

Heart Disease and Stroke in Iowa

Burden Report 2009



Iowa Department of Public Health

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Executive Summary

Despite decades of declining death rates, heart disease and stroke remain the first and third leading causes of death for men and women both in Iowa and the United States. They are also major causes of hospitalization and disability.

In 2007, of the 27,126 total deaths in Iowa, 9,200 deaths (33.9%) were due to major cardiovascular disease. Of those, 6,843 deaths were attributed to heart disease and 1,680 from stroke, which accounts for 31.4 percent of the total deaths.

According to the Behavioral Risk Factor Surveillance System (BRFSS) in 2007, approximately 90,000 Iowans had a heart attack or coronary heart disease and over 60,000 have had a stroke.

During 2007, there were over 40,000 hospitalizations for heart disease and 8,500 for stroke, which accounted for nearly 1.3 billion dollars in associated charges.

Deaths and disability from heart disease and stroke are influenced by modifiable risk factors such as cigarette smoking, physical inactivity, poor nutrition, high blood pressure, and high cholesterol, and related conditions such as diabetes, overweight, and obesity.

Many of these risk factors were highly prevalent among adults ages 18 and older. Of Iowa's residents in 2007:

- 20% were current cigarette smokers;
- 52% lacked recommended physical activity;
- 80% ate less than five servings of fruits and vegetables per day;
- 27% had high blood pressure;
- 38% had high blood cholesterol;
- 65% were overweight or obese; and
- 7% had diabetes.

These risk factors are controllable. Reduction in these risk factors could reduce much of the burden and disability caused by heart disease and stroke.

There are documented disparities in heart disease and stroke in Iowa. Heart disease and stroke death and hospitalization rates were higher for males than females. The gender difference between instances of heart disease was greater than the gender gap in reported stroke diagnoses.

Iowa's African American population had higher heart disease and stroke death rates than did Iowa's white population.

People with low socioeconomic status reported a higher prevalence of heart disease and stroke than those with a high socioeconomic status.

Heart disease and stroke prevalence, hospitalizations, and deaths are much more common in older Iowans, especially for people aged 65 and over. Therefore, being of age 65 years and older

could be a risk factor for heart disease and stroke. The aging population of Iowa is growing rapidly. With increased numbers of aging persons in Iowa, an increase in the incidence of heart disease and stroke should be expected.

Geographically, high heart disease and stroke death rates were found in all parts of Iowa except in the northeast. Most of Iowa's counties are rural and their residents live 10 to 70 miles from emergency medical care or a health care facility.

The purpose of this report is to document the burden of heart disease and stroke in Iowa based on several available data sources. This report presents trends as well as current mortality rates, hospitalizations, and prevalence of risk factors for heart disease and stroke in Iowa. The Heart Disease and Stroke Prevention (HDSP) Program at the Iowa Department of Public Health provides this report to inform public health and health care professionals, advocacy and community organizations, policy makers, and the general public of the significant impact of heart disease and stroke in this state.

Background

Heart disease is a term that refers to several diseases of the heart and circulatory system including coronary heart disease, myocardial infarction, congestive heart failure, and other conditions. Coronary heart disease is the most common type of heart disease. It occurs when the coronary arteries, which supply blood to the heart muscle, become hardened and narrowed due to plaque buildup called atherosclerosis. Plaques are a mixture of fatty substances including cholesterol and other lipids. Blood flow and oxygen supply to the heart can be reduced or even fully blocked with accumulating plaque. Coronary heart disease includes acute myocardial infarction (MI or heart attack) and angina (chest pain).

Congestive heart failure is a common type of heart disease. It is caused by impairment in the pumping function of the heart from heart disease. “Congestive” means fluid is building up in the body because of the heart isn’t pumping properly. The term “heart failure” simply means that your heart isn’t pumping blood as well as it should. Heart failure does not mean your heart has stopped or that you are having a heart attack. People who have heart failure often have had a heart attack in the past.

Stroke, or cerebrovascular disease, generally refers to the interruption of blood supply to the brain due to either an obstruction or rupture of a blood vessel. There are two primary types of stroke: ischemic and hemorrhagic. Ischemic stroke is the most common stroke. Ischemic stroke occurs as a result of an obstruction within a blood vessel supplying blood to the brain. The underlying condition for this type of obstruction is the development of fatty deposits lining the vessel walls, a condition called atherosclerosis. These fatty deposits often make it difficult for blood to flow properly, which can cause the blood to clot. There are two major types of clots: 1) a clot that stays in place in the brain called a cerebral thrombus and 2) a clot that breaks loose and moves through the blood to the brain called a cerebral embolism.

A hemorrhagic stroke occurs when an artery in the brain bursts. A hemorrhage can occur in several ways. One cause is an aneurysm, a weak or thin spot on an artery wall that can expand like a balloon. The thin walls of the stretched artery easily rupture or break allowing a hemorrhage. A hemorrhage may also occur when arterial walls lose their elasticity and become brittle and thin. They may then crack and bleed. This can happen with atherosclerosis (a type of arteriosclerosis). High blood pressure increases the risk of hemorrhagic stroke.

There are two types of hemorrhagic stroke: intracerebral hemorrhage and subarachnoid hemorrhage. An intracerebral hemorrhage occurs when a blood vessel in the brain leaks blood into the brain itself. A subarachnoid hemorrhage is bleeding under the outer membranes of the brain and into the thin, fluid-filled space that surrounds the brain.

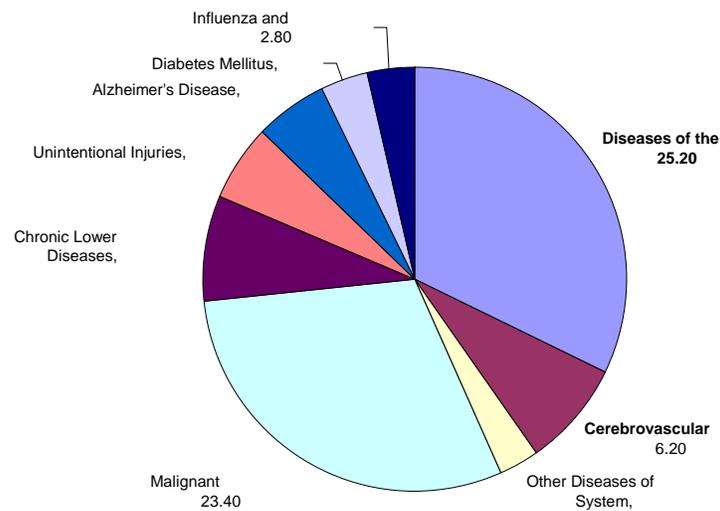
A transient ischemic attack (also called TIA) is often referred to as a “minor” or “warning stroke.” In a TIA, conditions indicative of an ischemic stroke are present and stroke warning signs develop. Blood clotting occurs for a short time and tends to resolve itself through normal mechanisms. When symptoms begin, there is no way to tell whether a TIA or an ischemic stroke will occur. The sudden onset of the symptoms of a stroke signals an emergency. Anyone experiencing symptoms should seek medical attention.

Heart Disease

Mortality

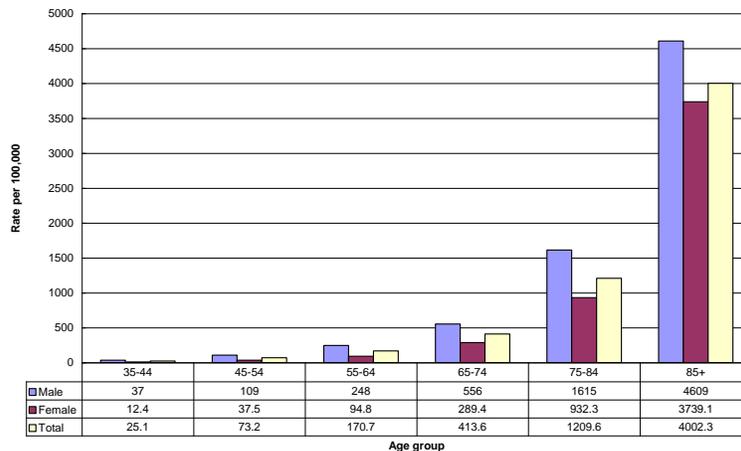
Despite decades of declining death rates, heart disease remains the leading cause of death in Iowa and the United States. In 2007, the total number of heart disease deaths was 6,843, comprising 25.2% of all deaths in Iowa.

Figure 1. Leading Causes of Death in Iowa 2007



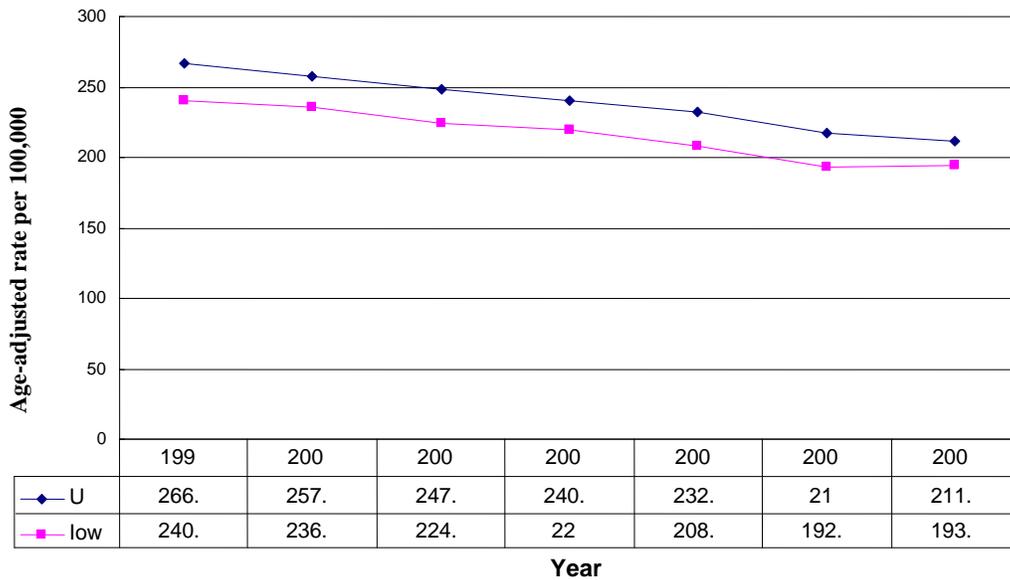
Mortality is much more common in older ages. Figure 2 shows that heart disease death rates increase rapidly as age increases, particularly above the age of 65 years. Figure 2 also shows that heart disease death rates were higher in men than in women in most age groups.

