



Chronic Disease Management and Control Branch

Heart Disease and Stroke Prevention Program

2012 Stroke Fact Sheet

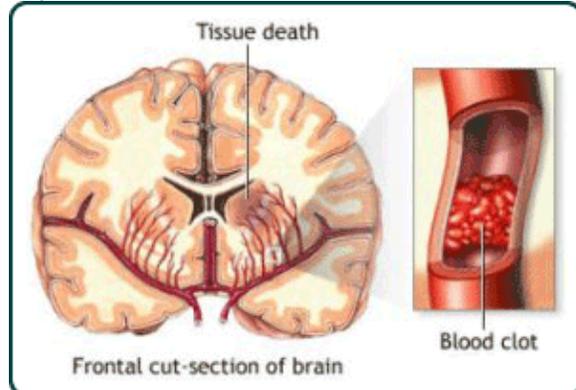
Background¹

A stroke occurs if the flow of oxygen-rich blood to a portion of the brain is blocked. Without oxygen, brain cells start to die after a few minutes. Sudden bleeding in the brain also can cause a stroke if it damages brain cells. The two main types of stroke are ischemic and hemorrhagic. Ischemic is the more common type of stroke.

An **ischemic stroke** occurs if an artery that supplies oxygen-rich blood to the brain becomes blocked. Blood clots often cause the blockages that lead to ischemic strokes (Figure 1).

A **hemorrhagic stroke** occurs if an artery in the brain leaks blood or ruptures. The pressure from the leaked blood damages brain cells. High blood pressure and aneurysms are examples of conditions that can cause hemorrhagic strokes. Aneurysms are balloon-like bulges in an artery that can stretch and burst.

Figure 1 (Centers for Disease Control and Prevention)



Another condition that's similar to a stroke is a **transient ischemic attack**, also called a TIA or "mini-stroke." A TIA occurs if blood flow to a portion of the brain is blocked only for a short time. Thus, damage to the brain cells isn't permanent. Like ischemic strokes, TIAs often are caused by blood clots. Although TIAs are not full-blown strokes, they greatly increase the risk of having a stroke. Both strokes and TIAs require emergency care.

Risk Factors for Stroke

Conditions such as high blood pressure, high blood cholesterol, obesity, diabetes and heart disease can raise the risk of stroke. Behaviors such as unhealthy diet, physical inactivity, and smoking all contribute to the conditions that can cause a stroke. Some factors, such as age, ethnicity, and previous history of stroke or TIA, cannot be modified but are associated with a higher risk of stroke.

¹ National Heart, Lung, and Blood Institute. Diseases and Conditions Index. Stroke Key Points. http://www.nhlbi.nih.gov/health/dci/Diseases/stroke/stroke_summary.html. Accessed January 19, 2012.

The Impact of Stroke

Stroke is the fourth leading cause of death in the United States² and accounts for about one out of every 18 deaths.³ Each year, 795,000 people experience a new or recurrent stroke.³ On average, one person in the U.S. has a stroke every 40 seconds and one person dies from stroke every four minutes.³ Unlike heart disease, which is more common in men, it is estimated about 55,000 more women than men have strokes in the U.S. each year.³

The Economic Impact of Stroke

The indirect and direct costs of stroke are estimated to be \$40.9 billion in the U.S. in 2007.³ Stroke is a leading cause of disability and is responsible for high indirect costs associated with loss in productivity and premature death. Three months after a stroke has occurred, 15% to 30% of patients are permanently disabled.³ The majority of costs related to stroke come from direct medical charges and added up to \$25.2 billion in 2007.³

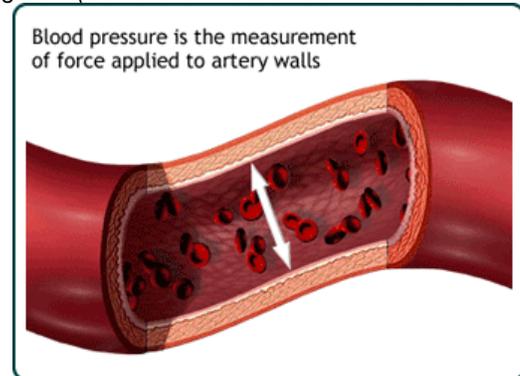
In Hawaii, stroke was responsible for \$60 million in direct costs and \$90 million in indirect impacts (lost work days and lower productivity of stroke patients and caregivers) in 2003.⁴ At the current pace, these figures are projected to reach \$160 million and \$270 million, respectively by 2023.⁴

