Stroke Report

Georgia | 2007

GEORGIA STROKE REPORT, 2007

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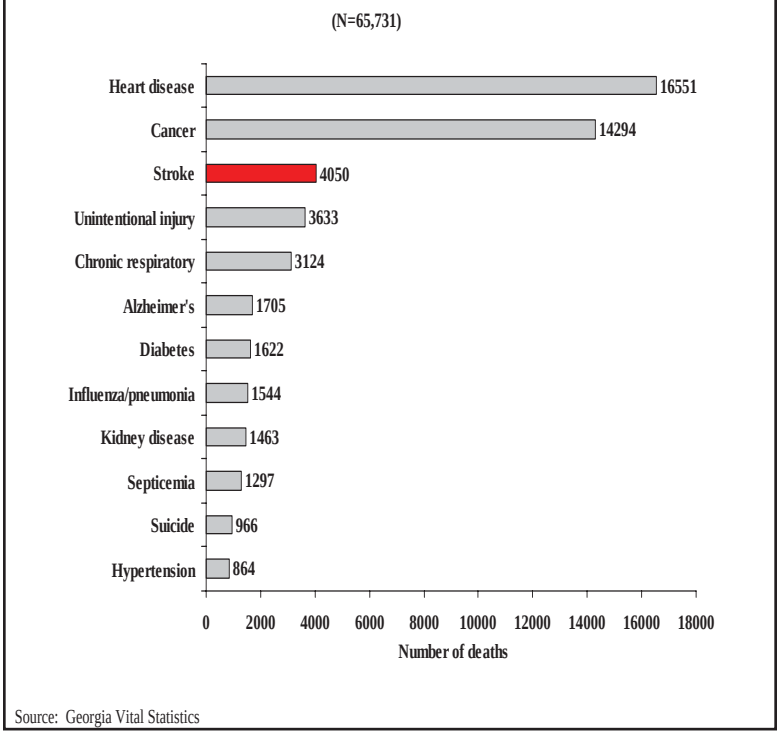
This report is dedicated in memory of Roger Davis who died from a sudden stroke on April 1, 2007. Roger was an integral member of the Georgia Division of Public Health's HIV/AIDS Epidemiology Section since the early years of the HIV epidemic. He played an important role in the development of Georgia's HIV/AIDS Surveillance System. His dedication and hard work have led to a better understanding of the HIV epidemic in Georgia. He will be greatly missed by all those who worked with him.

Table of Contents

Executive Summary

- Stroke was the third leading cause of death for Georgians in 2004, accounting for 4,050 deaths, or 6% of all deaths.
- The stroke death rate in Georgia was 21% higher than the national rate in 2004.
- For both men and women in Georgia, age-adjusted stroke mortality and hospitalization rates are higher for blacks than whites.
- Georgia is in a geographic region called the “stroke belt,” a region identified based on high rates of stroke mortality.
- Stroke caused more than 23,000 hospitalizations and $533 million in hospital charges in 2004 in Georgia.
- Lifestyle modifications can be made in order to decrease risk of stroke and prevent medical conditions that contribute to stroke, such as high blood pressure.
- The majority of Georgians do not know all the signs and symptoms of stroke. Quick identification of a stroke is key in receiving timely clinical treatments to prevent brain damage.

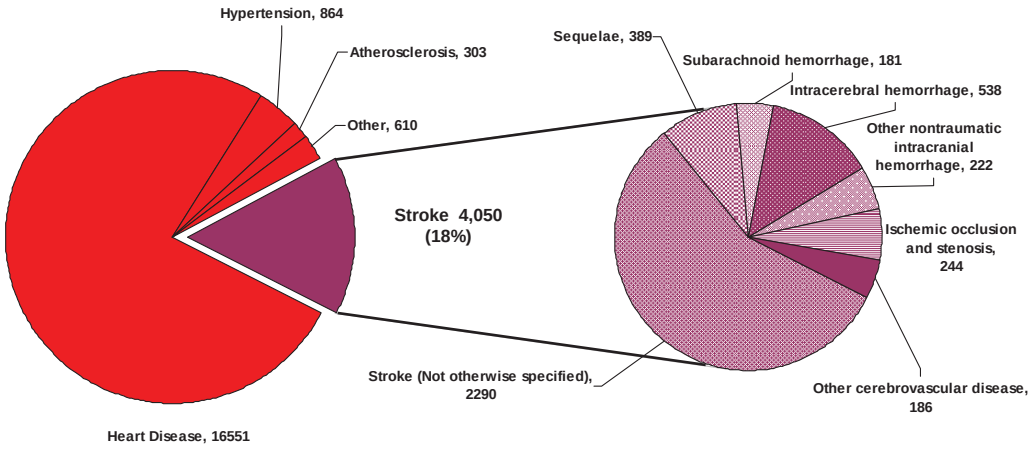
Figure 1. Leading causes of death, Georgia, 2004



Source: Georgia Vital Statistics

- Stroke is a disease that occurs when the blood supply to part of the brain is suddenly interrupted or when a blood vessel in the brain bursts, spilling blood into the spaces surrounding brain cells.
- A stroke is sometimes called a “brain attack” because just as a heart attack involves an interruption in the blood supply to the heart, stroke involves interruption in the blood supply to the brain.
- Stroke causes brain cell death by depriving cells of oxygen and nutrients from the blood or by damage to cells from sudden bleeding into or around the brain.
- There are two main types of stroke:
  - *Ischemic strokes* involve blockage of a blood vessel supplying the brain.
  - *Hemorrhagic strokes* involve bleeding into or around the brain.
- Stroke is the third leading cause of death in Georgia, responsible for 4,050 deaths in 2004 (Figure 1).
- Stroke was responsible for 6% of all deaths in Georgia in 2004.

Figure 2. Cardiovascular disease deaths and stroke sub-classification, Georgia, 2004



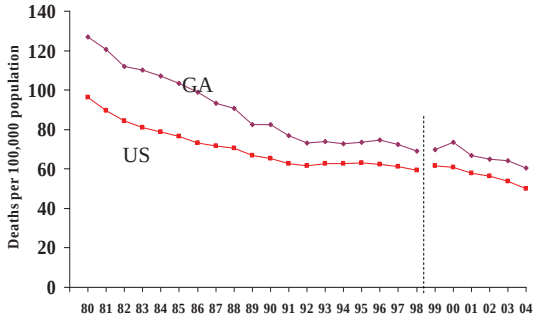
Source: Georgia Vital Statistics

- Of the 22,378 cardiovascular disease deaths in 2004, 18% were due to stroke (Figure 2).
- Stroke deaths are sometimes subclassified into specific stroke subtypes, however the majority of stroke deaths (57%) were not specified beyond “stroke” (Figure 2).
- According to stroke research, ischemic strokes represent 80% of all strokes and hemorrhagic strokes account for the remaining 20% of strokes.[1]

Mortality trends

- Age adjusted death rates from stroke have decreased during the past 24 years in both Georgia and the United States (Figure 3).
- In Georgia, the stroke death rate decreased an average of 4.4% per year from 1980 to 1992 but decreased only 1.5% per year from 1992 to 2004 (Figure 3).
- Age-adjusted stroke death rates in Georgia have been consistently above the U.S. rate although the gap is narrowing, with Georgia's rate 32% above the U.S. rate in 1980 but only 21% above the U.S. rate in 2004 (Figure 3).

