



# Heart Disease and Stroke in Minnesota

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## 2011 Burden Report



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# Heart Disease and Stroke in Minnesota 2011 Burden Report



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For more information, contact:  
Minnesota Heart Disease and Stroke Prevention Unit  
Minnesota Department of Health  
P.O. Box 64882  
85 East 7th Place, Suite 400  
St Paul, MN 55164-0882  
Telephone 651-201-5412

Website: [www.health.state.mn.us/cvh](http://www.health.state.mn.us/cvh)

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**AUTHORS**

JAMES M. PEACOCK, PhD, MPH  
HEART DISEASE & STROKE PREVENTION UNIT  
CENTER FOR HEALTH PROMOTION  
MINNESOTA DEPARTMENT OF HEALTH  
ST. PAUL, MN

STANTON SHANEDLING, PhD, MPH  
HEART DISEASE & STROKE PREVENTION UNIT  
CENTER FOR HEALTH PROMOTION  
MINNESOTA DEPARTMENT OF HEALTH  
ST. PAUL, MN

**CONTRIBUTORS**

ELIZABETH J BELL, BA  
DIVISION OF EPIDEMIOLOGY & COMMUNITY HEALTH  
UNIVERSITY OF MINNESOTA SCHOOL OF PUBLIC HEALTH  
MINNEAPOLIS, MN

PETER RODE, MA  
CENTER FOR HEALTH STATISTICS  
MINNESOTA DEPARTMENT OF HEALTH  
ST. PAUL, MN

**REVIEWERS**

TOM ARNESON, MD, MPH  
CHRONIC DISEASE RESEARCH GROUP  
MINNEAPOLIS MEDICAL RESEARCH FOUNDATION  
MINNEAPOLIS, MN

WENDY BRUNNER, MS  
CHRONIC DISEASE & ENVIRONMENTAL EPIDEMIOLOGY SECTION  
MINNESOTA DEPARTMENT OF HEALTH  
ST. PAUL, MN

JAY DESAI, MPH  
HEALTHPARTNERS RESEARCH FOUNDATION  
BLOOMINGTON, MN

WILLIAM J. LITCHY, MD  
MMSI/MAYO CLINIC HEALTH SOLUTIONS  
ROCHESTER, MN

CARRIE OSER, MPH  
CARDIOVASCULAR HEALTH PROGRAM  
MONTANA DEPARTMENT OF PUBLIC HEALTH & HUMAN SERVICES  
HELENA, MT

JIM PANKOW, PhD, MPH  
DIVISION OF EPIDEMIOLOGY & COMMUNITY HEALTH  
UNIVERSITY OF MINNESOTA SCHOOL OF PUBLIC HEALTH  
MINNEAPOLIS, MN

ALBERT TSAI, PhD, MPH  
HEART DISEASE & STROKE PREVENTION UNIT  
CENTER FOR HEALTH PROMOTION  
MINNESOTA DEPARTMENT OF HEALTH  
ST. PAUL, MN

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HEALTH PROMOTION AND CHRONIC DISEASE DIVISION  
MINNESOTA DEPARTMENT OF HEALTH, ST. PAUL, MN

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# Introduction



This document, *Heart Disease & Stroke in Minnesota: 2011 Burden Report*, is a surveillance report describing the impact of cardiovascular disease and its major risk factors on Minnesotans. Special emphasis is placed on heart disease and stroke, the two largest categories of cardiovascular disease. This report presents current and recent trends in heart disease and stroke risk factors for Minnesota adults and children, prevalence of heart disease and stroke in Minnesota adults, awareness of the signs and symptoms of heart attack and stroke, hospitalizations for heart disease, stroke, and other cardiovascular diseases, quality of care in

clinics and hospitals, and deaths due to heart disease and stroke. The report relies on publicly-reported data sources, described in detail in Appendix E.

The Heart Disease and Stroke Prevention (HDSP) Unit in the Center for Health Promotion, part of the Health Promotion and Chronic Disease Division at the Minnesota Department of Health, compiles and presents these data to inform public health and health care professionals, advocacy and community organizations, policy makers, and the general public on the significant impact of heart disease and stroke in Minnesota. It also serves as a data companion to the *Minnesota Heart Disease & Stroke Prevention Plan: 2011-2020*, which outlines specific objectives to improve the state of prevention, acute treatment, and disease management for heart disease and stroke in the state of Minnesota.

Requests for additional information may be addressed to:  
Heart Disease & Stroke Prevention Unit  
Center for Health Promotion  
Health Promotion & Chronic Disease Division  
Minnesota Department of Health  
PO Box 64882  
St. Paul, MN 55164-0882  
(651) 201-5412

# Executive Summary

## Chapter 1: Prevalence of Heart Disease, Stroke, and Risk Factors

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- Approximately 139,000 Minnesotans (3.5% of adults) have coronary heart disease (CHD), and over 90,000 (2.3% of adults) have had a stroke
- 
- Heart disease and stroke risk factors are prevalent among adults in Minnesota:
    - 15.8% of adults do not participate in any leisure time physical activity
    - 16.7% of adults are current cigarette smokers
    - 78.1% of adults consume less than five fruit and vegetable servings per day
    - 6.4% of adults have diabetes
    - 24.9% of adults are obese
    - 21.6% of adults have high blood pressure
    - 33.8% of adults have high cholesterol
- 
- Behavioral risk factors for heart disease and stroke are prevalent in school-age children in Minnesota:
    - 19.2% of 12th graders are current cigarette smokers
    - 56.6% of 12th graders do not get adequate physical activity
    - 82.4% of 12th graders consume less than five fruit and vegetable servings per day
- 
- Disparities in risk factors appear very early in Minnesota children enrolled in WIC:
    - Rates of overweight and obesity are much higher for American Indian, Asian/Pacific Islander and Hispanic children than for white and black children

## Chapter 2: Heart Attack and Stroke Symptom Awareness

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- Approximately half of Minnesota adults do not recognize the signs and symptoms of heart attack and stroke
- Most Minnesota adults know to call 9-1-1 as their first action when they suspect someone is having a heart attack or stroke

## Chapter 3: Heart Disease and Stroke Hospitalizations

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- In 2009, there were over 72,000 hospitalizations for cardiovascular disease, including more than 50,000 for heart disease and almost 12,000 for stroke, among Minnesota residents
- Total charges for cardiovascular disease hospitalizations among Minnesota residents topped \$2.5 billion in 2009

## Chapter 4: Heart Disease and Stroke Quality of Care Measures and Access to Care

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- In 2009, more than one-third of patients visiting Minnesota clinics received optimal vascular care, and almost three-fourths were able to get their blood pressure adequately controlled
- Minnesota hospitals performed better than the national average on five of twelve key process of care measures for heart disease hospitalizations, but lagged the national average in two others
- Disparities in rehabilitation care after heart attack or stroke exist, with men more likely than women to receive rehabilitation care after heart attack (19 percentage points higher) and stroke (24 percentage points higher)

## Chapter 5: Mortality

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- In 2009, heart disease and stroke were the second and fourth leading causes of death in Minnesota
- In 2009, there were 37,801 deaths among Minnesota residents – Heart disease accounted for 7,233 (19.1 percent) deaths, and stroke accounted for 2,023 (5.4 percent) deaths
- Between 2000 and 2009, the overall heart disease mortality (death) rate declined approximately 31 percent
- Between 2000 and 2009, the overall stroke mortality (death) rate declined approximately 38 percent
- Minnesota continues to experience lower mortality rates due to heart disease and stroke than the United States as a whole

- Racial disparities in heart disease and stroke are a problem in Minnesota:
  - American Indian men have persistently higher heart disease mortality rates than white men (39% higher in the 2005-2009 time period)
  - American Indian women have persistently higher heart disease mortality rates than white women (34% higher in the 2005-2009 time period)
  - Black men have persistently higher stroke mortality rates than white men (23% higher in the 2005-2009 time period)
  - Black women have persistently higher stroke mortality rates than white women (22% higher in the 2005-2009 time period)
  - The gap in stroke mortality rates between American Indians and whites has begun to increase (23% and 22% higher for American Indian men and women in the 2005-2009 time period)
  - The gap in stroke mortality rates between Asians/Pacific Islanders and whites has begun to increase (37% and 30% higher for Asian/Pacific Islander men and women in the 2005-2009 time period)
  - Mortality rates due to heart disease and stroke vary considerably across Minnesota counties
  - Compared to whites and Asians/Pacific Islanders, premature death due to heart disease disproportionately impacts blacks and American Indians in Minnesota
  - Compared to whites, premature death due to stroke disproportionately impacts blacks, American Indians, and Asians/Pacific Islanders in Minnesota



# Chapter 1: Prevalence of Heart Disease, Stroke, and Risk Factors



## I. Prevalence of Heart Disease and Stroke

Cardiovascular Disease encompasses a broad range of different disease conditions, including coronary heart disease (CHD), heart attack or myocardial infarction (MI), and stroke, which is commonly grouped with cardiovascular disease. The annual Behavioral Risk Factor Surveillance System (BRFSS) survey asks Minnesota adults about previous diagnoses of cardiovascular disease. In survey results from 2009, 3.5 percent of Minnesota adults reported being

diagnosed with CHD, 2.9 percent reported having had a heart attack, and 2.3 percent reported having had a stroke. As shown in Table 1.1, significantly more men than women report having CHD or having had a heart attack. More women report having had a stroke than men, but this difference is not statistically significant.

Table 1.1. Prevalence of coronary heart disease, heart attack, and stroke by sex  
– Minnesota, Ages 18+, 2009.

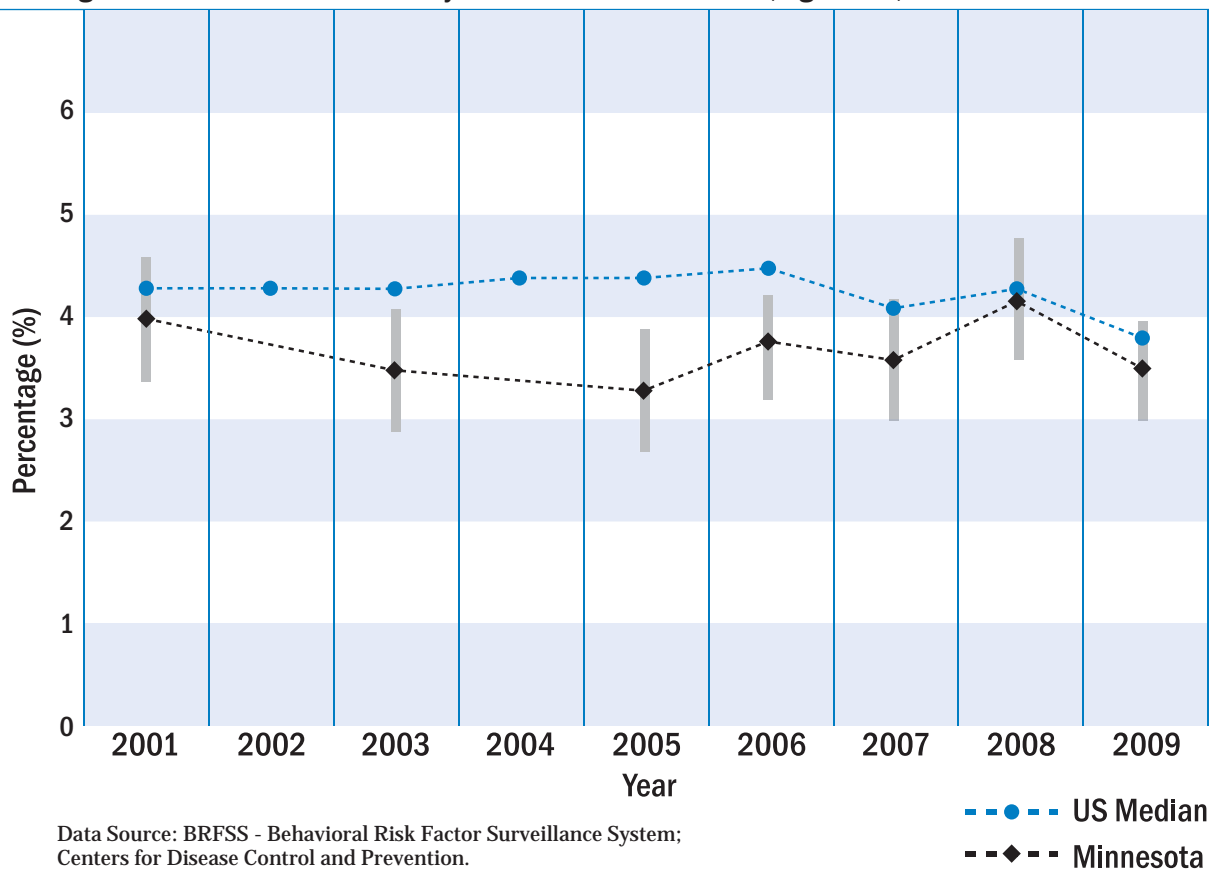
	Female	Male
Coronary Heart Disease	2.8%	4.2%
Heart attack	2.1%	3.7%
Stroke	2.5%	2.1%

Data Source: BRFSS – Behavioral Risk Factor Surveillance Survey, Centers for Disease Control & Prevention

The following series of figures shows trends in the prevalence of coronary heart disease, heart attack, and stroke in Minnesota and the United States from 2001 to 2009. The trend line for the Minnesota values includes a 95% confidence interval, which is similar to a margin of error. Because these data come from a survey of randomly-selected Minnesotans, the 95% confidence interval shows the range that should contain the true value if the entire population of Minnesota had been surveyed.

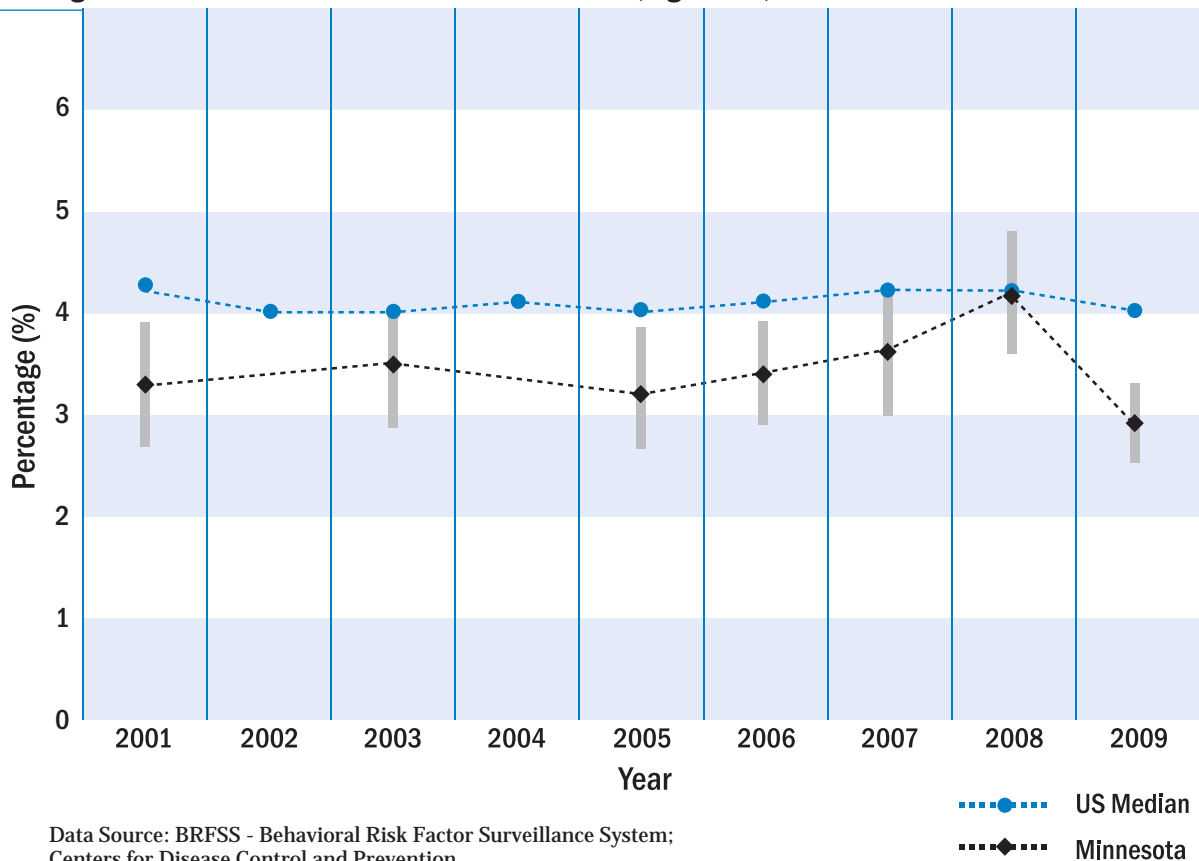
The percentage of Minnesota adults who report they have coronary heart disease (CHD) has remained stable from 2001 through 2009, at between 3.3 and 4.1 percent (Figure 1.1). This is slightly lower than the median value for all states during the same time period. Appendix C provides more details on CHD by sex, race/ethnicity, age group, income, and education level.

Figure 1.1. Prevalence of coronary heart disease - Minnesota, ages 18+, 2001-2009.



The percentage of Minnesota adults who report they have had a myocardial infarction (MI) or heart attack has remained relatively stable from 2005 through 2009, ranging from approximately 3 to 4 percent (Figure 1.2). Except for 2008, this figure has been significantly lower than the median value for all states during the same time period. Appendix D provides more details on heart attack by sex, race/ethnicity, age group, income, and education level.

