



## Cardiovascular Disease in Georgia, 2008



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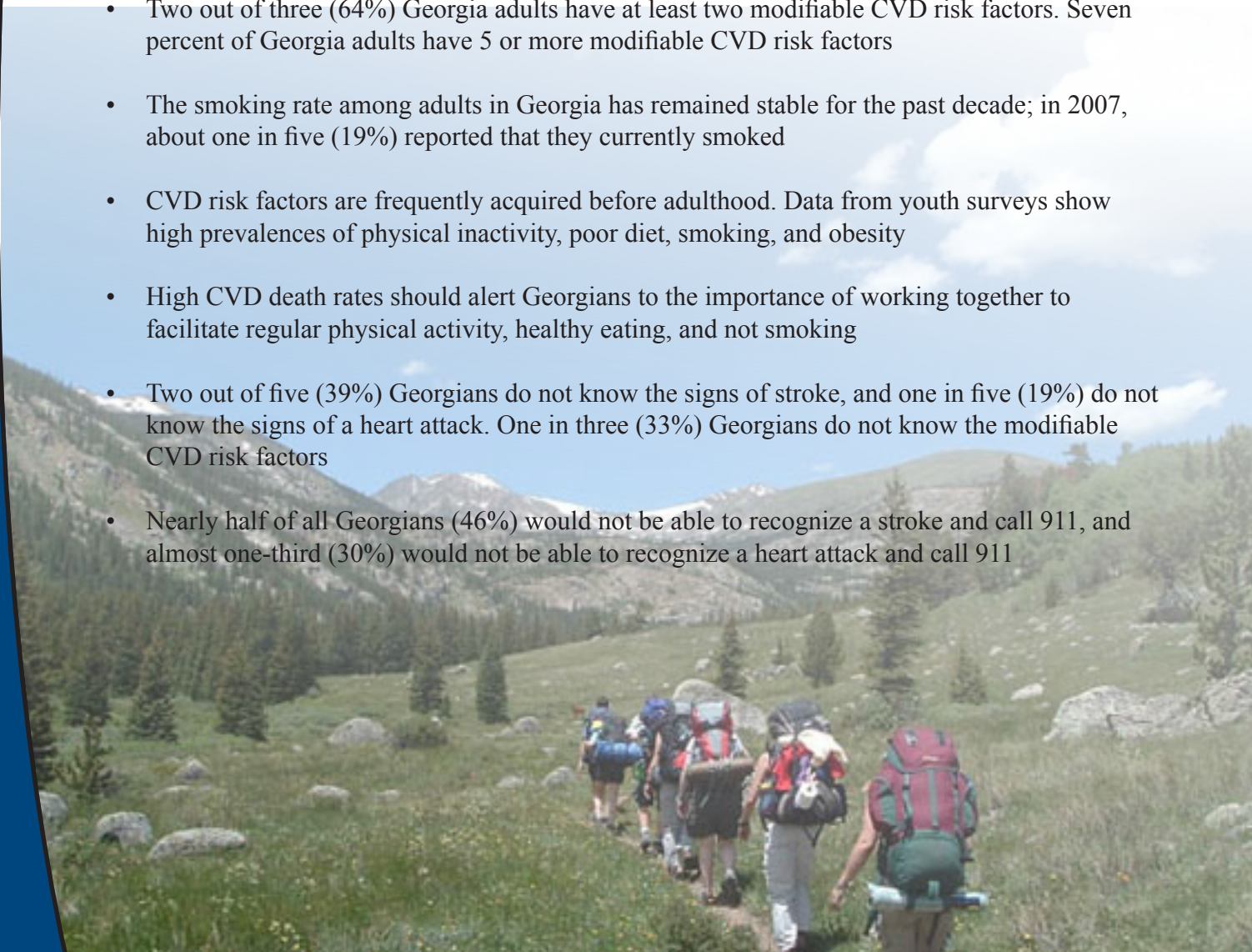
# Contents

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Highlights .....	4
Introduction .....	5
Cardiovascular Disease in Georgia.....	6
Ischemic Heart Disease in Georgia.....	8
Stroke in Georgia.....	9
Cardiovascular Disease Statistics by County.....	10
Cardiovascular Disease Risk Factors .....	19
Secondary Prevention of CVD.....	25
Conclusions .....	27
References.....	28
Appendix.....	29

## Highlights

- Cardiovascular disease (CVD), including heart disease and stroke, was the number one killer of Georgians in 2006, accounting for 21,754 deaths, 32% of all deaths
- The CVD death rate in Georgia was 9% higher than the national rate in 2006
- For both men and women in Georgia, age-adjusted CVD death rates were higher for blacks than whites
- In 2006, more than half of CVD deaths in Georgia were classified as ischemic heart disease (38%) or stroke (18%)
- Georgia had the thirteenth highest CVD mortality rate among the 50 states in 2005; for stroke in particular, Georgia had the tenth highest mortality rate among the 50 states
- CVD caused approximately 143,800 hospitalizations in 2006 and \$4.4 billion in hospital charges
- Two out of three (64%) Georgia adults have at least two modifiable CVD risk factors. Seven percent of Georgia adults have 5 or more modifiable CVD risk factors
- The smoking rate among adults in Georgia has remained stable for the past decade; in 2007, about one in five (19%) reported that they currently smoked
- CVD risk factors are frequently acquired before adulthood. Data from youth surveys show high prevalences of physical inactivity, poor diet, smoking, and obesity
- High CVD death rates should alert Georgians to the importance of working together to facilitate regular physical activity, healthy eating, and not smoking
- Two out of five (39%) Georgians do not know the signs of stroke, and one in five (19%) do not know the signs of a heart attack. One in three (33%) Georgians do not know the modifiable CVD risk factors
- Nearly half of all Georgians (46%) would not be able to recognize a stroke and call 911, and almost one-third (30%) would not be able to recognize a heart attack and call 911



## Introduction

Cardiovascular disease (CVD) includes all diseases of the heart and blood vessels, including ischemic heart disease, stroke, congestive heart failure, hypertensive disease and atherosclerosis. CVD is the nation's leading killer of both men and women across all racial and ethnic groups. Each year in the United States, about 856,000 people die from CVD, accounting for approximately 35% of all deaths (1,2). Over 6 million hospitalizations each year are due to CVD (1). According to the American Heart Association, CVD is a leading cause of disability in the nation.

In Georgia, CVD caused 21,754 deaths in 2006, 32% of all deaths that year (Table 1). Heart disease (all forms) and stroke are the first and third most common causes of death in Georgia (Figure 1). Ischemic heart disease (IHD) - the most common form of heart disease - and stroke account for 18% of deaths in Georgia.

Death and disability from CVD are related to a number of risk factors, including smoking, high blood pressure, high blood cholesterol, inadequate physical activity, obesity, poor diet, and diabetes. The adoption of a healthier lifestyle can lower the risk of developing CVD or reduce the severity of existing disease.

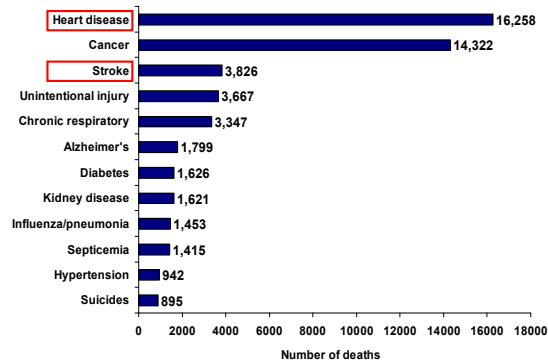
This report describes the burden of CVD in Georgia and has the following purposes:

- To present a brief overview of CVD death rates during the past two decades, including rates of IHD and stroke;
- To report county-specific death rates;
- To report the number of CVD, IHD, and stroke hospitalizations for Georgia residents; and
- To describe the prevalence of CVD risk factors in Georgia and to describe the prevalence of secondary prevention measures in Georgia.

Table 1. Cardiovascular Disease Deaths, Georgia, 2006

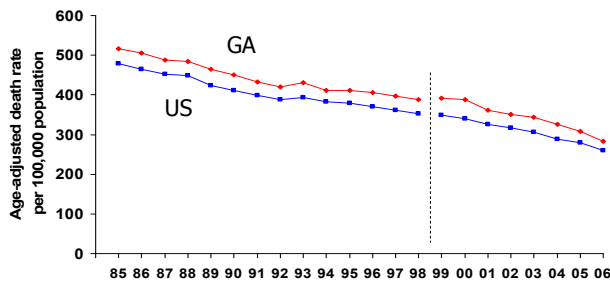
Causes	# Deaths
<b>Cardiovascular Disease Total</b>	<b>21,754</b>
<b>Heart Disease</b>	<b>16,258</b>
Ischemic Heart Disease	8,246
Hypertensive Heart Disease	1,099
Other Heart Disease	6,913
<b>Stroke</b>	<b>3,826</b>
<b>Hypertension</b>	<b>1,099</b>
<b>Atherosclerosis</b>	<b>175</b>
<b>Other</b>	<b>396</b>

Figure 1. Leading Causes of Death, Georgia, 2006  
N=67,079



## Cardiovascular Disease in Georgia

Figure 2. Cardiovascular Disease Death Rates, Georgia and the US, 1985-2006

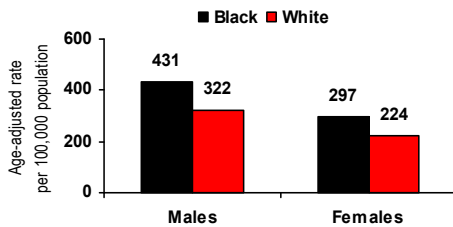


Note: The dotted line indicates a change in the coding system for cause of death. ICD-9 codes were used for 1985-1998 deaths; ICD-10 codes were used for 1999-2006 deaths.