Figure 3. Age-adjusted stroke death rates, Georgia and the United States, 1980-2004



Note: The dotted line indicates a change in coding systems used for cause of death. ICD-9 codes were used for 1980-1998 deaths; ICD-10 codes were used for 1999-2004 deaths.

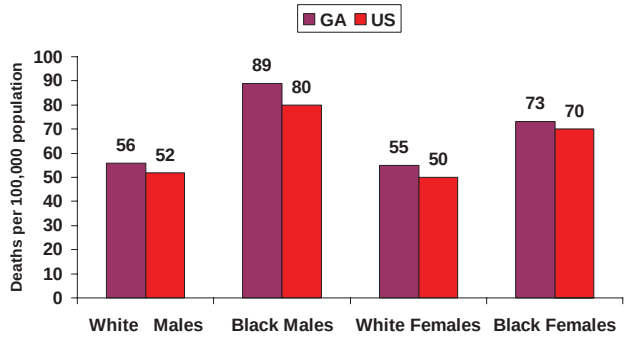
Death rates by sex

- In Georgia, the age-adjusted death rates from stroke were similar for men (61 per 100,000) and women (59 per 100,000) in 2004.

Death rates by race

- In Georgia, black males have the highest stroke death rate (Figure 4).
- In Georgia, the age-adjusted death rate from stroke was 1.4 times higher for blacks (80 per 100,000) than for whites (56 per 100,000) in 2004.
- Stroke death rates in Georgia were higher than national rates across racial and sex subgroups (Figure 4).

Figure 4. Age-adjusted stroke death rates by race and sex, Georgia, 2004 and the United States, 2003

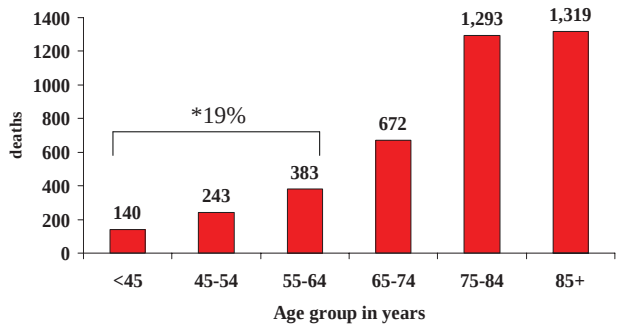


NOTE: U.S. Data from 2004 unavailable at time of publication

Death rates by age group

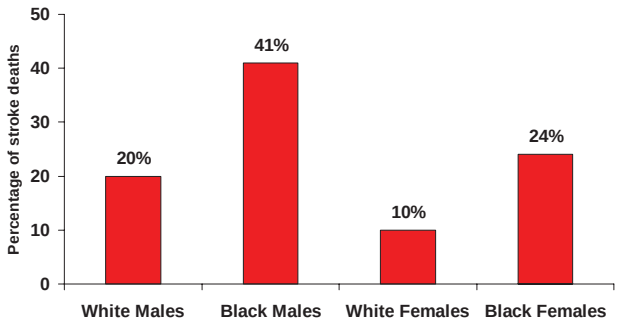
- Of Georgians who died of stroke in 2004, 19% were younger than 65 years of age (Figure 5).
- Almost one-third (31%) of blacks who died of stroke in 2004 were less than 65 years of age, whereas only 14% of whites who died of stroke in 2004 were less than 65 years of age.

Figure 5. Stroke deaths by age group, Georgia, 2004



*Deaths before age 65 are classified as "premature deaths"

Figure 6. Percentage of stroke deaths that occur prematurely* by race and sex, Georgia, 2004

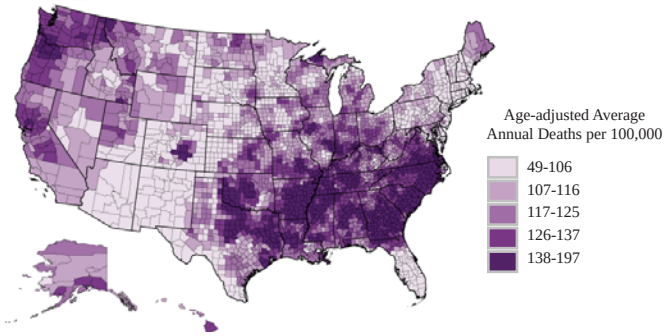


*Deaths before age 65 are classified as "premature deaths"

Premature deaths by race and sex

- Approximately 2 in 5 (41%) stroke deaths among black males in 2004 occured before age 65 (Figure 6).
- 1 in 5 (20%) stroke deaths among white males in 2004 occured before age 65 (Figure 6).
- Approximately 1 in 4 (24%) stroke deaths among black females in 2004 occured before age 65 (Figure 6).
- Approximately 1 in 10 (10%) stroke deaths among white females in 2004 occured before age 65 (Figure 6).

Figure 7. Age-adjusted stroke death* rates among adults ages 35 and older by county, United States, 1999-2003

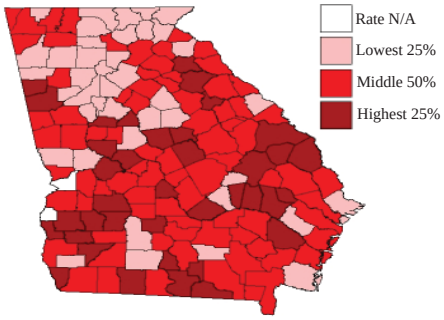


*Stroke deaths ICD-10: I60-I69
Data Source: National Vital Statistics System, U.S. Census Bureau.
Map Source: Atlas of Stroke Mortality: Racial, Ethnic, and Geographic Disparities in the United States. January 2003. http://www.cdc.gov/DHDSP/library/fs_stroke.htm

Geographic stroke death disparities in the U.S.

- The southeastern part of the United States has the highest stroke mortality rates and is known as the "stroke belt" (Figure 7).
- Three states, Georgia, North Carolina, and South Carolina have the highest rates in the stroke belt and are referred to as the "stroke buckle" (Figure 7).
- The stroke buckle has extremely high stroke mortality rates, higher than the rate in other stroke belt states, and up to two times the stroke mortality rate of the United States.
- Explanation for the high stroke mortality rates in the stroke belt have included high percentage of African-Americans and an overall lower socioeconomic status (SES) in the southeastern U.S. However these explanations do not fully account for the higher incidence of stroke mortality, meaning other factors must be contributing as well.