Prevalence of Preventable Risk Factors in Hawaii

High Blood Pressure:

Blood pressure is the force of blood pushing against the artery walls (Figure 2). Chronic high blood pressure can cause hardening of the artery walls which can eventually cause decreased blood flow. High blood pressure is often referred to as a “silent killer.” In Hawaii, 30.2% of adults reported that they have been told by a health care professional that they have high blood pressure (Figure 3). High blood pressure is more common in people with lower educational attainment, lower household income, people older than 55 years, retirees and residents unable to work, and people of Native Hawaiian or Japanese ethnicity.

Figure 2 (Centers for Disease Control and Prevention)



High Blood Cholesterol:

Blood cholesterol is a waxy, fat-like substance that is made in the body and is present in many foods. Too much cholesterol in the blood can cause a build-up on the artery walls (called plaque) that can narrow the artery allowing less blood to pass through. In Hawaii, 38.9% of adults reported that they were told by a health care professional they had high blood cholesterol (Figure 3). The prevalence of high blood cholesterol increases with age but is common across ethnicities, counties, and people of all educational and household income categories. High blood cholesterol is particularly common in retirees and those unable to work, Japanese, and older Hawaii residents.

² Kochanek KD, Xu JQ, Murphy SL, Minino AM, Hsiang-Ching K. Deaths: Preliminary data for 2009. National vital statistics reports; vol 59 no 4. Hyattsville, MD: National Center for Health Statistics. 2011.

³ Roger VL, et al. Heart disease and stroke statistics 2011 update: A report from the American Heart Association. *Circulation* 2011;123:e18-e209; published online Dec 15, 2010. DOI: 10.1161/CIR.0b013e3182009701

⁴ Milken Institute. An Unhealthy America: The Economic Burden of Chronic Disease. Charting a New Course to Save Lives and Increase Productivity and Economic Growth. October 2007.

Diabetes:

Diabetes is a group of diseases characterized by high levels of blood glucose or blood sugar that results from improper production or use of the hormone insulin. High blood sugar can lead to hardening of the blood vessels and is also linked to increases in blood pressure. In Hawaii, 8.3% of adults reported that they have diabetes (Figure 3). However, diabetes increases with age and is present in 17.9% of adults aged 65 or more and in 18.3% of retirees and those unable to work. Native Hawaiians and those with low educational attainment or low household income tend to have a higher prevalence of diabetes. There is little difference in prevalence between genders or among counties.

Smoking:

Smoking speeds up the progression of atherosclerosis, the process of plaque build-up and hardening of the arteries, and increases the likelihood of a blood clot by causing platelets to clump together.⁵ In Hawaii, 14.5% of adults reported that they are current smokers (Figure 3) and 10.7% of adults say they smoke every day. Smoking is most common in the 25 to 34 year old age group, Native Hawaiians, adults with less than a high school education, those with lower household income, and in residents of Hawaii County compared to Honolulu County. Unemployed residents of Hawaii are more likely to smoke than students or homemakers and retirees (23.0% vs. 12.1% and 10.9%, respectively).

Physical Inactivity:

Not getting regular physical activity is a risk factor for high blood pressure, high cholesterol, and diabetes, all of which are the primary risk factors for stroke. In Hawaii, 19.2% of adults reported that they participated in no leisure time exercise or physical activity in the past 30 days. Some groups that tend to report lower levels of physical activity include older adults, Japanese, Filipinos, females, those with less than a high school education, those who are retired or can't work, and those with lower household incomes. There was little difference in prevalence of physical inactivity by county.



Overweight and Obesity:

Body Mass Index (BMI), a surrogate indicator of body fat, is often used as a measure of overweight and obesity. Overweight and obesity results from consuming more calories than are expended and strain the cardiovascular system by increasing the risk of high blood pressure, high blood cholesterol, and diabetes. There is some research that suggests other measures of fat distribution, such as waist circumference and waist-to-hip ratio, may be more closely associated with increased risk of poor health outcomes.⁶ However, overweight increases the risk of ischemic stroke and obesity increases the risk of both ischemic and hemorrhagic stroke.⁷ In Hawaii, 34.1% of adults are overweight and 23.1% are obese (Figure 3). This means 57.2% of Hawaii's adults are carrying excess weight. Overweight is more common in men compared to women. Overweight is common across age groups,

⁵ The 2004 Surgeon General's Report. *The Health Consequences of Smoking*. http://www.cdc.gov/tobacco/data_statistics/sgr/2004/pdfs/whatitmeanstoyou.pdf. Accessed March 6, 2012.