Figure 2. Heart Disease Death Rates by Age and Gender in Iowa, 2007



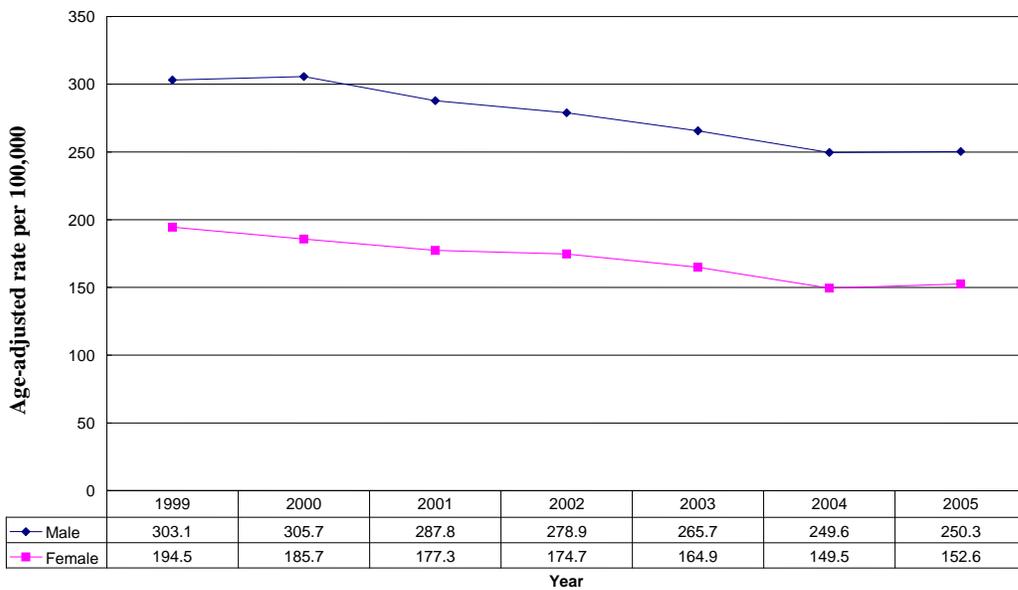
Heart disease death rates have been declining over time both in Iowa and the United States. Iowa's age-adjusted death rate for heart disease is lower than the nation's. See Figure 3.

Figure 3. Age-adjusted Heart Disease Mortality Rates in Iowa and the United States, 1999-2005



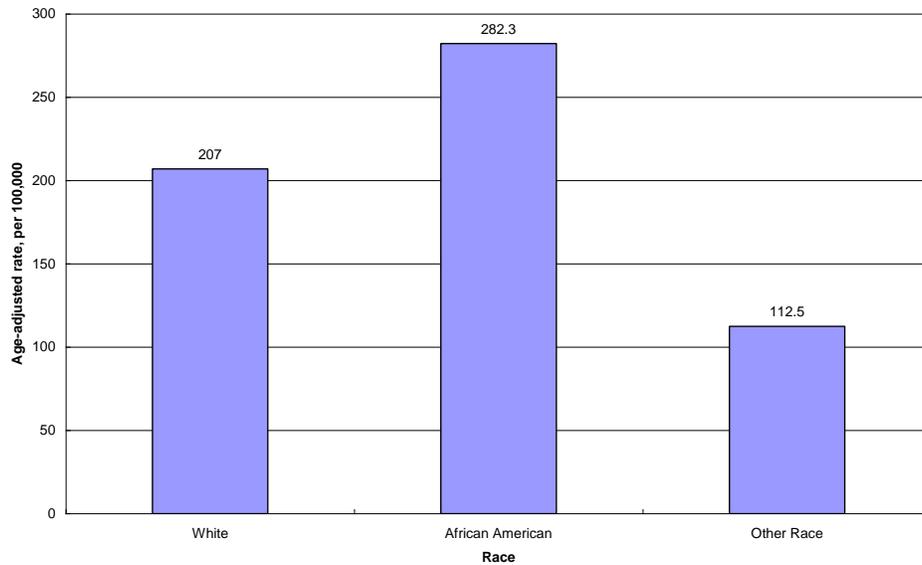
Over time, the death rate was consistently higher for Iowa's males than females. See Figure 4.

Figure 4. Age-adjusted Death Rate for Heart Disease by Gender in Iowa, 1999-2005



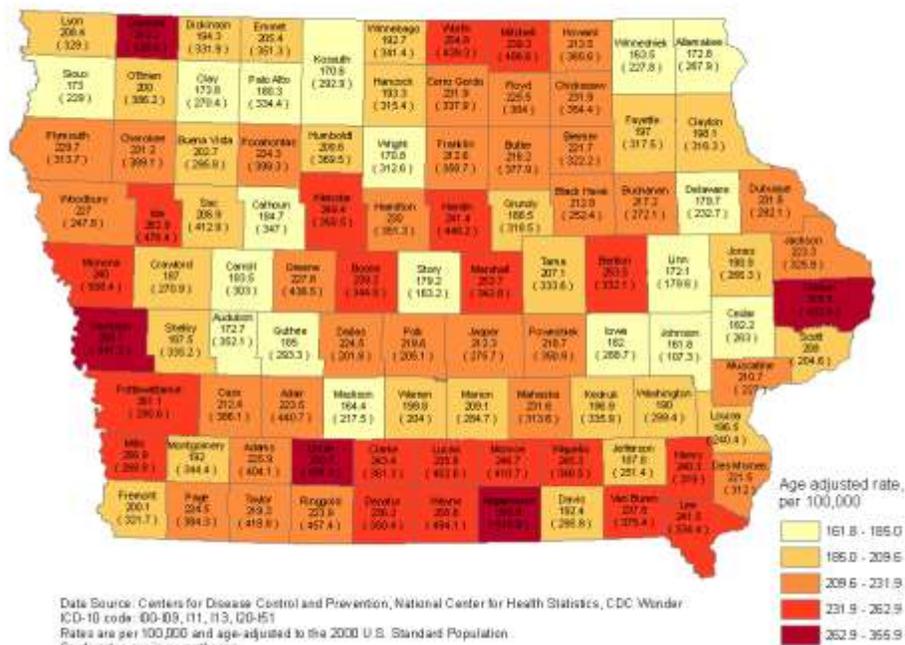
African Americans have a greater death rate than whites and other races in Iowa. See Figure 5.

Figure 5. Heart Disease Death Rate by Race in Iowa, 2001-2005



There are geographic differences in heart disease death rates in Iowa. Figure 6 shows higher age-adjusted heart disease mortality rates in southern Iowa, some border counties in the west, in north central counties, and several counties in central Iowa.

Figure 6. Heart Disease Mortality Rate by County in Iowa, 2001-2005



Prevalence

The prevalence data for heart disease and stroke is collected through the Behavioral Risk Factor Surveillance System (BRFSS). Based on BRFSS responses in 2007, 4.7% of Iowans aged 18 and older reported having had heart attack or myocardial infarction. Angina or coronary heart disease was reported by 3.7% of adult Iowans. Although these percentages may seem small, they represent approximately 90,000 Iowans with a history of heart attack or coronary heart disease.

	Year						
	2001	2002	2003	2004	2005	2006	2007
Heart Attack or Myocardial Infarction	3.6	4.2	NA	NA	4.4	4.6	4.7
Angina or Coronary Heart Disease	3.5	3.3	NA	NA	4.6	4.6	3.7
NA: Not available Source: Iowa BRFSS, 2007							

Table 2 demonstrates the differences in prevalence of heart attack and coronary heart diseases by demographics. Consistent with mortality rates, males reported a higher rate of coronary heart disease than females. African Americans reported a slightly higher prevalence than whites. The rates for African Americans were based on very small survey numbers and thus should be interpreted with caution. The prevalence increases with age, especially for individuals 65 years of age and older. The rate was more than twice for people over 65 as compared to those 55-64. People with a high school education or less reported higher rates than those with a college education. And, those in households earning less than \$15,000 reported a higher prevalence than those earning more than \$50, 000.

Table 2. Prevalence of Heart Disease by Selected Demographic Variables in Iowa, 2007

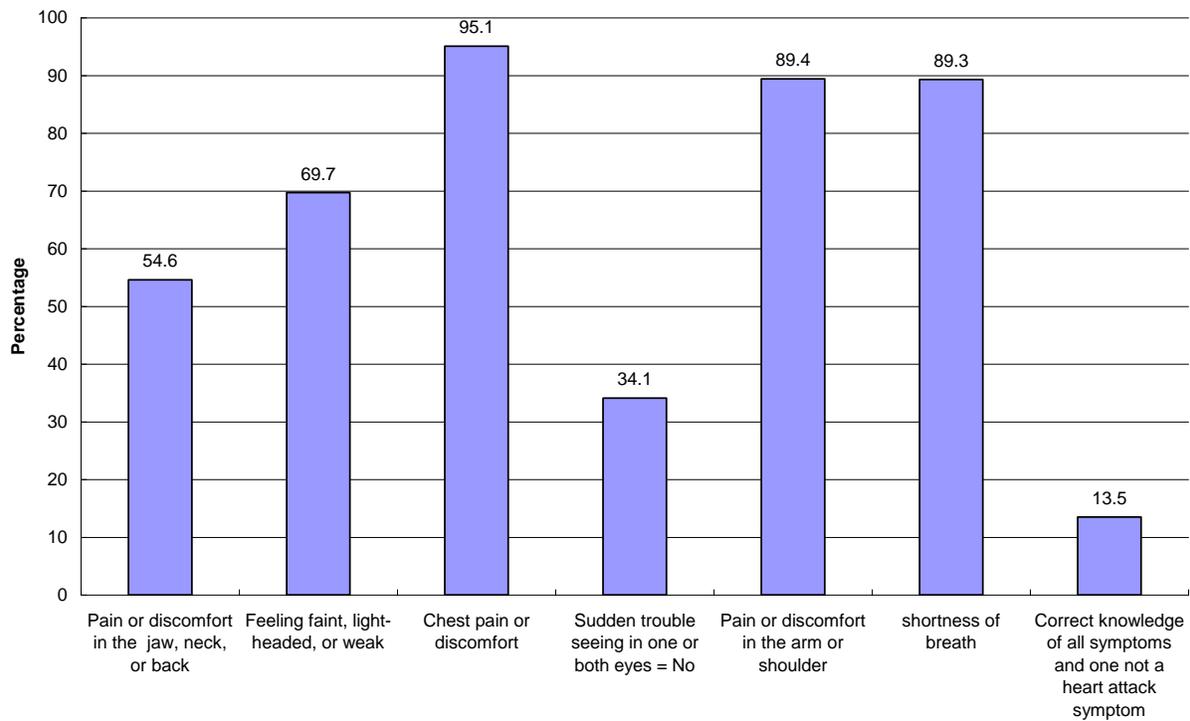
Demographic Variable	Had any Heart Disease (Heart Attack or Myocardial, Angina or Coronary Heart Disease)	
	%	CI 95%
TOTAL	6.3	(5.7-7)
SEX		
Male	8.2	(7.1-9.4)
Female	4.5	(3.8-5.2)
RACE/ETHNICITY		
White/Non-Hispanic	6.4	(5.7-7.1)
Black/Non-Hispanic	7.0	(0.4-13.5)
Other/Non-Hispanic	6.0	(2.2-9.9)
Hispanic	4.5	(0.3-8.6)
AGE		
18-24	0.9	(0-1.9)
25-34	0.0	(0-0)
35-44	1.5	(0.4-2.6)
45-54	4.8	(3.5-6.2)
55-64	7.9	(6-9.8)
65-74	17.0	(14-20)
75+	22.8	(19.6-26.1)
EDUCATION		
Less Than H.S.	8.2	(5.5-11)
H.S. or G.E.D.	8.6	(7.4-9.9)
Some Post-H.S.	4.8	(3.6-5.9)
College Graduate	4.2	(3.2-5.3)
HOUSEHOLD INCOME		
Less than \$15,000	11.6	(8.5-14.7)
\$15,000- 24,999	12.7	(10-15.5)
\$25,000- 34,999	8.7	(6.4-11)
\$35,000- 49,999	5.7	(4.1-7.4)
\$50,000- 74,999	3.2	(2.1-4.2)
\$75,000+	3.4	(2.3-4.5)