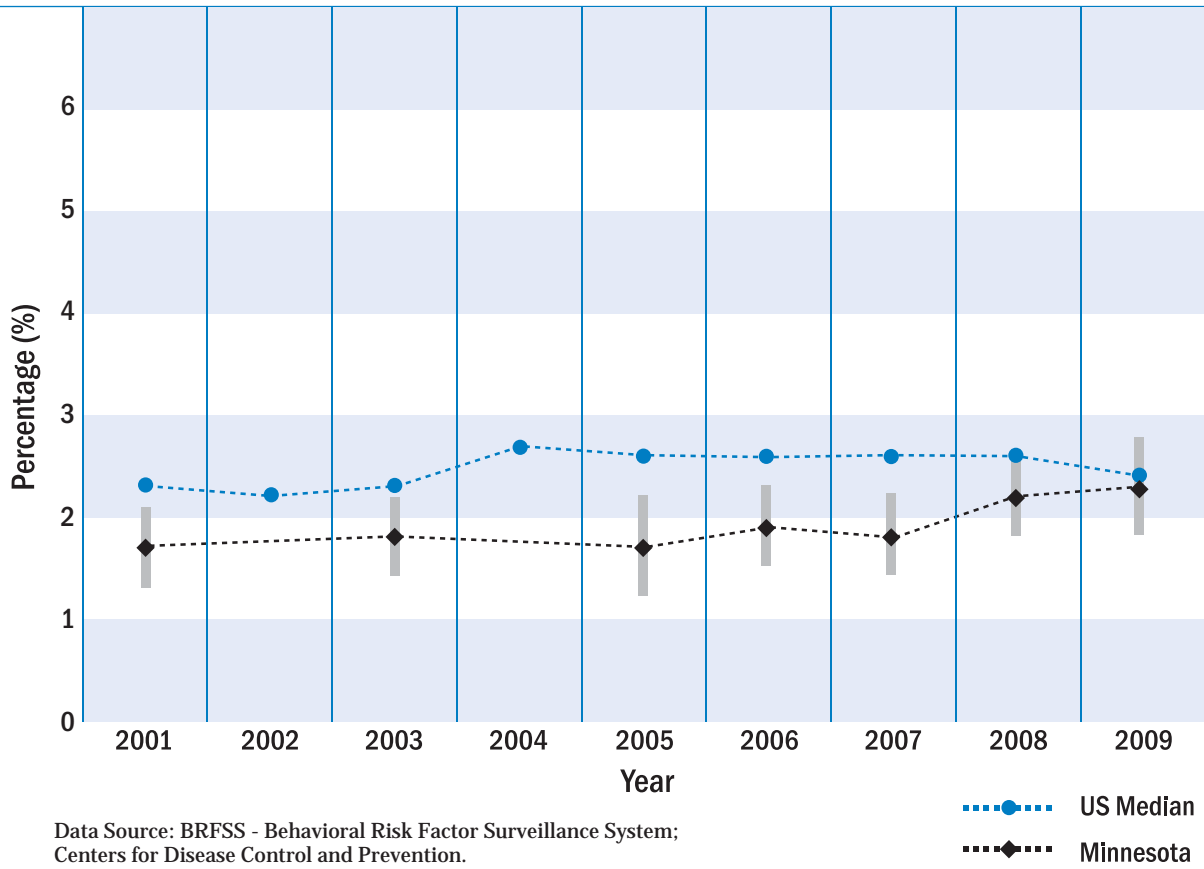
Figure 1.2. Prevalence of heart attack - Minnesota, ages 18+, 2001-2009.



Data Source: BRFSS - Behavioral Risk Factor Surveillance System; Centers for Disease Control and Prevention.  
 "Don't Know/Not Sure" and "Refused" were excluded from the denominator.  
 Not asked in Minnesota in 2002 and 2004.  
 Age adjusted to the 2000 U.S. standard population.  
 Minnesota is shown with 95% confidence intervals.

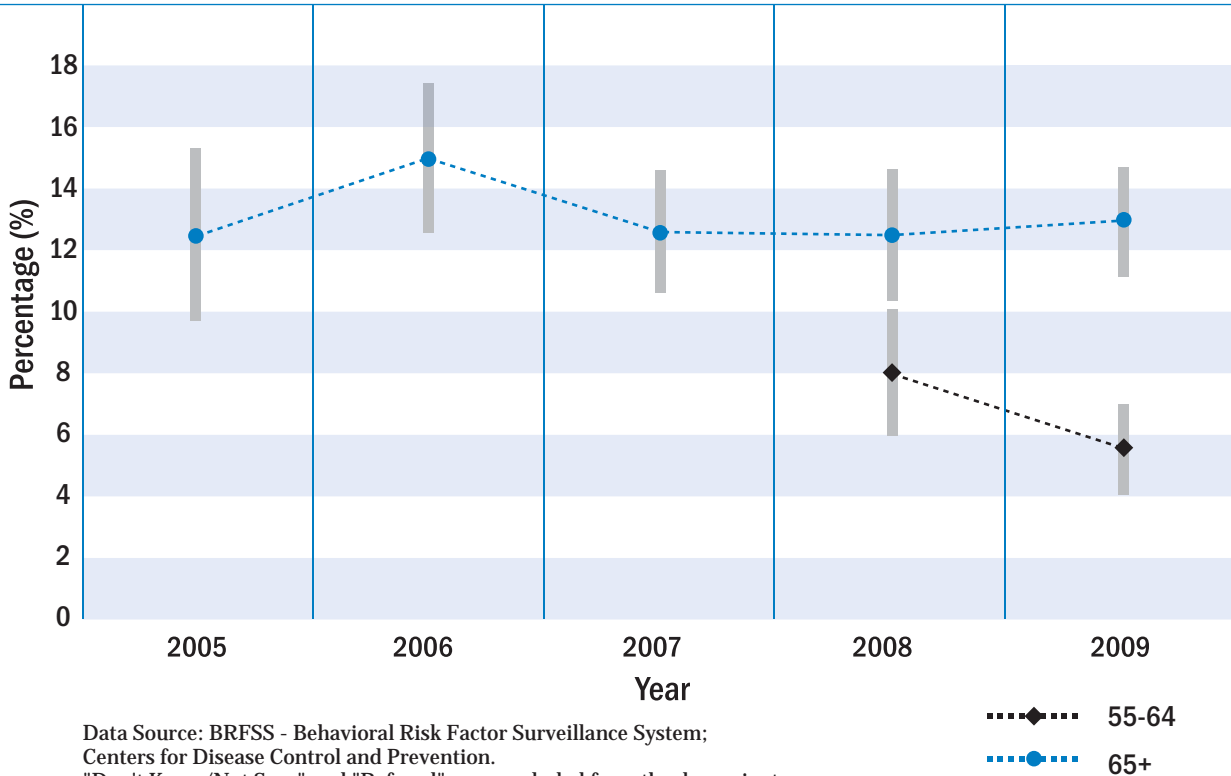
The percentage of Minnesota adults who report they have had a stroke has remained relatively stable from 2005 through 2009 from approximately 1.7 to 2.3 percent (Figure 1.3). Until 2007, this figure was significantly lower than the median for all states, but in 2008 and 2009 the prevalence of stroke in Minnesota was no different than the median of all states.

Figure 1.3. Prevalence of stroke - Minnesota, ages 18+, 2001-2009.



CHD occurs much more frequently in older age groups. Figure 1.4 shows the percentage of Minnesota adults who report they have CHD by two age groups (55-64 years, and 65 years and older). For the oldest Minnesotans, the percentage who report they have CHD has ranged from a high of 15.0 percent in 2006 to a low of 12.5 percent in 2005 and 2008. The percentage of Minnesota adults aged 55-64 years who report they have CHD is significantly lower than for the oldest Minnesotans (8.0 percent in 2008 and 5.6 percent in 2009). CHD in the 55-64 year age group cannot be estimated for the years 2005 through 2007 due to a small survey sample size.

Figure 1.4. Prevalence of coronary heart disease by age group – Minnesota, 2005-2009.



Data Source: BRFSS - Behavioral Risk Factor Surveillance System;  
Centers for Disease Control and Prevention.  
"Don't Know/Not Sure" and "Refused" were excluded from the denominator.  
The denominator for ages 55-64 is too small in 2005, 2006, and 2007.  
Age adjusted to the 2000 U.S. standard population.  
Data shown with 95% confidence intervals.

## II. Prevalence of Risk Factors for Heart Disease and Stroke

The annual BRFSS survey asks about many risk factors for heart disease and stroke, but not necessarily all in the same year. Table 1.2 shows the most recent values (collected in 2009) for the major modifiable risk factors of heart disease and stroke by sex. More women than men report being physically inactive (16.4 vs. 15.1 percent). More men than women report currently smoking (18.6 vs. 14.9 percent). The percentage of men reporting eating less than 5 servings of fruits or vegetables daily was 86 percent, significantly higher than for women (75.4 percent). Men were more likely to report being diagnosed as diabetic (7.2 vs. 5.6 percent for women). Approximately 1 of 4 women and men reported being obese. Slightly more men (22.1 percent) than women (21 percent) reported currently having high blood pressure, and significantly more men (36.6 percent) than women (31.2 percent) reported having being diagnosed with high blood cholesterol. In addition, men were less likely to have had their cholesterol checked in the last 5 years (27.8 vs. 20.5 percent for women).

**Table 1.2. Prevalence of heart disease and stroke risk factors – Minnesota, ages 18+, 2009.**

Risk Factor	Female	Male
Physical inactivity	16.4%	15.1%
Smoking <sup>1</sup>	14.9%	18.6%
Less than 5 fruits/veggies daily	75.4%	86%
Diabetes <sup>2</sup>	5.6%	7.2%
Obesity <sup>3</sup>	25.7%	25.0%
High blood pressure <sup>4</sup>	21.0%	22.1%
High cholesterol	31.2%	36.6%
No cholesterol check in last 5 years	20.5%	27.8%

Data Source: BRFSS – Behavioral Risk Factor Surveillance System.

"Don't know/Not sure" and "Refused" were excluded from the denominator.

Age adjusted to the 2000 U.S. standard population.

<sup>1</sup>Smoking is defined as having ever smoked at least 100 cigarettes and now smoking every day or some days.

<sup>2</sup>Female respondents who were told they had diabetes only while pregnant were excluded from the denominator.

<sup>3</sup>Obesity is defined as BMI  $\geq 30$  kg/m<sup>2</sup>.

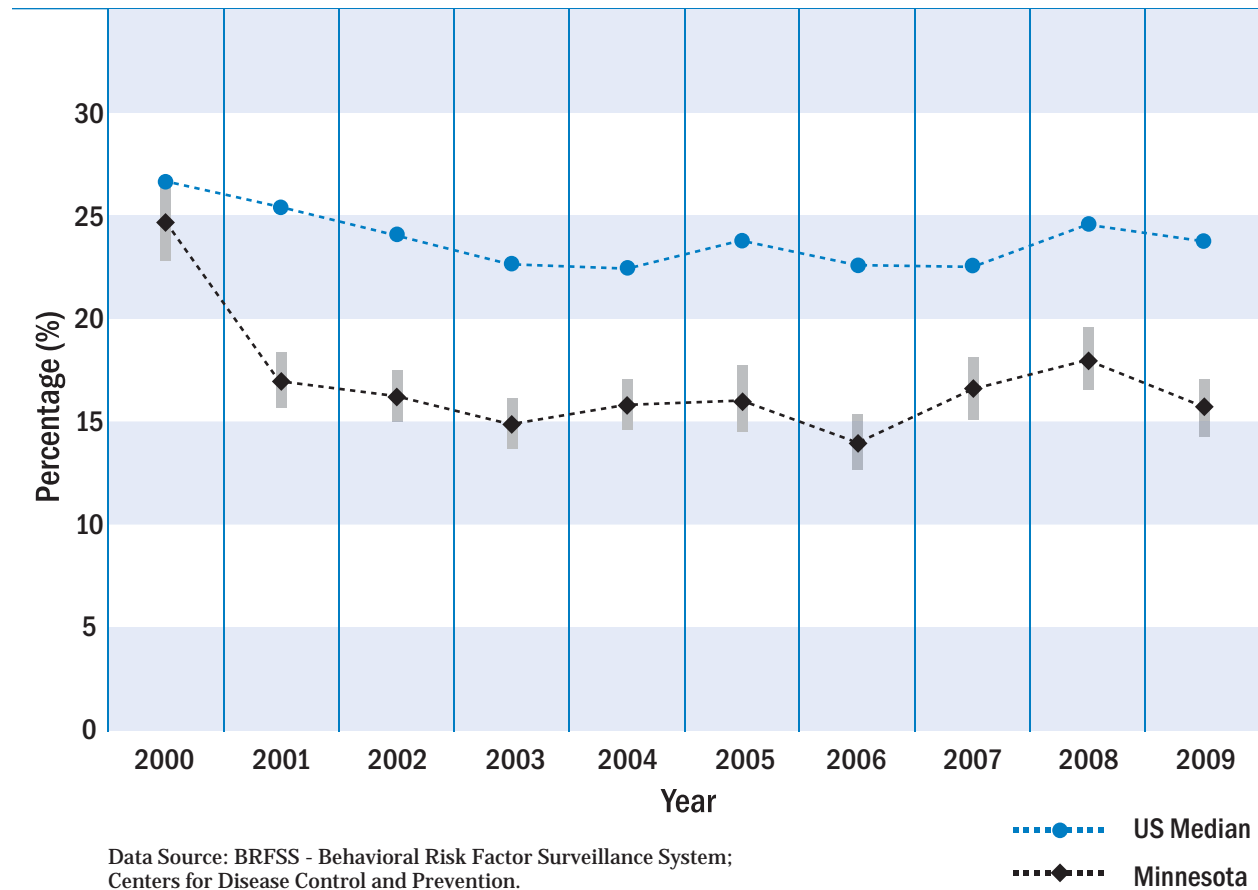
<sup>4</sup>Female respondents who were told they had high blood pressure only while pregnant were excluded from the denominator.

## Trends in Prevalence of Risk Factors

The following series of figures shows trends in the prevalence of modifiable risk factors for heart disease and stroke in Minnesota and the United States from 2000 to 2009. The trend line for the Minnesota values includes a 95% confidence interval, which is similar to a margin of error. Because these data come from a survey of randomly-selected Minnesotans, the 95% confidence interval shows the range that should contain the true value if the entire population of Minnesota had been surveyed.

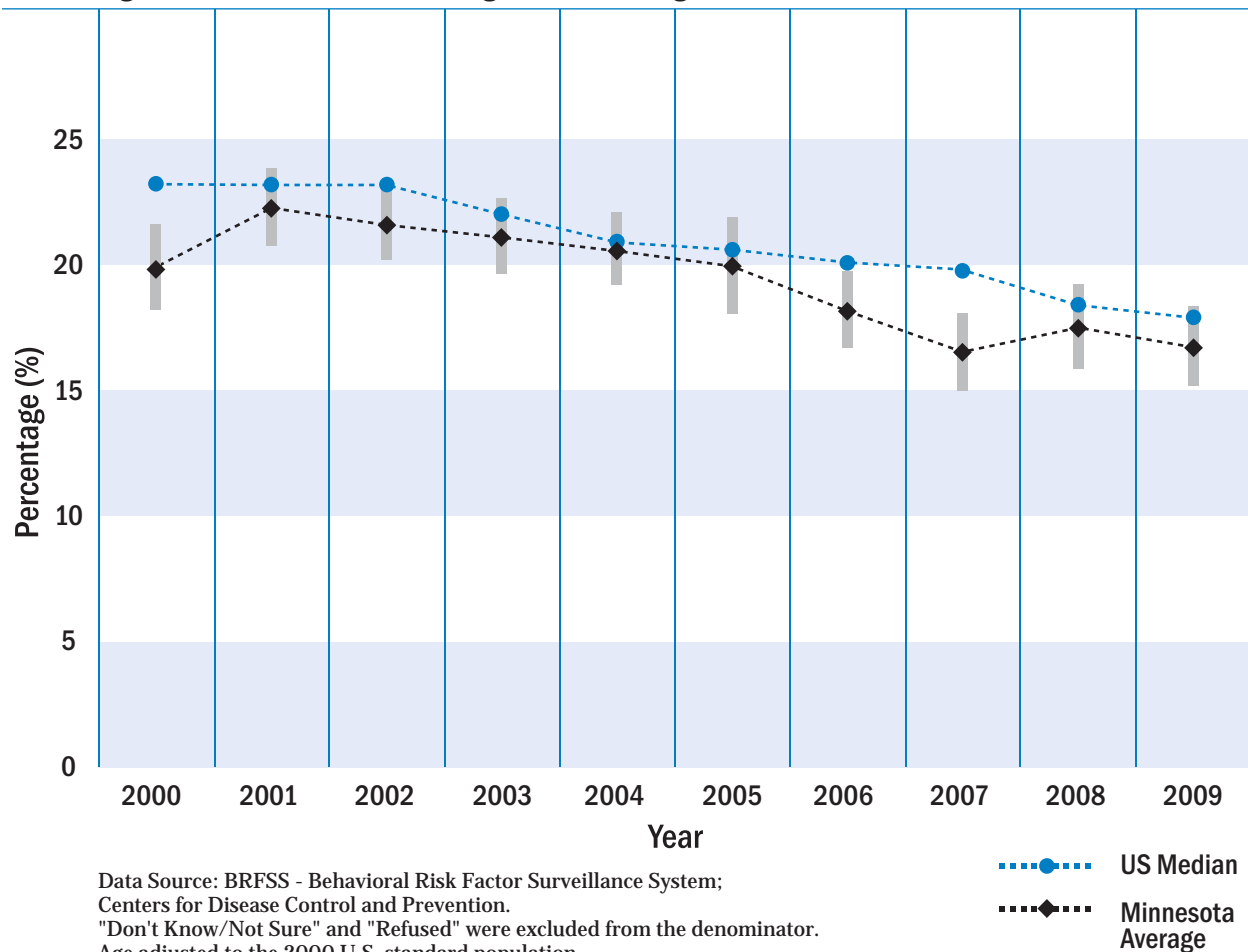
Lack of regular physical activity is an important predictor of heart disease, stroke, obesity, and other risk factors for heart disease and stroke. The percentage of Minnesota adults who report having engaged in no physical activity in the past month has decreased from 24.8 percent in 2000 to 15.8 percent in 2009 (Figure 1.5), a decline of 9 percentage points. This improvement is much better than in most states, with significantly fewer Minnesotans reporting being physically inactive than the median percentage for all states.

Figure 1.5. Prevalence of no physical activity in the past month - Minnesota, ages 18+, 2000-2009.



