

Stroke

Definition: Sudden loss of muscle function, vision, sensation, or speech, resulting from problems in blood vessels that lead to brain injury. Ischemic stroke, about 80% of all strokes, is caused by a severe reduction in blood supply to part of the brain. Blood flow becomes obstructed from a blockage of an artery by atherosclerosis or by bits of debris (emboli) transported through the bloodstream, usually from the heart. Hemorrhagic stroke occurs when blood vessels break, causing bleeding into or around the brain. ICD-9 codes 430-438. ICD-10 codes I60-I69 for 1999-2004; F01, I60-I69 for 2005 (See Technical Notes)

Summary

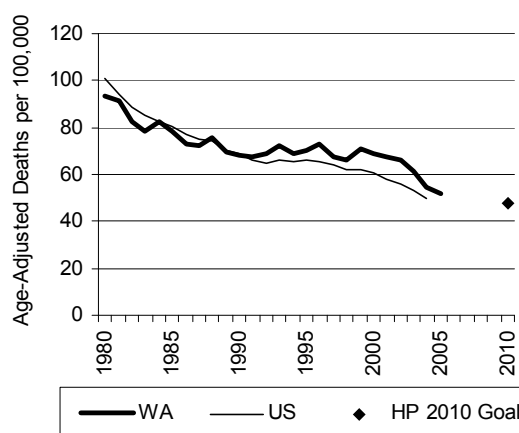
Stroke caused 3,167 deaths in Washington State in 2005 ([age-adjusted](#) death rate: 52 per 100,000). Stroke is the third leading cause of death and a leading cause of serious, long-term disability in Washington and the nation.

In 2003–2005, blacks and American Indians and Alaska Natives had higher stroke death rates (71 and 68 per 100,000, respectively) than whites (55 per 100,000); blacks also had higher stroke death rates than people of Hispanic origin (52 per 100,000). National studies suggest that increased stroke deaths are associated with lower education levels after taking age, gender, race, and Hispanic origin into account. Many stroke deaths can be prevented or delayed by modifying known risk factors, such as high blood pressure, atrial fibrillation, tobacco use, physical inactivity, obesity, and diabetes. Effective interventions include reducing or treating risk factors, increasing knowledge of signs and symptoms and of the importance of taking prompt action to call 911 in the event of a stroke, strengthening the emergency response system, and improving quality of care.

Time Trends

In Washington, age-adjusted stroke death rates fell from 94 ([±4](#)) deaths per 100,000 in 1980 to 52 (± 2) deaths per 100,000 in 2005. The age-adjusted stroke mortality rate in the United States also declined from 1980 to 2004, from 101 to 50 deaths per 100,000. This decrease likely reflects a combination of improved acute stroke care as well as improved detection and treatment of hypertension.¹ In 2003, Washington ranked 13th highest of all states in its stroke death rate.²