⁶ Lewis CE, McTigue KM, Burke LE, et al. Mortality, health outcomes, and body mass index in the overweight range. A science advisory from the American Heart Association. *Circulation*. 2009;119. <http://circ.ahajournals.org/content/119/25/3263.full.pdf+html>. Accessed January 19, 2012.

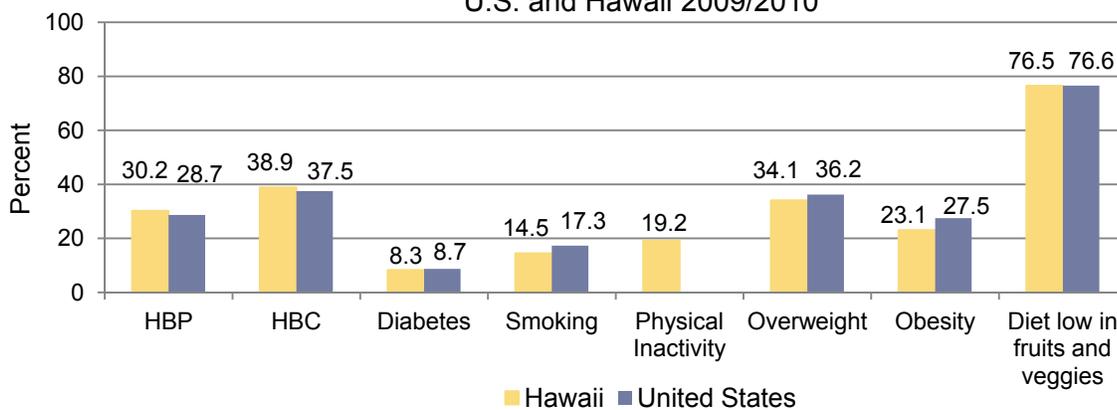
⁷ Strazullo P, D'Elia L, Cairella G, Garbagnati F, Cappuccio FP, Scalfi L. Excess body weight and incidence of stroke: Meta-analysis of prospective studies with 2 million participants. *Stroke*. 2010;41:e418-e426. <http://stroke.ahajournals.org/content/41/5/e418.full.pdf+html>. Accessed January 20, 2012.

household incomes, and counties. Native Hawaiians and those of lower educational attainment and household income tend to have a higher prevalence of obesity. Obesity is also high among those aged 25 to 44 years and the unemployed.

Low Fruit and Vegetable Consumption:

Diets rich in fruits, vegetables, whole grains, fat free or 1% milk, lean meats, poultry, fish, beans, eggs, and nuts and low in saturated fats, trans fats, cholesterol, salt (sodium), and added sugars are optimal for maintaining a healthy weight. Consumption of five or more servings of fruits and vegetables every day is recommended to achieve a healthy diet. In Hawaii, 76.5% of adults fail to eat fruits or vegetables at least five times per day (Figure 3). This is more commonly seen among males, people in the 18 to 24 year age group, and the Japanese.

Figure 3: Adult Prevalence of Select Chronic Conditions and Risk Factors, U.S. and Hawaii 2009/2010