Smoking doubles or triples the risk of dying from heart disease and stroke, and is a major contributor to the incidence of peripheral artery disease (PAD). The percentage of Minnesota adults who report being current smokers has declined from 19.9 percent in 2000 to 16.7 percent in 2009 (Figure 1.6). Minnesota has been below the median value of all states in all years, though not always by a significant margin. The improvement in Minnesota's smoking rates has been similar to the median value of all states.

Figure 1.6. Prevalence of smoking - Minnesota, ages 18+, 2000-2009.



Data Source: BRFSS - Behavioral Risk Factor Surveillance System;  
Centers for Disease Control and Prevention.

"Don't Know/Not Sure" and "Refused" were excluded from the denominator.

Age adjusted to the 2000 U.S. standard population.

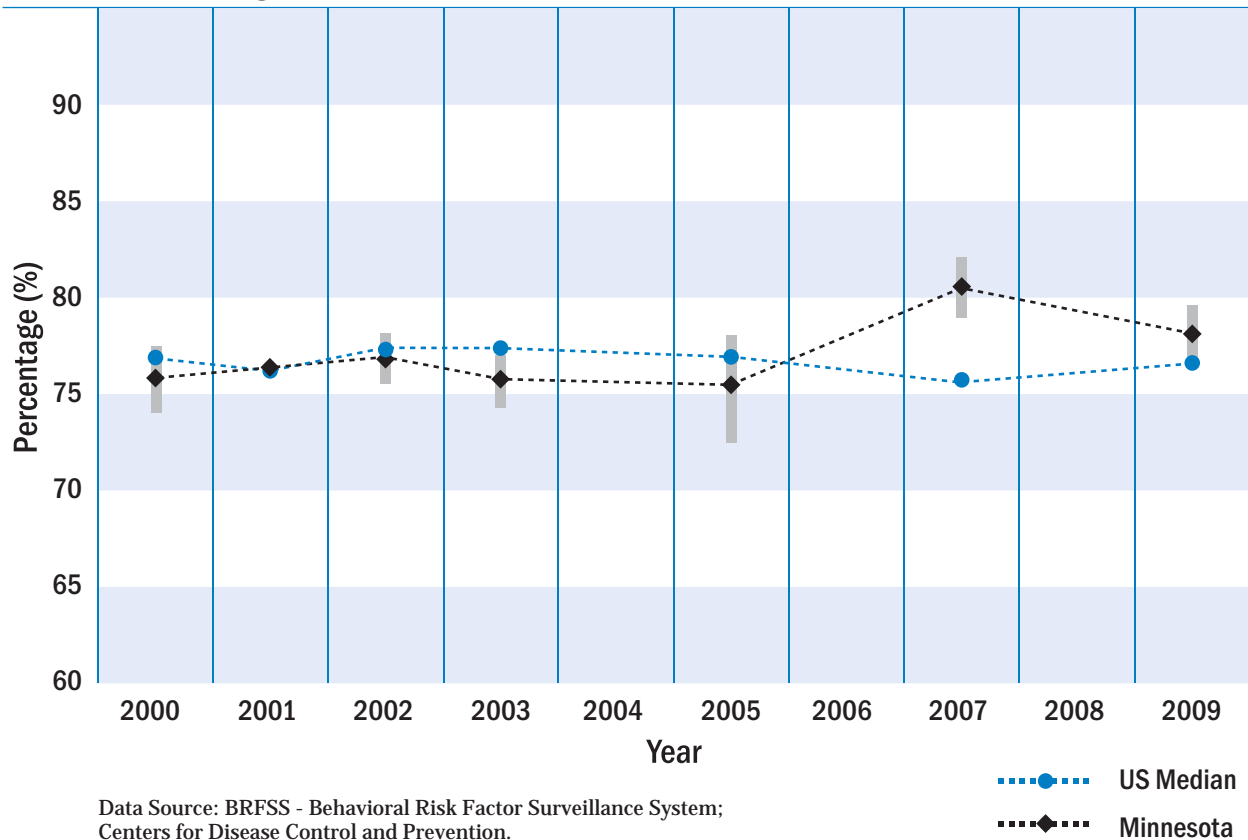
Smoking is defined as having ever smoked at least 100 cigarettes and now smoking every day or some days.

Minnesota is shown with 95% confidence intervals.



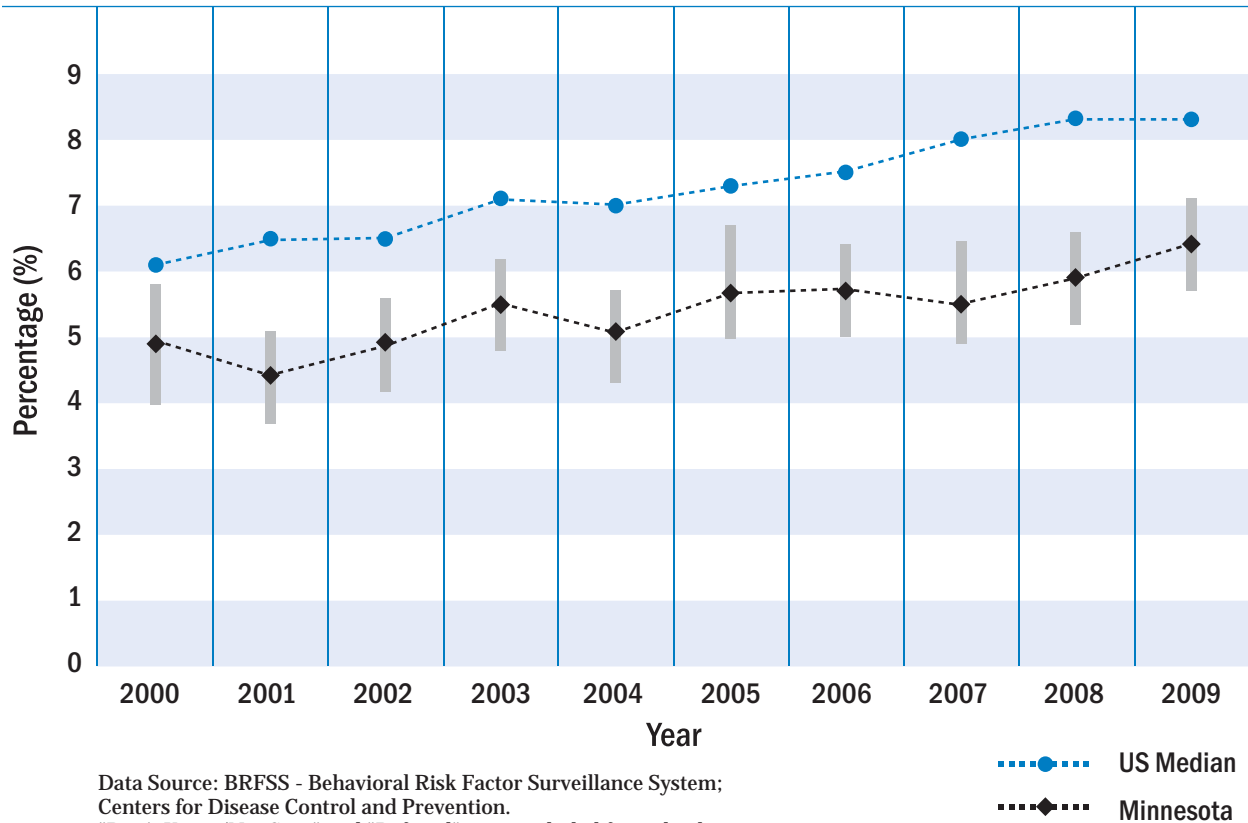
Eating a diet rich in fruits and vegetables can reduce the risk of heart disease and stroke. As shown in Figure 1.7, the percentage of Minnesota adults who report eating less than five servings of fruits and vegetables per day is quite high, increasing from 75.8 percent in 2000 to 78.1 percent in 2009. In 2008 and 2009, this value was significantly higher in Minnesota than the median value of all states.

Figure 1.7. Prevalence of consuming less than 5 servings of fruits and vegetables per day - Minnesota, ages 18+, 2000-2009.



Individuals with diabetes have a significantly higher risk of developing heart disease or having a stroke. The percentage of Minnesota adults who report they have been diagnosed with diabetes increased from 4.9 percent in 2000 to 6.4 percent in 2009 (Figure 1.8). This value has remained significantly lower than the median value of all states over the entire time period.

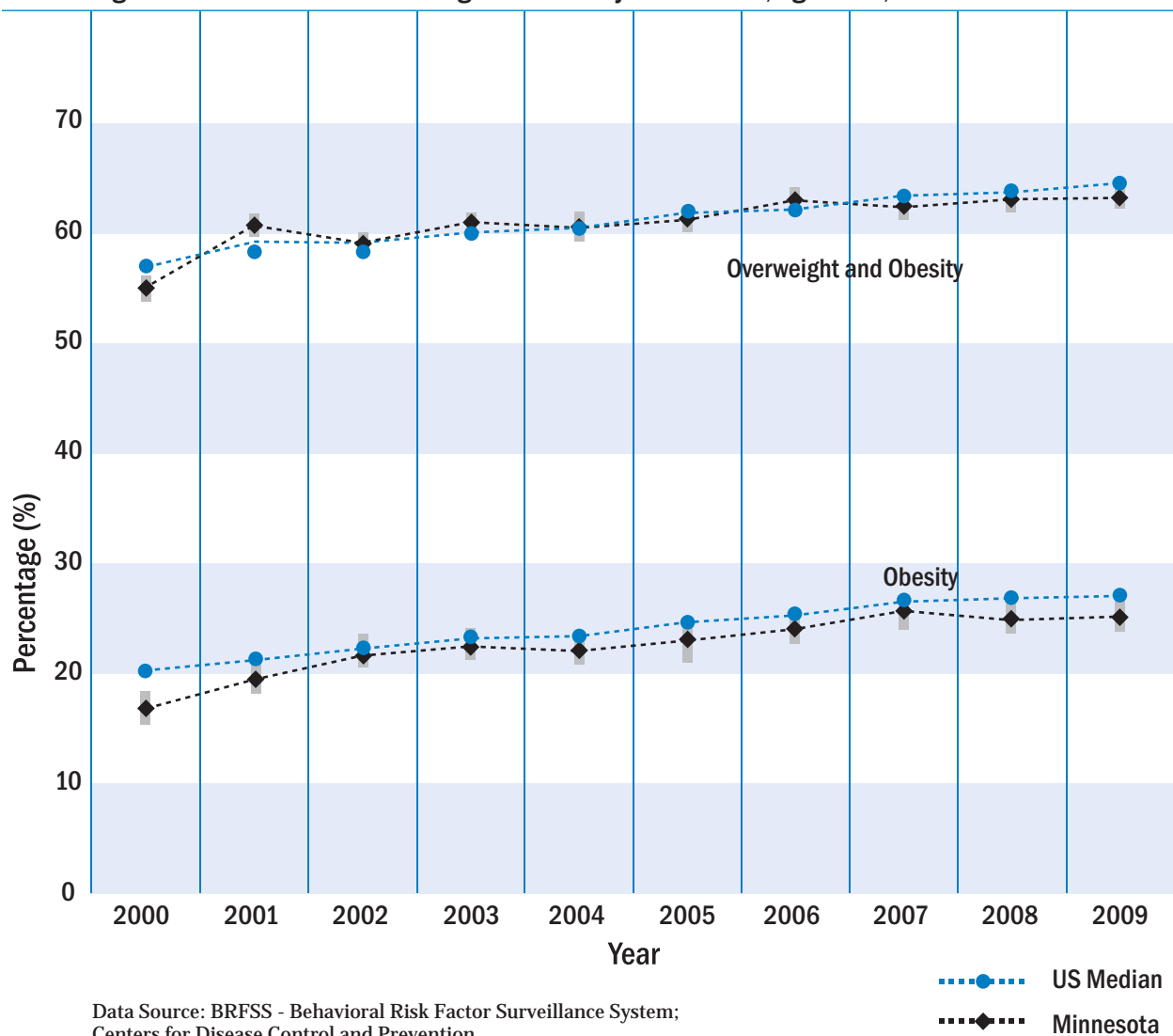
Figure 1.8. Prevalence of diabetes - Minnesota, ages 18+, 2000-2009.



Increasing body weight is associated with increased risk of heart disease and stroke. The prevalence of overweight, defined as a body mass index (BMI) of 25 up to 30, and obesity, defined as a BMI greater than or equal to 30, has increased dramatically in Minnesota and across the United States. The percentage of Minnesota adults classified as obese has increased by 8.2 percentage points from 16.7 percent in 2000 to 24.9 percent in 2009 (Figure 1.9). The percentage of obese adults in Minnesota has been consistently slightly lower than the median value of all states.

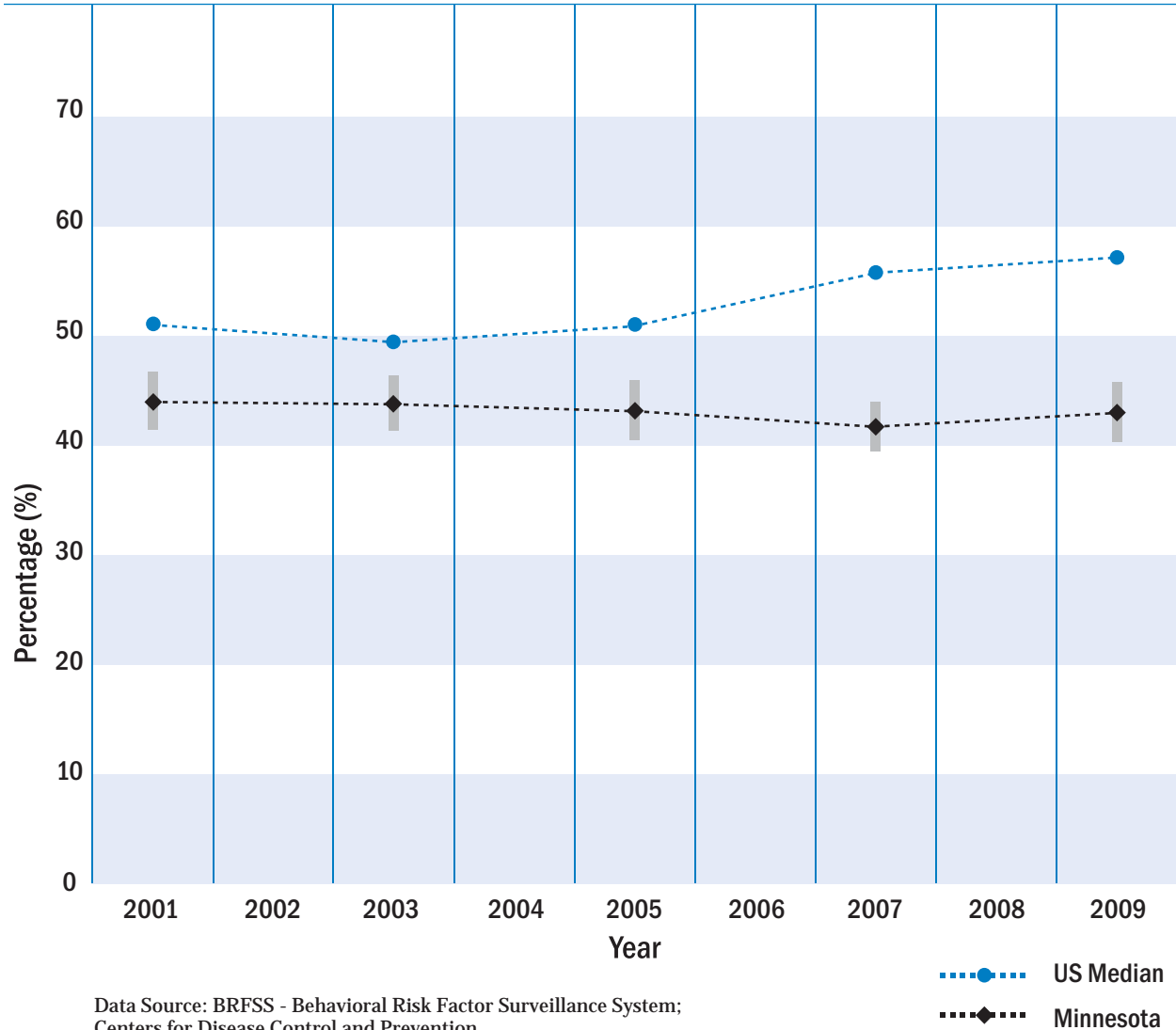
The percentage of adults in Minnesota classified as either overweight or obese has continued to rise over the same time frame, also increasing by 8.2 percentage points from 55 percent in 2000 to 63.2 percent in 2009. This trend closely approximates the median value of all states over the 10 year period.

Figure 1.9. Prevalence of overweight and obesity - Minnesota, ages 18+, 2000-2009.