Cardiovascular disease death rates have declined in both Georgia and the U.S. during the past 20 years (Figure 2). The causes of the decline are presumably related to the decline in cigarette smoking during the 1980s, improved blood pressure control, population-wide reduction in blood cholesterol, and improvements in medical care.

From 1985 through 2006, the CVD death rate in Georgia declined by an average of 2.6% per year (Figure 2). Through the entire time period, Georgia's CVD death rate was consistently above the U.S. rate. Georgia's rate was 8% above the U.S. rate in 1985 and 9% above the U.S. rate in 2006. Among the 50 states in 2005, Georgia had the thirteenth highest CVD death rate.

Figure 3. Cardiovascular Disease Death Rates, by Race and Sex, Georgia, 2006



CVD death rates in Georgia differ by sex and race. The age-adjusted death rate from CVD was 1.4 times higher for males (339 per 100,000) than for females (239 per 100,000) in 2006. The age-adjusted death rate from CVD was 1.3 times higher for blacks (352 per 100,000) than for whites (268 per 100,000) in 2006. In 2006, the CVD death rate in Georgia was 1.3 times higher for black males than white males and 1.3 times higher for black females than white females (Figure 3). The reasons for higher rates among blacks are not well understood, but contributing factors may include a higher percentage of blacks with high blood pressure, or a higher percentage living in poverty with associated factors of poor diet or more difficult access to health care.

## Cardiovascular Disease in Georgia

Although males have a higher risk than females for dying from CVD, more females (11,143) than males (10,611) in Georgia died from CVD in 2006. Since men experience CVD at a higher rate earlier in life, many people consider heart disease a man's disease. However, CVD is the leading killer of women in Georgia, so current health promotion campaigns are promoting awareness and education of the severity of CVD among women.

CVD is not just a disease of old age. The process of arterial narrowing, which causes heart attacks and strokes, may begin in the teenage years (3,4). The age at which blocked arteries actually kill varies greatly, and death can occur before old age. Of Georgians who died from CVD in 2006, 26% were younger than 65 years of age (Figure 4). A greater percentage of blacks than whites die from CVD at ages less than 65 years (Table 2). One half (50%) of black men who died of CVD in 2006 were less than 65 years, whereas only 30% of white men who died of CVD were less than 65 years.

Georgia also has a large financial burden from CVD. In 2006, CVD caused 143,800 hospitalizations and resulted in \$4.4 billion in hospital charges at non-federal acute care facilities. (See Tables 3 and 4 for cost of hospital charges by county and by health district.)

Figure 4. Cardiovascular Disease Deaths, by Age, Georgia, 2006

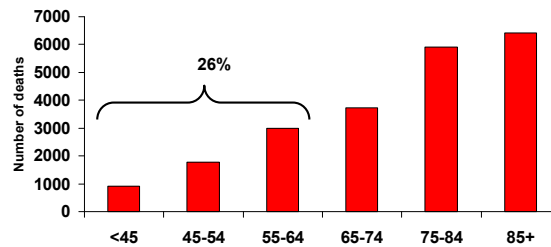


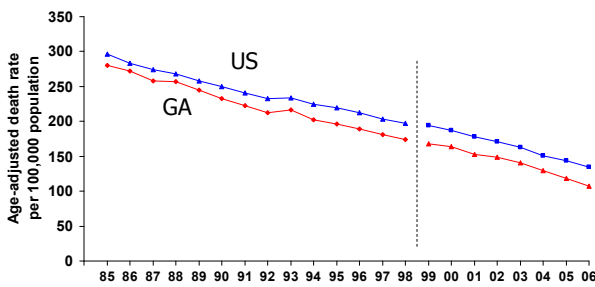
Table 2. Premature\* Cardiovascular Disease Deaths, by Race and Sex, Georgia, 2006

	Total CVD Deaths	Premature* CVD Deaths	
		#	%
Black males	2,976	1,480	50%
White males	7,581	2,264	30%
Black females	3,148	934	30%
White females	7,942	986	12%

\* Premature death defined as death before age 65

## Ischemic Heart Disease in Georgia

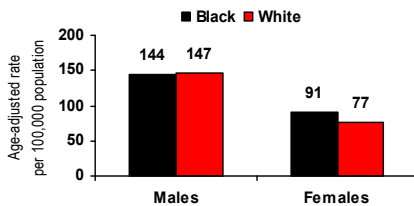
Figure 5. Ischemic Heart Disease Death Rates, Georgia and the US, 1985-2006



Note: The dotted line indicates a change in the coding system for cause of death. ICD-9 codes were used for 1985-1998 deaths; ICD-10 codes were used for 1999-2006 deaths.

Ischemic heart disease (IHD), also known as coronary heart disease, refers to narrowing of the coronary arteries, which reduces blood flow and oxygen to the heart. IHD includes acute myocardial infarctions (heart attacks) and complications resulting from previous myocardial infarctions. Of the 21,754 cardiovascular deaths in Georgia in 2006, 8,246 (38%) were from IHD. The death rate from IHD has decreased during the past 21 years at an average of 1.8% per year (Figure 5). Unlike total cardiovascular disease, Georgia's death rate from IHD is below the national rate. In 2006, Georgia's death rate from IHD was 21% below the national rate (Figure 5).

Figure 6. Ischemic Heart Disease Death Rates, by Race and Sex, Georgia, 2006

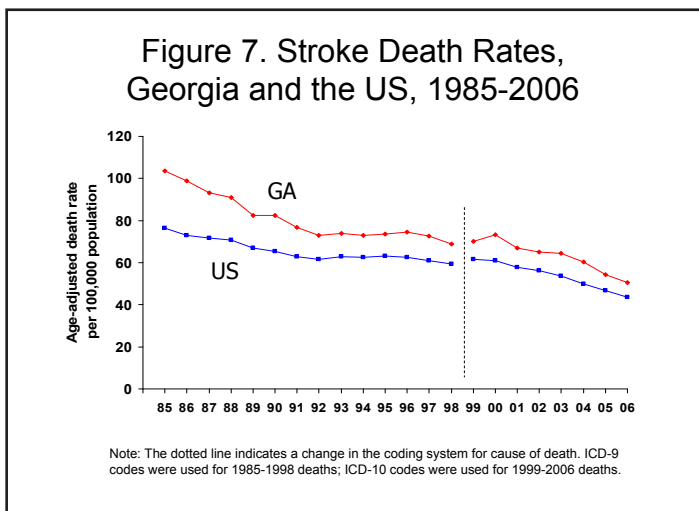


Data Source: 2006 Georgia Vital Records Death File

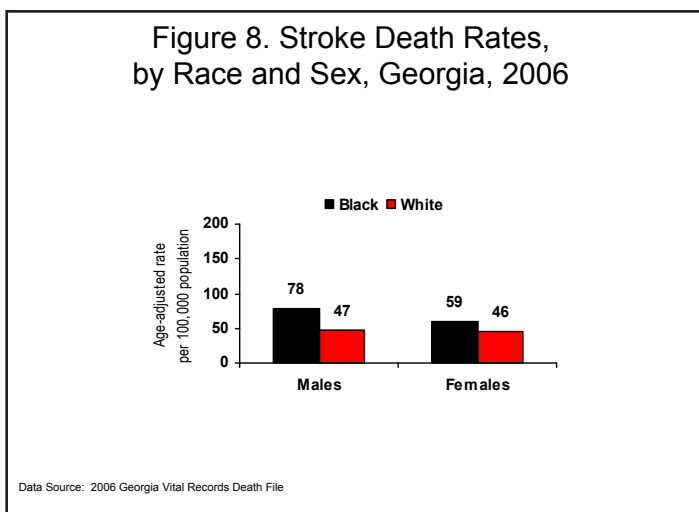
In Georgia, the age-adjusted death rate from IHD was 1.8 times higher for men (144 per 100,000) than for women (79 per 100,000) in 2006. The age-adjusted death rate from IHD was similar for blacks (113 per 100,000) and whites (107 per 100,000) in 2006. Among men, whites had a slightly higher age-adjusted death rate than blacks, whereas among women, blacks had a higher age-adjusted death rate than whites (Figure 6). Similar to overall CVD, the death rate from IHD increases with age, but 27% of deaths in 2006 occurred in persons less than 65 years.