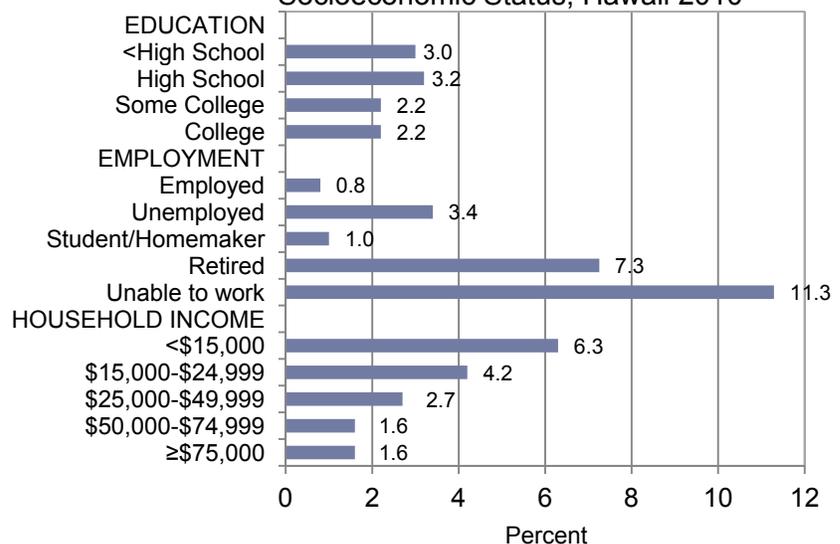


Source: Hawaii Behavioral Risk Factor Surveillance System, U.S. Behavioral Risk Factor Surveillance System, 2009/2010
 Note: Prevalence of diabetes does not include gestational diabetes; U.S. includes the 50 states and the District of Columbia; data on HBP (high blood pressure), HBC (high blood cholesterol), and diet low in fruits and veggies comes from 2009 BRFSS; data on diabetes, smoking, physical inactivity, overweight, and obesity comes from 2010 BRFSS

Prevalence of Stroke in Hawaii⁸

In 2010, 2.5% of Hawaii adults reported that a health care professional told them they had a stroke. The prevalence of stroke was highest among Whites (3.0%) and Japanese (2.9%) and increases with age. Similar to the distribution of stroke risk factors, the prevalence of stroke is disproportionately higher in Hawaii residents with low socioeconomic status, or the social and economic conditions that can determine a person's risk for disease. Three measures that

Figure 4: Adult Stroke Prevalence by Socioeconomic Status, Hawaii 2010



Source: Hawaii Behavioral Risk Factor Surveillance System

⁸ Data Source: Hawaii Behavioral Risk Factor Surveillance System

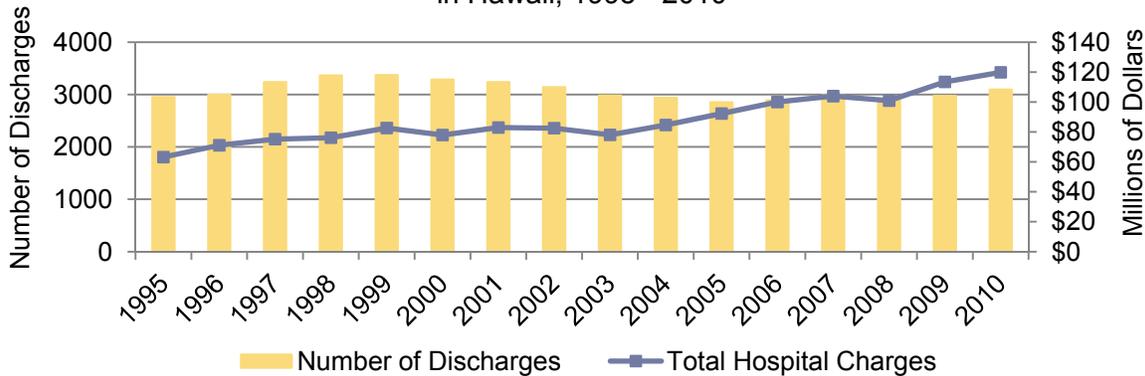
contribute to a person's socioeconomic status are educational attainment, employment, and household income. The prevalence of stroke is highest in Hawaii residents that are the most vulnerable: those with a high school education or less, those with lower household income, and those that are unemployed, retired, or unable to work (Figure 4). There was little difference in prevalence between the genders.

Stroke Hospitalizations in Hawaii⁹

In 2010, stroke was the primary cause of 3,098 inpatient hospital admissions. Of these, 63% were ischemic strokes, 20% were hemorrhagic, and 17% were other or ill-defined stroke. Patients hospitalized for stroke spend an average of 7 days in the hospital. Although the number of hospital discharges with a primary diagnosis of stroke has been decreasing since 1999 followed by a slight increase since 2005, hospital charges have continued to climb (Figure 5). In Hawaii, the average charge per stroke discharge increased from \$21,384 in 1995 to \$38,694 in 2010, an increase of 81%.