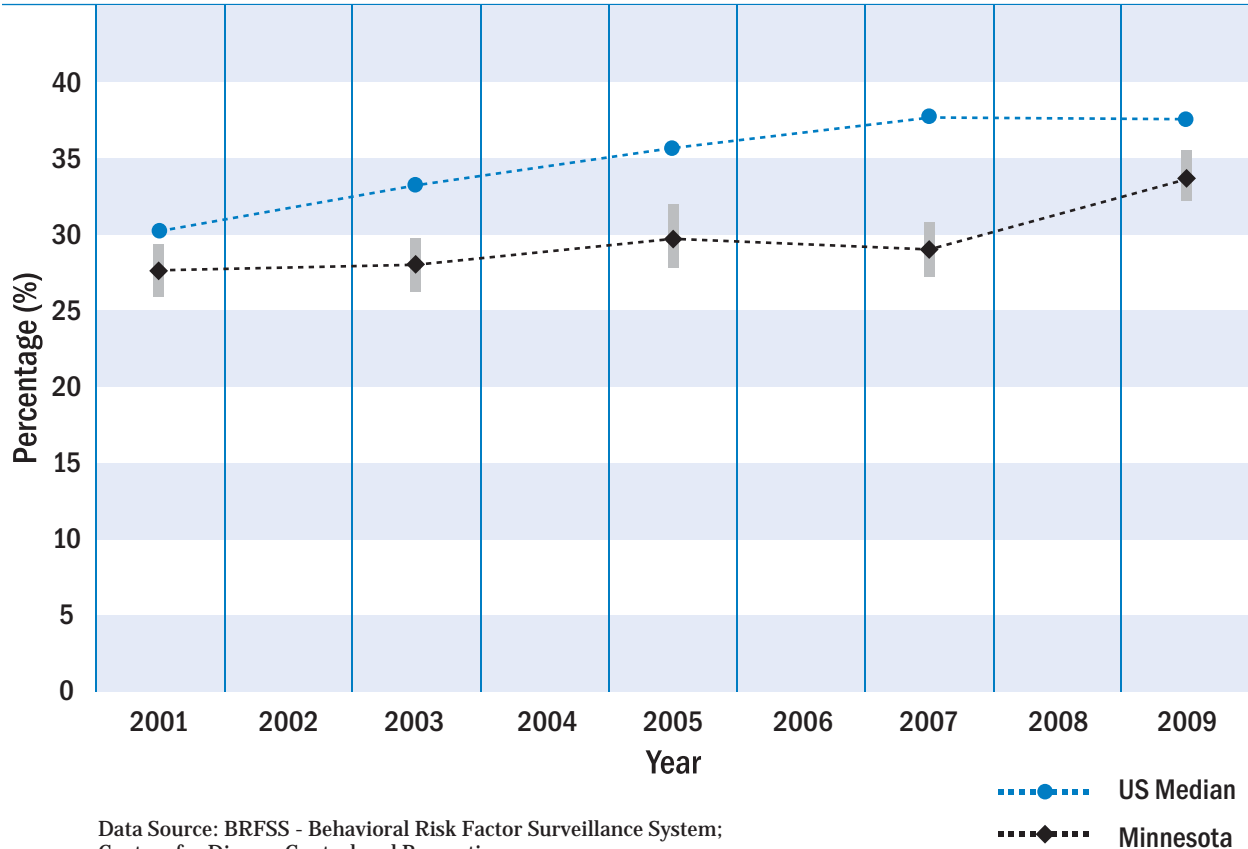
Hypertension, also known as high blood pressure, is one of the most important risk factors for both heart disease and stroke. Controlling hypertension through lifestyle changes and medication use has been shown to significantly reduce the risk of both CHD and stroke. As shown in Figure 1.10, the percentage of Minnesota adults reporting they have been diagnosed with high blood pressure has remained relatively constant from 2001 through 2009 at between 21 percent (2007) and 22.1 percent (2003). This is significantly lower than the median value of all states over the entire time period.

Figure 1.10. Prevalence of hypertension - Minnesota, ages 18+, 2000-2009.



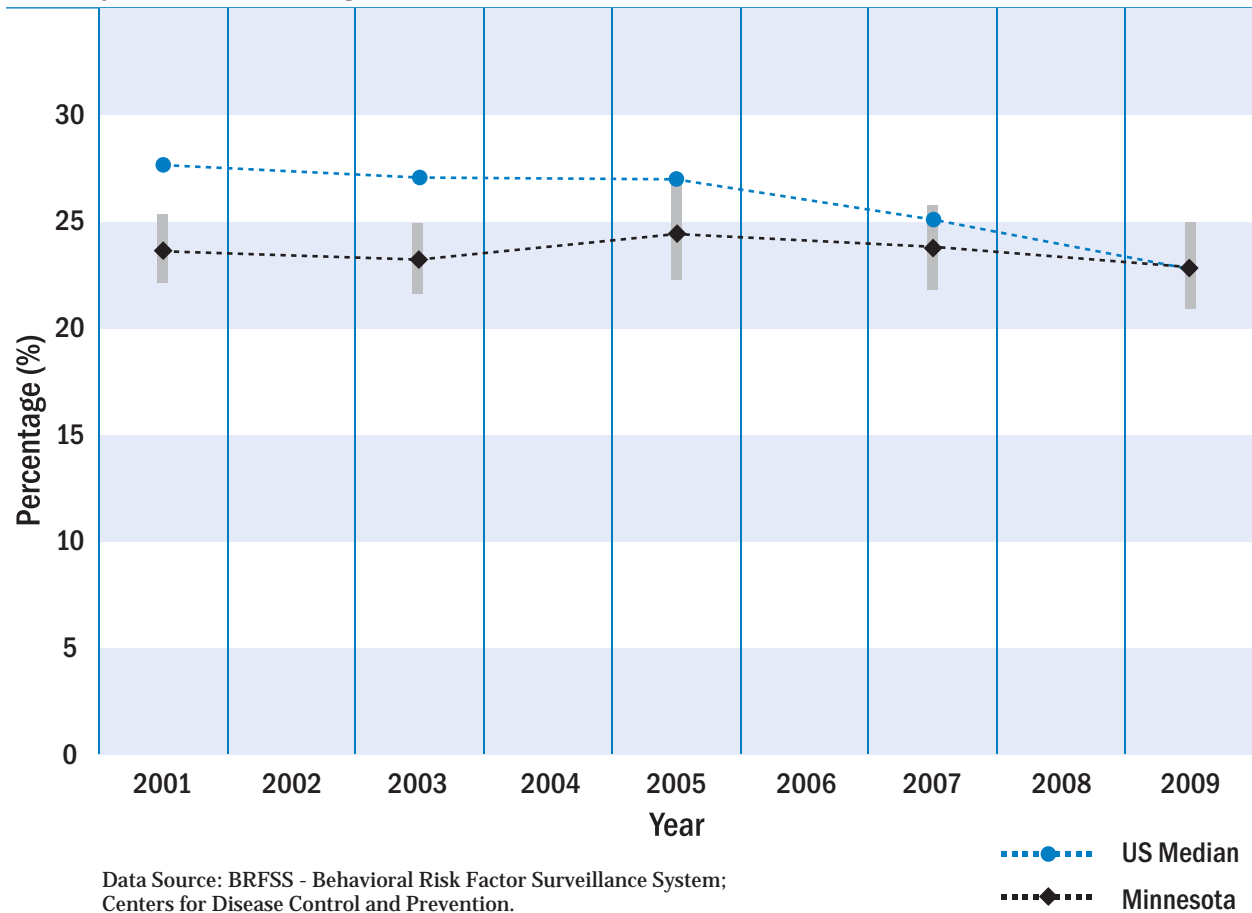
Cholesterol is a waxy substance found among the fats in the bloodstream and in the body's cells. Produced in the liver and contained in many foods, high levels of blood cholesterol are associated with increased risk of both heart disease and stroke. The percentage of Minnesota adults reporting they have been diagnosed with high blood cholesterol has increased from 27.6 percent in 2001 to 33.8 percent in 2009 (Figure 1.11). Even though there has been an increase, this value has stayed significantly lower than the median value of all states over the entire time period.

Figure 1.11. Prevalence of high total cholesterol - Minnesota, ages 18+, 2000-2009.



Knowledge of one's personal levels of cholesterol is important to identification of high blood cholesterol and the initiation or maintenance of treatment to reach cholesterol level targets. Over the last decade, the percentage of Minnesota adults reporting they have not had their cholesterol checked in the previous 5 years has remained relatively constant from 23 percent in 2009 to 24.7 percent in 2005 (Figure 1.12). Over time, Minnesota's relative standing has worsened as the median value for all states has declined, while Minnesota's value has remained constant.

Figure 1.12. Prevalence of adults reporting NOT having their cholesterol checked in the past 5 years - Minnesota, ages 18+, 2001-2009.



For the modifiable risk factors for heart disease and stroke already described in this chapter, striking disparities by sex, race/ethnicity, age group, income, and education level are observed (Table 1.3).

**Sex:** Men report cigarette smoking at higher rates than women, and are more likely than women to consume less than five fruits or vegetables a day, have high blood cholesterol, have been diagnosed with diabetes, and to be either overweight or obese.

**Race/Ethnicity:** Blacks report cigarette smoking at higher rates than whites, are more likely to be physically inactive than whites and other races, are more likely to have high blood pressure than whites and other races, less likely to experience high blood cholesterol than whites and Hispanics and are more likely to be overweight or obese compared to whites and Hispanics. Individuals in other race groups are less likely to have high blood pressure than whites and blacks, and less likely to have high blood cholesterol than whites.

**Age:** The youngest adults in Minnesota are more likely to report cigarette smoking and eating less than five fruits or vegetables a day than older adults. The youngest adults in Minnesota are less likely to be overweight or obese than older adults. High blood pressure and high blood cholesterol increase significantly with age.

**Income:** The lowest income Minnesota adults report the highest rates of cigarette smoking, physical inactivity, consuming less than five fruits or vegetables daily, high blood pressure, high blood cholesterol, diabetes, and obesity.

**Education:** Minnesota adults with a High School education or less report the highest rates of cigarette smoking, physical inactivity, consuming less than five fruits or vegetables daily, high blood pressure, high blood cholesterol, and diabetes. College graduates report the lowest rate of obesity.

**Table 1.3. Heart Disease and Stroke Risk Factors in Minnesota, by sex, race/ethnicity, age, income, and education level, 2009.**

		Cigarette Smoking (%)	Physical Inactivity (%)	Less than 5 fruits/veggies daily (%)	High Blood Pressure (%)	High Blood Cholesterol (%)	Diabetes (%)	Overweight or Obese (%)	Obesity (%)
Overall		16.7	15.8	78.2	21.6	33.8	6.4	62.1	24.9
Sex	Male	18.6	15.1	82.7	22.1	36.6	7.2	69.8	24.9
	Female	14.9	16.4	73.9	21.0	31.2	5.6	54.6	25.0
Race/Ethnicity	White, Not Hispanic	16.1	15.3	78.5	21.7	34.4	6.4	61.5	24.6
	Black, Not Hispanic	29.8	27.9	-	27.0	25.0	-	70.8	29.5
	Hispanic	-	-	-	21.9	35.4	-	63.7	28.9
	Other	-	17.3	69.1	11.9	24.4	-	69.0	25.8
Age	18-24	23.7	-	82.5	-	-	-	44.6	20.8
	25-34	19.4	12.1	76.3	6.7	18.4	-	60.8	24.4
	35-44	16.6	9.9	79.5	10.9	13.6	3.1	61.0	23.2
	45-54	18.1	15.9	79.6	19.4	25.6	5.5	65.4	26.0
	55-64	15.9	17.3	76.9	32.9	47.4	11.6	73.1	30.7
	65+	7.7	25.1	74.1	52.7	51.5	15.6	64.3	24.0
Income	<\$15,000	35.5	34.0	85.8	39.4	42.3	14.9	62.1	37.5
	\$15,000-\$24,999	27.4	29.7	84.5	28.8	39.8	9.9	67.9	29.2
	\$24,000-\$34,999	26.6	19.4	78.2	28.4	36.9	10.8	67.0	25.2
	\$35,000-\$49,999	22.7	17.2	78.2	26.8	36.7	5.6	66.6	29.4
	\$50,000 +	10.1	10.8	76.1	15.8	30.3	4.1	61.6	22.0
Education	< HS	39.3	27.8	89.2	29.6	38.8	11.8	59.8	27.4
	HS or GED	21.5	23.3	82.4	27.2	39.6	8.4	60.8	26.9
	Some post HS	21.6	14.6	79.8	22.5	35.4	6.9	65.8	28.4
	College graduate	8.2	10.7	73.5	16.6	29.5	4.2	60.6	21.0

Data Source: BRFSS – Behavioral Risk Factor Surveillance Survey, Centers for Disease Control &amp; Prevention

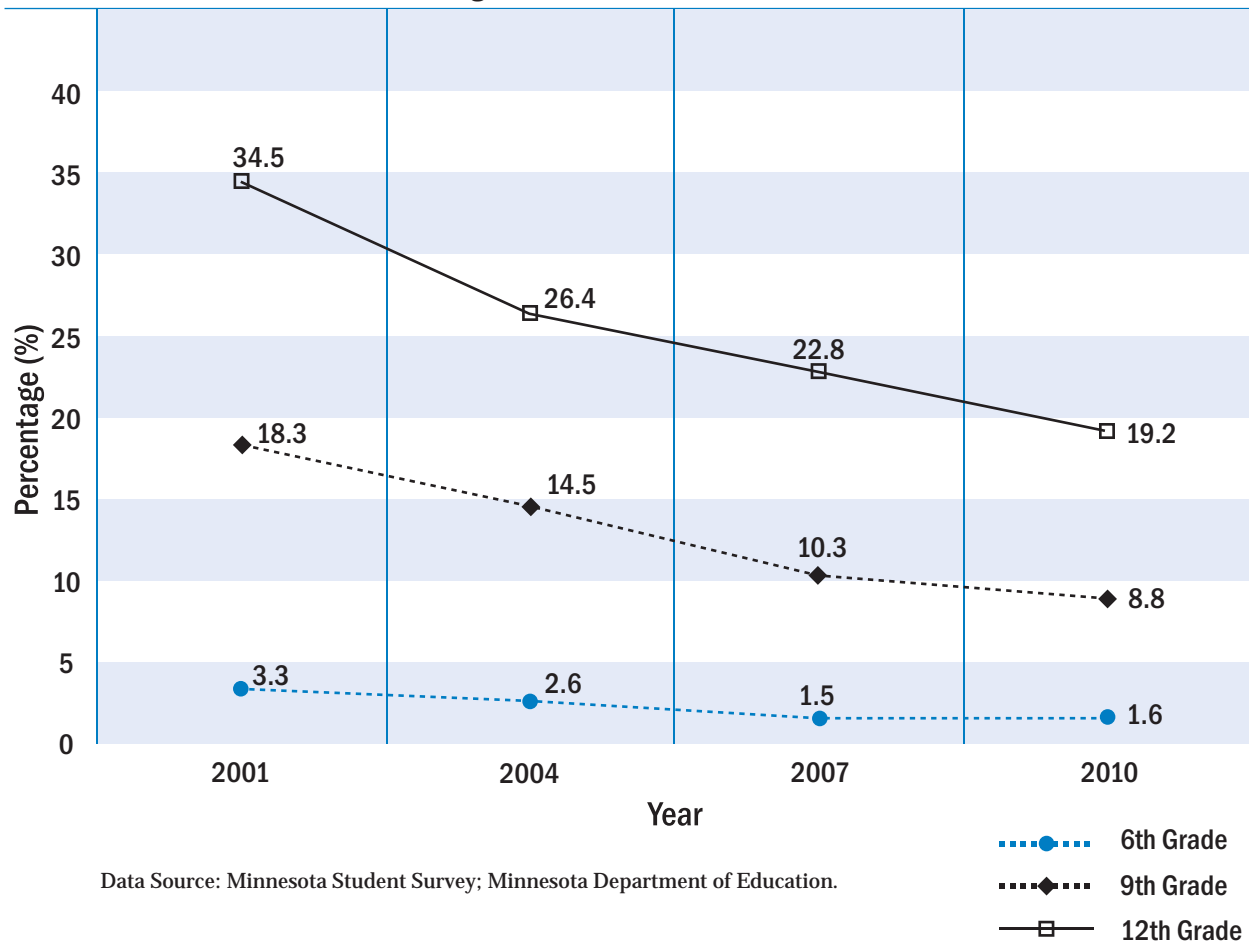


### III. Prevalence of Risk Factors in Children & Youth

The development of risk factors for heart disease and stroke does not necessarily begin in adulthood. Often, risk behaviors and risk factors begin developing as early as childhood and adolescence, setting the stage for poor risk factor profiles and increased risk of heart disease and stroke in adulthood. The following tables document the prevalence of cigarette smoking, physical inactivity, and consumption of fruits and vegetables in Minnesota school-age children. Additionally, tables from the Pediatric Nutrition Surveillance Survey detail trends in obesity and overweight in pre-school children ages 2 through 5 years.

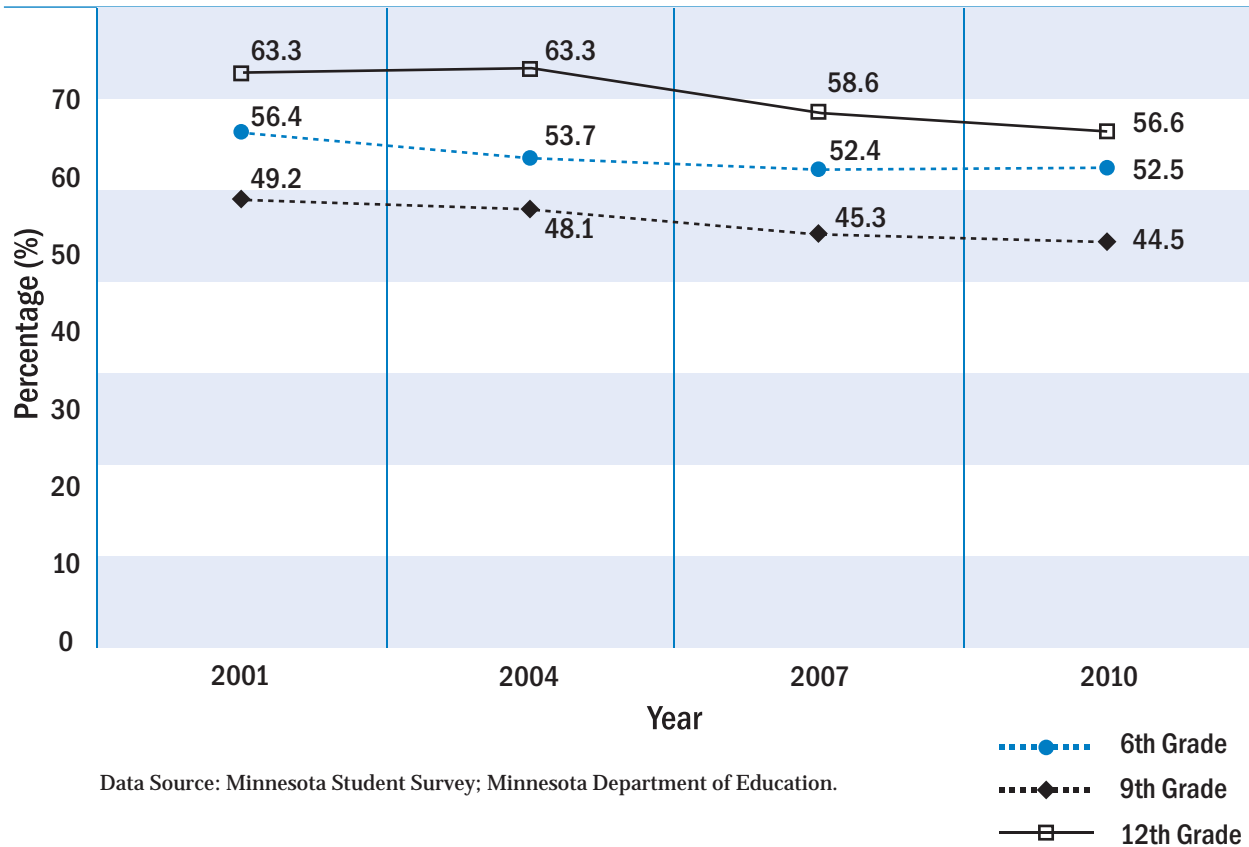
Cigarette smoking by Minnesota students in all grades has declined strongly between 2001 and 2010 (Figure 1.13). Smoking rates for 6th grade students declined by 1.7 percentage points, from 3.3 percent in 2001 to 1.6 percent in 2010, and rates for 9th grade students declined by 9.5 percentage points, from 18.3 percent in 2001 to 8.8 percent in 2010. Rates for 12th grade students declined by 15.3 percentage points, from 34.5 percent in 2001 to 19.2 percent in 2010. The smoking rate for 12th grade students in 2010 was approximately equal to the statewide rate for adults in 2009.