## Stroke in Georgia

Stroke, or cerebrovascular disease, refers to an infarct (loss of blood supply due to a blocked artery) or hemorrhage in the brain. Of the 21,754 CVD deaths in Georgia in 2006, 3,826 (18%) were due to stroke. Age-adjusted death rates from stroke have decreased during the past 21 years in both Georgia and the US (Figure 7). In Georgia, the age-adjusted stroke death rate declined an average of 2.3% per year from 1985 to 2006. Age-adjusted stroke death rates in Georgia are consistently above the US rate, although the gap is narrowing: Georgia's rate was 36% above the US rate in 1985, but only 15% above the US rate in 2006.



Unlike IHD deaths, for which sex differences are more striking than racial differences, age-adjusted stroke deaths are much higher for blacks than whites. In Georgia, the age-adjusted death rate from stroke was 1.4 times higher for blacks (67 per 100,000) than for whites (47 per 100,000) in 2006. Reasons for the difference are not well understood, but may include the higher prevalence of high blood pressure and more difficult access to health care among blacks. Black males had a higher age-adjusted death rate from stroke than black females, but the rates for white males and white females were almost the same in 2006 (Figure 8).



As for most other types of cardiovascular disease, the stroke mortality rate increases with age. Nonetheless, 23% of persons dying from stroke in Georgia in 2006 were less than 65 years.

Stroke is a major cause of disability and 15% to 30% of stroke survivors are permanently disabled (5,6).

## Cardiovascular Disease Statistics by County

Tables 3 and 4 show the following data for Georgia counties and public health districts respectively: the number of CVD deaths in 2006, the average annual age-adjusted mortality rate for CVD from 2002 to 2006, the number of IHD deaths and the corresponding age-adjusted rate, and the number of stroke deaths and the corresponding age-adjusted rate. Average annual age-adjusted mortality rates were calculated for a 5-year period because counties with small populations had too few deaths to calculate a stable rate accurately for a shorter time period. Caution should be used when making comparisons among age-adjusted county death rates because counties with small populations are more likely to have wide variations in rates from year to year simply because of chance.

The right-hand set of columns in Tables 3 and 4 shows the total charges for CVD hospitalizations in 2006, the crude rate of hospitalizations for CVD in 2006, the number of hospitalizations for

CVD in 2006, and the number of hospitalizations for IHD and stroke. 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. Caution should be used when making comparisons among counties because 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).

Figure 9 shows average annual age-adjusted CVD death rates by county during 2001 through 2006, and Figure 10 shows average annual age-adjusted stroke death rates by county during the same time period. Both figures show that, in general, the death rates are lower in counties in the northwest and in and around Atlanta than in the rest of the state.



Figure 9. Cardiovascular Disease Death Rates, by County, Georgia, 2001-2006

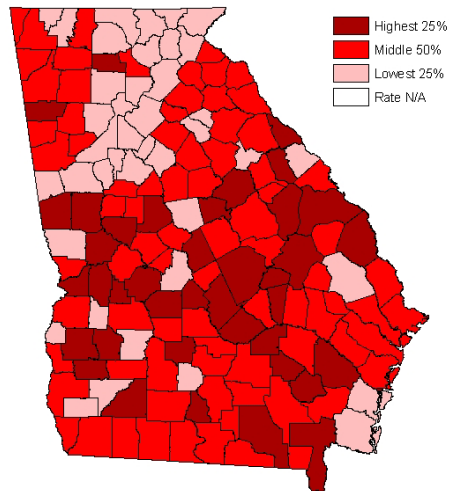


Figure 10. Stroke Death Rates, by County, Georgia, 2001-2006

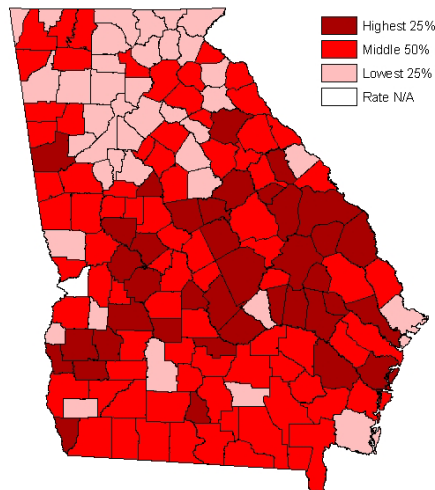


Table 3. Cardiovascular Disease Deaths, Age-Adjusted Mortality Rates, and Hospitalizations by County, Georgia 2002-2006

County	Deaths					
	CVD Deaths 2006	CVD Annual AAMR 2002-2006	Stroke Deaths 2006	Stroke Annual AAMR 2002-2006	IHD Deaths 2006	IHD Annual AAMR 2002-2006
<b>Georgia</b>	<b>21,754</b>	<b>321</b>	<b>3,826</b>	<b>59</b>	<b>8,246</b>	<b>128</b>
Appling County	76	366	13	71	28	125
Atkinson County	21	372	2	39	8	140
Bacon County	40	398	7	54	22	202
Baker County	8	237	2	44	1	65
Baldwin County	163	390	26	88	81	192
Banks County	37	336	5	62	23	149
Barrow County	144	362	25	51	66	163
Bartow County	211	336	39	56	102	157
Ben Hill County	59	375	17	89	18	139
Berrien County	65	339	17	71	23	140
Bibb County	577	369	87	67	218	135
Bleckley County	41	337	7	76	14	115
Brantley County	41	341	16	78	18	148
Brooks County	69	374	16	63	14	88
Bryan County	68	379	16	80	17	104
Bulloch County	136	318	29	65	47	108
Burke County	67	465	17	84	18	155
Butts County	73	346	11	68	32	120
Calhoun County	23	455	2	93	11	209
Camden County	84	300	15	36	24	118
Candler County	41	341	12	84	18	134
Carroll County	317	383	53	76	129	164
Catoosa County	170	325	33	50	87	188
Charlton County	31	396	9	71	5	120
Chatham County	770	330	116	52	327	122
Chattahoochee County	6	368	0	*	3	146
Chattooga County	89	345	17	63	40	178
Cherokee County	287	319	46	55	110	121
Clarke County	168	276	33	57	66	112
Clay County	11	361	4	86	3	159
Clayton County	427	307	64	45	156	133
Clinch County	22	445	2	62	11	237
Cobb County	1,039	268	198	52	338	95
Coffee County	114	382	19	68	53	170
Colquitt County	147	364	29	59	51	146
Columbia County	174	276	22	48	74	124
Cook County	63	386	8	74	18	127
Coweta County	287	330	43	65	121	129
Crawford County	33	354	11	80	12	182
Crisp County	91	371	24	82	31	132

## Hospitalizations

CVD Total Charges 2006	CVD Rate 2006	Total CVD 2006	Stroke 2006	IHD 2006
<b>\$4,419,295,483</b>	<b>1,220</b>	<b>114,208</b>	<b>16,671</b>	<b>39,492</b>
\$11,078,526	2,055	367	48	139
\$3,946,478	1,901	153	19	43
\$3,477,295	2,032	213	29	68
\$1,116,002	879	36	6	8
\$33,549,842	1,760	797	93	304
\$8,661,252	1,374	226	27	81
\$30,983,775	1,250	796	118	309
\$80,396,206	1,813	1,655	190	802
\$16,494,746	2,348	414	42	171
\$10,316,291	2,065	346	46	111
\$143,267,505	2,053	3,180	461	1,129
\$9,715,641	2,097	259	28	100
\$4,968,830	1,265	199	30	75
\$7,785,559	1,877	309	53	91
\$12,197,452	948	281	52	100
\$33,724,680	1,215	768	126	262
\$13,714,459	1,819	418	65	137
\$18,032,295	1,613	380	67	138
\$3,173,722	1,920	117	21	24
\$4,804,493	519	234	30	42
\$7,238,396	2,014	215	27	78
\$65,922,975	1,560	1,674	204	759
\$6,737,405	464	288	35	88
\$629,574	460	50	6	9
\$123,681,617	1,296	3,128	569	762
\$2,009,187	264	37	5	10
\$26,194,400	2,073	548	61	235
\$93,198,077	1,063	2,076	255	936
\$35,855,232	833	939	152	291
\$245,661	220	7	1	4
\$103,961,380	922	2,500	396	729
\$2,318,250	1,580	109	14	32
\$284,607,399	956	6,497	987	2,477
\$18,013,354	1,826	735	102	232
\$19,029,749	1,526	684	123	217
\$50,698,146	975	1,042	138	398
\$8,674,296	2,088	341	51	101
\$50,348,913	1,073	1,237	201	436
\$9,985,024	1,856	238	38	94
\$12,091,250	2,199	485	76	153

Table 3. Cardiovascular Disease Deaths, Age-Adjusted Mortality Rates, and Hospitalizations by County, Georgia 2002-2006

