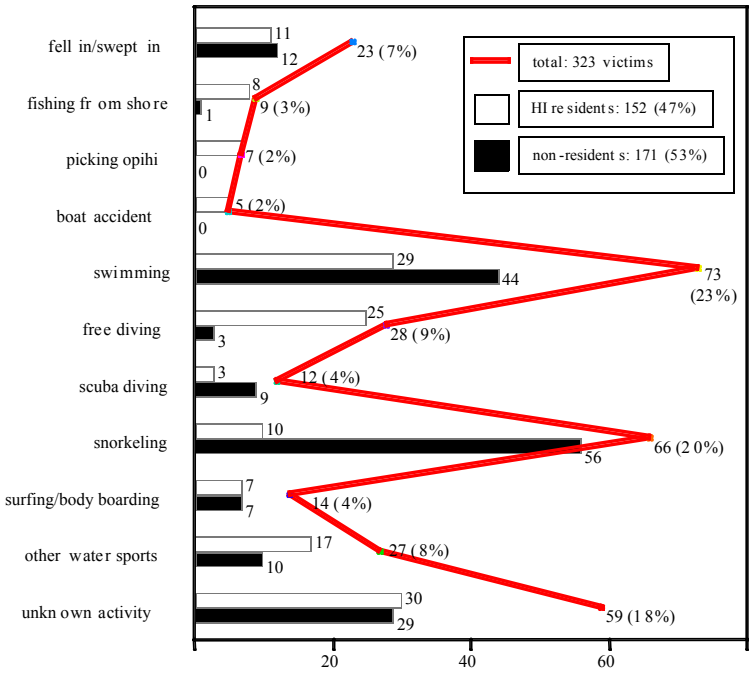
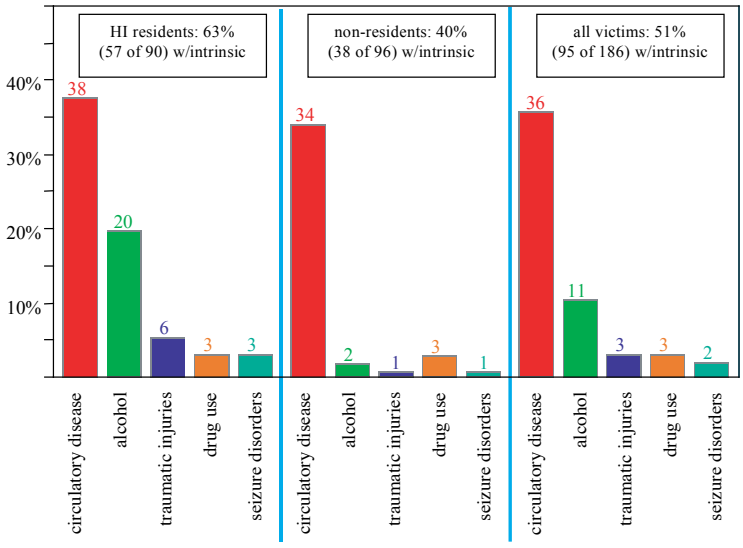
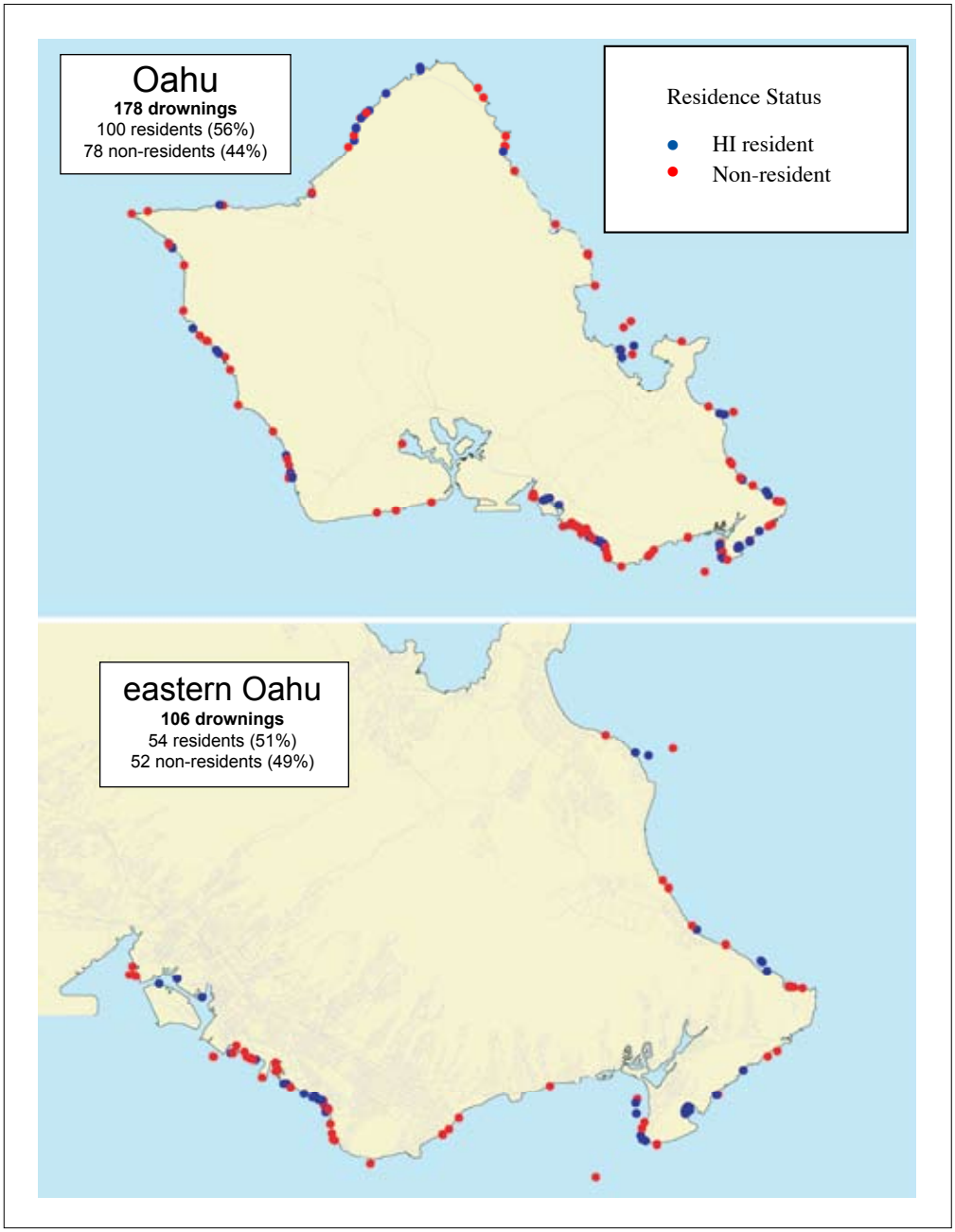