Figure 1.13. Prevalence of cigarette smoking during the previous 30 days  
- Minnesota 6th, 9th, and 12th grade students, 2001-2010.



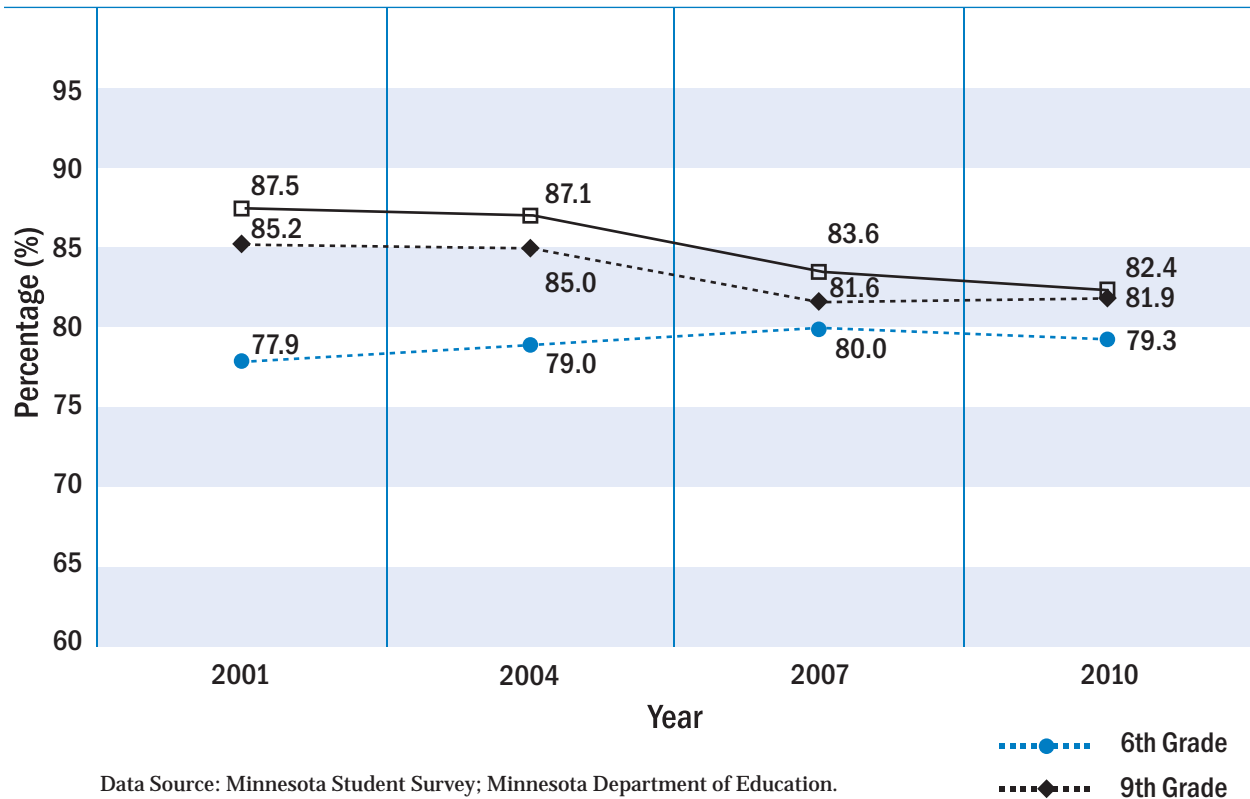
Rates of physical inactivity, defined as less than 5 days of 30 minutes of physical activity per week, have improved from 2001 to 2010 in Minnesota students (Figure 1.14). Over the nine year time period, 6th graders have improved by 3.9 percentage points to 52.5 percent, 9th graders have improved by 4.7 percentage points to 44.5 percent, and 12th graders have improved by 7.7 percentage points to 56.6 percent. Still, more than half of students surveyed are getting less than 5 days of 30 minutes of physical activity per week.

Figure 1.14. Less than 5 days of 30 minutes of physical activity per week  
- Minnesota 6th, 9th, and 12th grade students, 2001-2010.



As shown in Figure 1.15, the percentage of students eating less than five fruits and vegetables daily improved by 3.3 percentage points for 9th graders (85.2 percent in 2001 and 81.9 percent in 2010) and 5.1 percentage points for 12th graders (87.5 percent in 2001 and 82.4 percent in 2010). The situation worsened slightly for 6th graders, increasing by 1.4 percentage points (77.9 percent in 2001 and 79.3 percent in 2010). Still, the vast majority of Minnesota students are not meeting dietary recommendations for the consumption of fruits and vegetables.

Figure 1.15. Less than five fruits and vegetables daily  
- Minnesota 6th, 9th, and 12th grade students, 2001-2010.



Overweight and obesity are important concerns throughout life. Health indicators for children enrolled in the Minnesota Women, Infants & Children (WIC) Program are summarized in the Pediatric Nutrition Surveillance Survey (PedNSS). Classifications of overweight and obese are based on the CDC BMI-for-age growth charts (for either girls or boys) to obtain a percentile ranking. Children in the 85th up to the 95th percentile are classified as overweight, while children in the 95th percentile and above are classified as obese. Over the last decade, there has been very little change in the percentage of Minnesota children ages 2-5 classified as obese (13.1 percent in 2000 vs. 13.0 percent in 2009), and a small decline in the percentage of Minnesota children classified as overweight (16.8 percent in 2000 vs. 15.8 percent in 2009) (Table 1.4).

**Table 1.4. Prevalence of overweight and obesity<sup>1</sup>**  
**– Minnesota children enrolled in WIC, ages 2-5, 2000-2009.**

Year	Overweight (85th - <95th %)	Obese (>=95th %)
2000	16.8	13.1
2001	17.0	13.4
2002	16.6	13.3
2003	16.5	13.1
2004	16.4	13.3
2005	16.9	13.8
2006	15.9	13.2
2007	15.8	13.2
2008	15.7	13.0
2009	15.8	13.0

Data Source: Pediatric Nutrition Surveillance System (PedNSS) Division of Nutrition, Physical Activity and Obesity, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, United States Department of Health and Human Services.

<sup>1</sup>Based on 2000 CDC BMI-for-age for children 2 years of age and older. 85th- <95th percentile category identifies overweight children and >=95th percentile category identifies obese children

Table 1.5 shows the percentage of Minnesota children ages 2-5 classified as overweight or obese by race and ethnicity in 2009. The highest rates of obesity are present in Hispanic (17.7 percent), Asian/Pacific Islander (15.8 percent), and especially, American Indian children (27.7 percent). The highest rates of overweight are again present in American Indian (23.2 percent), and Hispanic children (18.2 percent), but also in children of multiple races (18.5 percent). White and black children had the lowest rates of both obesity and overweight.

**Table 1.5. Prevalence of overweight and obesity<sup>1</sup>**  
**– Minnesota children enrolled in WIC, ages 2-5, by race/ethnicity, 2009.**

Race/Ethnicity	Overweight (85th - <95th %)	Obese (>=95th %)
White, Not Hispanic	16.0	10.0
Black, Not Hispanic	14.7	12.0
Hispanic	18.2	17.7
American Indian	23.2	27.7
Asian/Pacific Islander	17.0	15.8
Multiple Races	18.5	13.1

Data Source: Pediatric Nutrition Surveillance System (PedNSS) Division of Nutrition, Physical Activity and Obesity, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, United States Department of Health and Human Services.

<sup>1</sup>Based on 2000 CDC BMI-for-age for children 2 years of age and older. 85th- <95th percentile category identifies overweight children and >=95th percentile category identifies obese children

## Chapter 2: Heart Attack and Stroke Symptom Awareness



### I. Heart Attack and Stroke Symptom Awareness

Prompt activation of emergency medical services is the most important step an individual can take to receive the most appropriate and timely medical care for heart attack and stroke. Recognition of the five most typical symptoms of heart attack is vital to knowing when a heart attack is occurring and the need to activate emergency medical services through use of 9-1-1. Table 2.1 shows the percentage of Minnesota

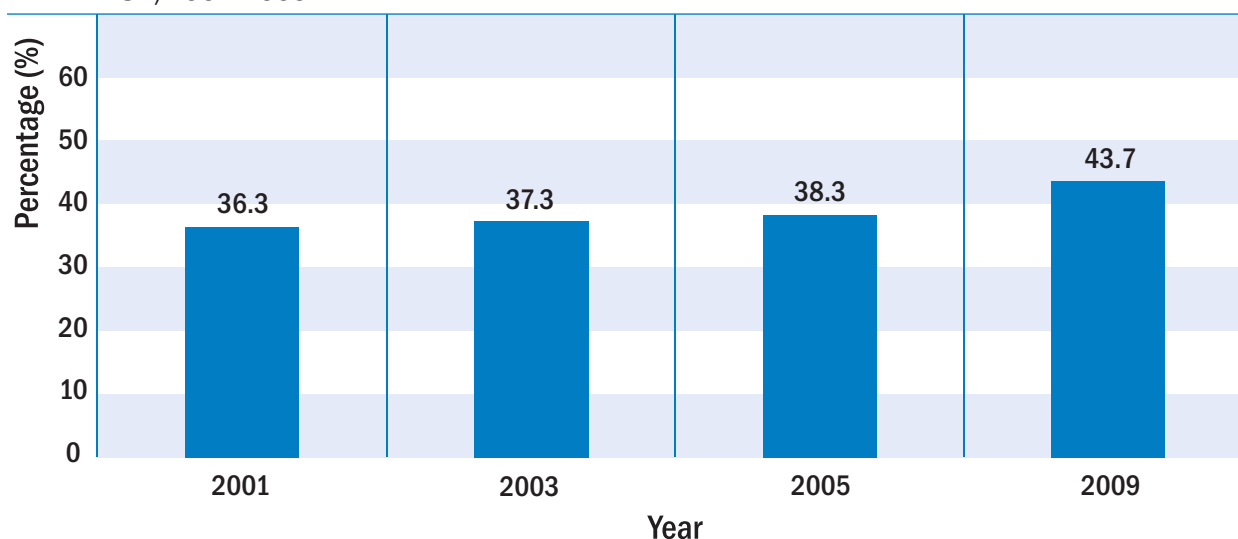
adults who could recognize five important signs and symptoms of heart attack in 2009. Recognition was quite high for chest pain or discomfort (93.7 percent); shortness of breath (89.4 percent); and pain or discomfort in the arms or shoulder (87.3 percent). Conversely, recognition of a feeling of weakness, lightheadedness, or faintness (68.8 percent) and pain or discomfort in the jaw, neck, or back (59.3 percent) were less frequently identified as symptoms of a heart attack. Only 43.7 percent of respondents could identify all five of the listed signs and symptoms of heart attack, and 38.8 percent of all respondents could identify all five signs and symptoms and correctly indicated that their first action would be to call 9-1-1.

**Table 2.1. Prevalence of recognition of signs and symptoms of heart attack and use of 9-1-1 as first action - Minnesota, ages 18+, 2009.**

Signs and Symptoms of Heart Attack	Prevalence of Recognition (%)
Pain or discomfort in the jaw, neck, or back	59.3
Feeling weak, light headed, or faint	68.8
Chest pain or discomfort	93.7
Pain or discomfort in the arms or shoulder	87.3
Shortness of breath	89.4
All 5 major signs and symptoms of heart attack as shown above	43.7
All signs and symptoms of heart attack and indicated calling 9-1-1 as first action	38.8

Data Source: BRFSS - Behavioral Risk Factor Surveillance System; Centers for Disease Control and Prevention.

Despite the relatively low percentage of respondents who could correctly identify five signs and symptoms of heart attack, there has been a slow and steady improvement in the last 10 years. Figure 2.1 shows the trend of correct identification of all five of the listed signs and symptoms of heart attack by Minnesota adults. Between 2001 and 2009, there was 7.4 percentage point increase in the percentage of respondents who could correctly identify all five listed signs and symptoms of heart attack.

**Figure 2.1. Prevalence of recognition of signs and symptoms of Heart Attack – Minnesota, ages 18+, 2001-2009.**

Data Source: BRFSS – Behavioral Risk Factor Surveillance System; Centers for Disease Control and Prevention.

Correct responses to all of the following: Which of the following do you think is a symptom of a heart attack. Pain or discomfort in the jaw, neck, or back (YES); feeling weak, lightheaded, or faint (YES); chest pain or discomfort (YES); pain or discomfort in the arms or shoulder (YES).

Table 2.2 shows the percentage of Minnesota adults who recognize five important signs and symptoms of stroke in 2009. Recognition was quite high for sudden numbness or weakness of face, arm, or leg, especially on one side (94.6 percent); sudden confusion or trouble speaking (91.3 percent); and sudden trouble walking, dizziness, or loss of balance (89.8 percent). Conversely, recognition of sudden trouble seeing in one or both eyes (76.9 percent) and sudden severe headache with no known cause (65.4 percent) were less frequently identified as symptoms of a stroke. Slightly more than half (55.4 percent) of Minnesota adults could identify all five of the listed signs and symptoms of stroke and 49.3 percent of all respondents could identify all five signs and symptoms and correctly indicated that their first action would be to call 9-1-1.

**Table 2.2. Prevalence of recognition of signs and symptoms of stroke and use of 9-1-1 as first action - Minnesota, ages 18+ 2009.**

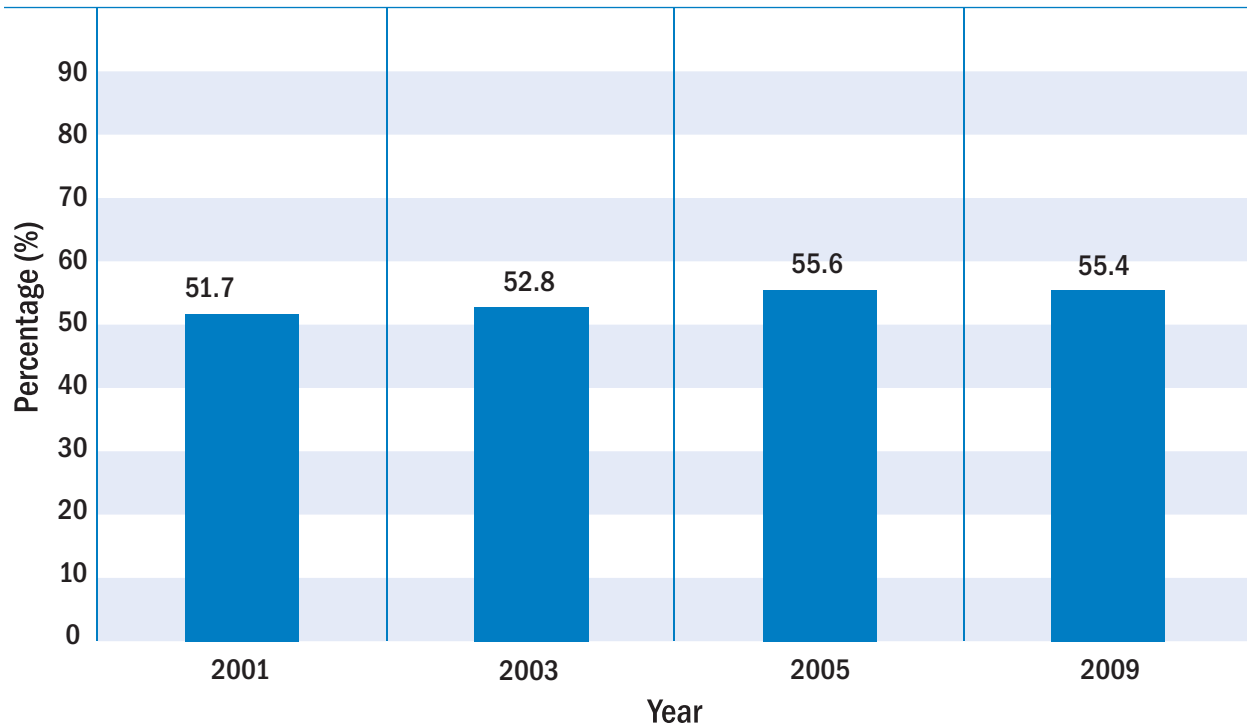
Signs and Symptoms of Stroke	Prevalence of Recognition (%)
Sudden confusion or trouble speaking	91.3
Sudden numbness or weakness of face, arm, or leg, especially on one side	94.6
Sudden trouble seeing in one or both eyes	76.9
Sudden trouble walking, dizziness, or loss of balance	89.8
Sudden severe headache with no known cause	65.4
All 5 signs and symptoms of stroke shown above	55.4
All signs and symptoms of stroke and indicated calling 9-1-1 as first action	49.3

Data Source: BRFSS - Behavioral Risk Factor Surveillance System; Centers for Disease Control and Prevention.