County	Deaths					
	CVD Deaths 2006	CVD Annual AAMR 2002-2006	Stroke Deaths 2006	Stroke Annual AAMR 2002-2006	IHD Deaths 2006	IHD Annual AAMR 2002-2006
Dade County	48	354	5	48	29	214
Dawson County	51	356	10	60	23	147
Decatur County	99	354	15	58	28	90
DeKalb County	1,190	250	211	50	339	87
Dodge County	95	405	22	81	54	198
Dooly County	37	409	9	71	9	187
Dougherty County	314	336	59	66	105	119
Douglas County	252	376	33	53	75	137
Early County	50	378	6	54	21	180
Echols County	9	319	2	75	3	82
Effingham County	102	342	15	58	44	148
Elbert County	88	344	17	73	51	180
Emanuel County	96	425	16	87	39	158
Evans County	49	383	10	96	26	170
Fannin County	80	298	14	45	28	116
Fayette County	177	245	31	49	72	100
Floyd County	342	342	60	51	126	140
Forsyth County	269	326	46	55	98	123
Franklin County	87	325	16	48	41	173
Fulton County	1,755	289	312	52	606	106
Gilmer County	81	313	9	50	28	128
Glascocock County	11	392	4	73	4	132
Glynn County	222	293	48	63	64	105
Gordon County	151	329	25	63	58	152
Grady County	97	366	20	64	37	155
Greene County	46	377	5	57	19	158
Gwinnett County	776	252	157	49	286	89
Habersham County	103	261	22	53	42	117
Hall County	346	312	61	64	126	121
Hancock County	33	418	5	73	8	93
Haralson County	86	366	10	70	34	167
Harris County	84	300	9	49	30	119
Hart County	101	357	29	71	36	154
Heard County	30	318	5	55	12	96
Henry County	294	302	41	47	118	131
Houston County	248	301	49	60	98	117
Irwin County	34	370	3	65	16	159
Jackson County	151	363	25	60	70	175
Jasper County	35	334	4	63	20	178
Jeff Davis County	56	526	10	81	28	235

## Hospitalizations

CVD Total Charges 2006	CVD Rate 2006	Total CVD 2006	Stroke 2006	IHD 2006
\$659,488	209	34	2	11
\$12,002,238	1,313	271	31	103
\$6,608,352	1,395	400	67	107
\$250,554,539	894	6,468	1,039	1,760
\$17,958,110	2,401	473	65	213
\$7,798,248	2,222	261	39	102
\$43,314,522	1,278	1,211	196	272
\$60,407,106	1,236	1,478	187	593
\$1,939,304	763	92	12	15
\$776,794	842	36	5	9
\$20,530,710	962	471	86	157
\$10,363,507	1,796	373	52	108
\$16,643,192	2,407	544	90	142
\$6,328,324	1,847	211	27	82
\$15,458,096	1,797	401	45	152
\$39,928,498	964	1,028	137	387
\$96,974,864	2,055	1,959	204	836
\$61,824,007	951	1,435	194	555
\$14,136,832	1,881	408	60	165
\$377,935,465	925	8,875	1,360	2,444
\$16,150,318	1,647	464	45	176
\$3,333,739	2,132	58	12	21
\$29,461,424	1,372	1,010	133	280
\$45,369,484	2,044	1,051	113	538
\$8,310,860	1,376	345	75	109
\$10,557,252	1,770	275	36	93
\$214,597,139	693	5,247	751	1,997
\$21,962,467	1,404	577	101	217
\$78,261,726	1,052	1,822	305	617
\$6,441,156	1,757	170	19	56
\$26,125,628	1,999	572	53	265
\$10,728,495	1,195	344	64	117
\$12,108,111	1,693	411	72	151
\$6,512,375	1,595	183	31	67
\$74,741,890	1,119	1,992	273	764
\$82,184,712	1,685	2,149	246	883
\$5,863,929	1,644	171	21	62
\$32,017,118	1,459	814	109	322
\$6,175,088	1,468	200	27	75
\$7,996,563	1,860	247	27	88

Table 3. Cardiovascular Disease Deaths, Age-Adjusted Mortality Rates, and Hospitalizations by County, Georgia 2002-2006

County	Deaths					
	CVD Deaths 2006	CVD Annual AAMR 2002-2006	Stroke Deaths 2006	Stroke Annual AAMR 2002-2006	IHD Deaths 2006	IHD Annual AAMR 2002-2006
Jefferson County	80	412	15	79	22	144
Jenkins County	22	337	4	59	12	167
Johnson County	42	399	9	68	11	118
Jones County	64	321	12	83	21	123
Lamar County	63	392	8	65	23	149
Lanier County	18	352	2	62	3	96
Laurens County	175	405	34	76	80	213
Lee County	48	306	9	63	26	124
Liberty County	97	357	13	54	26	128
Lincoln County	39	422	4	61	16	191
Long County	12	320	0	61	4	123
Lowndes County	261	352	57	76	89	119
Lumpkin County	66	302	10	40	32	158
Macon County	74	400	13	79	22	146
Madison County	35	332	6	69	9	97
Marion County	64	405	22	85	28	199
McDuffie County	74	347	12	49	25	164
McIntosh County	20	456	2	76	5	183
Meriwether County	111	497	19	75	61	305
Miller County	22	306	5	38	2	100
Mitchell County	83	395	15	69	36	167
Monroe County	82	413	13	61	39	225
Montgomery County	31	424	5	82	9	88
Morgan County	72	356	4	43	46	214
Murray County	81	328	15	69	30	136
Muscogee County	654	385	101	62	284	174
Newton County	207	311	40	59	77	138
Oconee County	45	302	5	53	21	136
Oglethorpe County	40	377	12	83	14	142
Paulding County	161	333	29	69	45	116
Peach County	67	338	13	63	26	135
Pickens County	119	379	11	40	32	80
Pierce County	74	371	13	66	27	138
Pike County	45	325	9	60	23	167
Polk County	169	432	24	58	75	201
Pulaski County	53	446	12	113	25	215
Putnam County	62	325	8	42	27	143
Quitman County	7	267	0	39	4	129
Rabun County	47	258	10	41	20	113
Randolph County	46	480	10	97	8	115

Hospitalizations

CVD Total Charges 2006	CVD Rate 2006	Total CVD 2006	Stroke 2006	IHD 2006
\$11,103,915	1,920	322	48	88
\$4,686,392	1,662	145	24	48
\$6,904,059	1,797	173	18	69
\$26,990,744	1,846	498	44	234
\$12,381,695	1,745	291	48	90
\$3,134,181	1,761	136	11	44
\$41,723,267	2,173	1,028	123	413
\$9,875,111	809	263	37	86
\$16,715,811	614	384	69	117
\$7,668,784	1,986	164	23	69
\$4,009,932	786	90	17	25
\$35,218,722	1,236	1,209	187	383
\$11,379,713	1,383	352	52	123
\$9,897,562	2,352	325	48	93
\$19,762,086	1,710	476	79	198
\$2,950,494	1,374	100	20	29
\$14,423,702	1,775	389	51	133
\$4,840,242	1,369	154	17	44
\$12,306,869	1,788	409	61	126
\$2,280,811	1,603	100	17	16
\$10,591,921	1,296	309	44	103
\$17,682,770	1,612	394	63	147
\$4,064,438	1,566	142	15	45
\$10,326,163	1,558	279	33	114
\$13,791,370	1,089	451	58	137
\$87,304,099	1,316	2,483	424	729
\$35,766,799	1,281	1,171	165	361
\$13,112,123	1,037	320	52	109
\$9,397,715	1,622	227	35	84
\$57,050,967	1,121	1,362	157	604
\$21,879,867	2,090	518	60	195
\$18,900,361	1,673	496	66	196
\$6,469,407	1,519	265	38	91
\$10,925,161	1,494	251	54	90
\$40,233,485	2,100	863	106	390
\$9,626,668	2,357	233	30	98
\$16,451,849	2,072	413	63	167
\$265,327	362	9	1	5
\$9,962,415	1,535	251	42	85
\$2,628,056	1,346	99	10	21

Table 3. Cardiovascular Disease Deaths, Age-Adjusted Mortality Rates, and Hospitalizations by County, Georgia 2002-2006

County	Deaths					
	CVD Deaths 2006	CVD Annual AAMR 2002-2006	Stroke Deaths 2006	Stroke Annual AAMR 2002-2006	IHD Deaths 2006	IHD Annual AAMR 2002-2006
Richmond County	540	344	94	59	180	136
Rockdale County	165	310	39	58	59	125
Schley County	13	423	0	61	6	211
Screven County	72	418	25	124	24	134
Seminole County	34	344	9	78	12	130
Spalding County	211	385	39	71	99	172
Stephens County	100	341	18	71	27	98
Stewart County	37	379	6	63	10	158
Sumter County	107	359	13	80	48	164
Talbot County	26	408	8	61	8	147
Taliaferro County	8	321	0	55	3	77
Tattnall County	73	381	16	90	25	159
Taylor County	43	368	18	93	12	150
Telfair County	65	505	9	98	18	201
Terrell County	35	426	4	88	13	132
Thomas County	158	325	37	69	50	111
Tift County	111	317	19	60	58	154
Toombs County	89	387	16	80	37	108
Towns County	36	234	8	48	15	84
Treutlen County	30	446	6	67	11	112
Troup County	209	399	30	70	101	150
Turner County	41	425	3	63	15	184
Twiggs County	42	441	2	64	19	203
Union County	72	239	13	45	32	95
Upton County	134	476	35	128	51	172
Walker County	228	380	31	59	90	197
Walton County	216	359	35	61	101	186
Ware County	155	372	20	63	68	155
Warren County	23	345	4	63	5	86
Washington County	83	388	10	62	28	124
Wayne County	94	391	9	78	40	182
Webster County	8	294	0	49	3	142
Wheeler County	18	308	2	46	2	101
White County	75	311	14	49	25	133
Whitfield County	214	318	42	62	86	129
Wilcox County	30	397	1	60	9	175
Wilkes County	43	351	8	68	18	149
Wilkinson County	37	367	6	74	16	145
Worth County	82	371	10	50	48	189