Knowledge of Symptoms

Information regarding knowledge of signs and symptoms was based on BRFSS responses collected in 2005. Iowa BRFSS asked if respondents recognized a series of signs and symptoms of heart attack including pain in the jaw, neck, back, and shoulder, shortness of breath, and feeling weak or faint. A decoy question was asked to test if they truly recognized the correct signs and symptoms. Respondents were also asked about the appropriate action to take if someone had signs and symptoms suggestive of heart attack.

Prevalence of adults who correctly recognized heart attack symptoms and correct action when symptoms occur ranged from 55% to 95%, while only 34% correctly recognized that the decoy sign – sudden trouble seeing in one or both eyes – was not a symptom of heart attack. Only 14% of adults responded correctly on all symptoms. See Figure 7.

Figure 7. Knowledge of Heart Attack Signs and Symptoms in Iowa, 2005



Hospitalization and Costs for Heart Disease

The economic burden of heart disease can be described in part through associated charges for hospitalizations. In most cases, adults are hospitalized if they experience a heart attack, stroke or other cardiovascular disease event. Over 15% of Iowa's 2007 hospitalizations were credited to major cardiovascular diseases, accounting for charges that totaled more than 1.5 billion dollars.

Heart disease was the primary condition related to more than 40,057 hospitalizations and 1.1 billion dollars in charges (Table 3). This is a conservative estimate, since not all of the hospitals in Iowa report cost data. The average cost of each heart disease hospitalization was \$28,193 and the average length stay was 3.8 days.

	Total hospitalization	Average length of stay (days)	Total inpatient days	Average charge per stay	Total charges of all stays
Diseases of the Heart¹	40,057	3.81	152,764	\$28,193	\$1,129,313,385
Coronary Heart Disease	17,628	3.40	59,957	\$36,850	\$649,595,631
Congestive Heart Failure	9,621	4.53	43,574	\$18,219	\$175,286,841

¹Diseases of the heart (ICD-9:390-398, 402, 404-429) includes coronary heart disease (ICD-9:410-414), congestive heart failure (ICD-9:428) and other heart disease subtype.

Source: Iowa hospital inpatient discharge data, Iowa Department of Public Health

Table 4 shows the number of hospitalizations for heart disease by age groups and sex. For the majority of age groups, males had a higher number of hospital discharges than females. Females had a higher number of hospital discharges than males for the age 75-84 and 85+ age groups.

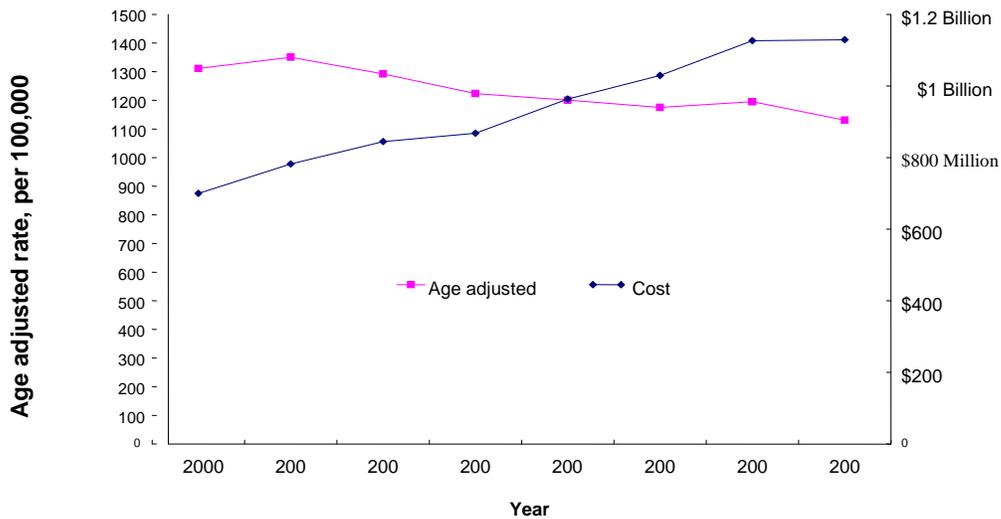
	Age groups by sex													
	<35		35-44		45-54		55-64		65-74		75-84		85 +	
	F	M	F	M	F	M	F	M	F	M	F	M	F	M
Diseases of the Heart¹	273	326	464	862	1,281	2,806	2,240	4,233	3,701	5,272	5,738	5,728	4,545	2,585
Coronary Heart Disease	20	64	189	452	591	1,766	1,088	2,630	1,628	2,863	1,950	2,453	1,161	772
Congestive Heart Failure	36	30	55	99	196	274	378	528	735	967	1,654	1,574	1,963	1,132

¹Diseases of the heart (ICD-9:390-398, 402, 404-429) includes coronary heart disease (ICD-9:410-414), congestive heart failure (ICD-9:428) and other heart disease subtype.

Source: Iowa hospital inpatient discharge data, Iowa Department of Public Health

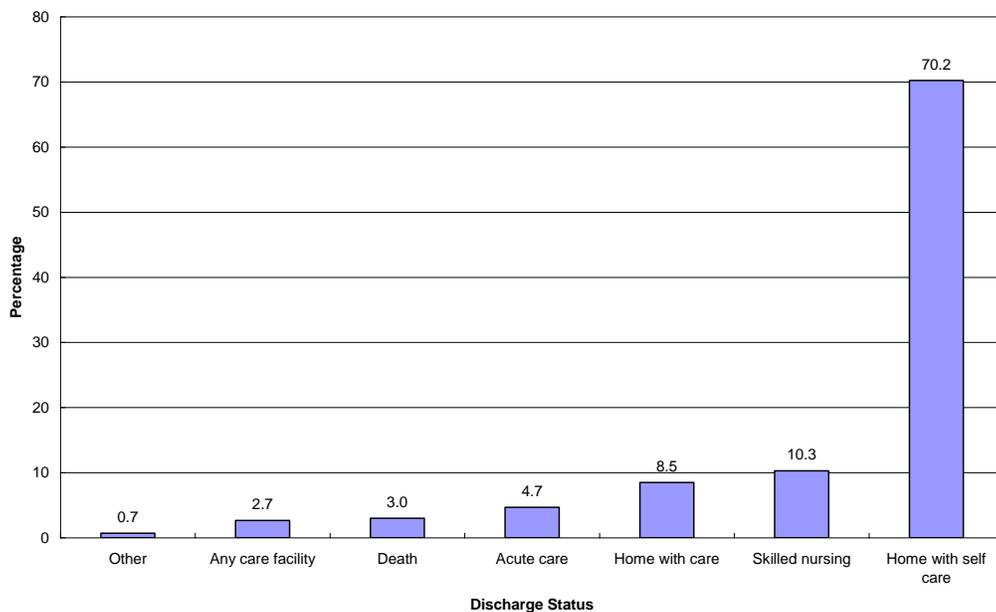
Age-adjusted hospitalization rates for heart disease have declined over time, but the associated charges have accelerated from 2000 through 2007. See Figure 8. (Expanded data are located in the Appendix).

Figure 8. Heart Disease Discharge Rate and Associated Cost, 2000-2007



The majority (70%) of heart disease hospitalizations resulted in discharge to home with self-care. Ten percent of those hospitalized were discharged to skilled nursing facilities and approximately 9% were discharged to their homes with arranged care (Figure 9).

Figure 9. Heart Disease Hospitalization Discharge Status in Iowa, 2007

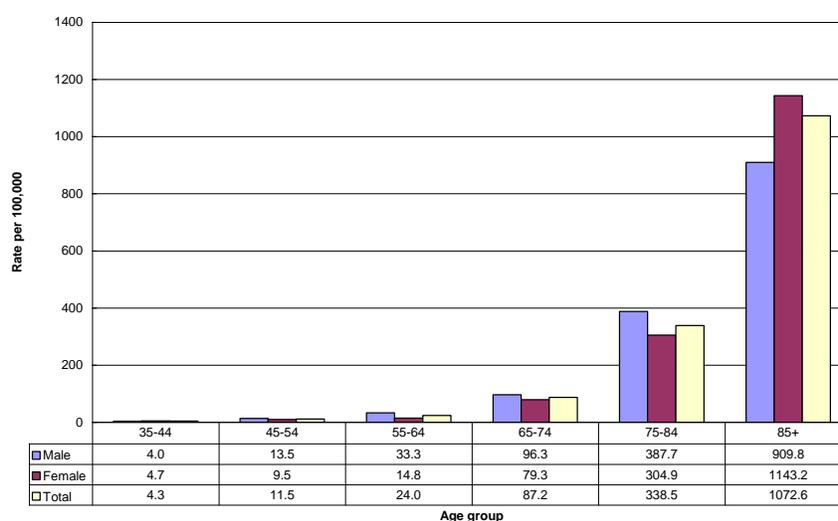


Stroke

Mortality

Stroke continues as the third leading cause of death in Iowa. In 2007, the total number of deaths from stroke was 1,680. This number represents 6.2% of all deaths in Iowa. See Figure 1. Stroke death rates increase rapidly as age increases - significantly in those age 75 years and older. Stroke death rates among Iowa men and women were similar for most age groups. With exception, women age 85 years and older had a significantly higher stroke death rate. See Figure 10.

Figure 10. Stroke Death Rate by Age and Sex Iowa, 2007



Stroke death rates in Iowa and the United States have declined, but unlike heart disease, Iowa's stroke death rate was slightly higher than the nation's (except year 2000). See Figure 11.