Though the percentage of respondents who could correctly identify five signs and symptoms of stroke was higher than for heart attack, there has been very little change in stroke signs and symptoms recognition in the last 10 years. Figure 2.2 shows the trend of correct identification of all five of the listed signs and symptoms of stroke by Minnesota adults. Between 2001 and 2009, there was 3.7 percentage point increase in the percentage of respondents who could correctly identify all five listed signs and symptoms of stroke.

Figure 2.2. Prevalence of recognition of signs and symptoms of Stroke – Minnesota, ages 18+, 2001-2009.



Data Source: BRFSS – Behavioral Risk Factor Surveillance System; Centers for Disease Control and Prevention.

Correct responses to all of the following: Which of the following do you think is a symptom of a stroke. Sudden confusion or trouble speaking (YES); sudden numbness or weakness of face, arm, or leg, especially on one side (YES); sudden trouble seeing in one or both eyes (YES); sudden trouble walking, dizziness, or loss of balance (YES).

While the recognition of signs and symptoms of both heart attack and stroke are both important, the first actions an individual takes when they think they or someone else is having an event are vital to initiating appropriate time-critical emergency care. 86.7 percent of Minnesota adults asked about their first response to someone having a heart attack or stroke correctly indicated that calling 9-1-1 and activating emergency medical services was their first choice (Table 2.3).

**Table 2.3. First Response to Someone Having a Heart Attack or Stroke,  
- Minnesota, ages 18+, 2009.**

First Response	%
Take them to the hospital	4.6%
Tell them to call their doctor	0.7%
Call 9-1-1	86.7%
Call their spouse or family member	0.7%
Do something else	5.6%
Don't know/Not sure	0.4%

Data Sources: BRFSS - Behavioral Risk Factor Surveillance System;  
Centers for Disease Control and Prevention.

## Chapter 3: Heart Disease and Stroke Hospitalizations



The economic burden of heart disease and stroke can be described in part through associated inpatient charges for hospital care. In most cases, adults who experience a myocardial infarction (heart attack), stroke, or other cardiovascular disease events are hospitalized. In some cases, individuals may be hospitalized multiple times for the same or additional events. Approximately 1 of every 8 hospitalizations in 2009 in Minnesota were principally for cardiovascular disease events, accounting for total inpatient charges of over \$2.5 billion. Heart Disease was the principal reason for over 50,000 hospitalizations and \$1.79 billion in total inpatient charges. Stroke was the principal reason for almost 12,000 hospitalizations and \$367 million in total inpatient charges. Other cardiovascular disease subtypes accounted for almost 10,00 hospitalizations and \$340 million in total inpatient charges.

The number of hospital discharges by age groups, sex, and principal cardiovascular disease diagnosis group for Minnesota residents in 2009 is illustrated in Table 3.1. Hospitalizations increase with age for all diagnosis groups, and men account for the majority of hospitalizations for all conditions except for stroke. Starting at age 75, women outnumber men for total cardiovascular disease hospitalizations, largely because of the number of stroke hospitalizations in older women. After age 85, women are discharged in greater numbers than men in each cardiovascular disease diagnosis group.

**Table 3.1. Number of hospital discharges, by age groups and sex, by principal diagnosis groups, Minnesota residents, 2009.**

Principal Diagnosis Group		<35	35-44	45-54	55-64	65-74	75-84	85+	All	Overall
All Cardiovascular Diseases <sup>1</sup>	M	990	1,578	5,206	8,072	9,140	9,138	4,954	39,078	72,092
	F	888	1,085	2,709	4,261	6,341	9,298	8,432	33,014	
Diseases of the Heart	M	589	1,099	3,915	6,088	6,529	6,400	3,564	28,184	50,496
	F	520	651	1,745	2,822	4,293	6,315	5,966	22,312	
Coronary Heart Disease <sup>2</sup>	M	72	478	2,150	3,246	3,082	2,376	984	12,388	18,827
	F	30	177	706	1,114	1,455	1,634	1,323	6,439	
Acute Myocardial Infarction <sup>3</sup>	M	49	256	1,023	1,265	1,101	1,057	623	5,374	8,566
	F	14	82	305	439	622	804	926	3,192	
Congestive Heart Failure <sup>2</sup>	M	64	100	338	747	1,201	1,741	1,473	5,664	11,727
	F	41	55	246	461	897	1,819	2,544	6,063	
Cerebrovascular Disease (Stroke) <sup>4</sup>	M	111	155	550	986	1,428	1,565	835	5,630	11,634
	F	108	155	444	799	1,130	1,801	1,567	6,004	
Hemorrhagic Stroke	M	42	39	117	132	183	208	97	818	1,629
	F	29	38	101	117	133	224	169	811	
Ischemic Stroke	M	40	76	312	653	989	1,052	566	3,688	7,427
	F	38	68	195	472	738	1,176	1,052	3,739	
Transient Ischemic Attack	M	8	21	67	126	178	226	139	765	1,660
	F	10	15	54	100	147	303	266	895	
Other Cardiovascular Diseases	M	290	324	741	998	1,183	1,173	555	5,264	9,962
	F	260	279	520	640	918	1,182	899	4,698	

Source: Minnesota Hospital Uniform Billing (UB) Claims Data, Health Economics Program - Minnesota Department of Health and the Minnesota Hospital Association.

<sup>1</sup> All cardiovascular diseases (ICD-9: 390-459) includes all diseases of the heart (ICD-9: 390-398, 402, 404, 410-429), cerebrovascular disease (ICD-9: 430-438), and other cardiovascular diseases (ICD-9: 401, 403, 405-409, 439-459).

<sup>2</sup> Coronary Heart Disease (ICD-9: 410-414, 429.2) and Congestive Heart Failure (ICD-9: 428) are included in Diseases of the Heart (ICD-9: 390-398, 402, 404, 410-429).

<sup>3</sup> Acute Myocardial Infarction (ICD-9: 410) is included in Coronary Heart Disease (ICD-9: 410-414, 429.2).

<sup>4</sup> Hemorrhagic Stroke (ICD-9: 430-431), Ischemic Stroke (ICD-9: 434, 436), and Transient Ischemic Attack (TIA) (ICD-9: 435) are included in Cerebrovascular Disease (Stroke) (ICD-9: 430-438).

Data exclude non-Minnesota residents.

Table 3.2 shows average and median length of stay, the total number of inpatient days, and average and median inpatient hospitalization charges by principal cardiovascular disease diagnosis group for Minnesota residents in 2009. These charges are not the same as the total cost of care, and are not fully-reimbursed by payers. These charges underestimate the total cost of cardiovascular disease as they do not capture the cost of routine clinic visits, medications, rehabilitation therapy, and long-term skilled nursing care. The primary discharge diagnosis (i.e. first listed diagnosis) is used to classify each hospitalization by principal diagnosis group.

**Table 3.2. Number of hospital discharges, by principal diagnosis groups, with associated length of stay and charges, Minnesota residents, 2008.**

Principal Diagnosis Group	Total	Length of Stay (Days)		Total Inpatient Days	Average Charge per Stay	Median Charge per Stay	Total Charges of All Stays
		Average	Median				
All Cardiovascular Diseases <sup>1</sup>	72,092	3.7	3.0	266,633	\$34,707	\$21,068	\$2,502,102,499
Diseases of the Heart	50,496	3.6	3.0	181,153	\$35,537	\$22,441	\$1,794,481,299
Coronary Heart Disease <sup>2</sup>	18,827	3.3	2.0	62,767	\$43,331	\$34,303	\$815,785,717
Acute Myocardial Infarction <sup>3</sup>	8,566	4.0	3.0	34,313	\$46,340	\$35,697	\$396,944,386
Congestive Heart Failure <sup>2</sup>	11,727	4.1	3.0	48,618	\$25,367	\$14,890	\$297,483,995
Cerebrovascular Disease (Stroke) <sup>4</sup>	11,634	4.0	3.0	46,468	\$31,552	\$19,053	\$367,077,798
Hemorrhagic Stroke	1,629	6.9	4.0	11,165	\$64,861	\$31,311	\$105,658,288
Ischemic Stroke	7,427	3.7	3.0	27,763	\$27,511	\$19,745	\$204,326,908
Transient Ischemic Attack	1,660	2.0	2.0	3,261	\$14,438	\$12,809	\$23,967,551
Other Cardiovascular Diseases	9,962	3.9	3.0	39,012	\$34,184	\$18,853	\$340,543,403

<sup>1</sup> All cardiovascular diseases (ICD-9: 390-459) includes all diseases of the heart (ICD-9: 390-398, 402, 404, 410-429), cerebrovascular disease (ICD-9: 430-438), and other cardiovascular diseases (ICD-9: 401, 403, 405-409, 439-459).

<sup>2</sup> Coronary Heart Disease (ICD-9: 410-414, 429.2) and Congestive Heart Failure (ICD-9: 428) are included in Diseases of the Heart (ICD-9: 390-398, 402, 404, 410-429).

<sup>3</sup> Acute Myocardial Infarction (ICD-9: 410) is included in Coronary Heart Disease (ICD-9: 410-414, 429.2).

<sup>4</sup> Hemorrhagic Stroke (ICD-9: 430-431), Ischemic Stroke (ICD-9: 434, 436), and Transient Ischemic Attack (TIA) (ICD-9: 435) are included in Cerebrovascular Disease (Stroke) (ICD-9: 430-438).

Data exclude non-Minnesota residents.

Source: Minnesota Hospital Uniform Billing (UB) Claims Data, Health Economics Program - Minnesota Department of Health and the Minnesota Hospital Association.

The number of hospitalizations for all cardiovascular diseases has declined by 10.7 percent from 2005 through 2009 from 80,724 discharges to 72,092 discharges (Table 3.3). This is largely due to a moderate decline (-12.8 percent) in hospitalizations for diseases of the heart, and mostly due to a strong decline (-26.3 percent) in the number of coronary heart disease hospitalizations. The number of hospitalizations for stroke has declined at a more modest rate (-3.6 percent), with most of this decline due to a drop in the number of hospitalizations for transient ischemic attack (-17.7 percent); the number of hospitalizations for hemorrhagic and ischemic stroke remained constant. At the same time, hospitalizations for other cardiovascular disease (-6.9 percent) declined at a slower rate. These trends are expected to reverse in coming years as Minnesota's population continues to age.

**Table 3.3. Number of hospital discharges, by principal diagnosis groups, Minnesota residents, 2005-2009.**

Principal Diagnosis Group	2005	2006	2007	2008	2009	% Change
All Cardiovascular Diseases <sup>1</sup>	80,712	80,448	76,211	76,384	72,092	-10.7
Diseases of the Heart	57,941	57,568	54,220	54,133	50,496	-12.8
Coronary Heart Disease <sup>2</sup>	25,541	24,417	22,024	21,358	18,827	-26.3
Acute Myocardial Infarction <sup>3</sup>	9,740	9,325	8,893	8,953	8,566	-12.1
Congestive Heart Failure <sup>2</sup>	12,817	12,447	11,688	11,827	11,727	-8.5
Cerebrovascular Disease (Stroke) <sup>4</sup>	12,065	12,025	11,512	11,757	11,634	-3.6
Hemorrhagic Stroke	1,615	1,589	1,561	1,658	1,629	+0.9
Ischemic Stroke	7,457	7,374	6,928	7,280	7,427	-0.4
Transient Ischemic Attack	2,016	2,068	2,030	1,853	1,660	-17.7
Other Cardiovascular Diseases	10,706	10,855	10,479	10,494	9,962	-6.9

Source: Minnesota Hospital Uniform Billing (UB) Claims Data, Health Economics Program - Minnesota Department of Health and the Minnesota Hospital Association.

<sup>1</sup>All cardiovascular diseases (ICD-9: 390-459) includes all diseases of the heart (ICD-9:390-398, 402, 404, 410-429), cerebrovascular disease (ICD-9: 430-438), and other cardiovascular diseases (ICD-9: 401, 403, 405-409, 439-459).

<sup>2</sup>Coronary Heart Disease (ICD-9: 410-414, 429.2) and Congestive Heart Failure (ICD-9: 428) are included in Diseases of the Heart (ICD-9: 390-398, 402, 404, 410-429).

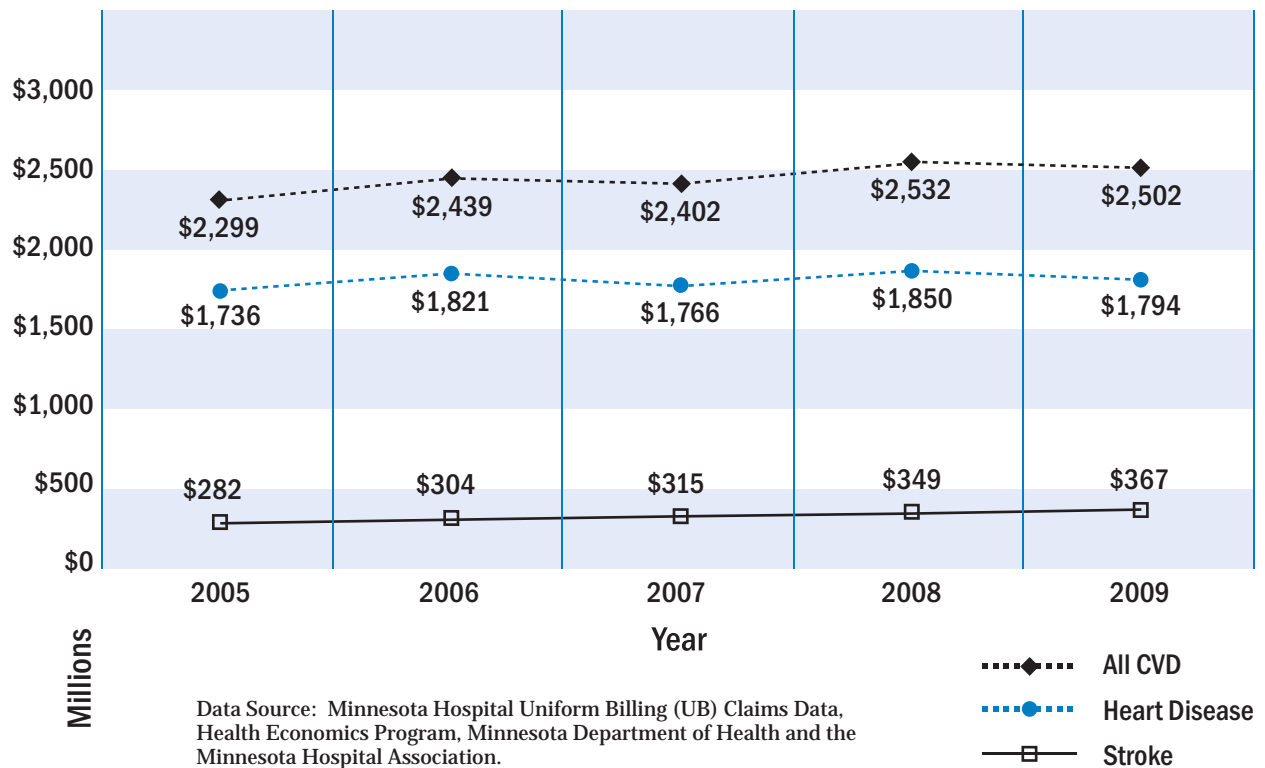
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<sup>4</sup>Hemorrhagic Stroke (ICD-9: 430-431), Ischemic Stroke (ICD-9: 434, 436), and Transient Ischemic Attack (TIA) (ICD-9: 435) are included in Cerebrovascular Disease (Stroke) (ICD-9: 430-438).

Data exclude non-Minnesota residents.

Figure 3.1 illustrates the total inpatient hospitalization charges for all cardiovascular disease, heart disease, and stroke for Minnesota residents from 2005 through 2009. For all cardiovascular disease, the total charges rose 8.8 percent over the 5 year period to \$2.502 billion. Over the same time period, the total inpatient hospitalization charges for diseases of the heart increased by 3.3 percent to \$1.794 billion and for stroke increased by a much larger 30.1 percent to \$367 million. These increases occurred despite an overall decline in the number of hospitalizations.

**Figure 3.1. Total inpatient hospitalization charges (millions) for all cardiovascular disease, heart disease, and stroke, Minnesota residents, 2005-2009.**



## Chapter 4: Heart Disease and Stroke Quality of Care Measures and Access to Care



### I. Risk Factor Management in the Clinic

Appropriate and successful management of risk factors for heart disease and stroke is a major challenge for patients and their health care providers. Data collected by Minnesota Community Measurement and supplied to the Minnesota Department of Health as part of the state's health care reform process include two "living with illness" measures: Optimal Vascular Care and Controlling High Blood Pressure. Data to calculate these measures are supplied directly to Minnesota Community Measurement by

clinics, and the averages represent a weighted average of all reporting Minnesota clinics. Table 4.1 describes each measure in detail and shows that for the Optimal Vascular Care measure, the statewide clinic average for 2009 dates of service is 33.8 percent of patients meeting the measure goal, and increase of 1.2 percentage points over three years. For the Controlling High Blood Pressure measure, the statewide clinic average for 2009 was 72.4 percent, a significant improvement of 6.9 percentage points over four years.



Table 4.1. Living with Illness measures, Clinics in Minnesota, 2009.

Living with Illness Measures	Description of Measure	Statewide Clinic Rate (2009 dates of service)	Percentage Point change over time
Optimal Vascular Care	Percentage of patients ages 18-75 who have vascular disease and have reached all of the following four treatment goals to reduce the risk of cardiovascular disease 1. Blood pressure less than 130/80 mm Hg2. LDL-c less than 100 mg/dl3. Documented tobacco-free status4. Daily aspirin use	33.8%	+1.2% (3 years)
Controlling High Blood Pressure	Percentage of patients ages 18-85 with a diagnosis of hypertension, or high blood pressure, whose blood pressure was adequately controlled at less than 140/90 mm Hg during the measurement year. The representative blood pressure is the most recent blood pressure reading during the measurement year (as long as the blood pressure reading occurred after the diagnosis of hypertension was made).	72.4%	+6.9% (4 years)

Data Source: MN Community Measurement , 2010 Health Care Quality Report.