\* Rates based on <5 events are not shown.  
 AAMR = Age-adjusted mortality rate per 100,000 population  
 CVD = Cardiovascular disease  
 IHD = Ischemic heart disease  
 Rate = Crude rate per 100,000 population

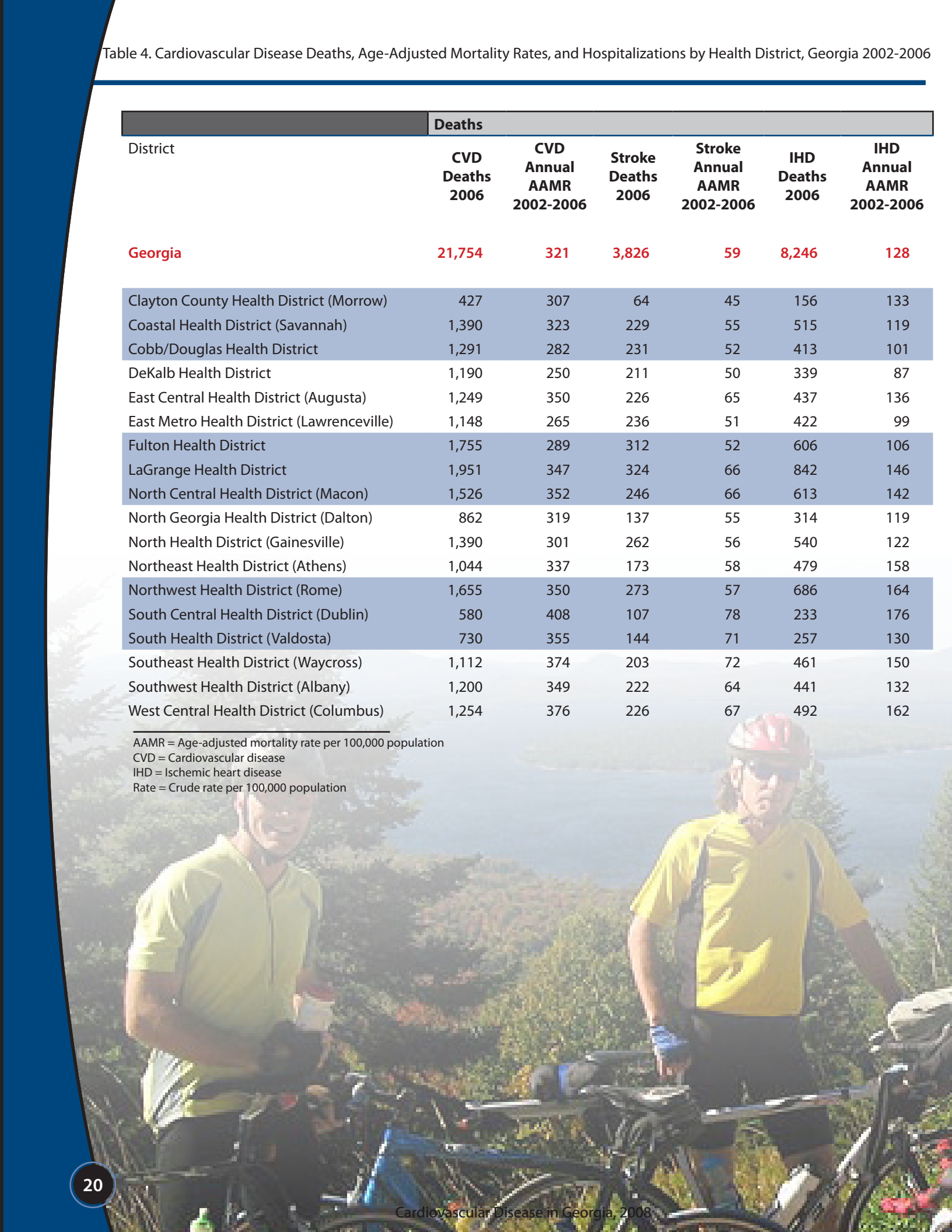
Hospitalizations

CVD Total Charges 2006	CVD Rate 2006	Total CVD 2006	Stroke 2006	IHD 2006
\$114,122,443	1,299	2,526	389	786
\$36,195,733	1,271	1,021	174	326
\$1,935,037	1,477	62	10	31
\$10,274,664	1,857	282	52	83
\$1,856,541	927	85	18	11
\$50,500,312	1,827	1,136	190	399
\$16,095,252	2,044	514	74	167
\$2,314,812	1,809	86	13	12
\$14,258,279	1,305	424	63	111
\$4,069,432	1,968	130	26	37
\$1,170,762	1,971	37	4	10
\$14,517,438	1,733	407	57	124
\$6,610,905	2,104	185	43	66
\$12,400,794	2,600	345	41	132
\$4,895,283	1,417	151	24	37
\$16,431,772	1,586	716	121	202
\$18,162,334	1,358	566	81	185
\$13,459,374	1,615	446	52	179
\$6,875,830	1,900	200	29	71
\$5,482,085	1,985	136	18	67
\$34,643,510	1,958	1,238	185	443
\$5,942,084	1,674	156	11	72
\$9,354,983	2,229	227	29	85
\$12,612,376	1,869	386	48	147
\$22,765,406	2,468	683	132	247
\$11,470,253	772	499	50	157
\$44,830,496	1,587	1,260	170	447
\$16,370,653	1,933	691	94	197
\$5,169,567	2,303	137	27	32
\$12,951,852	1,757	364	60	136
\$15,973,765	1,917	554	77	206
\$559,633	622	14	2	5
\$5,003,590	2,229	154	15	61
\$16,033,612	1,516	375	58	141
\$27,594,429	1,037	964	164	239
\$6,376,167	2,181	190	28	81
\$9,228,903	2,417	253	40	76
\$9,965,863	2,151	215	26	90
\$12,247,202	1,550	340	63	109

Table 4. Cardiovascular Disease Deaths, Age-Adjusted Mortality Rates, and Hospitalizations by Health District, Georgia 2002-2006

District	Deaths					
	CVD Deaths 2006	CVD Annual AAMR 2002-2006	Stroke Deaths 2006	Stroke Annual AAMR 2002-2006	IHD Deaths 2006	IHD Annual AAMR 2002-2006
<b>Georgia</b>	<b>21,754</b>	<b>321</b>	<b>3,826</b>	<b>59</b>	<b>8,246</b>	<b>128</b>
Clayton County Health District (Morrow)	427	307	64	45	156	133
Coastal Health District (Savannah)	1,390	323	229	55	515	119
Cobb/Douglas Health District	1,291	282	231	52	413	101
DeKalb Health District	1,190	250	211	50	339	87
East Central Health District (Augusta)	1,249	350	226	65	437	136
East Metro Health District (Lawrenceville)	1,148	265	236	51	422	99
Fulton Health District	1,755	289	312	52	606	106
LaGrange Health District	1,951	347	324	66	842	146
North Central Health District (Macon)	1,526	352	246	66	613	142
North Georgia Health District (Dalton)	862	319	137	55	314	119
North Health District (Gainesville)	1,390	301	262	56	540	122
Northeast Health District (Athens)	1,044	337	173	58	479	158
Northwest Health District (Rome)	1,655	350	273	57	686	164
South Central Health District (Dublin)	580	408	107	78	233	176
South Health District (Valdosta)	730	355	144	71	257	130
Southeast Health District (Waycross)	1,112	374	203	72	461	150
Southwest Health District (Albany)	1,200	349	222	64	441	132
West Central Health District (Columbus)	1,254	376	226	67	492	162

AAMR = Age-adjusted mortality rate per 100,000 population  
 CVD = Cardiovascular disease  
 IHD = Ischemic heart disease  
 Rate = Crude rate per 100,000 population



## Hospitalizations

CVD Total Charges 2006	CVD Rate 2006	Total CVD 2006	Stroke 2006	IHD 2006
<b>\$4,419,295,483</b>	<b>1,220</b>	<b>114,208</b>	<b>16,671</b>	<b>39,492</b>
\$103,961,380	922	2,500	396	729
\$216,241,681	1,098	5,752	973	1,527
\$345,014,505	998	7,975	1,174	3,070
\$250,554,539	894	6,468	1,039	1,760
\$262,238,668	1,440	6,317	963	2,023
\$286,559,671	801	7,439	1,090	2,684
\$377,935,465	925	8,875	1,360	2,444
\$399,009,899	1,397	10,502	1,583	3,946
\$396,881,255	1,869	9,363	1,229	3,595
\$185,092,651	1,184	4,852	633	1,836
\$281,915,831	1,265	7,228	1,093	2,623
\$217,205,467	1,313	5,759	836	2,075
\$391,212,180	1,475	8,831	971	3,926
\$119,254,819	2,180	3,133	381	1,279
\$112,368,936	1,545	3,684	508	1,229
\$166,510,907	1,647	5,630	773	1,905
\$141,671,152	1,328	4,849	824	1,316
\$165,666,477	1,409	5,051	845	1,525



Some CVD risk factors are modifiable, meaning that individuals can change their behavior to prevent, slow, or even reverse, the process of arterial blockage and decrease their risk of having a heart attack or stroke. Modifiable risk factors among adults include smoking, high blood pressure, high blood cholesterol level, obesity, inadequate physical activity, poor diet, and diabetes (Figure 11). Risk factors for CVD are not exclusive to adults; many youth in Georgia adopt unhealthy habits early in life, which contribute to the risk of heart disease (Figure 12).