Figure 11. Age-adjusted Stroke Mortality Rates in Iowa and the United States, 1999-2000

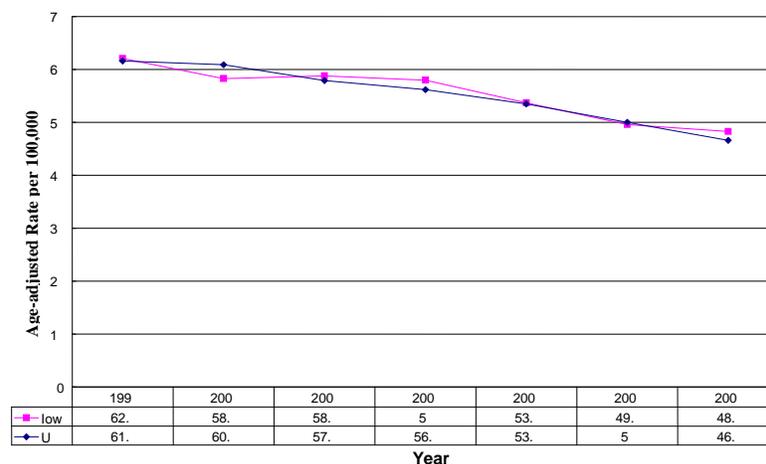


Figure 12 shows that Iowa’s males had a higher age-adjusted stroke death rate than females over time. The gender difference in stroke death rates was less than that for heart disease death rates.

Figure 12. Age-adjusted Death Rate for Stroke by Gender in Iowa, 1999-2005



Similar to heart disease, African Americans had higher stroke death rates than whites and other races in Iowa (Figure 13).

Figure 13. Stroke Death Rate by Race in Iowa, 2001-2005

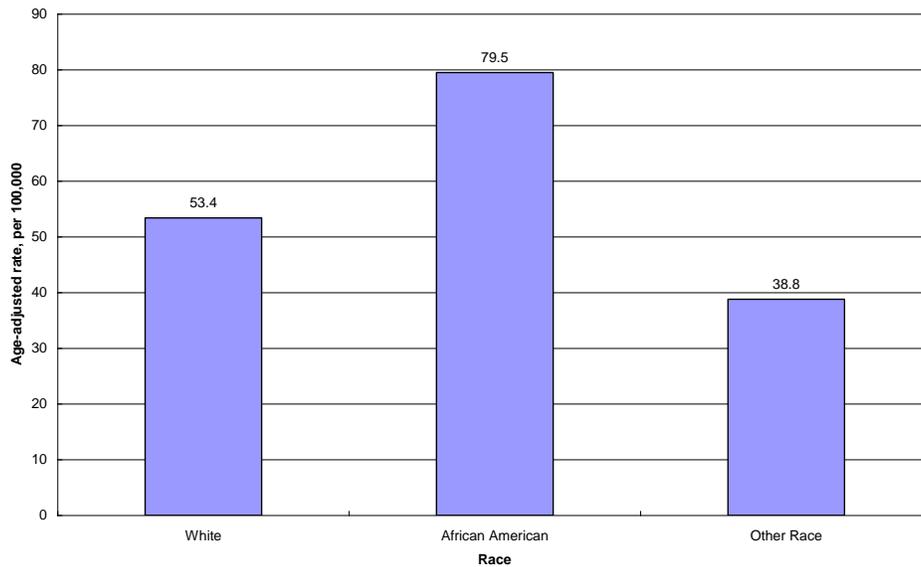
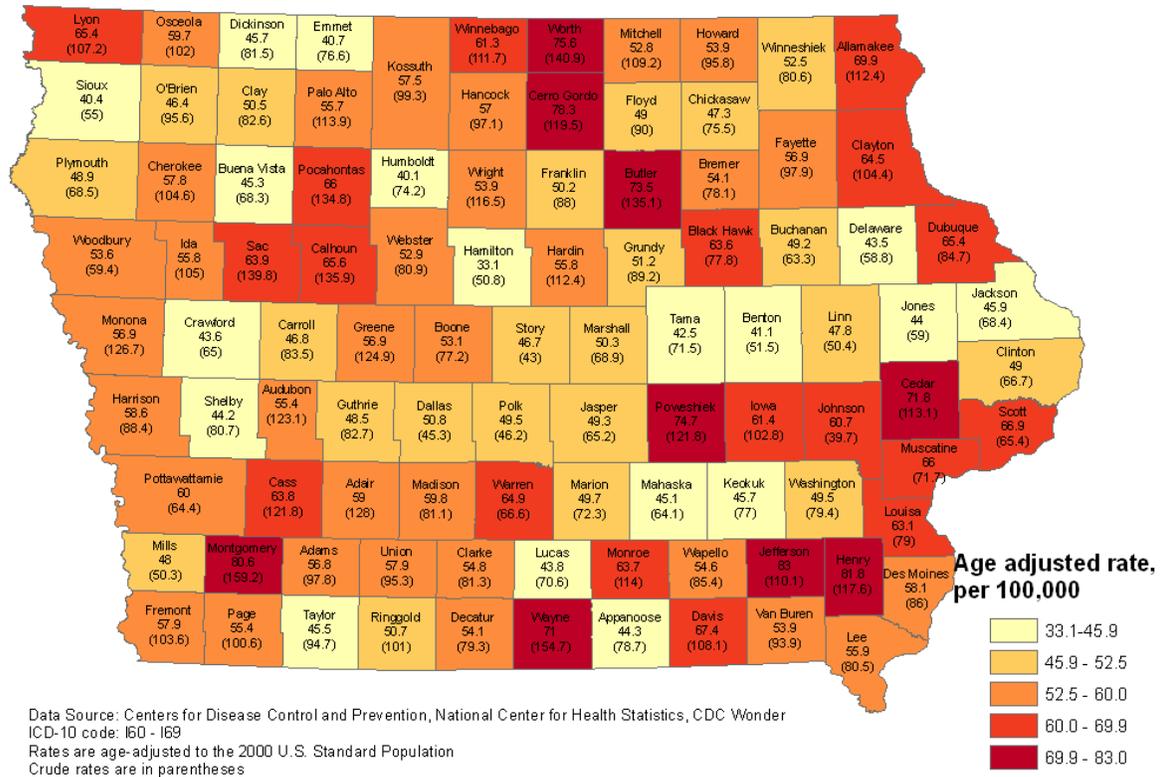


Figure 14 demonstrates the geographic differences in Iowa's stroke mortality rates. Greater age-adjusted stroke mortality rates occurred in southeast counties of the state, north central and northeast counties of Iowa, and other scattered counties. Stroke mortality rates are more scattered statewide than heart disease mortality rates, possibly because the smaller number of stroke deaths creates more variation.

Figure 14. Stroke Mortality Rate by County in Iowa, 2001-2005



Prevalence

Based on the 2007 BRFSS responses, 2.7% of Iowans aged 18 and older reported having had a stroke. This percent represents approximately 60,000 Iowans. Data collected in previous years reflect stroke rates as 2.3% in 2001, 1.9% in 2002, 2.9% in 2005, and 3.1% in 2006. The highest rate reported was 3.1% in 2006. It should be noted that the BRFSS is a telephone sample of non-institutional residents. It underestimates the prevalence of stroke because nursing home residents and others who are too ill to respond to the survey are excluded from the sample.

Table 5 demonstrates stroke prevalence by demographics. Females reported a slightly higher stroke rate than males, but the difference was very small and not statistically significant. Whites reported a higher prevalence of stroke than other minority groups. Stroke prevalence increases with age, especially for those 65 and older. The rates were more than twice for people 65 and older and four times greater for people 75 and older as compared to those ages 55-64. People with no more than a high school education reported strokes at greater rates than individuals with a college education. Those individuals in households making less \$35,000 per year reported greater stroke prevalence than those with higher incomes.

Table 5. Stroke Prevalence by Selected Demographic Variables in Iowa, 2007

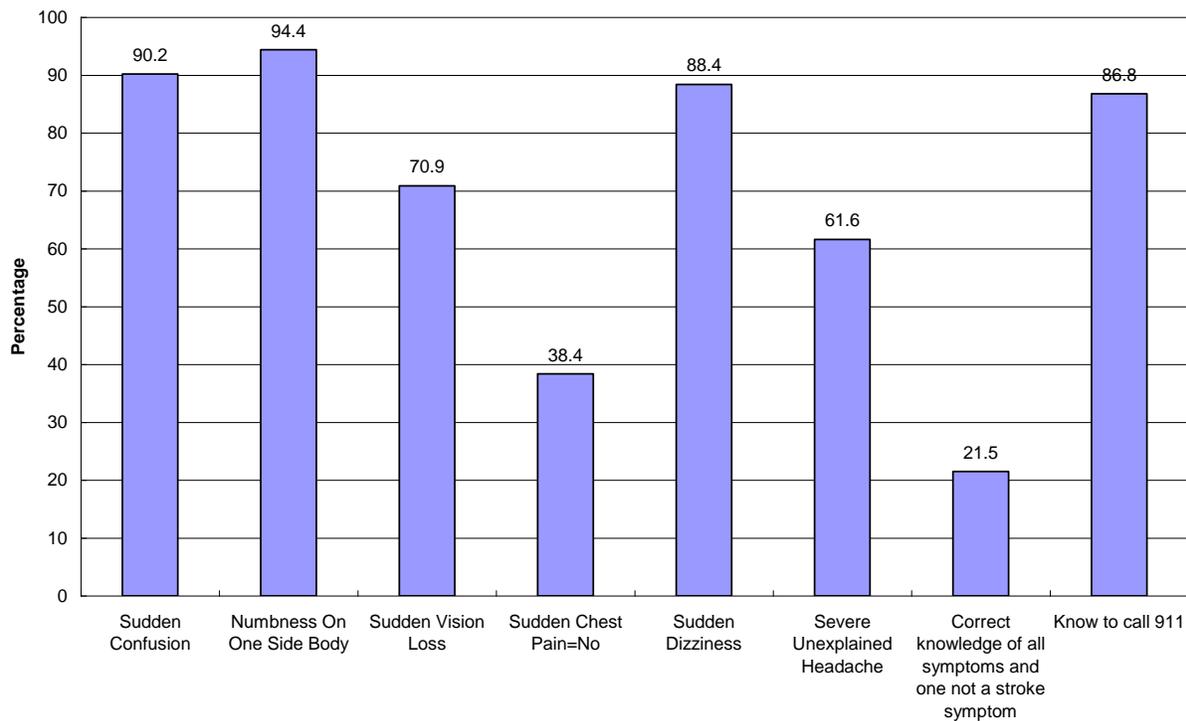
Demographic Variable	Had Stroke	
	%	CI (95%)
TOTAL	2.7	(2.3-3.1)
SEX		
Male	2.6	(2-3.2)
Female	2.8	(2.2-3.4)
RACE/ETHNICITY		
White/Non-Hispanic	2.8	(2.4-3.2)
Black/Non-Hispanic	1.9	(0-3.9)
Other/Non-Hispanic	0.9	(0-2.6)
Hispanic	2.2	(0-4.4)
AGE		
18-24	0.0	(0-0)
25-34	0.3	(0-0.7)
35-44	0.9	(0.1-1.7)
45-54	2.7	(1.7-3.7)
55-64	2.5	(1.5-3.5)
65-74	6.7	(4.7-8.7)
75+	10.3	(8-12.6)
EDUCATION		
Less Than H.S.	5.4	(3.4-7.4)
H.S. or G.E.D.	3.4	(2.6-4.2)
Some Post-H.S.	2.5	(1.7-3.3)
College Graduate	1.1	(0.5-1.7)
HOUSEHOLD INCOME		
Less than \$15,000	6.6	(4.2-9)
\$15,000- 24,999	5.5	(3.7-7.3)
\$25,000- 34,999	4.7	(2.9-6.5)
\$35,000- 49,999	1.4	(0.6-2.2)
\$50,000- 74,999	1.4	(0.6-2.2)
\$75,000+	0.7	(0.3-1.1)

Knowledge of Symptoms

Information regarding knowledge of stroke signs and symptoms was based on BRFSS responses collected in 2005. The Iowa BRFSS asked if respondents recognized a series of signs and symptoms of stroke including sudden confusion; sudden trouble in speaking, seeing, and walking; headache; and sudden numbness. A decoy question was asked to test if they truly recognized the correct signs and symptoms. Respondents were also asked about the appropriate action to take if someone had signs and symptoms suggestive to stroke.