Figure 5: Stroke Hospital Discharges and Hospital Charges (in Millions) in Hawaii, 1995 - 2010



Source: Hawaii Health Information Corporation

Stroke Hospital Costs in Hawaii⁹

- Every year stroke costs \$119,872,677
- Every day stroke costs \$328,418
- Every hour stroke costs \$13,684

Stroke Treatment and Rehabilitation

A stroke requires immediate emergency medical attention. One study of ischemic stroke patients in 32 hospitals in 2004 found only 38% of patients arrived at the hospital within 2 hours of symptom onset and the median arrival time was 3.4 hours.¹⁰ Timely arrival to the hospital is critical to receive

⁹ Data Source: Hawaii Health Information Corporation

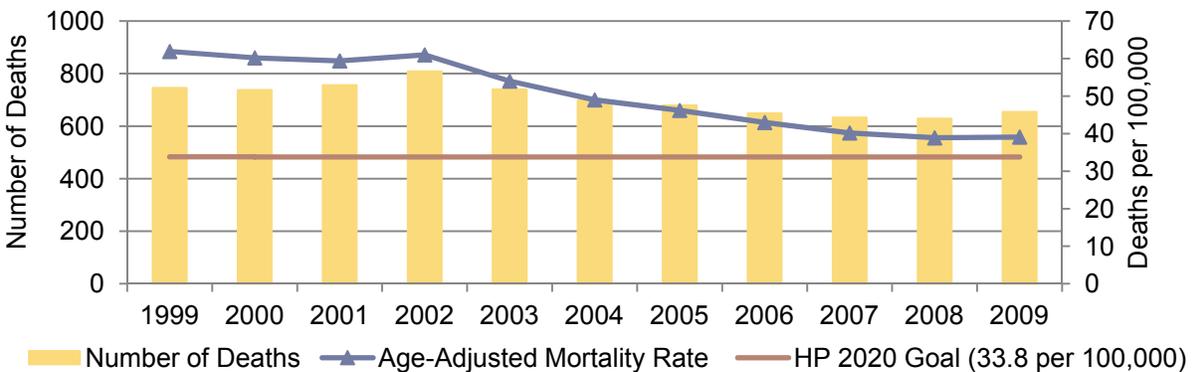
¹⁰ Lichtman JH, Watanabe E, Allen NB, Jones SB, Dostal J, Goldstein LB. Hospital arrival time and intravenous t-PA use in US academic medical centers, 2001-2004. *Stroke*. 2009;40:3845-3850.

life-saving treatment. Clot-busting medicine is most effective if given as soon as possible after symptom onset of ischemic stroke but can be given up to 3 hours after symptom onset. According to clinical guideline recommendations, most stroke survivors are good candidates for rehabilitation.^{11,12} Rehabilitation can help enhance recovery, decrease complications, and minimize functional disability.¹² However, a survey of stroke patients in 21 states and the District of Columbia found only 30.7% of stroke survivors participated in outpatient stroke rehabilitation.¹¹

Stroke Mortality in Hawaii¹³

Each year, stroke is responsible for over 600 deaths in Hawaii. In 2009, strokes caused 6.8% of all deaths. The age-adjusted mortality rate for stroke has been decreasing since 2002 (Figure 6) but stroke remains the third leading cause of death in Hawaii.

Figure 6: Number of Stroke Deaths and Age-Adjusted Stroke Mortality Rates per 100,000, Hawaii 1999 - 2009



Source: Hawaii State Department of Health Office of Health Status Monitoring
 Note: Age-adjusted to year 2000 U.S. Standard Population

In 2009, the age-adjusted stroke mortality rate was 39.1 per 100,000 in Hawaii (Figure 7). Hawaii experiences a similar age-adjusted stroke mortality rate compared to the United States but there is room for improvement to meet the Healthy People 2020 goal of 33.8 deaths per 100,000 (Figure 7). The Healthy People 2020 project is a national initiative to improve the health of Americans and eliminate disparities. The Hawaii Heart Disease and Stroke Prevention Program tracks Healthy People 2020 objectives to identify areas of improvement and monitor progress. The state of Hawaii is unique in geography and ethnic composition and mortality data is analyzed by many variables such as by county, age, and ethnicity to identify vulnerable populations. The age-specific stroke mortality rate, similar to other chronic diseases, increases with age with a rate of 262.4 per 100,000 among those aged 75 to 84 years (Figure 8). With the aging of Hawaii’s population, the burden of stroke is expected to increase. Neighbor Island counties, whose residents collectively made up 30% of the state population in 2010¹⁴, have unique issues of access to and quality of care. Hawaii and Kauai counties have higher stroke mortality rates than the state average (Figure 9). However, all counties but Maui County have stroke mortality rates above the Healthy People 2020 goal (Figure 9).