Some CVD risk factors cannot be changed, such as old age, male sex, and family history of heart attacks at a young age. Individuals with non-modifiable risk factors should be particularly diligent in eliminating modifiable risk factors.

### Smoking

The percentage of Georgians who currently smoke declined from 31% in 1984 to 19% in 1992; since then, the percentage of adults who smoke has remained constant. In 2007, 19% of Georgia adults reported that they currently smoke cigarettes (Figure 13), while in 2006, 20% reported currently smoking (Figure 11).

Lowering smoking rates is a public health priority. In addition to its well-known association with cancer, smoking is a major CVD risk factor. Each year in Georgia, smoking causes 3,289 CVD deaths (7). The good news is that giving up smoking reduces the risk of developing CVD (8). It is also important to prevent people, especially young people, from starting to smoke. Eighty percent of tobacco-users begin before their eighteenth birthday, suggesting that if adolescents are kept tobacco-free, most may never start smoking (9). In 2007, 19% of Georgia high school students were current smokers, the same as the rate in adults (Figure 12).

As of July 1<sup>st</sup>, 2005, a Georgia law bans smoking in workplaces and public establishments, with a few exceptions that mainly include bars and restaurants that do not admit people under 18. Violators may be fined \$100 to \$500 under the new law. These new

restrictions will reduce exposure to secondhand smoke. Forty-eight of 181 Georgia school districts have adopted a 100% tobacco-free policy. These districts include 1,143 schools and 882,629 students.

### High Blood Pressure

High blood pressure is a major risk factor for both heart disease and stroke. The percentage of Georgians who reported being told that they had high blood pressure was 30% in 2007 (Figure 11). The percentage of Georgians with previous high blood pressure whose blood pressure is under control is not known. Nationally, about 69% of people with high blood pressure know they have it, and about 58% of them are being treated with medication (10). Some people can control their high blood pressure by losing weight and engaging in regular physical activity. For those who are unable to decrease their blood pressure by lifestyle modification alone, medications prescribed by a physician can often control high blood pressure.

### High Cholesterol

When there is too much cholesterol in the blood, the excess can become trapped in the arterial walls, gradually narrowing the arteries and increasing the risk of heart attack or stroke. Cholesterol is transported to and from cells by lipoproteins. Low-density lipoprotein (LDL), the “bad cholesterol,” clogs the arteries; a high level of LDL increases the risk for heart disease. High-density lipoprotein (HDL), the “good cholesterol,” removes cholesterol from the arteries; a high level of HDL decreases the risk for heart disease. A high total cholesterol level increases the risk for heart disease. Lowering high total blood cholesterol levels can decrease the likelihood of death from heart disease (11).

The percentage of Georgian adults who reported ever having had their blood cholesterol level checked increased from 53% in 1987 to 82% in 2007. Of those checked, the percentage told that they had high cholesterol increased from 15% in 1987 to 37% in 2007 (Figure 11). It is not known if this increase represents a true increase in

cholesterol levels among Georgians or if improved screening is finding more Georgians who have high cholesterol but were not aware of it.

Many people can control their cholesterol level by modifying their diet. For those who cannot, medication can lower blood cholesterol levels. In adults, a total cholesterol level of 200 mg/dL or higher is considered high risk; LDL levels >130 mg/dL or HDL levels <40mg/dL are also considered high risk (10). The National Institutes of Health recommend that all adults get a fasting lipoprotein profile (total cholesterol, LCD cholesterol, HDL cholesterol, triglycerides) every 5 years (11).

### Physical Inactivity, Obesity and Diet

Regular, moderate, or vigorous physical activity can reduce the risk of CVD (10). CDC recommendations are 30 minutes, 5 days a week of moderate physical activity, or 20 minutes, 3 days a week of vigorous physical activity. Approximately 55% of Georgia adults and 56% of Georgia high school students do not meet the Center for Disease Control's recommended level of physical activity (Figure 12).

Obese adults are at an increased risk for CVD (13). In both Georgia and the US, there has been a steady increase in the percentage of obese adults (body mass index greater than 30; see appendix for details). In 2007, 29% of Georgia adults and 14% of Georgia high school students were obese (Figure 12).

Losing weight and being physically active on a regular basis can improve blood pressure and cholesterol levels, and can decrease the chance of developing diabetes, another risk factor for heart disease (13).

Eating five or more servings of fruits or vegetables per day can help to prevent heart disease, cancer, and other chronic conditions. In 2007, 75% of Georgia adults and 81% of Georgia high school students reported eating fewer than 5 daily servings of fruits and vegetables (Figure 12).

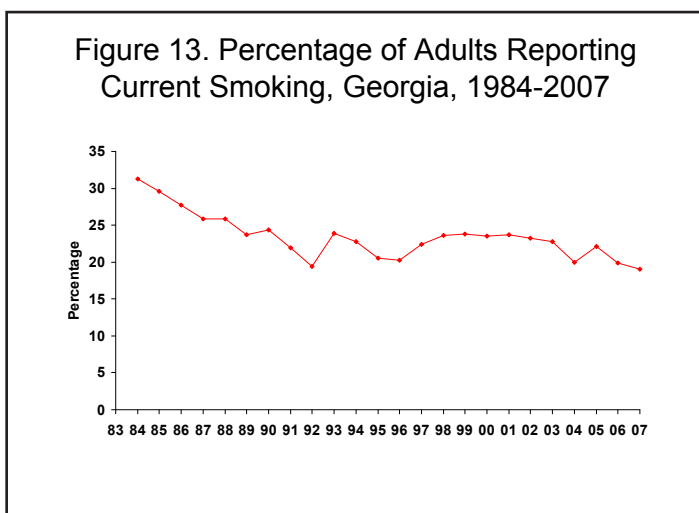
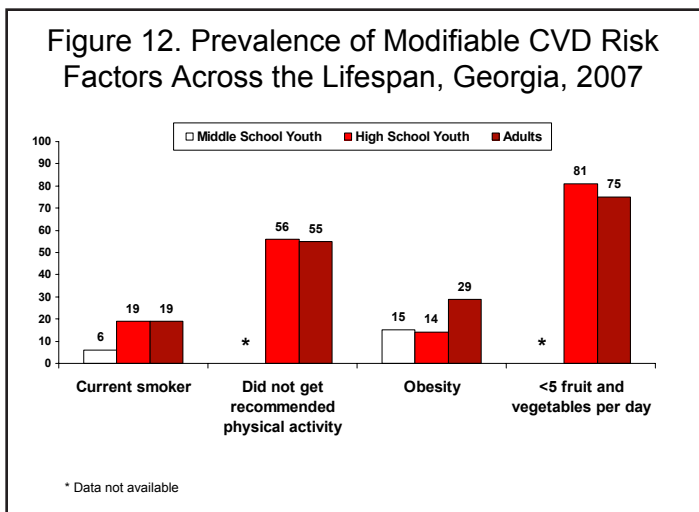
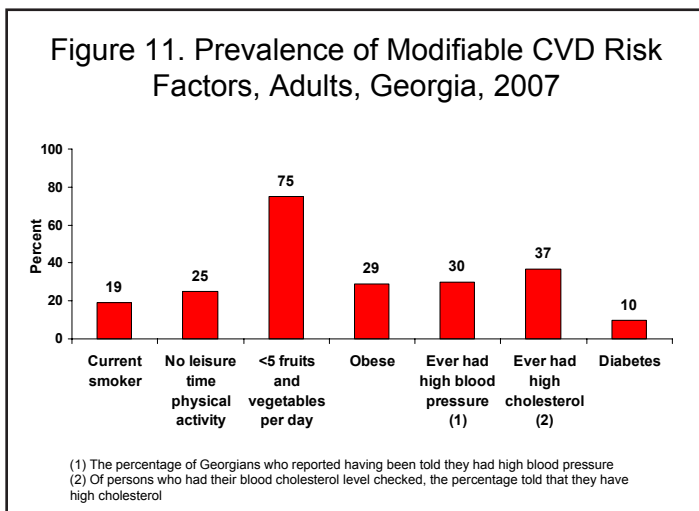