The percentage of respondents correctly recognizing individual stroke signs and symptoms ranged from 62% to 94%. Only 38% correctly recognized that the decoy symptom – sudden chest pain or discomfort – was not suggestive of stroke. Unfortunately, only 22% correctly recognized all symptoms and one that was not a stroke symptom. See Figure 15.

Figure 15, Knowledge of Stroke Signs and Symptoms in Iowa, 2005



Hospitalization and Costs

Stroke was the primary diagnosis responsible for over 8,500 hospitalizations and 168 million dollars in medical charges. This is a conservative estimate, since not all of the hospitals in Iowa supply cost data. The average cost of each stroke hospitalization was nearly \$20,000 with each hospitalization averaging 4.24 days. Ischemic stroke, which is the most treatable type of stroke, accounted for more than half of the stroke hospitalizations.

	Total hospitalization	Average length of stay (days)	Total inpatient days	Average charge per stay	Total charges of all stays
Stroke¹	8,543	4.24	36,248	\$19,716	\$168,431,602
Hemorrhagic	823	7.67	6,312	\$42,848	\$35,263,573
Ischemic	3,837	4.73	18,138	\$16,398	\$62,920,974
Transient Ischemic	1,442	2.60	3,746	\$10,401	\$14,997,695

¹Stroke (ICD-9: 430-438) include hemorrhagic stroke (ICD-9:430,431), ischemic stroke (ICD-9:434,436), and transient ischemic stroke (ICD-9:435) and other stroke types

Source: Iowa hospital inpatient discharge data, Iowa Department of Public Health

Table 7 illustrates that females had a higher number of stroke hospitalization discharges for younger (<35 and 35-44) and older age groups (75-84 and 85+). Males had a higher number of stroke discharges for age groups 45-54, 55-64, and 65-74.

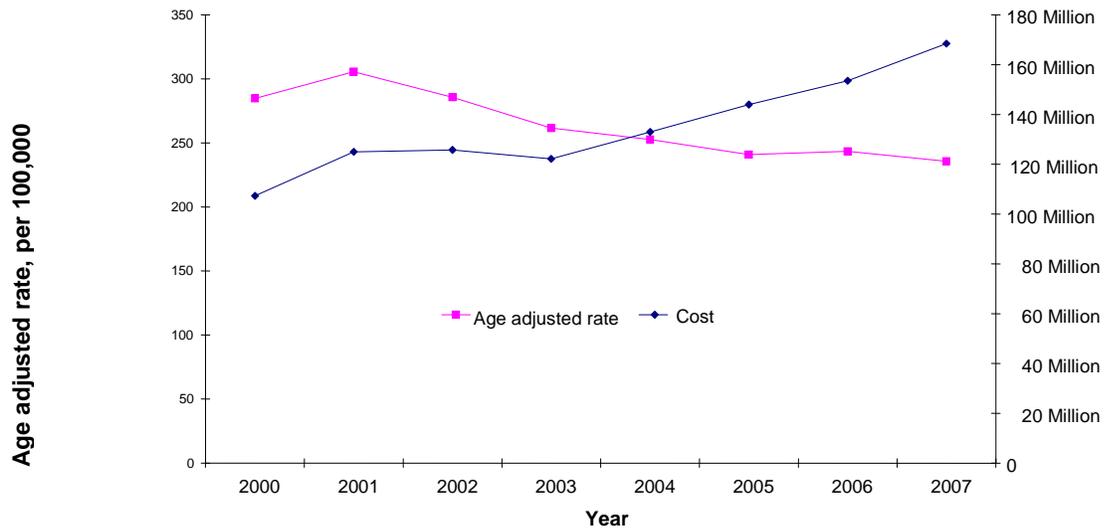
	Age groups by sex													
	<35		35-44		45-54		55-64		65-74		75-84		85 +	
	F	M	F	M	F	M	F	M	F	M	F	M	F	M
Stroke¹	71	54	97	92	252	295	497	708	789	991	1,469	1,299	1,343	586
Hemorrhagic	24	17	20	17	38	46	48	74	76	60	142	91	123	47
Ischemic	24	19	35	46	92	124	198	293	312	393	677	536	776	312
Transient Ischemic	9	3	14	16	54	49	84	80	118	143	276	218	270	108

¹Stroke (ICD-9: 430-438) include hemorrhagic stroke (ICD-9:430,431), ischemic stroke (ICD-9:434,436), and transient ischemic stroke (ICD-9:435) and other stroke types

Source: Iowa hospital inpatient discharge data, Iowa Department of Public Health

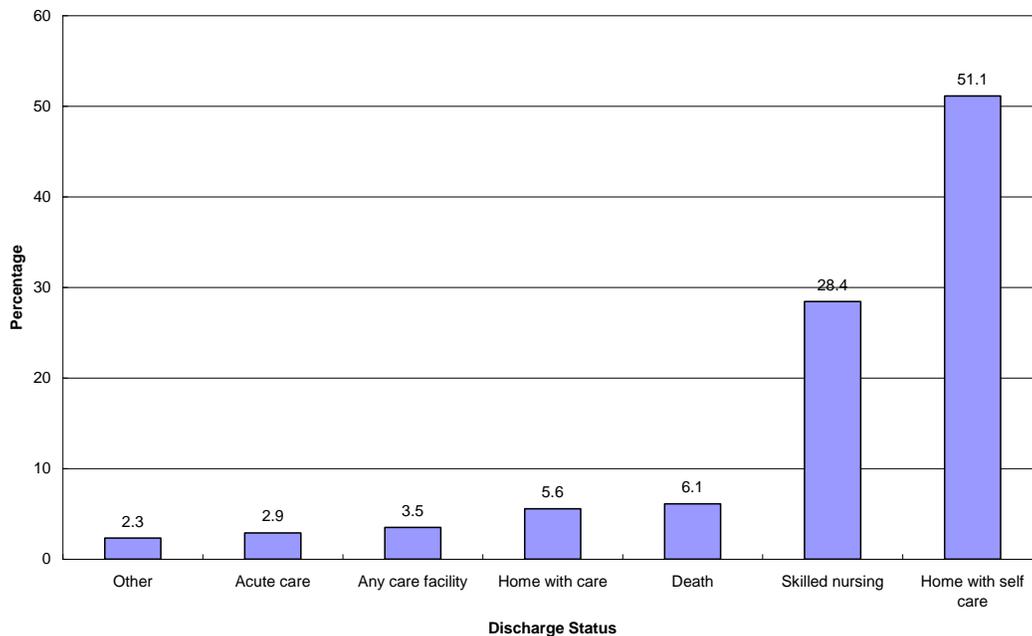
Age-adjusted hospitalization rates and associated cost for stroke show a similar trend as for heart disease. Figure 16 shows that age-adjusted hospitalization discharge rates for stroke have declined since 2000, but the cost associated with hospitalizations has risen considerably. (Expanded data are located in the Appendix).

Figure 16. Iowa Stroke Hospital Discharge Rates and Associated Costs 2000-2007



In 2007, approximately half of all stroke hospitalizations resulted in discharges to home with self-care. Rehabilitation and medical needs following stroke admissions were responsible for 28% of the stroke patients being discharged to skilled nursing facilities. Six percent of the stroke hospitalizations resulted in death. See Figure 17.

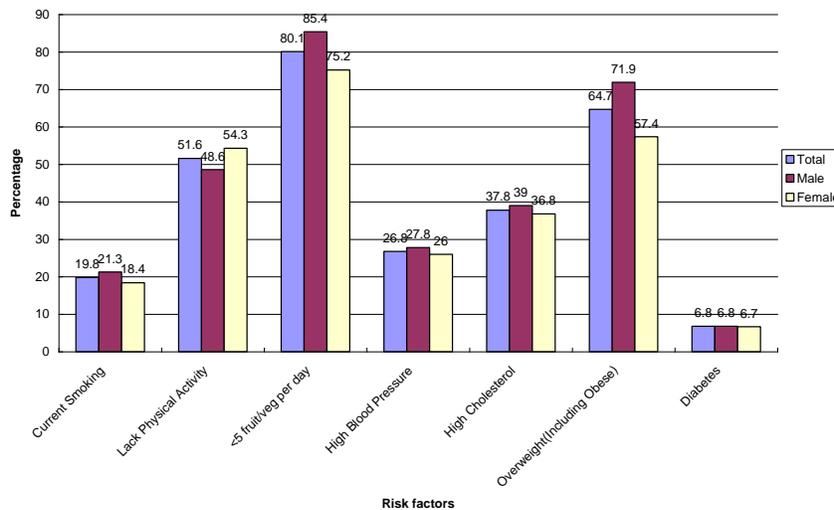
Figure 17. Stroke Hospitalization Discharge Status in Iowa, 2007



Risk Factors for Heart Disease and Stroke

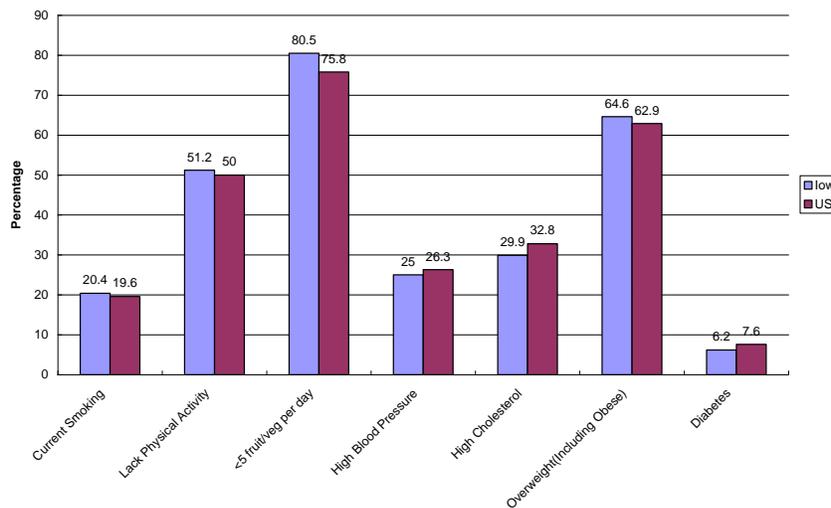
Major modifiable risk factors for heart disease and stroke include: smoking, lack of physical activity, high-fat diet, high blood pressure, high blood cholesterol, diabetes, and overweight/obesity. Figure 18 shows prevalence estimates of these risk factors for men and women. Males tend to have higher rates of smoking, eating less than five servings of fruits and vegetables per day, hypertension, high cholesterol, and overweight/obesity.