## II. Quality of Inpatient Hospital Care

Table 4.2 describes the performance of Minnesota hospitals for a series of Process of Care, Discharge and Mortality measures related to heart attack, heart failure, and other heart surgery procedures published annually in the National Healthcare Quality Report by the Agency for Healthcare Research and Quality (AHRQ). In the most recent data release, Minnesota performed significantly better than the average for all states in five measures: Heart attack: percutaneous coronary intervention (PCI) in 90 minutes; Heart attack: ACEI or ARB at discharge; Heart failure: ACE Inhibitor or Angiotensin Receptor Blocker (ACEI or ARB) at discharge; Avoidable hospitalizations: heart failure; and Abdominal aortic aneurysm repair deaths in hospital. Minnesota hospitals were significantly below the average for all states in just two measures related to heart failure: Evaluation of ejection fraction test in hospital, and recommended hospital care received.

**Table 4.2. Heart Attack, Heart Failure, and other Heart Process of Care Measures, Minnesota.**

Process of Care Measures	Description of Measure	Minnesota's Rate	All States Average Rate	State Performance <sup>1</sup>	Most Recent Data Collection Year
Heart attack: PCI in 90 minutes	Percentage of hospital patients with heart attack who received percutaneous coronary intervention (PCI) within 90 minutes of arrival.	91.5	73.1	Better than Average	2007
Heart attack: fibrinolytic medication within 30 minutes	Percentage of hospital patients with heart attack who received fibrinolytic medication within 30 minutes of arrival.	N/A	50.5	N/A	2007
Heart attack: ACEI or ARB at discharge	Percentage of hospital patients with heart attack and left ventricular systolic dysfunction who were prescribed ACE inhibitor or ARB at discharge.	94.7	91.8	Better than Average	2007
Heart attack deaths in hospital	Deaths per 1,000 adult admissions with acute myocardial infarction (AMI) as principal diagnosis (excluding transfers to another hospital)	68.4	73.7	Average	2006
Heart failure: recommended hospital care received	Percentage of hospital patients with heart failure who received recommended hospital care (evaluation of left ventricular ejection fraction and ACE inhibitor or ARB prescription at discharge, if indicated, for left ventricular systolic dysfunction)	92.6	93.6	Worse than Average	2007
Heart failure: evaluation of ejection fraction test in hospital	Percentage of hospital patients with heart failure who received an evaluation of left ventricular ejection fraction	92.6	94.9	Worse than Average	2007
Heart failure: ACEI or ARB at discharge	Percentage of hospital patients with heart failure and left ventricular systolic dysfunction who were prescribed ACE inhibitor or ARB at discharge	92.6	90.0	Better than Average	2007

Process of Care Measures	Description of Measure	Minnesota's Rate	All States Average Rate	State Performance <sup>1</sup>	Most Recent Data Collection Year
Avoidable hospitalizations: heart failure	Adult admissions for congestive heart failure (excluding patients with cardiac procedures, obstetric conditions, and transfers from other institutions) per 100,000 population	314	404	Better than Average	2006
Congestive heart failure deaths in hospital	Deaths per 1,000 adult hospital admissions with congestive heart failure as principal diagnosis (excluding obstetric admissions and transfers to another hospital)	33.4	32.3	Average	2006
Abdominal aortic aneurysm repair deaths in hospital	Deaths per 1,000 adult admissions with abdominal aortic aneurysm (AAA) repair (excluding obstetric admissions and transfers to another hospital)	42.6	62.8	Better than Average	2006
Coronary artery bypass graft deaths in hospital	Deaths per 1,000 adult admissions ages 40 and over with coronary artery bypass graft (excluding obstetric admissions and transfers to another hospital)	24.5	25.9	Average	2006
Angioplasty deaths in hospital	Deaths per 1,000 adult admissions ages 40 and over with percutaneous transluminal coronary angioplasties (excluding obstetric admissions and transfers to another hospital)	10.7	11.6	Average	2006

Data Source: National Healthcare Quality Report, State Snapshots 2009, Agency for Healthcare Research and Quality

<sup>1</sup> State Performance is for the most recent data year compared to the All States Average Rate.

### III. Actions to Control High Blood Pressure

Minnesota adults report taking several different actions and having received advice from a doctor or health professional on steps they can take to lower or control high blood pressure. Table 4.3 shows that 86.5 percent of Minnesota adults with diagnosed high blood pressure report taking antihypertensive medications, but only 1 of 3 report reducing their alcohol intake to control their high blood pressure. Similarly, 9 of 10 report receiving advice from their doctor or health professional to take antihypertensive medications, and only 24.3 percent report being advised by their doctor or health professional to reduce their alcohol intake.

**Table 4.3. Prevalence of actions and advice to lower or control high blood pressure - Minnesota, ages 18+, 2009.**

	Personal actions to lower or control high blood pressure	Advice from a doctor or health professional to lower or control high blood pressure
Changing your eating habits	71.1%	58.4%
Cutting down on salt	71.2%	62.4%
Reducing alcohol use	33.5%	24.3%
Exercising	74.2%	77.4%
Take Medication	86.5%	90.2%

Data Sources: BRFSS - Behavioral Risk Factor Surveillance System; Centers for Disease Control and Prevention.

### IV. Rehabilitation Therapy for Heart Attack and Stroke Survivors

Data from heart attack and stroke survivors who responded to the BRFSS indicated participation in outpatient rehabilitation was somewhat low (Table 4.4). Of the adults surveyed in 2007 who reported they had a heart attack, 57.3 percent indicated they had received outpatient rehabilitation. Many more men (62.4 percent) than women (43.2 percent) reported receiving outpatient rehabilitation therapy after being discharged from the hospital. The percentage of individuals who reported they had received outpatient rehabilitation therapy after having a stroke was even lower at only 33.6 percent. Similar to heart attack survivors, a higher percentage of men (46.2 percent) than women (22.7 percent) reported receiving outpatient rehabilitation after being discharged from the hospital.

**Table 4.4. Prevalence of outpatient rehabilitation services received after heart attack or stroke - Minnesota, ages 18+, 2007.**

	Men	Women	Overall
Heart Attack	62.4%	43.2%	57.3%
Stroke	46.2%	22.7%	33.6%

Data Source: BRFSS - Behavioral Risk Factor Surveillance System; Centers for Disease Control and Prevention.

## Chapter 5: Mortality



## I. Leading Causes of Death

Heart Disease and Stroke are the second and fourth leading causes of death among Minnesota residents in 2009 (Table 5.1). Combined, the two conditions account for 9,256 deaths (24.5 percent of all deaths), ranking just behind the leading cause of death, cancer. Minnesota was one of the first states in the nation in which heart disease fell below cancer as the leading cause of death.

**Table 5.1. Fifteen Leading Causes of Death, Minnesota, all ages, 2009.**

Cause of Death	Number of Deaths	Age Adjusted Mortality Rate <sup>1</sup>	Percent of Total
Malignant Neoplasms (ICD-10 codes C00-C97)	9,575	181.8	25.3
Diseases of the Heart (ICD-10 codes I00-I09,I11,I13,I20-I51)	7,233	137.3	19.1
Accidents (ICD-10 codes V01-X59,Y85-Y86)	2,031	38.5	5.4
Cerebrovascular Diseases (Stroke) (ICD-10 codes I60-I69)	2,023	38.4	5.4
Chronic Lower Respiratory Diseases (ICD-10 codes J40-J47)	1,961	37.2	5.2
Alzheimer's Disease (ICD-10 codes G30)	1,374	26.1	3.6
Diabetes Mellitus (ICD-10 codes E10-E14)	1,022	19.4	2.7
Nephritis, Nephrotic Syndrome, and Nephrosis (ICD-10 codes N00-N07,N17-N19,N25-N27)	801	15.2	2.1
Influenza and Pneumonia (ICD-10 codes J10-J18)	591	11.2	1.6
Intentional Self-harm (suicide) (ICD-10 codes X60-X84,Y87.0)	589	11.2	1.6
Essential Hypertension and Hypertensive Renal Disease (ICD-10 codes I10, I12)	474	9.0	1.3
Parkinson's Disease (ICD-10 codes G20-G21)	459	8.7	1.2
Chronic Liver Disease and Cirrhosis (ICD-10 codes K70, K73-K74)	403	7.7	1.1
Septicemia (ICD-10 codes A40-A41)	329	6.2	0.9
In Situ and Benign Neoplasms (ICD-10 codes D00-D48)	306	5.8	0.8
All Other Cases	8,630	163.8	22.8
Total – All Causes	37,801	717.8	100.0

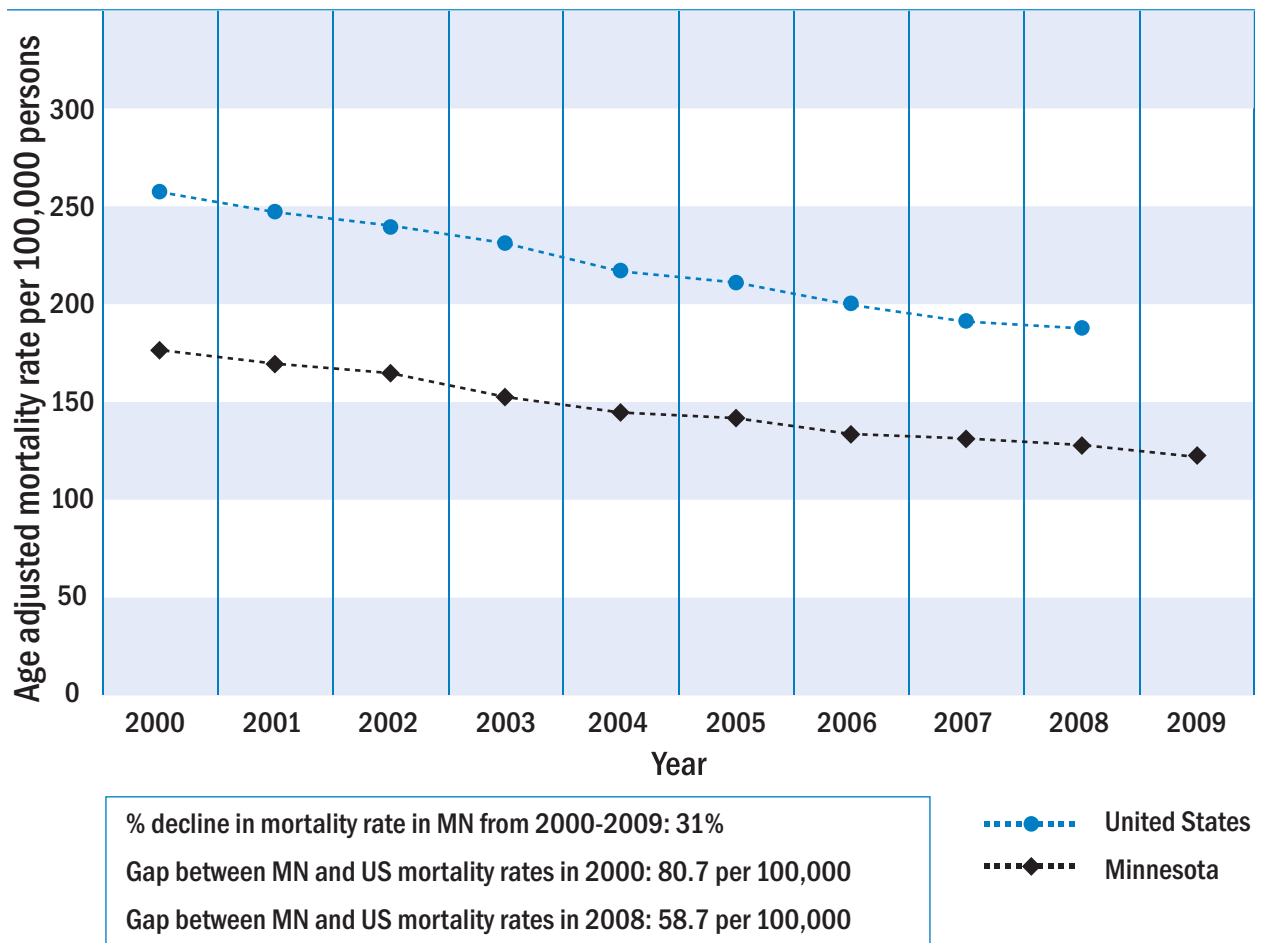
Data Source: 2009 Minnesota Health Statistics Annual Summary.

<sup>1</sup>Rate is per 100,000. Age adjusted to the 2000 U.S. standard population.

## II. Minnesota Compared to the United States

Since 2000, deaths from heart disease have declined significantly in Minnesota and the United States as a whole. Total deaths due to heart disease in Minnesota declined from 8,847 in 2000 to 7,233 in 2009. Over the same time period, the age adjusted mortality rate for heart disease has declined by 31 percent in Minnesota, from 176.9 to 121.8 per 100,000 (Figure 5.1). A similar pattern exists for the United States, with a decline of 28 percent from 257.6 per 100,000 in 2000 to 186.7 per 100,000 in 2008. The gap between mortality rates due to heart disease between Minnesota and the United States is extremely large; Minnesota's rate in 2000 was lower than the United States rate in 2008. The overall gap between Minnesota and the United States rate has narrowed somewhat, but the state continues to have the lowest heart disease mortality rate of all states as recently as 2007.

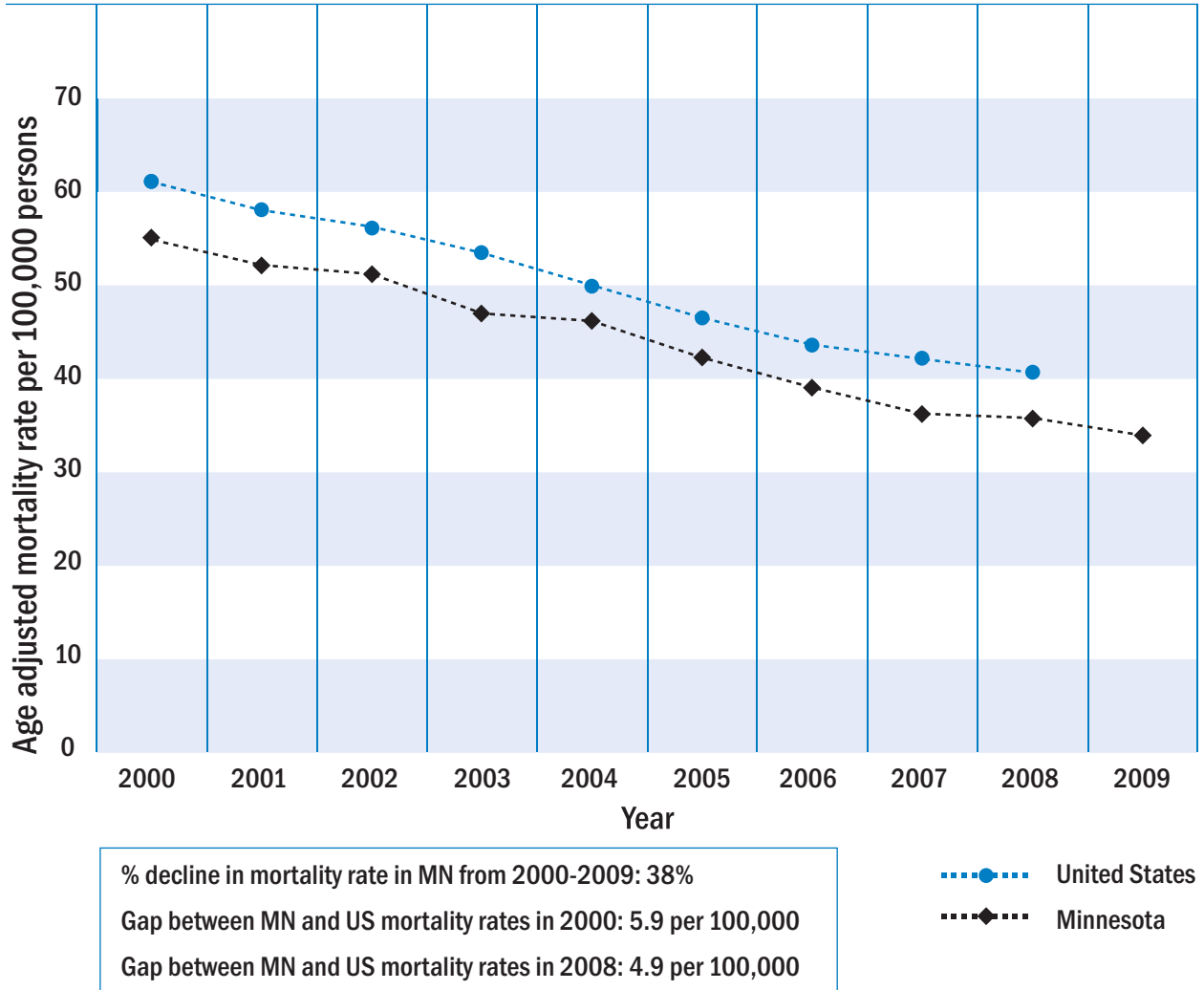
Figure 5.1. Heart disease mortality rates – Minnesota and the United States, all ages, 2000-2009.



Data Sources: Centers for Disease Control and Prevention; Minnesota Department of Health Center for Health Statistics  
 Minnesota Department of Health Center for Health Statistics.  
 Heart disease was defined as ICD-9 codes 390-398, 402, 404-429 and ICD-10 codes I00-I09, I11, I13, I20-I51.  
 Age adjusted to the 2000 U.S. standard population.

Figure 5.2 illustrates a similar decline in deaths from stroke over the last 10 years. Total deaths due to stroke in Minnesota declined from 2,775 in 2000 to 2,023 in 2009. Over the same time period, the age adjusted mortality rate for heart disease has declined by 38 percent in Minnesota, from 55.0 to 34.1 per 100,000. A similar pattern is observed in the United States, with a decline of 33 percent from 60.9 per 100,000 in 2000 to 40.6 per 100,000 in 2008. Unlike for heart disease, Minnesota's mortality rate due to stroke is only slightly lower than for the United States as a whole, ranking 12th lowest of all states in 2007.

Figure 5.2. Stroke mortality rates – Minnesota and the United States, all ages, 2000-2009.



Data Sources: Centers for Disease Control and Prevention; Minnesota Department of Health Center for Health Statistics  
 Minnesota Department of Health Center for Health Statistics.  
 Stroke was defined as ICD-9 codes 430-438 and ICD-10 codes I60-I69.  
 Age adjusted to the 2000 U.S. standard population.