Stroke Mortality
WA State and US
Death Certificates, 1980-2005

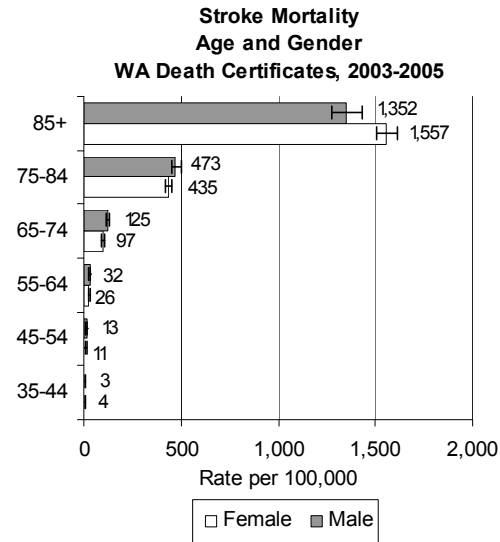
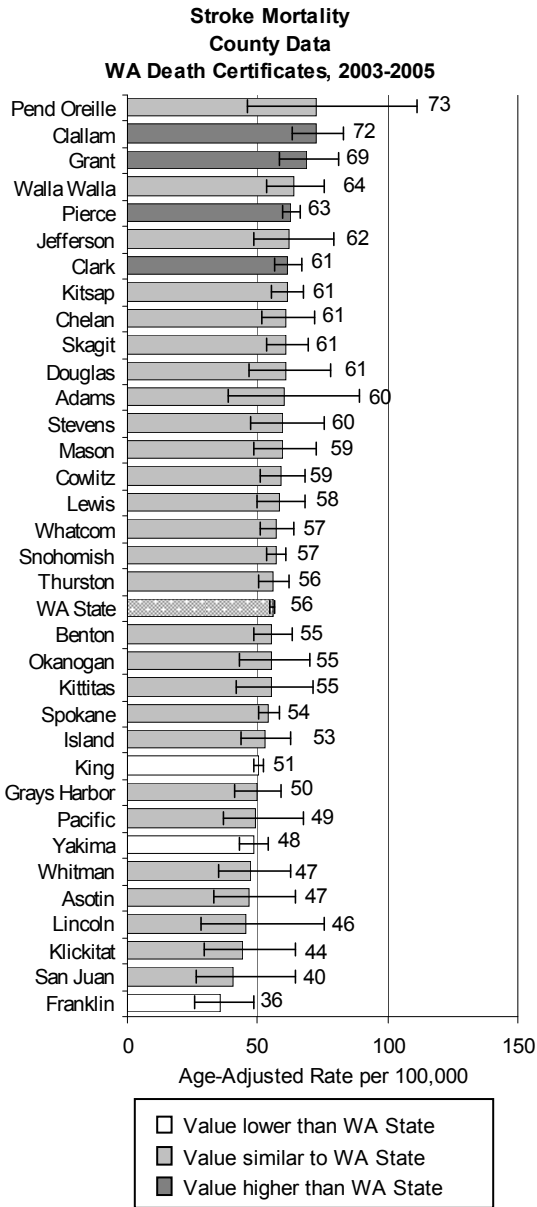


Year 2010 Goals

The national *Healthy People 2010, Midcourse Review* goal is to decrease stroke mortality to 48 deaths per 100,000 population. Based on the current rate of decline, Washington will probably meet this target.

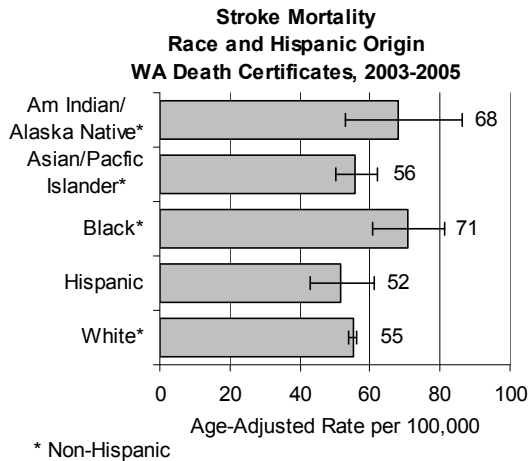
Geographic Variation

During 2003–2005, the age-adjusted stroke death rate in Washington was 56 per 100,000. Rates among counties ranged from 36 per 100,000 in Franklin County to 73 per 100,000 in Pend Oreille County. Clark, Pierce, Grant, and Clallam counties had stroke death rates higher than the state rate. King, Yakima, and Franklin counties had lower stroke death rates than the state rate. [Fewer than 20](#) people died of stroke in Garfield, Columbia, Wahkiakum, Ferry, and Skamania counties over the three-year period, and the following chart does not include these counties.



Race and Hispanic Origin

In Washington State, age-adjusted deaths rates from stroke for 2003–2005 were higher among blacks and American Indians and Alaska Natives compared to whites. Stroke death rates were also higher among blacks compared to people of Hispanic origin. Comparable data by race and Hispanic origin are not available at the national level.



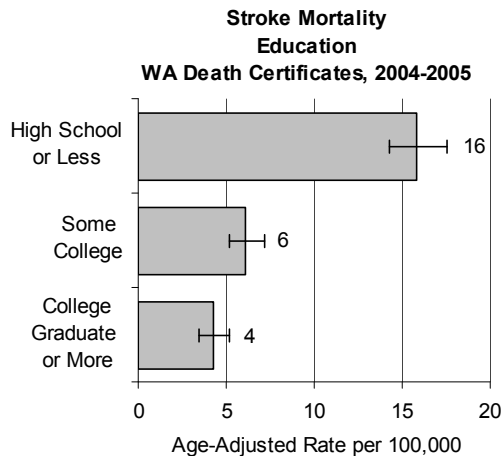
Age and Gender

In Washington and the nation, stroke death rates increase with age. Among men ages 65–74, stroke mortality was higher than among women, but women ages 85 and older had a higher stroke death rate than men.