Figure 18. Prevalence of Heart Disease and Stroke Risk Factors in Iowa, 2007



Prevalence of the major modifiable risk factors among adults in Iowa and the United States are similar. See Figure 19. Although the difference is minimal, compared to the nation, Iowans tend to have slightly higher rates of smoking, lack physical activity, eat less than five servings of fruits and vegetables per day, and are overweight/obese.

Figure 19. Age-Adjusted Prevalence Rate of Risk Factors in Iowa and US, 2007

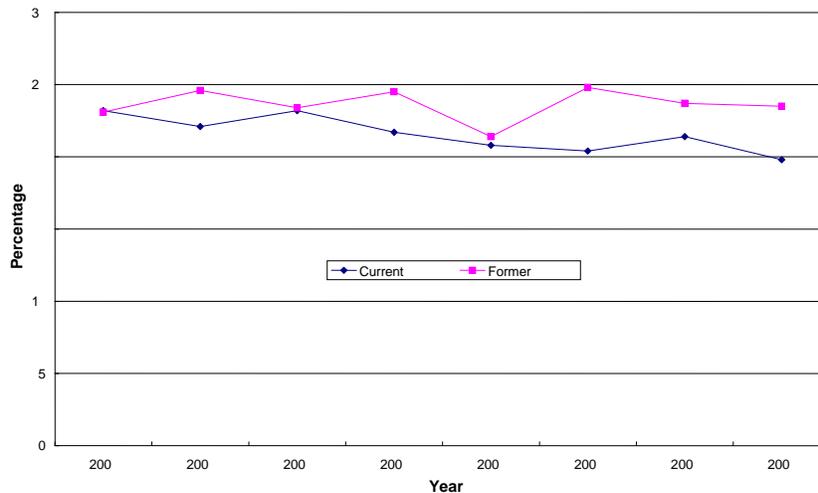


Smoking

Cigarette smoking is a major risk factor for heart disease and stroke. It increases clotting factors in the blood, damages the linings of blood vessels and decreases the level of good cholesterol (HDL) in the blood.

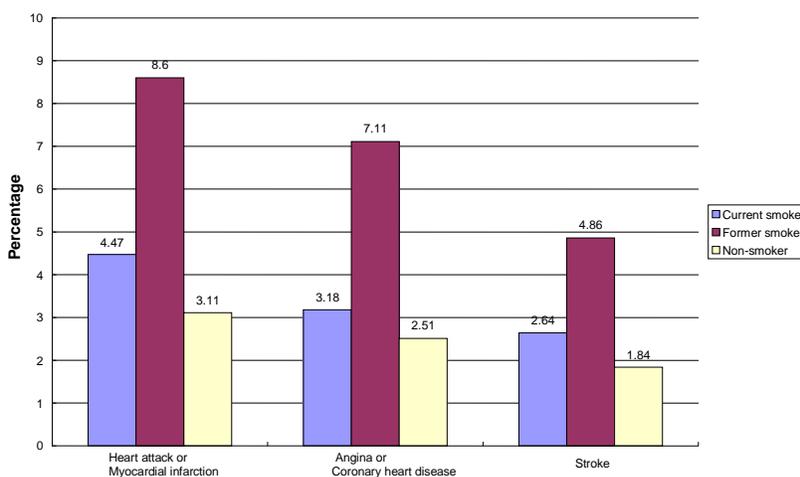
In 2007, approximately 20% of Iowa's adults reported they were current smokers. This percentage has decreased slightly since 2000. See Figure 20.

Figure 20. Prevalence of Smoking in Iowa, 2000-2007



Compared to nonsmokers, current smokers and former smokers in Iowa had higher rates of heart attack or myocardial infarction, angina or coronary heart disease, and stroke. See Figure 21. Former smokers had the highest rates, providing evidence that more research of smoking-related cardiovascular damage and recovery times may be necessary.

Figure 21. Prevalence of Heart Disease and Stroke by Smoking Status in Iowa, 2007

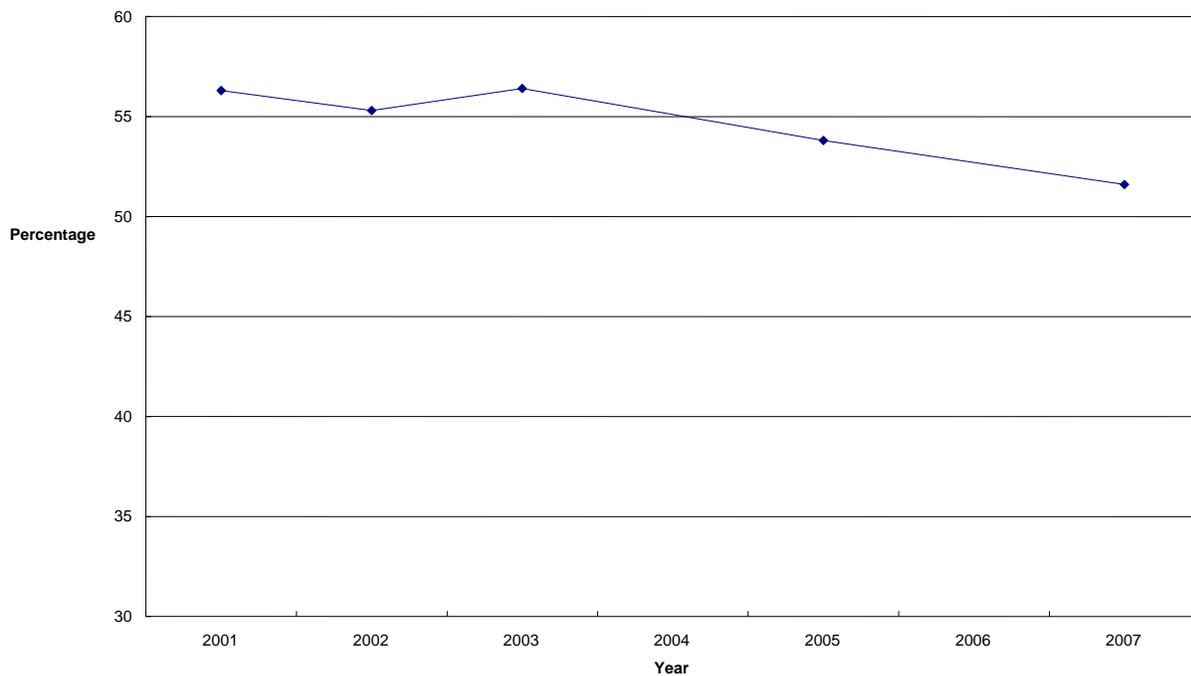


Lack of Physical Activity

Regular physical activity can help decrease the chances of developing heart disease and stroke. More than half of Iowa's adults did not meet physical activity recommendations¹. Over time, this percentage has declined from 2001 to 2007. See Figure 22.

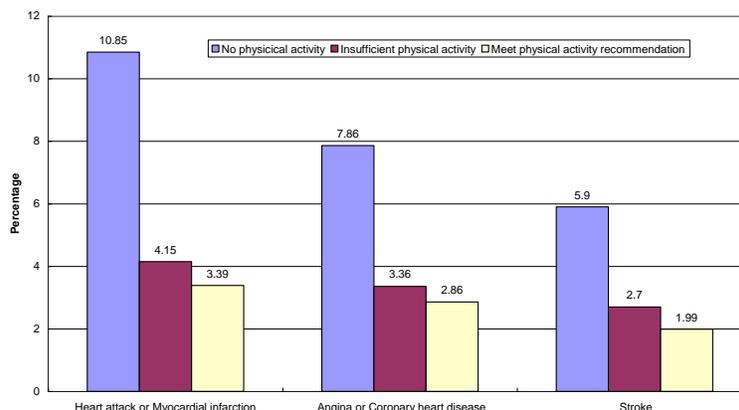
Iowa's adults who had no physical activity had highest heart disease and stroke prevalence rates. The rates were two-to-three times higher than those for Iowans who met the physical activity recommendations See Figure 23.

Figure 22. Prevalence of Lack of Recommended Physical Activity in Iowa, 2001-2007



¹ Meet physical activity recommendations was defined as having regular moderate physical activity for at least 5 days a week for at least 30 minutes per day and/or having regular vigorous physical activity for at least three days per week for at least 20 minutes per day. Insufficient physical activity was defined as less than recommended days or minutes for moderate or vigorous physical activity. No physical activity was defined as no any moderate and vigorous physical activity.

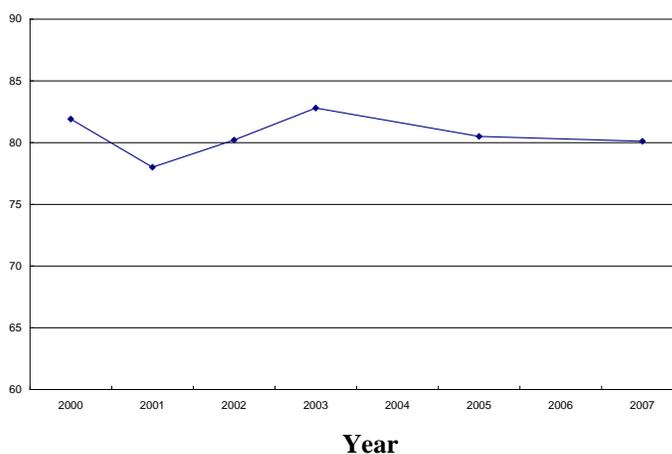
Figure 23. Prevalence of Heart Disease and Stroke by Physical Activity in Iowa, 2007



Fruit and Vegetable Consumption

Good nutrition is important for preventing heart disease and stroke. Eating habits help maintain normal blood pressure, desirable blood cholesterol levels and a healthy body weight. A daily consumption of five to ten fresh fruit and/or vegetable servings is associated with a reduced risk of heart disease and stroke. The consumption of fruits and vegetables provides antioxidants, natural vitamins and fiber. Those who consume fruits and vegetables prepared with trans fats, saturated fats or high salt/sodium place themselves at a greater risk of several cardiovascular risk factors, including hypertension, high blood cholesterol, overweight and diabetes. Eighty percent of Iowa’s adults reported eating less than five servings of fruits and/or vegetables per day. This percentage has remained relatively stable over time. See Figure 24.