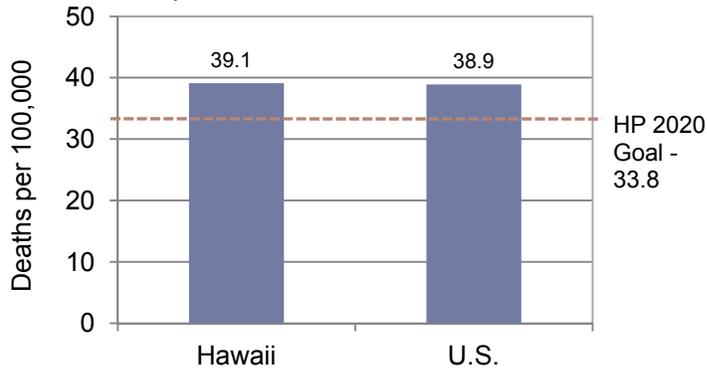
¹¹ Centers for Disease Control and Prevention. Outpatient rehabilitation among stroke survivors: 21 states and the District of Columbia. *MMWR*. 2005;56(20):504-507.

¹² Duncan PW, Zorowitz R, Bates B, et al. Management of adult stroke rehabilitation care: A clinical practice guideline. *Stroke*. 2005;36:e100-e143.

¹³ Data Source: Hawaii State Department of Health Office of Health Status Monitoring

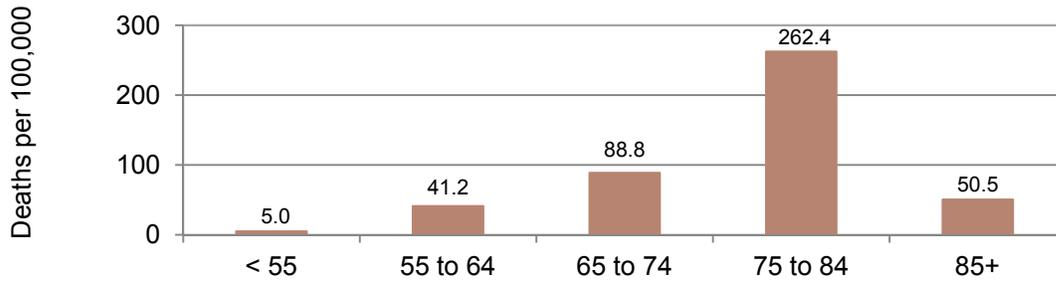
¹⁴ 2010 State of Hawaii Data Book. Table 1.08. Department of Business, Economic Development & Tourism. <http://hawaii.gov/dbedt/info/economic/databook/db2010/section01.pdf>. Accessed February 1, 2012.

Figure 7: Age-Adjusted Stroke Mortality Rate per 100,000, U.S. and Hawaii 2009



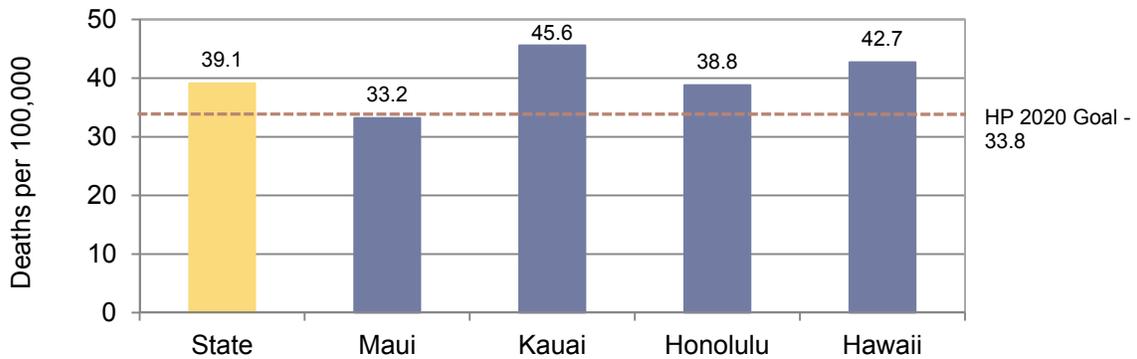
Source: Hawaii State Department of Health Office of Health Status Monitoring and Kochanek KD, Xu JQ, Murphy SL, Minino AM, Hsiang-Ching K. Deaths: Preliminary data for 2009. National vital statistics reports; vol 59 no 4. Hyattsville, MD: National Center for Health Statistics. 2011.
 Note: Age-adjusted to year 2000 U.S. Standard Population; U.S. data is preliminary but represents 96% of all death records