Income and Education

In Washington in 2004–2005, age-adjusted stroke death rates decreased as educational attainment increased for adults ages 25–64. Other studies have associated lower levels of education with higher stroke death rates.³ We found no significant variations in Washington stroke death rates by neighborhood poverty level.⁴ Perhaps individual income is more strongly related to stroke mortality

than is neighborhood poverty.³ Studies have shown that socioeconomic position, measured by income and education, continued to affect stroke mortality after accounting for age, race, Hispanic origin, and gender, independent of the severity of the stroke.⁵



Other Measures of Impact and Burden

Hospitalizations. In 2004, 26,612 Washington hospitalizations included a diagnosis of stroke at discharge. These hospitalizations cost \$600 million in charges. Stroke was the first-listed diagnosis for 12,814 of these 26,612 hospitalizations. The cost for the hospitalizations where stroke was the first-listed diagnosis was \$264 million.

From 1988 to 2004, annual age-adjusted hospitalization rates for Washington residents where stroke was the first-listed diagnosis decreased from 270 to 213 per 100,000, a decline of about 21%. Most of that decrease occurred in 2003 and 2004.

Although stroke can occur at any age, stroke hospitalization becomes more common as people age. In Washington in 2005, the risk of being hospitalized with a stroke after age 35 increased by about 2.7 times per decade of life through age 84.

Prevalence. Responses to the 2005 Washington State [Behavioral Risk Factor Surveillance System](#) (BRFSS) survey reveal that 2% of adults reporting having had a stroke. Men more often reported a stroke than women (3% and 2%, respectively). As adults aged, they were more likely to report having had a stroke. Less than 1% ($\pm <1\%$) of adults ages 18–34, 1%

($\pm <1\%$) ages 35–49, 3% ($\pm 1\%$) ages 50–64, and 8% ($\pm 1\%$) ages 65 and older reported having had a stroke.

Morbidity. Stroke is a leading cause of serious, long-term disability in the United States.⁶ While the number of people living with serious disability from stroke is difficult to quantify, the impact is clear. The Framingham Heart Study reported that stroke survivors older than 64 had the following disabilities six months post-stroke: 50% had some one-sided paralysis; 30% were unable to walk without some assistance; 26% required assistance in activities of daily living; 19% had difficulty speaking; 35% had symptoms of depression; and 26% were institutionalized in a nursing home.⁷

Risk and Protective Factors

High blood pressure. High blood pressure (hypertension) is the leading risk factor for stroke and is the only one found consistently for all types of stroke.⁸ Control of high blood pressure helps prevent strokes, heart attacks, congestive heart failure, and renal failure.

Based on the 2005 Washington BRFSS, 25% ($\pm 1\%$) of Washington adults had hypertension. National data from 1999–2000 showed that only 70% of adults with hypertension knew they had it.⁸ Similar data for Washington are not available. On the 2005 Washington BRFSS, men reported having hypertension more often than women (27% $\pm 1\%$ and 23% $\pm 1\%$, respectively). The prevalence of high blood pressure increases with age.⁸ High blood pressure prevalence reported on the 2005 Washington BRFSS was 8% ($\pm 1\%$) among adults ages 18–34; 17% ($\pm 1\%$) among adults ages 35–49; 37% ($\pm 2\%$) among adults ages 50–64; and 56% ($\pm 2\%$) among adults ages 65 and older.

In 2005, 95% ($\pm 3\%$) of adults reporting hypertension in Washington said they took one or more of the following steps to control their high blood pressure: 55% ($\pm 2\%$) took prescription anti-hypertensive medications (compared to 59% nationally in 1999–2000), 74% ($\pm 6\%$) reduced their salt intake, 76% ($\pm 6\%$) exercised, 70% ($\pm 6\%$) changed their eating habits, and 40% ($\pm 6\%$) reduced their alcohol intake (a national study showed that 34% modified one or more behaviors to reduce their risk in 1999–2000).⁹ Medicines for treating hypertension significantly reduce the risk of stroke.