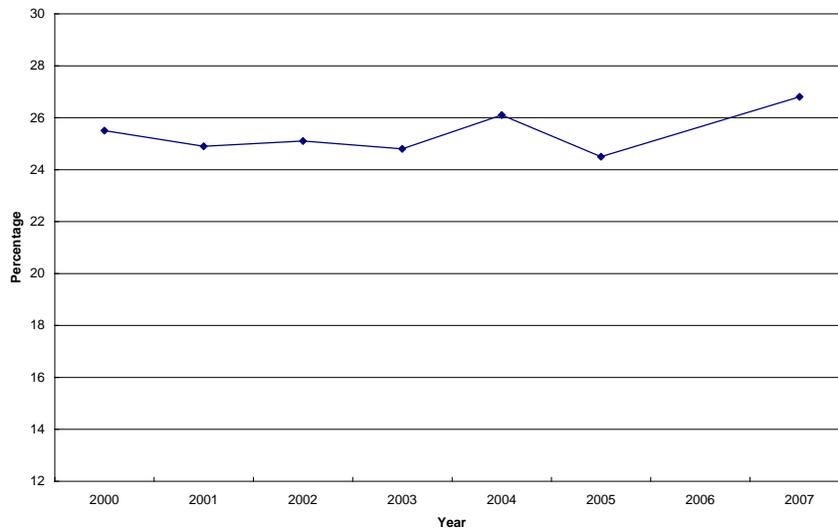
Figure 24. Prevalence of Iowa Adults Consuming Less Than 5 Servings of Fruits/veggies Per Day in Iowa, 2000-2007



Hypertension

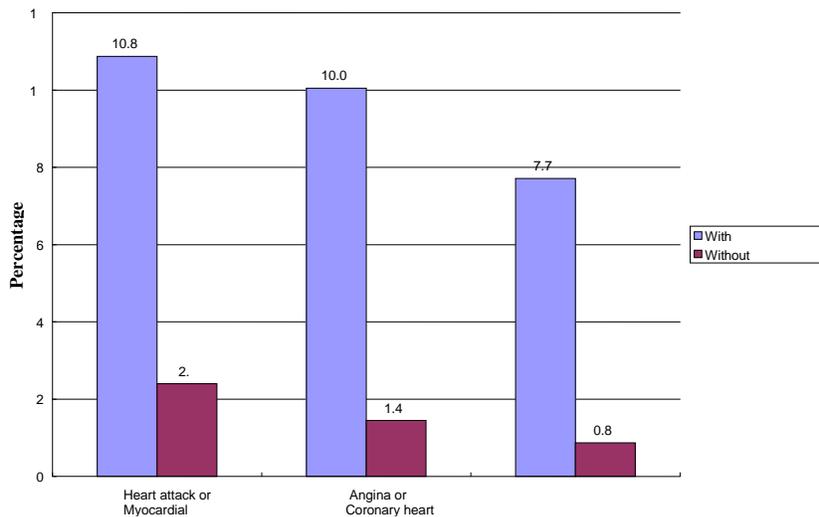
In 2007, one in four Iowa adults reported having been told by a health professional that they have high blood pressure (hypertension). Eighty-one percent of the survey participants reporting high blood pressure were taking medication to control their blood pressure. The prevalence of hypertension among Iowa adults remained fairly constant from 2000 to 2007.

Figure 25. Prevalence of Hypertension in Iowa, 2000-2007



High blood pressure is a major risk factor for both heart disease and stroke. The prevalence of heart attack or myocardial infarction, angina or coronary heart disease and stroke was approximately four-to-eight times greater among Iowans with hypertension than those without hypertension. See Figure 26.

Figure 26. Prevalence of Heart Disease and Stroke by Hypertension Diagnosis in Iowa, 2007



High Blood Cholesterol

In 2007, 37.8% of Iowa adults reported having been told by a health professional that they have high cholesterol. The prevalence of high cholesterol has increased from 2001 to 2007. Refer to Figure 27.

High blood cholesterol contributes to atherosclerosis, the gradual buildup of fatty plaques in the arteries that may lead to heart attack and stroke. Figure 28 demonstrates the prevalence of heart attack or myocardial infarction, angina or coronary heart disease and stroke as three to four times greater in adult Iowans with high cholesterol than those without.

Figure 27. Prevalence of High Cholesterol in Iowa, 2001-2007

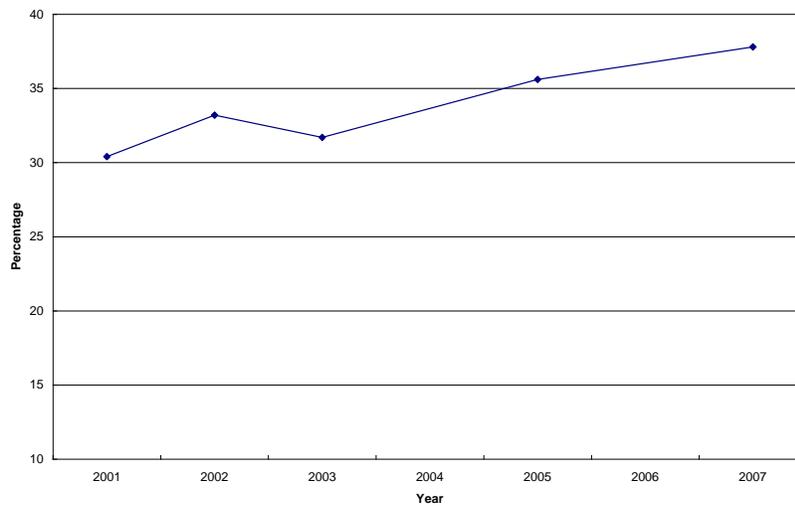
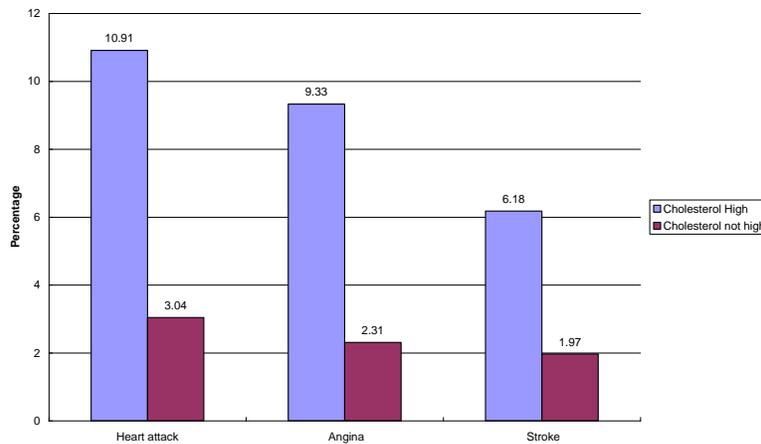


Figure 28. Prevalence of Heart Disease and Stroke by Cholesterol Diagnosis in Iowa, 2007



Overweight and Obesity

Body mass index (BMI) is based on a person's reported height and weight. According to the National Institutes of Health, a healthy adult weight is a BMI of 18.5-24.9; overweight is 25-29.9; and obese is 30 or higher. To calculate BMI, divide weight in pounds by height in inches squared, and then multiply the results by a conversion factor of 703. For someone who is 5 feet 5 inches tall (65 inches) and weighs 150 pounds, the calculation would look like this: $[150 \div (65)^2] \times 703 = 24.96$.

Overweight/obesity is the most commonly shared risk factor contributing to heart disease and stroke. Overweight/obese individuals are at a greater risk of cardiovascular complications such as high blood pressure, high cholesterol, high triglycerides, and diabetes. In 2007, 65% of Iowa adults were overweight or obese. The prevalence of obesity in Iowa has increased since 2000 while the percentage of overweight remains stable (Figure 29). Overweight/obese adult Iowans reported a greater prevalence of heart disease and stroke than those of normal weight. Refer to Figure 29.

Figure 29. Prevalence of Overweight and Obesity, Iowa, 2000-2007

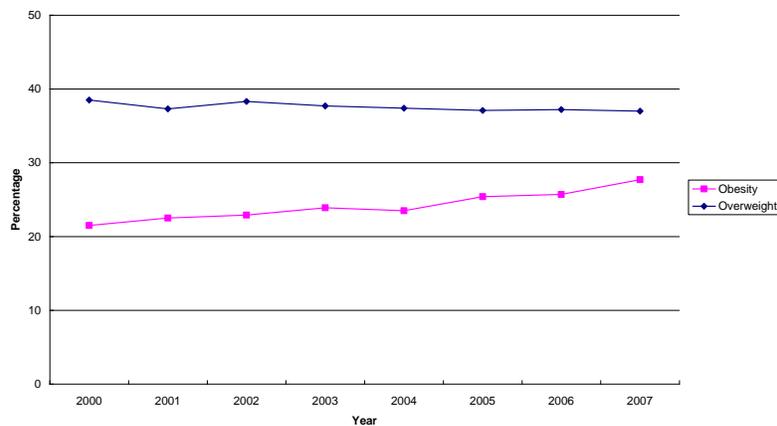
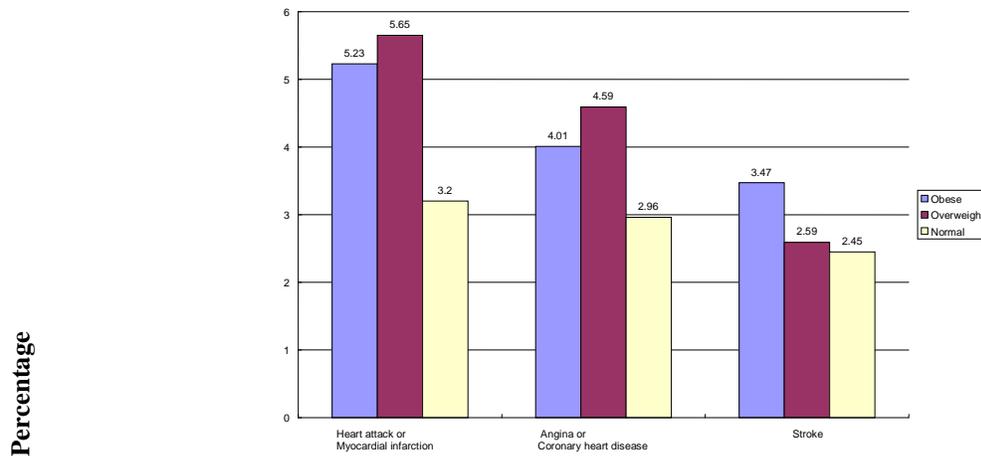