Figure 8. Age-adjusted stroke death rates by county, Georgia, 2000-2004



NOTE: Deaths are classified based upon county of residence.

Geographic stroke death disparities in Georgia

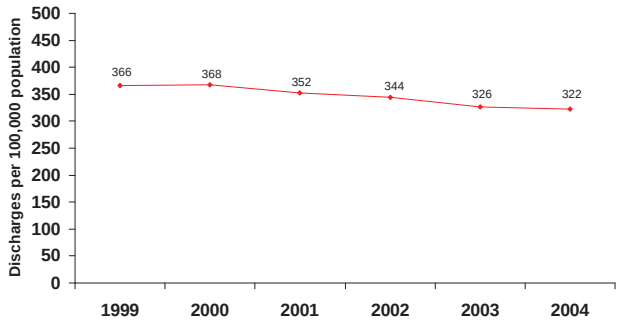
- The lowest stroke death rates are found mostly in counties containing metropolitan areas (Figure 8).
- Georgia counties with the highest stroke death rates tend to be rural (Figure 8).

Stroke Hospitalization in Georgia

Hospitalization* trends

- Stroke was responsible for 23,451 hospitalizations in 2004.
- The stroke hospitalization rate has declined 12% from 1999 to 2004 in Georgia (Figure 9).

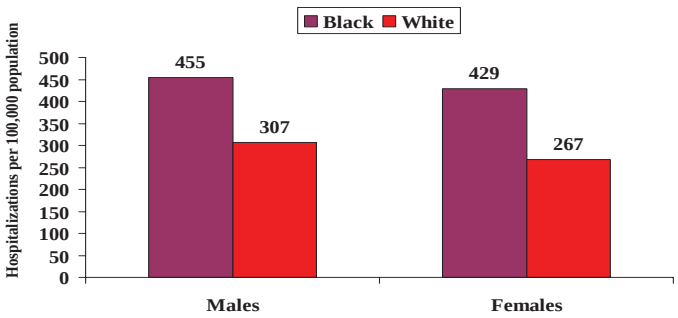
Figure 9. Age-adjusted stroke hospitalization rates, Georgia, 1999-2004



Hospitalization* disparities

- Stroke hospitalization rates are higher among blacks than whites (Figure 9).

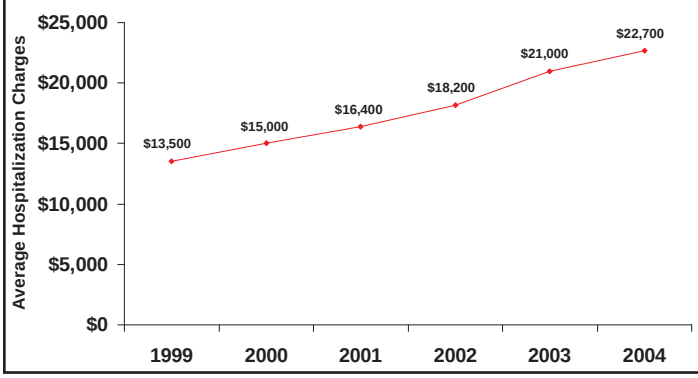
Figure 10. Age-adjusted stroke hospitalization rates by race and sex, Georgia, 2004



Hospitalization* cost

- The average length of stay for stroke hospitalization in 2004 was 5.8 days.
- The total hospital charges for stroke hospitalizations in 2004 were $533 million.
- The average charge per stroke hospitalization was $22,700 in 2004 (Figure 11).
- The average charge for stroke hospitalization has increased by 68% from 1999 to 2004 (Figure 11).

Figure 11. Average hospital charges per stroke hospitalization, Georgia, 1999-2004

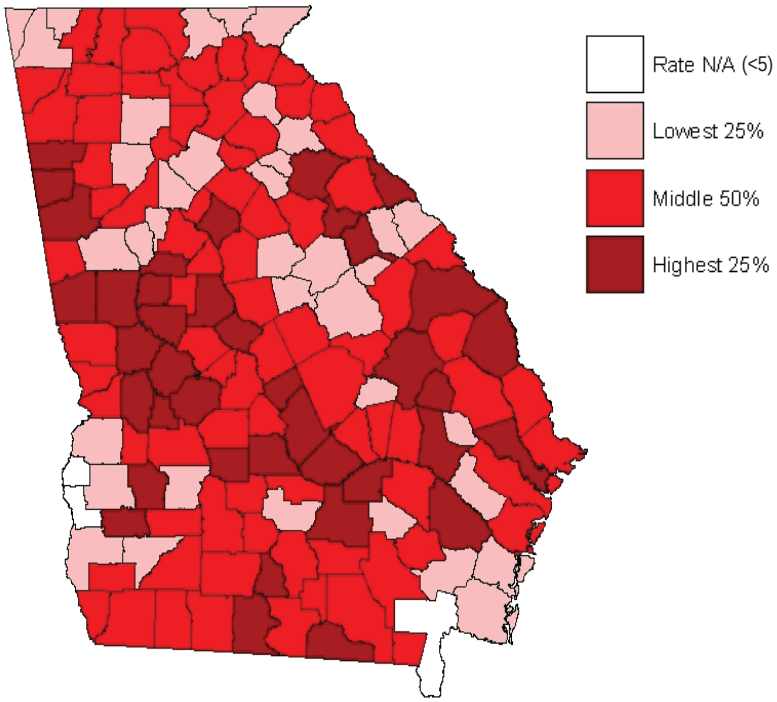


*Non-federal, acute-care facilities

Stroke hospitalizations by county

- Counties containing metropolitan areas were generally classified as having “lowest 25%” or “middle 50%” stroke hospitalization rates (Figure 12).
- Counties classified into the “highest 25%” of hospitalization rates were mostly rural counties (Figure 12).
- Georgia residents hospitalized outside of Georgia are not included in the map. This may lead to an underestimation of hospitalizations for residents of counties near large cities in neighboring states (e.g. counties bordering Chattanooga, TN or Jacksonville, FL).

Figure 12. Age-adjusted stroke hospitalization rates by county, Georgia, 2000 - 2004



NOTE: Hospitalizations are classified based upon county of residence. Map includes only hospitalizations at non-federal, acute care facilities.