Cigarette smoke. Cigarette smoking is a major risk factor for both ischemic and hemorrhagic strokes.⁸ Smoking cessation has been associated with a

decrease in stroke risk over time in epidemiological studies.⁸

Diabetes. Diabetes (both types 1 and 2) increases the risks of ischemic stroke, but only type 1 has been associated with an increased risk of hemorrhagic stroke.¹⁰ Intensive treatment of both type 1 and type 2 diabetes has been shown to significantly decrease cardiovascular events, including stroke.^{11,12}

Atrial fibrillation. An irregular heart rhythm called atrial fibrillation is associated with a five-times increase in stroke risk because blood clots can form in the heart and travel to the brain.⁸ People with atrial fibrillation should nearly always take blood-thinning medication to prevent the formation of blood clots and thereby decrease their risk of stroke.⁸

High blood cholesterol. High levels of total cholesterol are associated with ischemic stroke.¹³ The National Cholesterol Education Program guidelines recommend eating a diet low in fats and cholesterol, being physically active, and taking medication if diet and exercise alone do not lower blood cholesterol.¹³ These recommendations are appropriate for stroke risk reduction, and they are even more powerful in preventing recurrent stroke.⁸

Asymptomatic carotid stenosis. People with narrowing of the carotid arteries (stenosis), the main blood vessels to the brain, have a higher risk of stroke than the general population.⁹ People with carotid stenosis should talk with their health care providers about taking aspirin, controlling risk factors for stroke, and surgery.⁸

Obesity. Obesity increases the risk of high blood pressure, high blood cholesterol, and stroke.¹⁴

Knowledge of symptoms of stroke. Stroke outcomes improve when patients receive medical attention within three hours after the onset of symptoms.¹⁵ Thus knowing the symptoms of stroke and seeking prompt medical care can reduce stroke-related impairment. The 2005 Washington BRFSS asked adults which of a list of symptoms was an indication of a stroke in progress. About 94% ($\pm 1\%$) correctly identified numbness on one side of the body, 86% ($\pm 1\%$) named confusion, a similar percentage (86% $\pm 1\%$) named dizziness, 69% ($\pm 1\%$) knew about sudden loss of vision, and 58% ($\pm 2\%$) identified severe unexplained headache as symptoms of stroke. About 30% ($\pm 1\%$) incorrectly said that chest pain was a

symptom of stroke. Only 11% ($\pm 1\%$) of survey respondents correctly identified all five from this list of six as symptoms of stroke.

When Washington adults were asked what they would do first if they witnessed someone having a stroke, 90% ($\pm 1\%$) correctly said they would call 911. About 4% ($\pm 1\%$) said they would drive the person to the hospital themselves. Nationally, on average, people seek help for stroke symptoms three to six hours after their onset.¹⁶ There are no comparable Washington data.

Intervention Strategies

Primary prevention. Treating the risk factors for stroke can reduce or prevent some strokes from occurring. Where relevant, sections in Risk and Protective Factors above describe medical approaches with proven effectiveness in preventing stroke. Not smoking, being physically active, and eating a healthy diet can also help prevent strokes. The Tobacco Use, Physical Activity, and Nutrition chapters describe effective interventions to achieve healthy lifestyles. Public health approaches to prevent strokes also include education to improve recognition and treatment of stroke risk factors and encouraging those with stroke symptoms to seek treatment early.

Acute stroke care. Ensuring widespread use of stroke standards of care in pre-hospital, hospital, and rehabilitation settings may improve outcomes after stroke. One such standard, the administration of intravenous tissue plasminogen activator (tPA), can improve clinical outcomes for patients with acute ischemic stroke.¹⁷ Patients, however, must receive treatment within three hours from the onset of symptoms. National data show that the number of patients who received this therapy is low, even when patients presented within the three-hour window.¹⁶ Determining why patients are not getting best therapy even if they come within the three-hour window is critical in improving outcome. Public education campaigns that emphasize the importance of early treatment might be useful in decreasing delay times. Pre-hospital protocols that emphasize the emergency nature of stroke treatment can also reduce time from symptoms to hospital treatment.