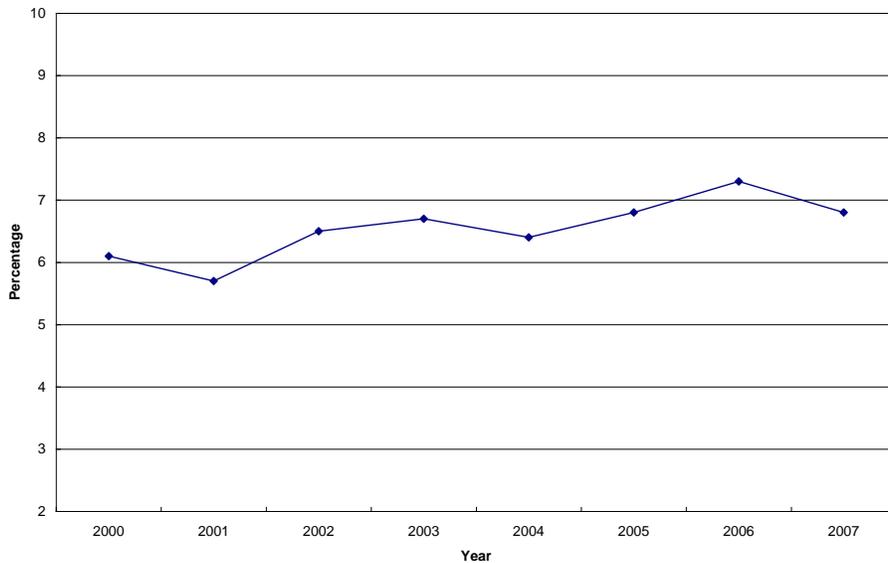
Figure 30. Prevalence of Heart Disease and Stroke by Weight Status in Iowa, 2007



Diabetes

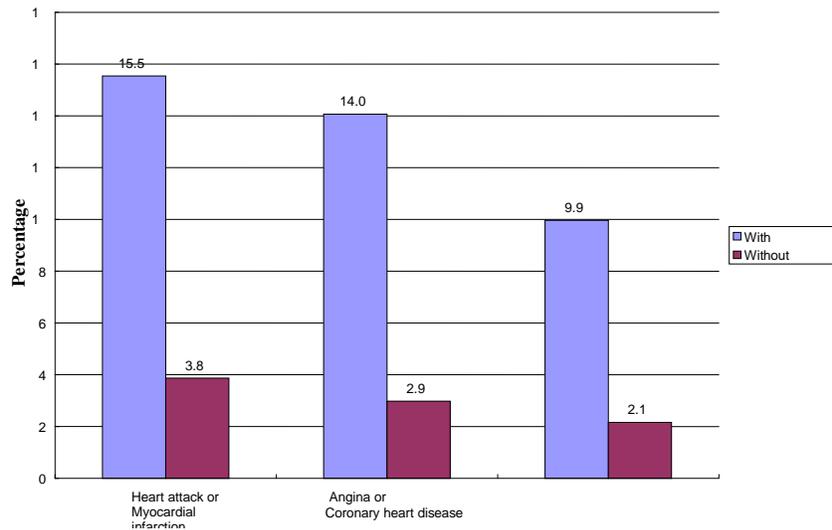
Diabetes is a disease in which the body does not produce or properly use insulin. In 2007, approximately 7% of adults in Iowa reported they had been told by a health professional that they have diabetes. This percentage has increased slightly, but remained fairly stable from 2000 through 2007. See Figure 31.

Figure 31. Prevalence of Diabetes in Iowa, 2000-2007



Iowa's adults with diabetes have more than four times a greater rate of heart attack or myocardial infarction, angina or coronary heart disease, and stroke than those without diabetes. See Figure 32.

Figure 32. Prevalence of Heart Disease and Stroke by Diabetes Diagnosis in Iowa,



Recommendations

In 2007, more than one-third of the total deaths in Iowa were due to major cardiovascular disease. Heart disease is Iowa's leading cause of death and stroke is the third. Since 2000, heart disease hospitalization discharge rates have slowly decreased while associated costs have jumped from approximately 700 million dollars to over 1.1 billion dollars annually. This cost does not include expenses incurred by individuals after being discharged to home with self-care (70%) or to skilled nursing facilities (10%). Stroke statistics mirror heart disease trends. Associated costs have not been compiled for Iowans discharged home with self care (51%) or to skilled nursing facilities (28%) after stroke hospitalization. These data gaps need to be quantified and reduced through coordinated efforts of federal, state, local and community nonprofit and governmental entities.

Modifiable cardiovascular risk factors are highly prevalent in Iowa's population. As reflected in data collected since 2000, Iowans demonstrate little motivation to consume five or more fruit and/or vegetable servings per day, reduce their body weight, or engage in regular physical activity. Taking personal control of blood cholesterol levels, high blood pressure and smoking are serious issues not being aggressively pursued. Only personal control of diabetes has modestly increased. Attempts to control cardiovascular conditions through medication alone may provide positive results; yet, long-term medical monitoring is just beginning to associate adverse side effects as serious complications. Physician recommended lifestyle changes are just as important as medication regimes.

The Centers for Disease Control and Prevention National Heart Disease and Stroke Prevention Program has provided Iowa an opportunity to develop and update a comprehensive state plan for heart disease and stroke prevention with emphasis on heart-healthy policies that promote physical and social environmental change, and elimination of disparities (e.g., based on geography, gender, race or ethnicity, or socioeconomic status). Strategies include policy, environmental, and systems changes to support cardiovascular health and education that will increase awareness of the need for such changes. This goal addresses the idea that the places where people live, work, learn, and play will protect and promote their health and safety, especially those people at greater risk of health disparities.

It is recommended that the Iowa Department of Public Health engage partners from the private and public health sectors to collectively require primary prevention approaches on both individual and population-based levels. Clinical practice can identify actual and potential risk for individuals and provide health promotion and disease prevention guidance and intervention. Population-based interventions are complex, and public health system partners need to be concerned not only with the determinants of health but also with the social determinants of health.

Social determinants of health are factors in the social environment that contribute to or detract from the health of individuals and communities. These factors include, but are not limited to Iowan's:

- Socioeconomic status
- Transportation
- Housing
- Access to services
- Social or environmental stressors

Social determinants of health have repeatedly been found to be associated with heart disease and stroke. These factors work either directly to affect the burden of heart disease and stroke and their risk factors, or indirectly, through their influence on health-promoting behaviors. With this in mind, selected social determinants of health should be used in tandem with other data sources to match heart disease and stroke prevention policy and environmental changes to the needs of Iowa's populations.

This burden document provides data to demonstrate the challenge that exists to improve the cardiovascular health of Iowans and the need for education about cardiovascular disease modifiable risk factors. The burden of heart disease and stroke is the basis for a companion document, a comprehensive state plan that will engage Iowa's policymakers, governments, employers, health institutions and other entities in efforts to change current policies and environments that are not supportive of cardiovascular health.

Appendix A

Data Sources and Technical Notes

Mortality data are primarily collected from Iowa death certificates filed with the Iowa Department of Public Health, Bureau of Vital Records. All of the mortality data in this report is based on deaths of Iowa residents, regardless of where the deaths occurred. Iowa cooperates with other states in the exchange of death records to be able to include the deaths of Iowans that occurred in other states. Data for Figure 4-6 and Figure 13-15 are from Centers for Disease Control and Prevention (CDC), National Center for Health Statistics: CDC wonder.

The primary cause of death is indicated by an International Classification of Disease (ICD) code. The 9th revision of the ICD was used to define cause of death before 1999 and the 10th Revision (ICD-10) has been in effect since 1999. Table 1 defines the primary codes used in this report.

	ICD-9	ICD-10
Major cardiovascular disease	390-434, 436-448	
Disease of the Heart	390-398, 402, 404, 410-429	I00-I09, I11, I13, I20-I51
Coronary heart disease	410-414	
Heart Failure	428	
Stroke	430-438	I60-I69
Hemorrhagic stroke	430, 431	
Ischemic stroke	434, 436	
Transient Ischemic stroke	435	

Hospitalizations

Hospitalization data are based on inpatient hospital stays in Iowa's hospitals. The data are reported voluntarily by the hospitals to the Iowa Hospital Association on behalf of Iowa Department of Public Health. In 2007, 117 of the 123 state-licensed hospitals in Iowa were included in the state, inpatient database. This under-reporting of hospitalizations and associated charges causes under-estimates of the true totals.

Data on non-Iowa residents who were hospitalized in Iowa were included in this report. Hospitalization data represents occurrences, not individuals. Therefore, the same individual could be represented multiple times.

The primary diagnosis in the patient's medical record was used for categorizing heart disease and stroke hospitalizations. ICD-9 codes were used to classify diagnoses of hospitalizations for the years presented in this report (1999-2005).

Prevalence of Cardiovascular Disease and Risk Factors

Data for the prevalence of cardiovascular disease, modifiable risk factors, and knowledge of heart attack and stroke symptoms are provided by the Iowa Behavioral Risk Factor Surveillance System (BRFSS). The BRFSS survey is designed to measure health risk behaviors in the non-institutionalized adult (aged 18 years and older) population. This survey is a collaborative project of the Centers for Disease Control and Prevention (CDC) and health departments from states and territories. The BRFSS data are collected through randomly selected, monthly telephone interviews using standardized protocols and interviewing techniques. Statewide prevalence estimates for heart disease and stroke-related behaviors are derived from the BRFSS.

Appendix B

Hospitalization Data Over Time

	2000	2001	2002	2003	2004	2005	2006	2007
# hospital discharges	43,703	45,306	43,715	41,958	41,492	40,964	41,732	40,057
Average stays	4.54	4.42	4.26	4.28	4.05	3.92	3.85	3.81
Average cost	\$16,009	\$17,266	\$19,321	\$20,695	\$23,219	\$25,129	\$27,001	\$28,193

	2000	2001	2002	2003	2004	2005	2006	2007
# hospital discharges	9,834	10,607	9,945	9,243	8,963	8,606	8,701	8,543
Average stays	4.63	4.91	4.64	4.57	4.45	4.44	4.16	4.24
Average cost	\$10,907	\$11,784	\$12,646	\$13,218	\$14,837	\$16,727	\$17,641	\$19,716