Stroke Risk Factors

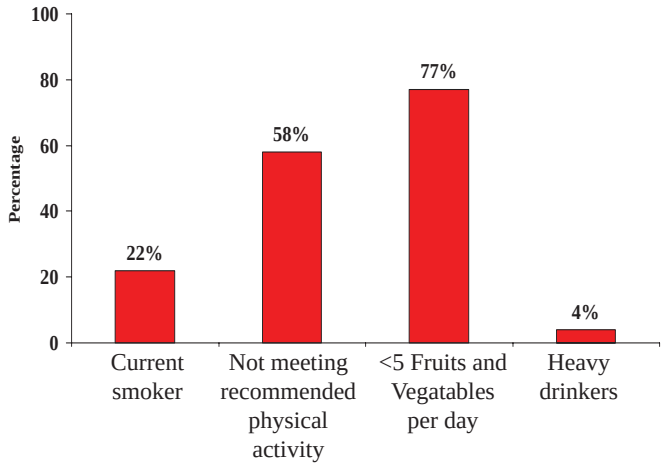
The following are factors a person cannot control but that do increase a person's risk for stroke:

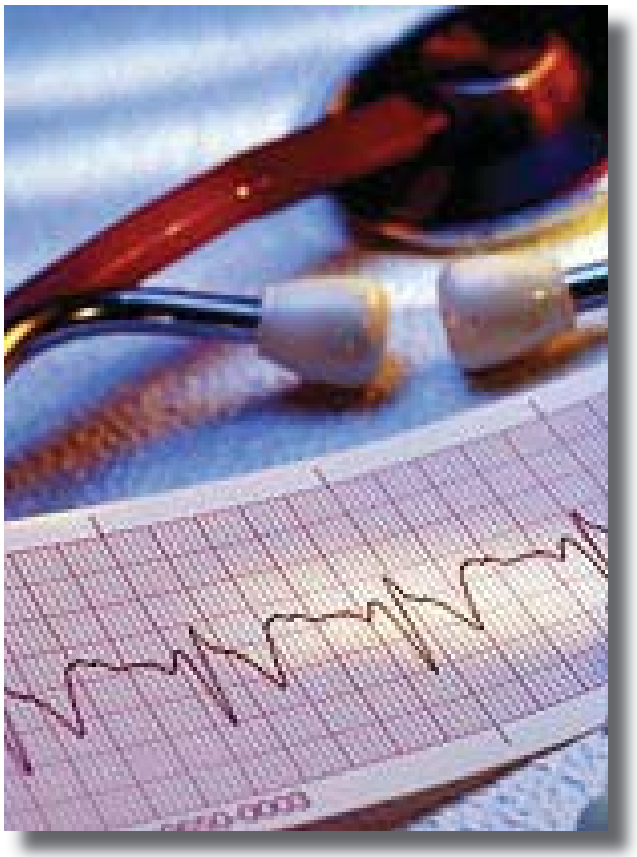
- **Age**. A stroke can happen to anyone, but the risk of stroke increases with age.
- **Sex**. Strokes are more common in men than women. But more women than men die from stroke.
- **Race**. Blacks have stroke death rates that are higher than the rate for whites.
- **Family History**. A person with a family member who has had a stroke has a higher risk of stroke.

The following are lifestyle behaviors that can be modified to decrease a person's risk for stroke:

- **Physical Inactivity**. Physical inactivity increases the risk of stroke. 58% of adults in Georgia did not meet the CDC's recommendations for physical activity (Figure 13).
- **Tobacco Use**. Tobacco use increases the risk of stroke. 22% of Georgia adults reported smoking cigarettes in 2005 (Figure 13).
- **Poor Diet**. A diet that includes few fruits and vegetables is associated with an increased risk of stroke. The majority (77%) of adults in Georgia did not consume the recommended five or more daily servings of fruits and vegetables in 2005 (Figure 13).
- **Heavy alcohol consumption**. Heavy drinking of alcohol has been linked to increased risk of stroke in some studies.[2] 4% of Georgia adults were heavy drinkers in 2005 (Figure 13).

Figure 13. Prevalence of modifiable lifestyle risk behaviors for stroke among adults, Georgia, 2005



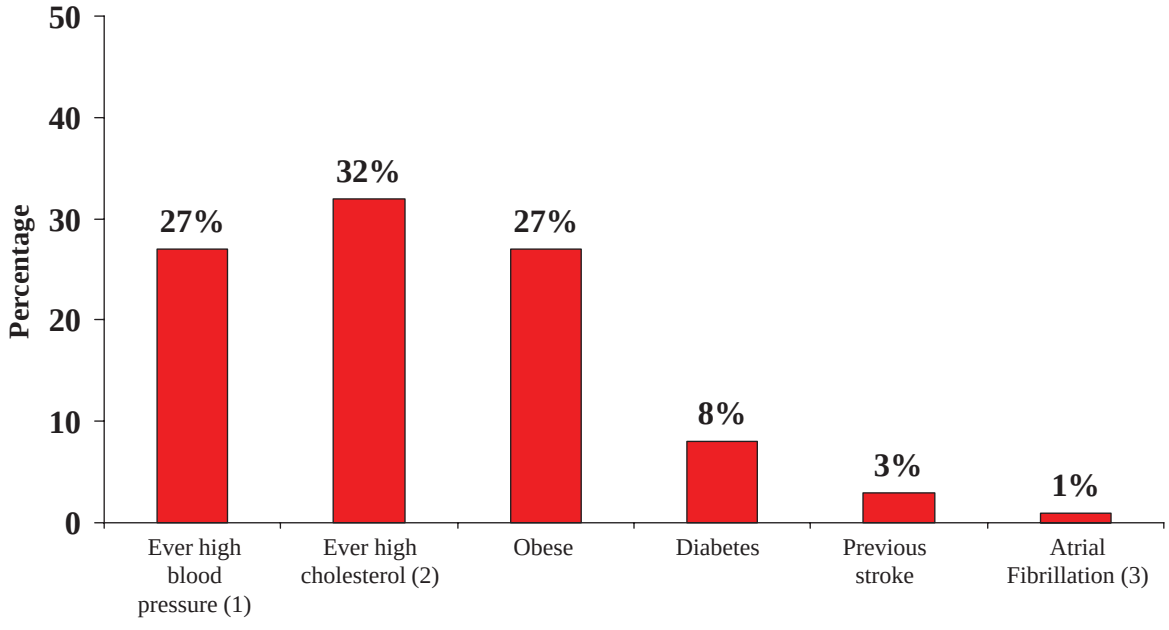


The following are medical conditions that increase a person's risk for stroke (Figure 14):