Figure 149. Prevalence of intrinsic factors in saltwater drownings in Hawaii, by residence of victims, 2001-2004.



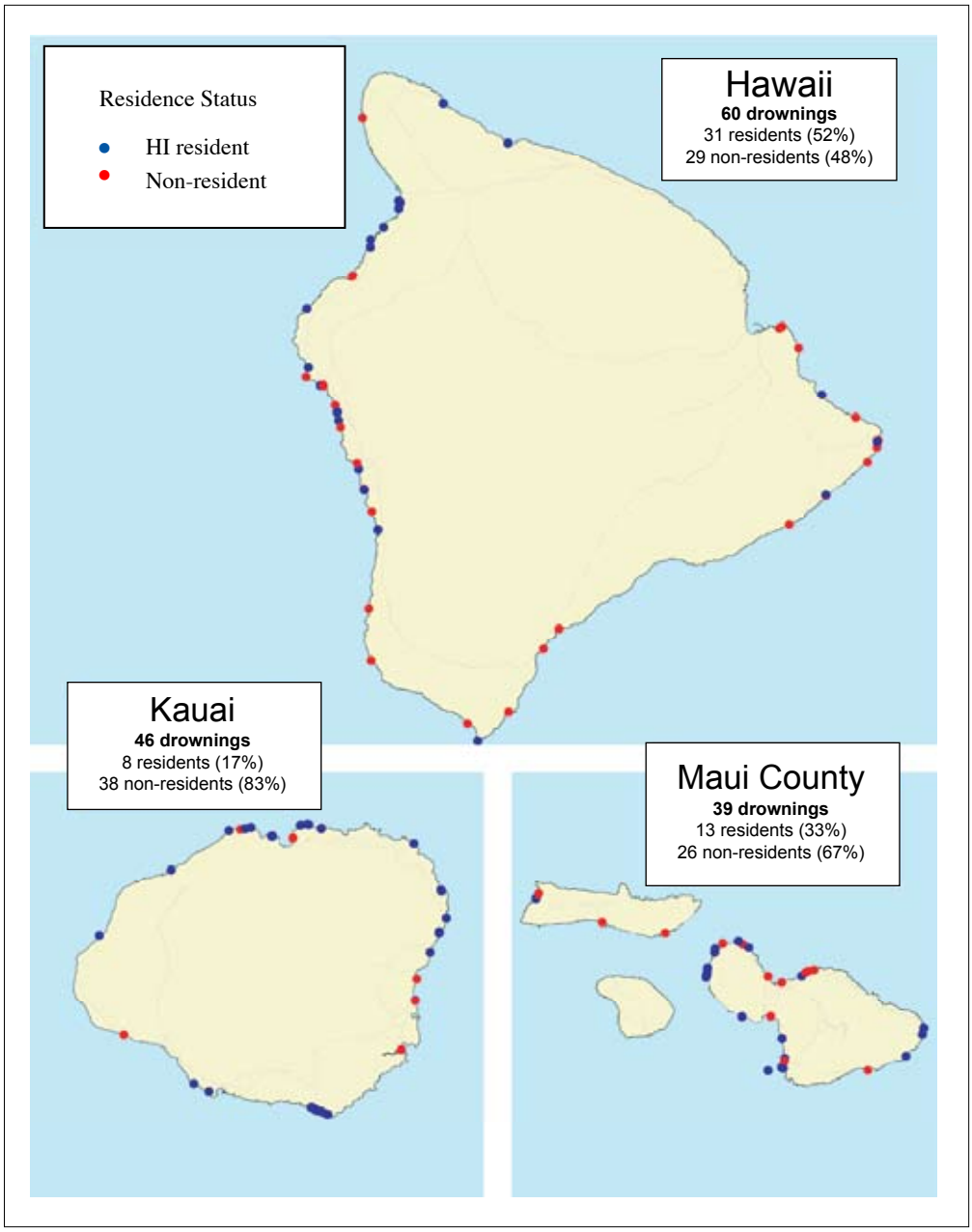
Resident (100 victims) slightly outnumbered non-residents (78 victims) among the 178 ocean drowning victims on Oahu from 2001-2006 (Figure 150). More than half (60%, or 106) of these drownings occurred on the eastern part of the island, from Sand Island, around Hanauma and Makapuu to Kailua Bay. There were 19 drownings at from Kewalo Basin to the Ala Wai Yacht Harbor, including 10 at Ala Moana Beach Park. Almost all (89%, or 17) of these victims were residents. In contrast, the 15 drownings in Waikiki included 11 (73%) non-residents. Half (5) of the 10 drownings in Portlock/Maunalua Bay occurred in the 2005 to 2006 period. All but 1 of the 22 drownings in Hanauma Bay were among non-residents, including 12 among residents of foreign countries, and 9 from other U.S. states. There were also 4 drownings in Makapuu Bay, all among Hawaii residents. There were 26 drownings along the length of the Waianae Coast, including 9 between Makaha and Lualaulei Beach Parks, and 10 between Hawaiian Electric and Ko Olina Beach Parks. The 15 drownings along the North Shore (from Haleiwa to Kahuku Point) included mostly (67%, or 10) non-residents. Ten of these drownings occurred between Moku Mana and Ehukai Beach Park.

Figure 150. Ocean drownings on Oahu, by residence status of victims, 2001-2006.



The 60 ocean drownings in Hawaii County included nearly equal numbers of state residents (31) and non-residents (29). However, Figure 151 shows that most (72%, or 21) of the non-residents drowned along the western coast, including 8 between Anaehoomalu Bay and the Mauna Kea Beach Hotel, and 7 from Kailua-Kona to Heeia Bay. Most (80%, or 12) of the 15 victims who drowned on the eastern part of the island from Hilo to Puna were Hawaii residents; all 3 of the non-resident victims drowned in 2006. Kauai County had by far the highest proportion (83%, or 38) of