Figure 8: Age-Specific Stroke Mortality Rates by Age Group, Hawaii 2009



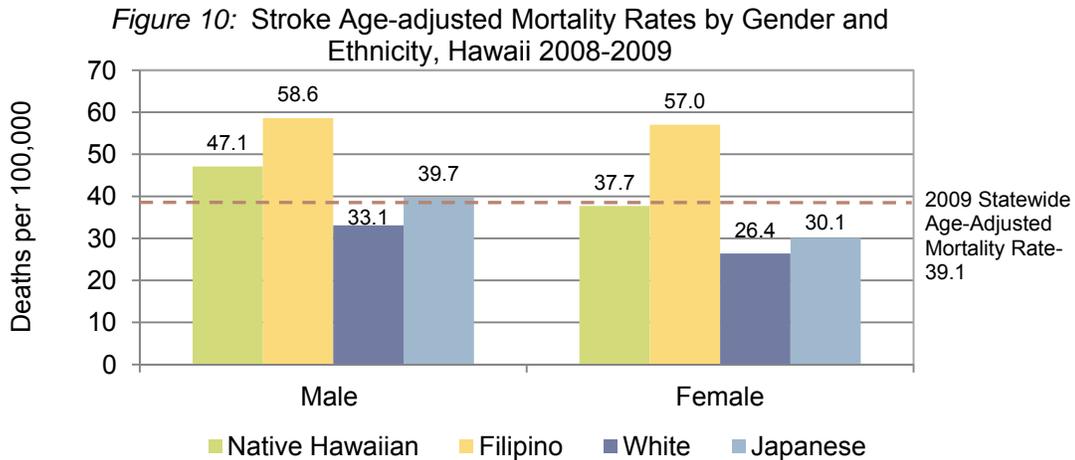
Source: Hawaii Department of Health Office of Health Status Monitoring
 Note: Age-adjusted to year 2000 U.S. Standard Population

Figure 9: Stroke Age-Adjusted Mortality Rates by County, Hawaii 2009



Source: Hawaii State Department of Health Office of Health Status Monitoring
 Note: Age-adjusted to year 2000 U.S. Standard Population

Disparities exist among ethnic groups in stroke mortality rates. The 2008-2009 stroke mortality rate is highest among Native Hawaiian and Filipino men and women (Figure 10). White men and women as well as Japanese women have stroke mortality rates below the Healthy People 2020 goal of 33.8 deaths per 100,000.



Source: Hawaii State Department of Health Office of Health Status Monitoring
 Note: Age-adjusted to year 2000 U.S. Standard Population

Awareness of the Signs and Symptoms of Stroke

In 2009, Hawaii BRFSS participants were asked if they thought the symptoms listed in Table 1 were symptoms of stroke. Of the five signs and symptoms of stroke, sudden numbness or weakness of the face, arm, or leg, especially on one side was the most recognized symptom with 91.4% of Hawaii adults reporting knowing that is a symptom of stroke (Table 1). However, only 41.9% of Hawaii adults were aware of all five signs and symptoms of stroke (Table 1). Additionally, 89.6% Hawaii adults reported that they would call 911 as the first thing they would do if they thought someone was having a stroke.

Sudden confusion or trouble speaking	82.6%
Sudden numbness or weakness of face, arm, or leg, especially on one side	91.4%
Sudden trouble seeing in one or both eyes	69.3%
Sudden trouble walking, dizziness, or loss of balance	82.3%
Severe headache with no known cause	56.8%
Aware of all five stroke signs and symptoms	41.9%

Source: Hawaii Behavioral Risk Factor Surveillance System

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