- **High Blood Pressure (Hypertension).** Of all the risk factors for stroke, the most powerful is high blood pressure, which increases risk of stroke by four to six times compared with non-hypertensive individuals.[1] The percentage of adults in Georgia who have been told that they have high blood pressure increased from 20% in 1995 to 27% in 2005 (Figure 14).
- **High Blood Cholesterol.** Unhealthy cholesterol levels over time result in blocked blood vessels and contribute to blood clot formation. The percentage of adults in Georgia who have been told that they have high cholesterol increased from 22% in 1995 to 32% in 2005 (Figure 14).
- **Obesity**. Excess weight strains the entire circulatory system. It also contributes to the development of high cholesterol, high blood pressure and diabetes. The percentage of adults in Georgia who were obese increased from 13% in 1995 to 27% in 2005.
- **Diabetes Mellitus**. The risk for stroke is three times greater in diabetics compared to non-diabetics.[1] The percentage of adults who report having diabetes has increased from 4% in 1995 to 8% in 2005 (Figure 14).
- **Previous Stroke or Transient Ischemic Attack (TIA)**. Persons who have already had a stroke or a TIA (ministroke) have a 25-40% chance of having another stroke in the next 5 years.[2] No prevalence data are available for TIA, however 3% of Georgia adults self-reported previous stroke(s) (Figure 14).
- **Atrial Fibrillation.** Artrial fibrillation is a form of heart disease involving irregular beating of the left atrium, or left upper chamber of the heart, which increases the risk of stroke. Atrial fibrillation is found in 1% of all adults, but the prevalence increases to 9% among adults ages 80 and over (Figure 14).[3]

- People with more than one risk factor for stroke have "amplification of risk." This means that the multiple risk factors compound their destructive effects and create an overall greater risk than a simple cumulative effect of individual risk factors.[1]

Figure 14. Prevalence of medical conditions that contribute to strokes among adults, Georgia, 2005



(1) The percentage of Georgians who reported having been told they had high blood pressure
(2) Of persons who had their blood cholesterol level checked, the percentage told that they have high cholesterol
(3) Based on national prevalence data for adults[3]

High blood pressure and stroke

- High blood pressure is a strong contributor for stroke risk. Some people can control their high blood pressure by losing weight, changing their dietary habits, exercising, and reducing alcohol consumption. For those who are unable to decrease their blood pressure with lifestyle modification alone, medication prescribed by a physician can often control high blood pressure successfully.
- The majority of persons with high blood pressure were advised by medical professionals to adopt lifestyle modification to control their blood pressure (Table 1).
- Of those persons advised, the majority of them self-reported adopting lifestyle changes (Table 1).
- Of those persons advised by medical professionals, exercise was changed most often whereas reducing binge drinking was changed the least frequently (Table 1).
- 88% of Georgia adults with high blood pressure have been advised by a medical professional to take blood pressure control medication.

Table 1. Actions to control high blood pressure among adults with high blood pressure, Georgia, 2005

Lifestyle Change	Advised by medical professional to change behavior	Of those advised, adopted lifestyle change
Change eating habits	63%	72%
Reduce salt intake	69%	76%
Exercise	74%	77%
Reduce alcohol consumption (restricted to binge drinkers)	57%	69%

Note: Self-reported lifestyle change response can be overestimated by individuals' varying definitions of a significant behavior change

Table 2. Individual stroke sign/symptom awareness among adults, Georgia, 2005

Stroke signs/symptoms	Percentage of adults who correctly identified it
Body numbness or weakness, especially on one side	97%
Sudden confusion or trouble speaking	95%
Sudden dizziness, trouble walking, or loss of balance	94%
Sudden vision trouble	86%
Severe unexplained headache	79%

NOTE: The BRFSS questions pertaining to awareness were asked in a prompted format. For example, "Do you think X is a symptom of stroke."

Table 3. Overall stroke signs/symptoms awareness among adults, Georgia, 2005

Total number of correctly identified stroke signs/symptoms	Percentage of Georgia adults*	
0	2%	
1	3%	
2	8%	
3	16%	
4	27%	86%
5	43%	

*Percentages do not add up to 100 due to rounding

NOTE: The BRFSS questions pertaining to awareness were asked in a prompted format. For example, "Do you think X is a symptom of stroke."

Table 4. Adults identifying all the sign/symptoms of stroke by demographics, Georgia, 2005

Subgroups within Georgia	% who correctly identified all 5 signs/symptoms of stroke
All Georgia Adults	**43%**
Sex:	
Males	39%
Females	48%
Race:	
Whites	48%
Blacks	38%
Age:	
18-44 years of age	40%
45-64 years of age	51%
65+ years of age	42%
Education:	
Some high school	27%
High school graduate	37%
Some college	46%
College graduate	53%

Stroke sign & symptom awareness

- The majority of Georgia adults were able to correctly identify specific stroke signs/symptoms when read from a list (Table 2).
- Georgia adults successfully identified "body numbness or weakness" correctly as a stroke symptom the most often (Table 2)
- Georgia adults successfully identified "severe unexplained headaches" as a stroke symptom the least often (Table 2)
- 48% of Georgia adults incorrectly identified chest pain or discomfort as a symptom of stroke.

Overall stroke awareness

- Of the 5 stroke signs/symptoms:
  - 86% of Georgia adults identified 3 or more correctly (Table 3).
  - 43% of Georgia adults correctly identified all 5 signs/symptoms of stroke (Table 3).

- Females were more likely than males to identify all the signs/symptoms of stroke (Table 4).
- Whites were more likely than blacks to identify all the signs/symptoms of stroke (Table 4).
- Adults ages 45-64 identified the stroke signs/symptoms the most frequently (51%). Adults older than 64 and younger than 45 were less aware of the signs and symptoms of stroke (Table 4).
- Stroke sign and symptom awareness increases with increased education level (Table 4).

Question format

- The BRFSS questions pertaining to awareness were asked in a prompted format. For example, "Do you think sudden vision trouble is a symptom of a stroke?"
- A stroke awareness survey conducted in 1999 among Georgia adults measured significantly lower awareness when respondents were asked open ended questions about signs and symptoms. Awareness is likely overestimated by the prompted question format.[4]

Conclusions

- Stroke was the third leading cause of death in Georgia in 2004.
- Stroke death rates in Georgia have been steadily decreasing over the past 25 years, but Georgia continues to have a stroke death rate that is substantially higher than the national average. Although the risk of stroke increases with age, 19% of stroke deaths in Georgia occur in persons who are less than 65 years of age.
- The burden of stroke is especially heavy for Georgia's black population. Blacks have stroke mortality rates that are 1.4 times higher than whites, and among stroke deaths occurring in blacks, a higher proportion occur before age 65 years.
- Reducing the high stroke death rates in Georgia will also require encouraging Georgians to adopt healthy lifestyle practices such as not smoking, eating a healthy diet, engaging in regular physical activity, and maintaining a healthy weight. Control of high blood pressure, high cholesterol levels, and diabetes are also important to stroke prevention.
- Average stroke hospitalization charges have increased over time and will likely continue to increase.
- Ensuring access to high quality medical care for stroke requires implementation of coordinated systems of care that ensure that patients can quickly get to a medical facility that has the capacity to provide this care.
- Public awareness of the signs and symptoms of stroke, and of the need to call 911 if a person is having a stroke, is also essential to getting stroke patients effective medical care. Surveys indicate that although there is good public awareness of some stroke signs and symptoms, others are not as well recognized.