non-residents among the 46 ocean drowning victims. Although there were drownings on most parts of the island, the 2 biggest clusters were from Koloa Landing to Brennecke's Beach on the south shore (12 drownings), and from Kee Beach to Anini Beach on the north coast (14 drownings). Most (90%, or 35) of the 39 ocean drownings on Maui County were on the island of Maui, and most of those (71%, or 25 of 35) were among non-residents. There were 6 drownings (all non-residents) from Kaanapali Beach to Honokowai Beach Park on the western coast, and 7 (including 6 non-residents) in the Makena area from Big Beach (Oneloa Beach) to Poolenalena Beach Park.

Figure 151. Ocean drownings on Neighbor Islands, by residence status of victims, 2001-2006.



Nonfatal injuries

Non-residents comprised nearly two-thirds (63%) of all patients treated for near drownings, and 70% of those who were hospitalized (Table 33). There was a consistent decrease in the number of near drownings that were treated in EDs over the 4-year period, with the most consistent decreases seen among resident patients (see Table 19). The annual number of hospitalizations varied inconsistently, although there was a substantial decrease in 2006. Male patients outnumbered females by a 2-to-1 ratio for both ED visits and hospitalizations. There were proportionally more male patients among Hawaii residents (77% of the total), compared to non-residents (65% of whom were males). ED patients were significantly younger on average than those who were hospitalized (34 vs. 42 years of age), with more than half (60%) in the 15 to 44 year age group. Only a minority of patients (11%) were under 15 years of age. (It was not possible to look at age-specific rate estimates since the age distribution of non-residents is not known. This also precludes age-standardized county rate comparisons.) Hospitalizations for near-drownings were relatively short (3.3 days on average), but the average charge was more than 12 times higher than that for ED visits.