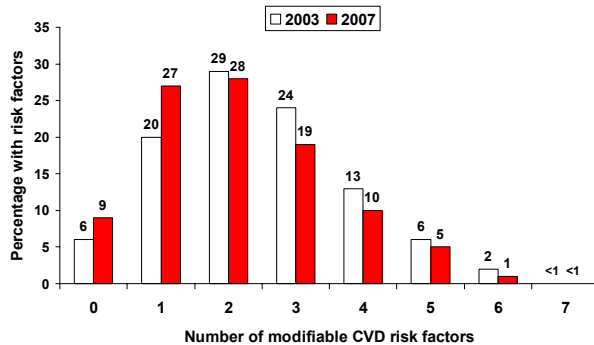
Table 5. Estimated Number of Georgians with Modifiable CVD Risk Factors, 2007

Number of Risk Factors	Adults	
	#	%
0	868,572	9%
1	2,605,717	27%
2	2,691,620	28%
3	1,775,324	19%
4	954,475	10%
5	496,327	5%
6	133,627	1%
7	28,634	<1%

## Diabetes

Persons with diabetes have two to three times the risk of death from cardiovascular disease as persons without diabetes (14). The adult prevalence of diabetes has increased nationwide during the past decade (15). Among children, prevalence of diabetes has increased, most likely because of an increase in type 2 diabetes, which is associated with obesity (16). In Georgia, the prevalence of diabetes among adults increased from 4% in 1993 to 10% in 2007 (Figure 11); youth data are not available. Maintaining healthy body weight and staying physically active can prevent type 2 diabetes. Persons with diabetes can prevent complications by keeping their blood sugar normal, refraining from smoking, eating a healthy diet, getting regular physical activity, and maintaining normal blood pressure.

Figure 14. Number of Modifiable CVD Risk Factors, Adults, Georgia, 2003 and 2007



## Multiple Risk Factors

Since risk factors work in combination to increase risk, it is important to consider multiple risk factors. Of the seven major modifiable risk factors, 64% of Georgia adults have at least two. Seven percent of Georgians have 5 or more risk factors. Only 9% of Georgia adults live with no major behavior-related CVD risk factors (Table 5). The percentage of Georgians living with one modifiable risk factor has increased by 7% from 2003 to 2007 (Figure 14).

Table 6. Percent Advised to Modify Behavior, by CVD Risk Factor, Adults, Georgia, 2005 and 2007

Risk Group	Desired Behavior Modification	%
Obese adults	Advised by health professional to lose weight	93%
Adults reporting ever had high blood pressure	Advised by health professional to change eating habits	66%
	Advised by health professional to cut down on salt	67%
	Advised by health professional to reduce alcohol use	38%
	Advised by health professional to exercise	79%
	Advised by health professional to take medication	88%

High-risk populations can benefit especially from behavior modification to reduce CVD risk factors. In Georgia, the majority of obese adults reported being advised by a health professional to lose weight (Table 6). Adults with high blood pressure frequently reported receiving counseling on changing eating habits, reducing salt intake, exercising, and taking medication. In addition to facilitating a personalized risk assessment, a medical professional can also provide counseling or direct individuals to resources to help with the modification of risk factors.

## Secondary Prevention of CVD

Secondary prevention involves efforts to reduce further risk among those individuals who have already experienced a CVD event. In 2007, approximately 9% of Georgia adults reported having had a previous heart attack, IHD, or a stroke (Figure 15). Although these persons cannot change the past, they can take steps to prevent recurrences. For individuals with previous CVD events, the risk for another event is substantial (17).

There is a strong association between modifiable risk factors and history of CVD event. For example, in 2007, 33% of persons reporting 7 modifiable risk factors had a history of CVD, whereas only 2% of persons with no modifiable risk factors had a history of CVD (Figure 16). In 2006, 33% of Georgians were not able to identify a modifiable CVD risk factor, indicating that further education is needed to prevent CVD (Figure 17).

In 2007, 27% of Georgia adults reporting past heart attack and 37% of those reporting past stroke said they used rehabilitation after their heart attack or stroke. According to the American Heart Association, cardiac rehabilitation refers to coordinated, multifaceted interventions designed to optimize a cardiac patient's physical, psychological, and social functioning, in addition to stabilizing, slowing, or even reversing the progression of the underlying atherosclerosis processes, thereby reducing morbidity and mortality. These comprehensive and long-term programs often involve baseline patient assessment, nutritional counseling, aggressive risk factor management, counseling, and exercise training. Exercise-based cardiac rehabilitation is associated with lower total and cardiac mortality rates when compared to usual medical care (18).

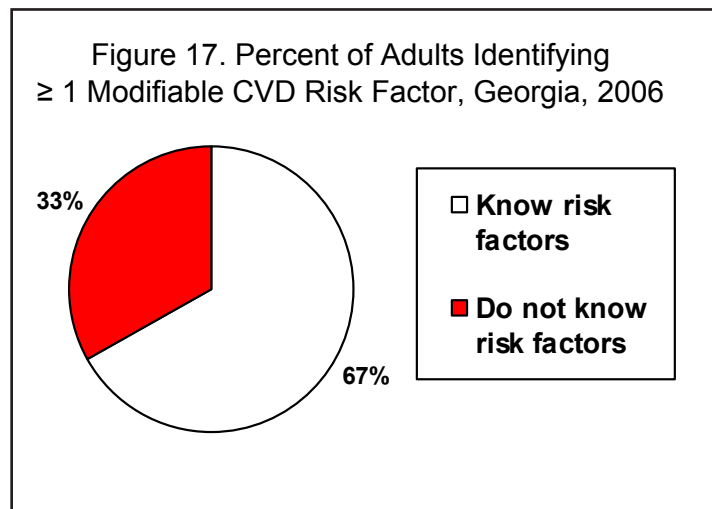
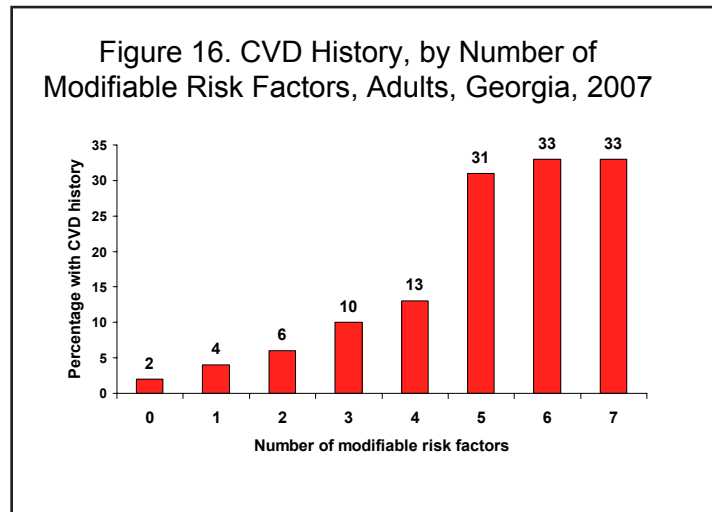
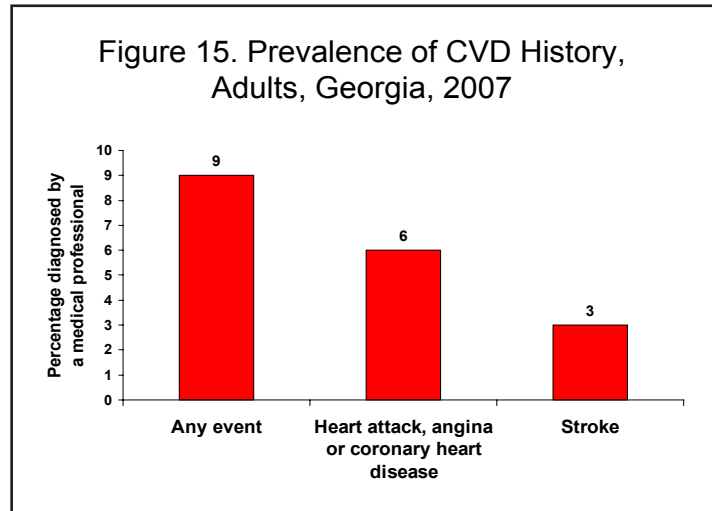


Figure 18. Percent of Adults Identifying  $\geq 1$  Stroke Sign, Georgia, 2006

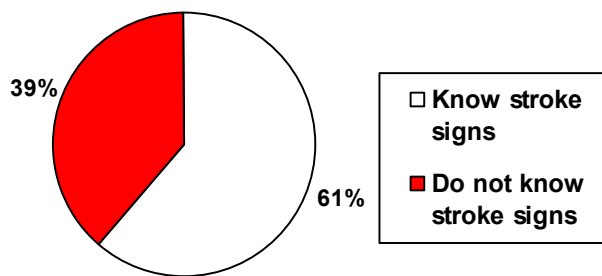


Figure 19. Percent of Adults Identifying  $\geq 1$  Heart Attack Sign, Georgia, 2006