References

1. “Stroke: Hope Through Research,” National Institute of Neurological Disorders and Stroke (NINDS). Publication date July 2004. http://www.ninds.nih.gov/disorders/stroke/detail_stroke.htm

2. Goldstein LB, et al.; Primary Prevention of Ischemic Stroke: A Guideline from the American Heart Association/ American Stroke Council. Stroke 2006; 37; 1583-1633.

3. Go AS, et al.; Prevalence of Diagnosed Atrial Fibrillation in Adults: National Implications for Rhythm Management and Stroke Prevention: the Anticoagulation and Risk Factors In Atrial Fibrillation (ATRIA) Study. JAMA 2001; 285: 2370-2375.

4. Rowe AK, Frankel MR, Sanders KA. Stroke Awareness Among Georgia Adults: Epidemiology and Consideration Regarding Measurement. Southern Medical Journal. Vol 94, number 6, June 2001, 613-618.

Appendix I

Stroke Statistics by Geography

Tables 5 and 6 (pages 16 to 21) show the following data for Georgia counties and public health districts:

- The number of stroke deaths in 2000-2004.
- The average annual age-adjusted mortality rate for stroke from 2000 to 2004 (AAMR).
- The number of stroke hospitalizations in 2004.
- The age-adjusted stroke hospitalization discharge rate in 2004 (AADR).
- Total hospitalization charges in 2004

Hospitalization data are based on county of residence, not location of hospital. Furthermore, the data are restricted to acute care, non-federal facilities, which excludes patients seen at Veteran's Administration and military facilities. Georgia residents hospitalized outside of Georgia are not included in the tables. This may lead to an underestimation of hospitalizations for residents of counties near large cities in neighboring states (e.g. counties bordering Chattanooga, TN or Jacksonville, FL).

Table 5. Georgia Stroke Mortality and Morbidity By County

County	2000-2004 Deaths		2004 Hospitalizations		
	Number	Average AAMR	Number	AADR	Total Charges
Georgia Total	21,405	65.9	23451	321.8	$533,427,525
Appling	66	79.2	73	409.7	$1,344,743
Atkinson	17	51.5	21	352.8	$223,961
Bacon	39	79.9	26	244.3	$327,136
Baker	19	85.0	8	190.9	$184,819
Baldwin	161	88.8	99	249.2	$2,462,948
Banks	44	75.4	40	278.3	$1,048,358
Barrow	124	69.9	151	365.4	$3,491,074
Bartow	177	59.2	229	328.4	$5,511,128
Ben Hill	67	73.0	67	374.8	$977,067
Berrien	53	64.8	66	377.9	$830,720
Bibb	566	71.8	672	428.8	$15,869,131
Bleckley	43	70.4	54	423.4	$1,155,822
Brantley	41	68.8	22	155.7	$457,851
Brooks	65	66.1	86	477.0	$1,107,850
Bryan	57	76.6	82	425.2	$2,372,657
Bulloch	154	72.5	183	409.0	$5,159,761
Burke	79	82.7	126	651.5	$1,614,088
Butts	76	88.2	76	401.1	$2,037,635
Calhoun	38	116.7	32	536.0	$397,956
Camden	45	41.6	33	121.2	$782,050
Candler	41	68.7	48	433.5	$828,109
Carroll	338	93.8	353	433.0	$8,601,540
Catoosa	138	55.8	67	113.5	$1,013,122
Charlton	29	70.5	<5	45.7	$234,899
Chatham	670	56.6	778	324.2	$20,263,744
Chattahoochee	<10	70.5	10	381.6	$264,951

Table 5. Georgia Stroke Mortality and Morbidity By County

County	2000-2004 Deaths		2004 Hospitalizations		
	Number	Average AAMR	Number	AADR	Total Charges
Chattooga	92	64.3	95	332.6	$3,230,915
Cherokee	251	61.7	299	273.4	$8,808,682
Clarke	234	66.8	200	279.4	$4,148,836
Clay	25	104.3	<5	86.4	$52,388
Clayton	314	49.7	512	289.1	$15,438,122
Clinch	21	65.6	27	405.8	$553,518
Cobb	989	56.0	1240	271.7	$31,631,790
Coffee	106	69.7	146	432.0	$2,366,842
Colquitt	131	60.8	140	320.9	$2,488,444
Columbia	193	62.0	213	272.5	$6,050,402
Cook	83	103.2	86	534.9	$1,161,762
Coweta	235	73.7	232	299.4	$5,717,458
Crawford	38	84.3	35	317.7	$620,328
Crisp	87	77.5	116	507.9	$2,196,548
Dade	44	65.2	9	55.8	$90,332
Dawson	34	66.7	59	371.2	$1,619,155
Decatur	99	67.9	100	360.4	$1,068,855
DeKalb	1326	57.6	1438	275.7	$38,785,010
Dodge	67	68.2	86	431.7	$1,406,841
Dooly	45	79.7	45	398.9	$601,156
Dougherty	330	74.2	345	376.7	$6,582,368
Douglas	179	61.2	278	366.7	$6,076,854
Early	59	71.7	22	162.6	$224,073
Echols	10	82.4	12	514.5	$106,654
Effingham	83	64.1	110	333.9	$3,185,053
Elbert	97	80.5	93	389.3	$1,379,309
Emanuel	100	86.6	159	708.0	$2,307,048
Evans	78	145.0	29	275.4	$437,354
Fannin	74	51.8	93	313.3	$1,971,534
Fayette	175	51.3	177	200.4	$4,338,210
Floyd	295	59.6	303	302.6	$6,522,837
Forsyth	177	59.6	251	316.4	$5,887,466
Franklin	65	52.2	83	319.6	$1,496,727