	ED visits	hospitalizations	total
Residence status			
Hawaii resident	219 (38%)	41 (30%)	259 (37%)
non-residents	354 (62%)	94 (70%)	448 (63%)
Year of admission			
2003	701	130	831
2004	598	161	759
2005	549	151	700
2006	441	96	537
average annual total	572	135	707
Patient gender			
Female	171 (30%)	45 (33%)	216 (30%)
Male	401 (70%)	90 (67%)	491 (69%)
Patient age			
Infants	1 (0%)	1 (1%)	2 (0%)
1-4 y	10 (2%)	7 (5%)	17 (2%)
5-14 y	54 (9%)	9 (7%)	63 (9%)
15-24 y	132 (23%)	12 (9%)	143 (20%)
25-34 y	106 (19%)	18 (14%)	125 (18%)
35-44 y	104 (18%)	18 (14%)	122 (17%)
45-54 y	100 (18%)	30 (22%)	130 (18%)
55-64 y	48 (8%)	23 (17%)	71 (10%)
65-74 y	14 (2%)	12 (9%)	25 (4%)
75-84 y	5 (1%)	5 (4%)	10 (1%)
85 + y	0 (0%)	1 (1%)	1 (0%)
Length of care and financial charges			
Ave. length of stay (days)	1.0	3.3	1.4
Total number of days	572	439	1011
Average charge	$1,383	$17,192	$4,374
Total charges	$0.8 million	$2.3 million	$3.1 million

References

1. External cause of injury mortality matrix. Centers for Disease Control and Prevention, National Center for Injury Prevention and Control web site.
   Available from: http://0-www.cdc.gov.mill1.sjlibrary.org/nchs/about/otheract/ice/matrix10.htm

2. Fatal Analysis Reporting System (FARS) Web-Based Encyclopedia [database on the Internet]. National Highway Traffic and Safety Administration (NHTSA) web site.
   Available from: http://www-fars.nhtsa.dot.gov/.

3. Fatal Injuries: Mortality Reports. [database on the Internet]. Centers for Disease Control and Prevention, National Center for Injury Prevention and Control web site.
   Available from: http://webapp.cdc.gov/sasweb/ncipc/mortrate10_sy.html.

4. State population datasets [database on the Internet]. U.S. Census Bureau.
   Available from: http://www.census.gov/popest/datasets.html.

5. County population datasets [database on the Internet]. U.S. Census Bureau.
   Available from: http://www.census.gov/popest/datasets.html.

6. Annual visitor research report. State of Hawaii Department of Business, Economic Development and Tourism website.
   Available from: http://www.hawaii.gov/dbedt/info/visitor-stats/visitor-research/.

7. Summary file 1 (SF1) [database on the Internet]. U.S. Census Bureau.
   Available from: http://www2.census.gov/census_2000/datasets/Summary_File_1/Hawaii/.

8. The National Household Travel Survey, Federal Highway Administration.
   Available from: http://nhts.ornl.gov/index.shtml.

9. Injury Surveillance Workgroup. Consensus Recommendations for Using Hospital Discharge Data for Injury Surveillance. Marietta (GA): State and Territorial Injury Prevention Directors Association; 2003.

10. Recommended framework of E-code groupings for presenting injury mortality and morbidity data (February 1, 2007). Centers for Disease Control and Prevention, National Center for Injury Prevention and Control web site.
    Available from: http://www.cdc.gov/ncipc/whatsnew/matrix2.htm.

11. Anderson RN, Rosenberg HM. Age standardization of death rates: Implementation of the year 2000 standard. National vital statistics reports;47(3). Hyattsville, Maryland:National Center for Health Statistics, 1998.

12. Clayton D, Hills M. Statistical Models in Epidemiology. New York: Oxford University Press; 1993.

13. Dever G.E.A. Epidemiology in Health Services Management. Rockville, MD: Aspen Systems Corporation; 1984.

Linda Lingle
Governor, State of Hawai‘i

Chiyome Leinaala Fukino, M.D.
Director, Hawai‘i State Department of Health

Produced by:
Hawai‘i State Department of Health
Injury Prevention and Control Program

For more information:
Injury Prevention and Control Program
Phone: 808-733-9320; Fax: 808-733-9222
http://www.nogethurt.hawaii.gov

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