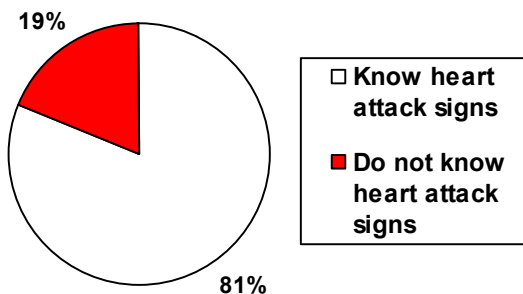


Figure 20. Percent of Adults Able to Recognize a Stroke and Call 911, Georgia, 2006

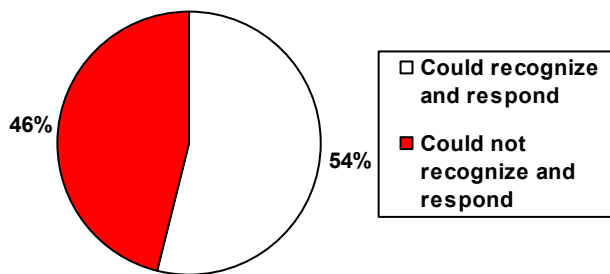
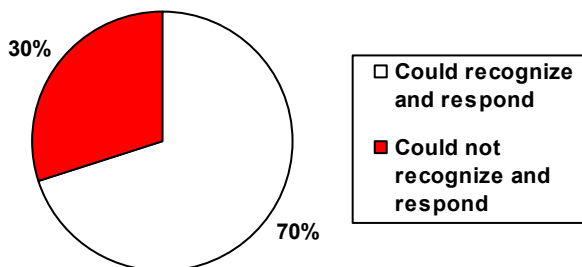


Figure 21. Percent of Adults Able to Recognize a Heart Attack and Call 911, Georgia, 2006



The American Heart Association recommends consideration, under medical supervision, of the use of aspirin for persons who have had a heart attack, unstable angina, ischemic stroke or transient ischemic attack (19). For certain types of heart conditions, other medications may be beneficial to reduce the risk of recurrence.

Early recognition of CVD events can expedite treatment and reduce complications and severity. In 2006, the majority of Georgia adults were able to correctly identify at least one major symptom of heart attack or stroke (Figures 20 and 21). However, nearly half of Georgians would not be able to recognize a stroke and call 911 (Figure 20). For ischemic stroke, which accounts for more than 80% of all strokes, medical treatment is needed within 3 hours for the best survival and recovery outcomes (20). Thirty percent of Georgians would not be able to recognize a heart attack and call 911 (Figure 21). The CDC estimates that 60% of cardiac deaths occur either before reaching a hospital or in the emergency room (21).

The Georgia Coverdell Acute Stroke Registry (GCASR) was established in 2005 to improve the care of acute stroke patients in hospital settings. This program addresses quality improvement in multiple areas of stroke care, from rapid screening, diagnosis, and intervention for patients experiencing an acute stroke, to secondary prevention measures such as blood pressure control, smoking cessation, and treatment of elevated cholesterol in order to reduce the incidence of recurrent stroke after hospital discharge. In addition, the program will help to improve use of rehabilitation services for those who have experienced an acute stroke, in the hopes of reducing long-term disability. The GCASR falls under a larger program within the Georgia Department of Community Health, Division of Public Health, Cardiovascular Health Initiative, whose goal is to address the many facets of prevention of cardiovascular disease.

## Conclusions

This report summarizes the most recent information available on cardiovascular disease deaths and hospitalizations in Georgia. The burden of cardiovascular disease in Georgia is immense. CVD is the leading cause of death in Georgia, resulting in over 143,800 hospitalizations and charges of \$4.4 billion in 2006. Annual CVD medical charges have increased over time and will likely continue to increase with rising healthcare costs, advances in medical care, an aging population, and escalating prevalences of obesity and diabetes.

The burden of CVD is greater among certain populations. Blacks have higher rates of CVD than whites, especially for stroke. Furthermore, men have higher rates of CVD than women.

The practical implications of these findings are clear. Because most heart attacks and strokes result from a process of arterial blockage that begins at an early age, a greater effort should be made to reduce the prevalence of risk factors among all Georgians, including children and adolescents. Reducing CVD risk factors involves not smoking, controlling high blood pressure, reducing blood cholesterol, engaging in regular physical activity, eating a healthy diet, maintaining a healthy weight, and preventing diabetes.

Changing health behaviors can be difficult and complicated. It may require individual behavior change as well as interpersonal, societal, policy, and environmental change (22). People may find it impossible to improve their health, highly motivated or not, if they do not have access to healthy food, a safe place to exercise, or health care. Some examples of support for healthy behavior at the interpersonal, societal, policy, and environmental levels are:

- Community leaders and parents acting as role models
- Faith-based centers establishing wellness programs
- Workplaces having gyms for employees to use
- Systems change and adherence to best practices and guidelines at doctor's offices and health centers
- Making communities more pedestrian-friendly
- Replacing soda with water in school vending machines
- Labeling restaurant menus with calorie and nutrient content of foods

Evidence supporting policy and environmental interventions is growing. The CDC recommends use of such programs to reduce certain CVD risk factors, including obesity (23), physical inactivity (24) and tobacco use (25).

Much of the death and disability from CVD in Georgia is preventable if we focus attention on realistic ways of reducing risk. Georgians can work together to reduce the number of individuals who suffer and/or die prematurely from cardiovascular disease by advocating for healthier communities and following treatment recommendations.

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## Appendix: Methods

Age-adjusted mortality rates for the US from 1980 through 1998 and for Georgia from 1980 through 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 through 2006 were obtained from OASIS at <http://oasis.state.ga.us>. The following ICD-9 codes were used: CVD, 390-434, 436-448; IHD, 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 US from 1999 through 2005 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 through 2006 were obtained from OASIS at <http://oasis.state.ga.us>. The following ICD-10 codes were used for CVD: CVD, I00-78; IHD, I20-25; stroke, I60-69; heart failure, I50; other CVD, CVD codes not already categorized. ICD-10 codes for stroke included subarachnoid hemorrhage, I60; other cerebral hemorrhage, I61-62; 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. Age-adjusted death rates for the US in 2006 were obtained from the National Vital Statistics Report, Vol 56, No. 10, April 24, 2008.

Data on hospitalizations at acute care hospitals in Georgia were provided by the Office of Health Indicators for Planning 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; IHD, 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 the Vital Records Section and the Office of Health Indicators for Planning. The number of deaths for 1999 through 2006 was determined using the ICD-10 codes above (CVD, I00-78; IHD, I20-25; stroke, I60-69). Age-adjusted mortality rates were calculated using county population estimates from the US 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 obtained from the 2003, 2005, and 2007 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. CVD risk factors assessed by the BRFSS include the following:

*Current smoker:* Defined as someone who has smoked at least 100 cigarettes 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]  $\geq 30.0$  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

Prevalence data on CVD risk factors among high school students were obtained from the 2007 Georgia Youth Risk Behavior Survey (YRBS) conducted by the Georgia Department of Human Resources, Division of Public Health, in collaboration with the Georgia Department of Education. The questionnaire was modeled after the core Youth Risk Behavior Survey, developed by the Centers for Disease Control and Prevention. Each student record is weighted so that it reflects the likelihood of sampling each student. CVD risk factors assessed by the GSHS are defined according to the above BRFSS terms, except:

*Current Smoker:* Defined as smoking cigarettes on one or more of the past 30 days

*Obese:* Body mass index for age and sex  $\geq 95^{\text{th}}$  percentile, based on self-reported height and weight

### 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, 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

*HDL (high-density lipoprotein):* carries cholesterol away from other parts of the body back to the liver for removal from the body

## Appendix: Glossary and Abbreviations

*Heart attack (also known as myocardial infarction):* death or damage to the heart muscle caused by an insufficient supply of oxygen due to blockage of one or more coronary arteries

*Heart failure:* condition in which the heart cannot pump enough blood to meet the body's needs

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

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

*LDL (low-density lipoprotein):* contains most of the cholesterol in the blood and carries it to tissues and organs via arteries; it is the main source of damaging buildup and blockage in the arteries

*Modifiable Risk Factor:* a risk factor that can be changed in order to slow, or reverse, the process of arterial blockage and decrease the risk of heart and stroke

*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

*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 nerve cells

### Abbreviations

AAMR = Age-adjusted mortality rate

BMI = Body mass index

CDC = Centers for Disease Control and Prevention

CHF = Congestive heart failure

CVD = Cardiovascular disease

HDL = High-density lipoprotein

IHD = Ischemic heart disease

ICD-9 = The International Classification of Diseases, 9th Revision

ICD-9-CM= The International Classification of Diseases, 9th Revision, Clinical Modification

ICD-10 = The International Classification of Diseases, 10th Revision

LDL = Low-density lipoprotein