Table 5. Georgia Stroke Mortality and Morbidity By County

County	2000-2004 Deaths		2004 Hospitalizations		
	Number	Average AAMR	Number	AADR	Total Charges
Fulton	1727	57.9	1850	306.9	$58,433,878
Gilmer	68	57.8	80	305.2	$975,980
Glascock	16	81.3	9	264.6	$163,125
Glynn	253	64.5	197	242.3	$5,395,237
Gordon	142	76.3	155	359.2	$3,997,341
Grady	86	68.7	101	408.2	$1,207,434
Greene	68	80.9	59	321.4	$1,012,081
Gwinnett	738	53.6	874	228.3	$22,310,587
Habersham	111	56.9	131	311.2	$2,343,128
Hall	408	78.0	425	347.5	$9,075,327
Hancock	38	81.1	25	249.2	$647,889
Haralson	112	84.7	125	428.1	$2,589,546
Harris	65	57.9	85	329.1	$1,607,355
Hart	87	62.5	94	325.9	$1,434,150
Heard	34	71.2	42	387.8	$709,679
Henry	214	54.4	344	328.3	$6,833,704
Houston	244	64.3	363	365.4	$6,560,102
Irwin	40	69.2	31	289.0	$895,310
Jackson	150	81.3	139	317.8	$2,958,208
Jasper	30	57.5	42	335.1	$851,860
Jeff Davis	42	72.4	55	450.2	$1,042,982
Jefferson	74	80.1	73	405.5	$1,066,059
Jenkins	42	94.4	31	344.1	$492,294
Johnson	37	68.2	34	329.4	$555,821
Jones	77	82.9	71	301.6	$2,291,192
Lamar	59	74.1	68	407.1	$2,407,443
Lanier	31	104.1	26	390.6	$412,564
Laurens	198	80.3	204	404.1	$3,638,230
Lee	58	83.2	50	277.6	$1,207,936
Liberty	85	75.6	93	345.5	$2,222,072
Lincoln	27	67.2	34	432.9	$627,798
Long	12	51.5	14	227.6	$206,771
Lowndes	276	82.0	276	369.1	$5,311,398

Table 5. Georgia Stroke Mortality and Morbidity By County

County	2000-2004 Deaths		2004 Hospitalizations		
	Number	Average AAMR	Number	AADR	Total Charges
Lumpkin	44	51.2	73	374.5	$1,336,689
Macon	79	78.8	89	429.1	$1,715,195
Madison	48	92.1	32	274.5	$739,641
Marion	46	64.3	68	491.5	$1,000,424
McDuffie	76	68.3	74	287.3	$1,445,840
McIntosh	25	79.8	22	333.1	$442,029
Meriwether	92	74.8	105	429.4	$1,957,454
Miller	26	55.8	31	360.6	$366,472
Mitchell	77	68.3	70	309.2	$1,115,414
Monroe	54	59.7	91	467.7	$1,564,972
Montgomery	28	83.4	27	367.4	$759,410
Morgan	42	50.9	65	385.2	$1,531,785
Murray	81	67.7	106	347.7	$1,774,649
Muscogee	573	67.6	591	341.4	$11,512,302
Newton	182	70.1	258	418.2	$4,804,379
Oconee	63	63.4	60	257.2	$1,140,188
Oglethorpe	51	84.2	59	441.8	$1,611,099
Paulding	154	75.6	233	375.8	$5,075,320
Peach	63	63.8	66	301.1	$1,455,827
Pickens	56	43.8	97	343.4	$2,192,883
Pierce	53	71.0	55	333.7	$1,349,359
Pike	39	63.4	63	428.1	$1,448,150
Polk	119	59.9	172	420.6	$5,279,387
Pulaski	50	96.1	40	386.8	$1,108,527
Putnam	61	61.8	67	286.4	$1,656,100
Quitman	<10	47.6	<5	79.9	$28,357
Rabun	48	47.3	62	261.5	$1,001,792
Randolph	60	131.4	20	264.9	$445,886
Richmond	561	67.2	640	359.7	$14,766,004
Rockdale	167	65.1	187	313.4	$3,696,972
Schley	13	80.4	21	574.2	$327,322
Screven	102	120.4	92	557.1	$1,769,959

Table 5. Georgia Stroke Mortality and Morbidity By County

County	2000-2004 Deaths		2004 Hospitalizations		
	Number	Average AAMR	Number	AADR	Total Charges
Seminole	45	83.4	33	301.7	$349,425
Spalding	225	83.3	273	468.7	$7,659,566
Stephens	119	74.3	111	359.0	$1,993,834
Stewart	29	74.9	22	296.8	$262,555
Sumter	185	107.9	128	399.2	$2,667,737
Talbot	21	61.3	30	427.0	$564,398
Taliaferro	13	87.9	12	495.1	$364,204
Tattnall	96	97.0	98	478.0	$1,405,698
Taylor	48	103.6	47	491.9	$774,111
Telfair	80	112.7	67	503.3	$876,830
Terrell	57	101.1	56	496.8	$857,458
Thomas	199	82.7	159	326.5	$3,074,021
Tift	120	65.7	128	333.4	$2,484,235
Toombs	107	82.0	97	370.2	$1,697,367
Towns	45	49.2	47	248.3	$512,731
Treutlen	21	57.0	20	277.2	$367,765
Troup	235	79.1	318	530.4	$4,901,802
Turner	39	81.7	29	313.2	$478,042
Twiggs	31	71.8	41	407.2	$746,395
Union	79	54.8	66	213.3	$755,610
Upson	237	142.1	184	582.7	$2,719,751
Walker	215	67.1	109	156.1	$1,635,305
Walton	191	73.8	195	318.4	$3,549,496
Ware	160	73.3	138	339.9	$3,185,273
Warren	27	67.2	36	473.5	$673,829
Washington	76	68.3	54	253.3	$1,108,701
Wayne	133	114.2	108	415.4	$2,275,439
Webster	10	70.7	9	350.9	$108,718
Wheeler	17	52.7	23	388.1	$561,246
White	61	55.5	90	337.4	$1,927,547
Whitfield	226	66.5	230	302.1	$3,978,716
Wilcox	32	68.2	47	509.4	$681,627
Wilkes	47	64.8	50	352.4	$635,530
Wilkinson	44	84.7	42	382.3	$1,042,995
Worth	59	55.9	73	325.5	$1,529,309

Table 6. Georgia Stroke Mortality and Morbidity By Health District

Health District	2000-2004 Deaths		2004 Hospitalizations		
	Number	Average AAMR	Number	AADR	Total Charges
Northwest (Rome)	1488	64.49	1497	289.1	$34,945,233
North Georgia (Dalton)	756	60.26	905	299.5	$19,702,444
North (Gainesville)	1322	62.82	1532	318.3	$30,432,514
Cobb/Dougles	1168	56.68	1518	284.7	$37,708,644
Fulton	1727	57.87	1850	306.9	$58,433,878
Calyton (Morrow)	314	49.66	512	289.1	$15,438,122
East Metro (Lawrenceville)	1087	57.07	1319	260.5	$30,811,938
Dekalb	1326	57.63	1438	275.7	$38,785,010
LaGrange	1959	76.47	2235	377.1	$49,332,392
South Central (Dublin)	573	78.26	602	408.4	$11,112,119
North Central (Macon)	1483	70.6	1668	361.2	$36,878,440
East Central (Augusta)	1360	72.12	1564	390.6	$32,245,535
West Central (Columbus)	1243	74.82	1220	363.1	$22,856,237
South (Valdosta)	784	76.67	807	380.7	$13,765,602
Southwest (Albany)	1283	73.04	1220	343.1	$20,653,984
Costal (Savannah/Brunswick)	1253	60.35	1339	298	$35,167,225
Southeast (Waycross)	1183	80.64	1130	367.4	$22,890,292
Northeast (Athens)	1096	71.45	1095	319.8	$22,267,916

Appendix II

Methodology

Age-adjusted mortality rates for the U.S. from 1980 through 1998 and for Georgia from 1980 though 1993 were obtained via WONDER at http://wonder.cdc.gov from the compressed mortality file compiled by the National Center for Health Statistics, CDC. Age-adjusted mortality rates for Georgia from 1994 though 1998 were obtained from OASIS at http://oasis.state.ga.us. The following ICD-9 codes were used: CVD, 390-434, 436-448; ischemic heart disease, 410-414, 429.2; and stroke, 430-434, 436-438. The 2000 U.S. standard population was used as the standard population.