Patients with acute strokes who received care from multidisciplinary teams that exclusively manage stroke patients on a dedicated ward (a stroke unit) were more likely to be alive, independent, and living at home a year after their strokes than those treated on general non-specialized units.¹⁸ Stroke units are a required element for certification as a Primary

Stroke Center. Increasing the number of such in Washington, along with a triage system to transport as many patients as possible to such centers, would likely improve stroke outcomes statewide.

Preventing a second stroke. Preventing a second stroke is an important aspect of stroke care. It includes treatment of all of the risk factors previously mentioned, especially hypertension. Treatment can also include antiplatelet agents in patients with a history of recent ischemic stroke, blood thinners for moderate to high-risk patients with atrial fibrillation, and surgery to open up severely narrowed internal carotid arteries. Cholesterol-lowering medication for recent ischemic stroke patients with high cholesterol reduces the risk of subsequent stroke.¹⁹ Studies indicate that the routine use of cholesterol-lowering medications and certain blood pressure-lowering medications, even in persons with normal lipid levels and blood pressures, may further reduce the risk of stroke recurrence.²⁰

See Related Chapters: [Diabetes](#), [Coronary Heart Disease](#), [Tobacco Use](#), [Physical Activity](#), [Nutrition](#), and [Obesity and Overweight](#)

Data Sources (For additional detail see [Appendix B](#))

Washington Hospitalization Data: Dataset compiled by the Washington State Department of Health, Center for Health Statistics from the Washington Comprehensive Hospitalization Abstract Reporting System, Oregon Hospital Discharge data, and Veterans Hospital Administration datasets, December 2006.

Washington State Behavioral Risk Factor Surveillance System (BRFSS) data: 1987–2006. The data for 2003–2006 were also weighted to reflect the county population estimates from the Washington State Office of Financial Management (OFM). Data release for 2003–2005: November 2006; data release for 2006: June 2007.

U.S. Behavioral Risk Factor Surveillance System data: 1994–2005, downloaded from http://www.cdc.gov/brfss/technical_infodata/surveydata.htm, August 2006

Washington State Death Certificate data: Washington State Department of Health, Vital Registration System Annual Statistical Files, Deaths 1980–2005, released December 2006

U.S. Centers for Disease Control and Prevention, CDC Wonder. Healthy People Data2010 at <http://wonder.cdc.gov/data2010>. Viewed September 5, 2007

Population counts by race and census tract: Washington State Department of Health, Vista

Partnership, Krupski Consulting; Washington State Population Estimates for Public Health. October 2006.

Technical Notes

National Center for Health Statistics rules for coding deaths due to stroke changed beginning in 2005. During 1999–2004, deaths due to vascular dementia were coded to stroke (ICD-10 codes I60-I69). Beginning in 2005, deaths due to vascular dementia were coded to ICD-10 code F01. Thus 1999–2004 deaths coded to I60-I69 are comparable to 2005 death coded to I60-I69 and F01, combined.

For More Information

Washington State Public Health Action Plan for Heart Disease and Stroke Prevention and Management, 2005. Available at:

http://www.doh.wa.gov/cfh/heart_stroke/state_plan.htm

Healthy People 2010, Heart Disease and Stroke. Available at:

<http://www.healthypeople.gov/Document/HTML/Volume1/12Heart.htm>

Washington State Collaborative. Available at: <http://www.doh.wa.gov/cfh/WSC/default.htm>

Washington State Department of Health, Heart Disease and Stroke Prevention Program, (360) 236-3792.

Endnotes

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² American Heart Association. (2004). *Death Rates by State – Statistics*. Retrieved December 4, 2006 from <http://www.americanheart.org/downloadable/heart/1136822342181Statedeathrates06.pdf>.

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¹³ National Cholesterol Education Program. (2002). *Third report on the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III) Final Report*. NIH Publication #02-5215. Washington, DC: National Institutes of Health. http://www.nhlbi.nih.gov/guidelines/cholesterol/atp3_rpt.htm.

¹⁴ American Heart Association. (2007). *Stroke Risk Factors*. Retrieved August 28, 2007 from <http://www.strokeassociation.org/presenter.jhtml?identifier=4716>.

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