Age-adjusted mortality rates for the U.S. from 1999 through 2004 were obtained via WONDER at http://wonder.cdc.gov from the compressed mortality file compiled by the National Center for Health Statistics, CDC. Age-adjusted mortality rates for Georgia from 1999 though 2004 were obtained from OASIS at http://oasis.state.ga.us. The following ICD-10 codes were used for CVD: CVD, I00-78; ischemic heart disease, I20-25; stroke, I60-69; heart failure, I50; other CVD, CVD codes not already categorized. ICD-10 codes for stroke included subarachnoid hemorrhage, I60; intracerebral hemorrhage, I61; other non-traumatic hemorrhage, I62; occlusion, I63; acute ill-defined, I64; other ill-defined, I67; sequelae, I69. ICD-10 codes for non-CVD causes of death included cancer, C00-C97; chronic respiratory disease, J40-J47; unintentional injuries, V01-X59, Y85-86; diabetes, E10-14; Alzheimers, G30; kidney disease, N00-07, N17-19, N25-27; influenza and pneumonia, J10-18. Age-adjusted death rates for Georgia were calculated using the direct method with population estimates from the U.S. Bureau of the Census (release date: August 30, 2000) and the 2000 U.S. standard population as the standard.

The average annual percentage change in age-adjusted death rates represents the average of the relative change between each pair of consecutive years.

Data on hospitalizations at acute care hospitals in Georgia were provided by the Office of Health Information and Policy after compilation by the Georgia Hospital Association. Analyses were restricted to Georgia residents. The following ICD-9-CM codes were used for principal diagnosis: CVD, 390-448; ischemic heart disease, 410-414; stroke, 430-438; heart failure, 428; hypertensive disease, 401-404; atherosclerosis, 440.

Age-adjusted mortality rates for counties and districts were calculated using data from death certificates provided by Vital Records and the Office of Health Information and Policy. The number of deaths for 2000 through 2004 was determined using the ICD-10 codes (stroke, I60-64, I67, I69). Age-adjusted mortality rates were calculated using county population estimates from the U.S. Bureau of Census and the year 2000 U.S. standard population as the standard.

Data on behaviors, health history, and health knowledge among adults were obtained from the 2005 Georgia Behavioral Risk Factor Surveillance System, a telephone survey conducted annually with a sample of adults aged 18 years and older. The sample is weighted so that it reflects the total adult population of the state. Stroke risk factors assessed by the BRFSS include the following:

Current smoker: Defined as someone who has smoked at least 100 cigarettes in his lifetime and smokes now.

High blood pressure: Defined as ever having been told by a doctor, nurse, or health professional that your blood pressure was high.

High cholesterol: Defined as ever having been told by a doctor or health professional that your blood cholesterol level was high.

Physical activity recommendations: 30 minutes, 5 days a week (moderate physical activity) or 20 minutes, 3 days a week (vigorous physical activity).

Obese: Defined as a body mass index [BMI] > 30.0 kilograms per meter squared, based on self-reported height and weight. BMI equals weight (in kilograms) divided by height (in meters) squared. Using weight (in pounds) and height (in inches), BMI equals 705 times weight divided by height squared.

Daily servings of fruits and vegetables: Number of servings of fruits or vegetables per day based on self-reporting of consumption during the past day, week, month, or year.

Diabetes: Defined as ever having been told by a doctor that you have diabetes.

Previous cardiovascular disease: Defined as ever having been told by a doctor that you had a heart attack and/or myocardial infarction, angina and/or coronary heart disease, or a stroke.

Heavy drinking: Defined as adult men having more than two drinks per day and adult women having more than one drink per day.

Glossary

Age-adjusted death rate: a rate calculated based on a standard age distribution to enable comparison of rates in populations with different age structures.

Angina: pain or discomfort in the chest that occurs when the heart does not receive enough blood.

Atherosclerosis: deposits of cholesterol and other substances in the walls of arteries.

Cardiovascular disease: includes a wide variety of diseases of the heart and blood vessels, including ischemic heart disease (heart attacks), high blood pressure, stroke, and hypertensive heart disease.

Cholesterol: fatty substance in blood that gets deposited in blood vessel walls, causing atherosclerosis, when blood cholesterol levels are high.

Hemorrhagic strokes: bleeding into or around the brain.

High blood pressure (Hypertension): Occurs when systolic and diastolic blood pressure readings are above 140 and 90 mmHg, respectively.

Hospital charges: a hospital's full established rates, which do not necessarily reflect costs or reimbursement.

Intracerebral hemorrhage: occurs when a diseased blood vessel within the brain bursts, allowing blood to leak inside the brain.

Ischemic heart disease (also known as *coronary heart disease*): includes heart attacks and related problems caused by a narrowing of the coronary arteries.

Ischemic stroke: blockage of a blood vessel supplying the brain.

Occlusion: closure or blockage of a blood vessel.

Prevalence: the percentage of a population that has a disease or a risk factor at a specific point in time.

Risk factor: a habit, characteristic, or finding on clinical examination that is associated with an increased probability of a disease.

Sequelae: pathological conditions resulting from a disease.

Stroke: occurs when blood vessels to the brain burst or become clogged by a blood clot or some other particle resulting in lack of blood flow and oxygen to the brain and death of brain cells.

Stenosis: narrowing or stricture of a passage or vessel.

Subarachnoid hemorrhage: occurs when a blood vessel just outside the brain ruptures. The area of the skull surrounding the brain (the subarachnoid space) rapidly fills with blood.

Abbreviations:

AAMR = Age-adjusted mortality rate.
BMI = Body Mass Index
CDC = Centers for Disease Control and Prevention
CVD = Cardiovascular Disease
ICD-9 = International Classification of Disease, 9th Revision
ICD-9-CM = International Classification of Disease, 9th Revision, Clinical Modification
ICD-10 = International Classification of Disease, 10th Revision

DHR

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