### III. Race/Ethnicity and Sex

Between 1995 and 2009 the mortality rate for heart disease declined in all race/ethnicity groups, for men and women. Table 5.2 shows that in all three five-year time periods from 1995 until 2009, mortality rates due to heart disease were higher in men than in women, for all race/ethnicity groups. Disparities by race and ethnicity are shown in Figure 5.3 (men) and Figure 5.4 (women). These mortality data have been aggregated into five-year time periods in order to calculate rates in the much smaller and younger non-white and Hispanic populations in Minnesota. The most notably persistent disparity in heart disease mortality is the higher rates experienced by American Indians in Minnesota. American Indian men have experienced the highest mortality due to heart disease of any race and sex group in Minnesota, ranging from 17 percent (1995-1999) to 73 percent (2000-2004) higher than white men (Figure 5.3). A similar gap between American Indian women and white women has persisted over all three time periods, ranging from a 29 percent higher mortality rate in 2000-2004 to a 38 percent higher mortality rate in the 1995-1999 period (Figure 5.4). Unlike the national picture, there is no significant difference in heart disease mortality rates between whites and blacks. Asian/Pacific Islanders and Hispanics have experienced significantly lower mortality rates due to heart disease than all other race groups over all three time periods. Notably, the heart disease mortality rate for Asian/Pacific Islander men was lower than for white, black and American Indian women in all time periods. Appendix C provides more details on heart disease mortality by sex, race/ethnicity, and age group in 2009.

Table 5.2. Heart disease deaths in Minnesota, by race/ethnicity and sex, all ages, 1995-2009.

		Years					
		1995-1999		2000-2004		2005-2009	
Sex	Race/ Ethnicity	Number of Deaths	Age Adjusted <sup>1</sup> Mortality Rate	Number of Deaths	Age Adjusted <sup>1</sup> Mortality Rate	Number of Deaths	Age Adjusted <sup>1</sup> Mortality Rate
Male	White <sup>2</sup>	24,438	276.1	20,752	212.5	18,677	173.0
	Black <sup>2</sup>	310	262.6	331	186.4	400	162.9
	American Indian <sup>2</sup>	165	323.4	202	368.3	199	240.7
	Asian/ Pacific Islander <sup>2</sup>	107	140.8	120	100.8	127	71.8
	Hispanic	139	203.4	109	117.3	97	65.1
Female	White <sup>2</sup>	23,265	154.6	20,271	122.6	17,606	98.3
	Black <sup>2</sup>	247	183.5	242	133.5	251	101.2
	American Indian <sup>2</sup>	135	214.0	115	157.8	121	131.7
	Asian/ Pacific Islander <sup>2</sup>	84	91.8	75	49.9	118	59.6
	Hispanic	94	101.0	86	97.1	69	42.4

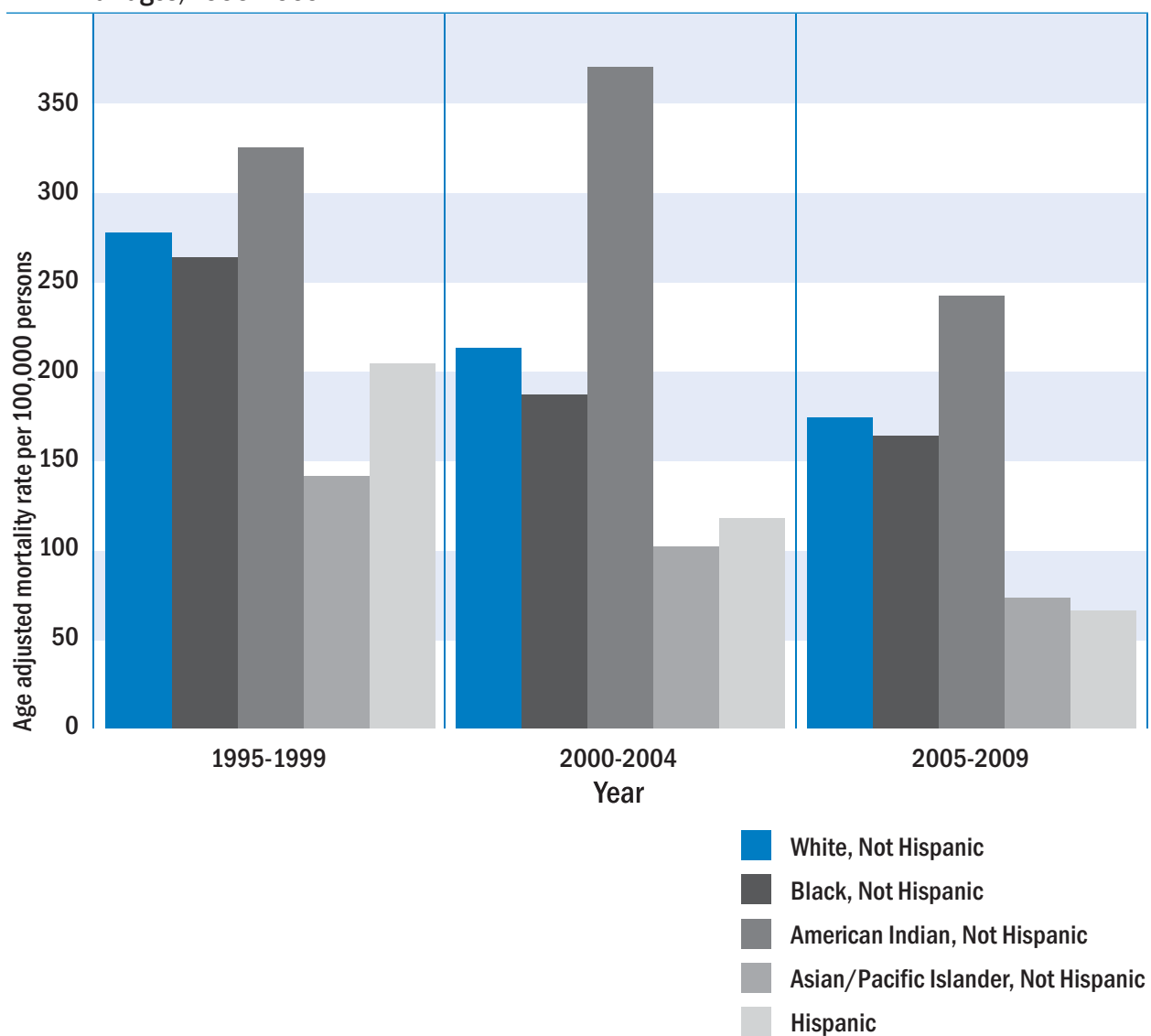
Data Source: Minnesota Department of Health Center for Health Statistics.

Heart disease was defined as ICD-9 codes 390-398, 402, 404-429 and ICD-10 codes I00-I09, I11, I13, I20-I51.

<sup>1</sup>Rate is per 100,000. Age adjusted to the 2000 U.S. standard population.

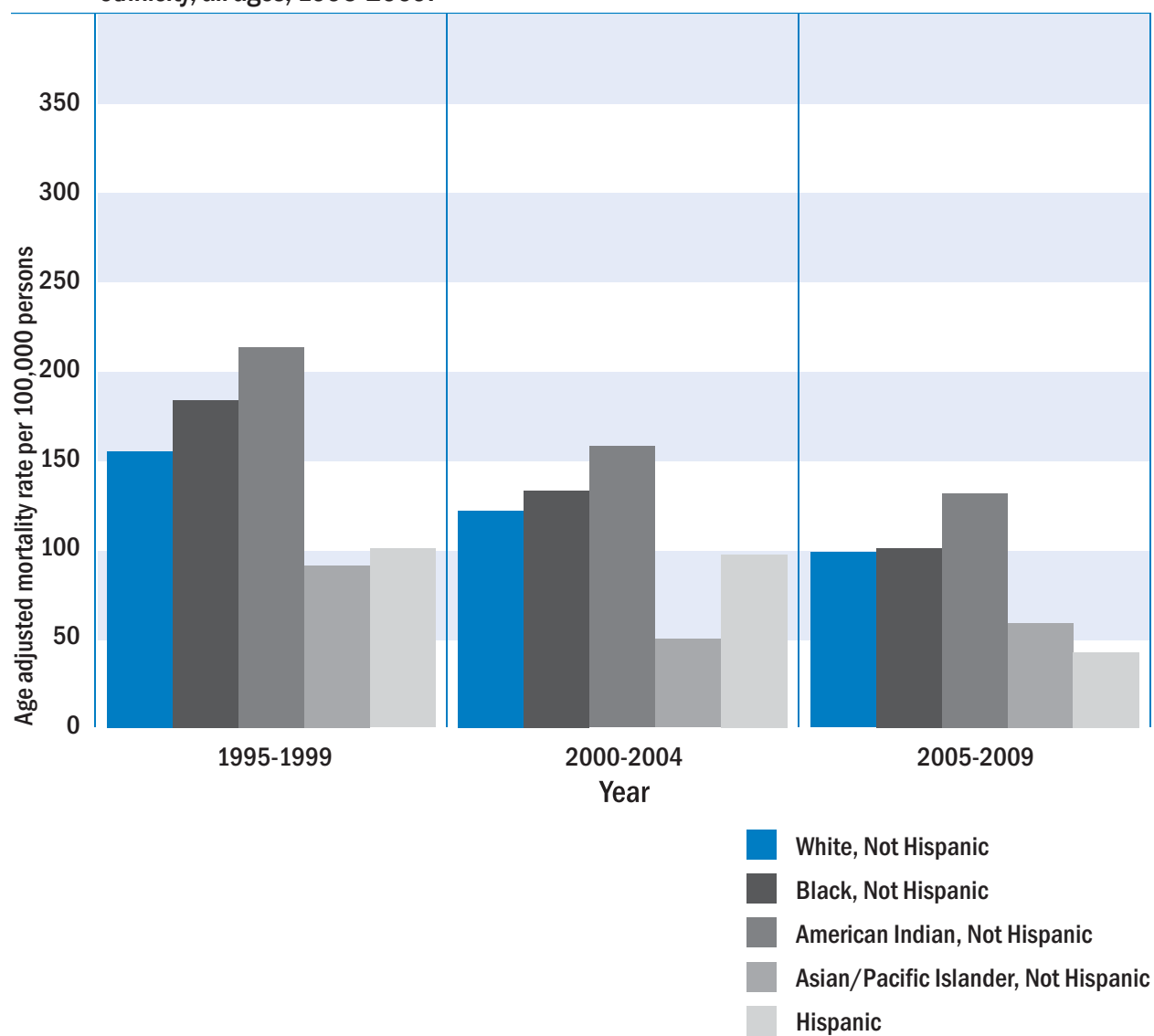
<sup>2</sup>Non-Hispanic.

Figure 5.3. Age adjusted mortality rates for heart disease in Minnesota men, by race and ethnicity, all ages, 1995-2009.



Data Source: Minnesota Department of Health Center for Health Statistics.  
Heart disease was defined as ICD-9 codes 390-398, 402, 404-429 and ICD-10 codes I00-I09, I11, I13, I20-I51.  
Age adjusted to the 2000 U.S. standard population.

Figure 5.4. Age adjusted mortality rates for heart disease in Minnesota women, by race and ethnicity, all ages, 1995-2009.



Data Source: Minnesota Department of Health Center for Health Statistics.  
Heart disease was defined as ICD-9 codes 390-398, 402, 404-429 and ICD-10 codes I00-I09, I11, I13, I20-I51.  
Age adjusted to the 2000 U.S. standard population.

Between 1995 and 2009 the mortality rate for stroke declined in all race/ethnicity groups, for men and women. The notably higher mortality rates in men compared to women in the 1995-1999 time period have largely disappeared ten years later (Table 5.3). Disparities by race and ethnicity are shown in Figure 5.5 (men) and Figure 5.4 (women). Mortality rates for black men and women have remained persistently higher than whites across all time periods, ranging from 23 percent higher (2005-2009) to 47 percent higher (2000-2004) in men and 21 percent higher (1995-1999) to 73 percent higher (2000-2004) in women. Differences between whites and American Indians were less pronounced, varying from 46 percent higher mortality in American Indian women (2000-2004) compared to white women to 13 percent lower mortality for both American Indian men and women compared to whites (1995-1999). Mortality rates due to stroke were generally higher in Asian/Pacific Islander men and women compared to whites over all three time periods. This difference included 37 percent higher mortality in Asian/Pacific Islander men (both 1995-1999 and 2005-2009) compared to whites and rising from 12 percent higher mortality (1995-1999) to 30 percent higher mortality (2005-2009) in Asian/ Pacific Islander women compared to whites. Except during the 1995-1999 time period, when American Indians had the lowest mortality rate for men, Hispanics have experienced significantly lower mortality rates due to stroke than all other race groups over all three time periods. Appendix D provides more details on stroke mortality by sex, race/ethnicity, and age group in 2009.

Table 5.3. Stroke deaths in Minnesota, by race/ethnicity and sex, all ages, 1995-2009.

		Years					
		1995-1999		2000-2004		2005-2009	
Sex	Race	Number of Deaths	Age Adjusted <sup>1</sup> Mortality Rate	Number of Deaths	Age Adjusted <sup>1</sup> Mortality Rate	Number of Deaths	Age Adjusted <sup>1</sup> Mortality Rate
Male	White <sup>2</sup>	5,498	64.5	4,925	52.0	3,876	36.9
	Black <sup>2</sup>	76	87.0	107	76.6	95	45.4
	American Indian <sup>2</sup>	25	55.9	20	*	35	45.3
	Asian/Pacific Islander <sup>2</sup>	58	88.4	66	56.5	84	50.6
	Hispanic	32	59.1	39	44.5	41	28.5
Female	White <sup>2</sup>	9,123	59.3	7,880	47.2	6,383	35.8
	Black <sup>2</sup>	93	72.0	133	81.8	113	48.7
	American Indian <sup>2</sup>	31	51.9	45	69.1	38	43.7
	Asian/Pacific Islander <sup>2</sup>	58	66.5	73	48.8	97	46.5
	Hispanic	37	45.9	26	25.4	43	30.4

\* Note - Rates based on 20 or less deaths not produced.

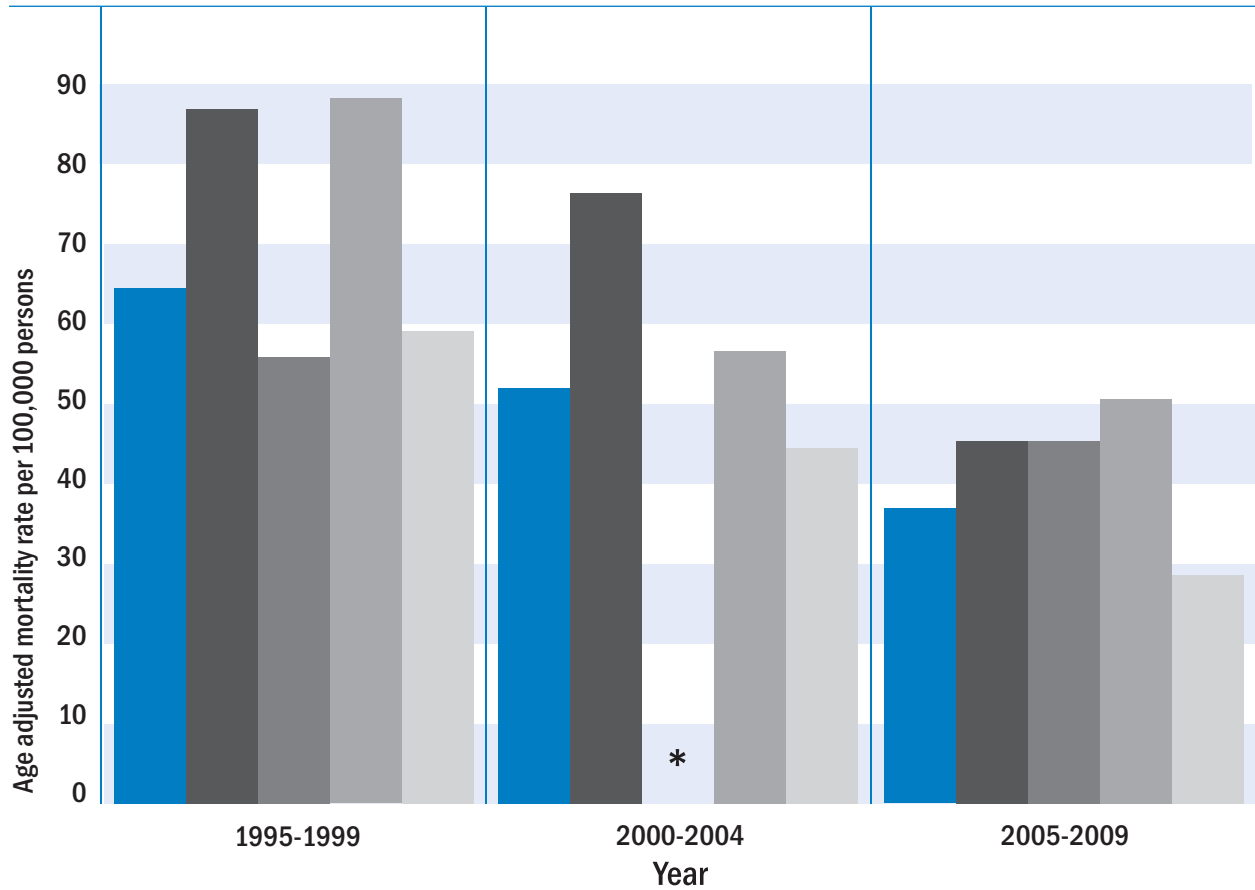
Data Source: Minnesota Department of Health Center for Health Statistics.

Stroke was defined as ICD-9 codes 430-438 and ICD-10 codes I60-I69.

<sup>1</sup>Rate is per 100,000. Age adjusted to the 2000 U.S. standard population.

<sup>2</sup>Not Hispanic.

**Figure 5.5. Age adjusted mortality rates for stroke in Minnesota men, by race and ethnicity, all ages, 1995-2009.**

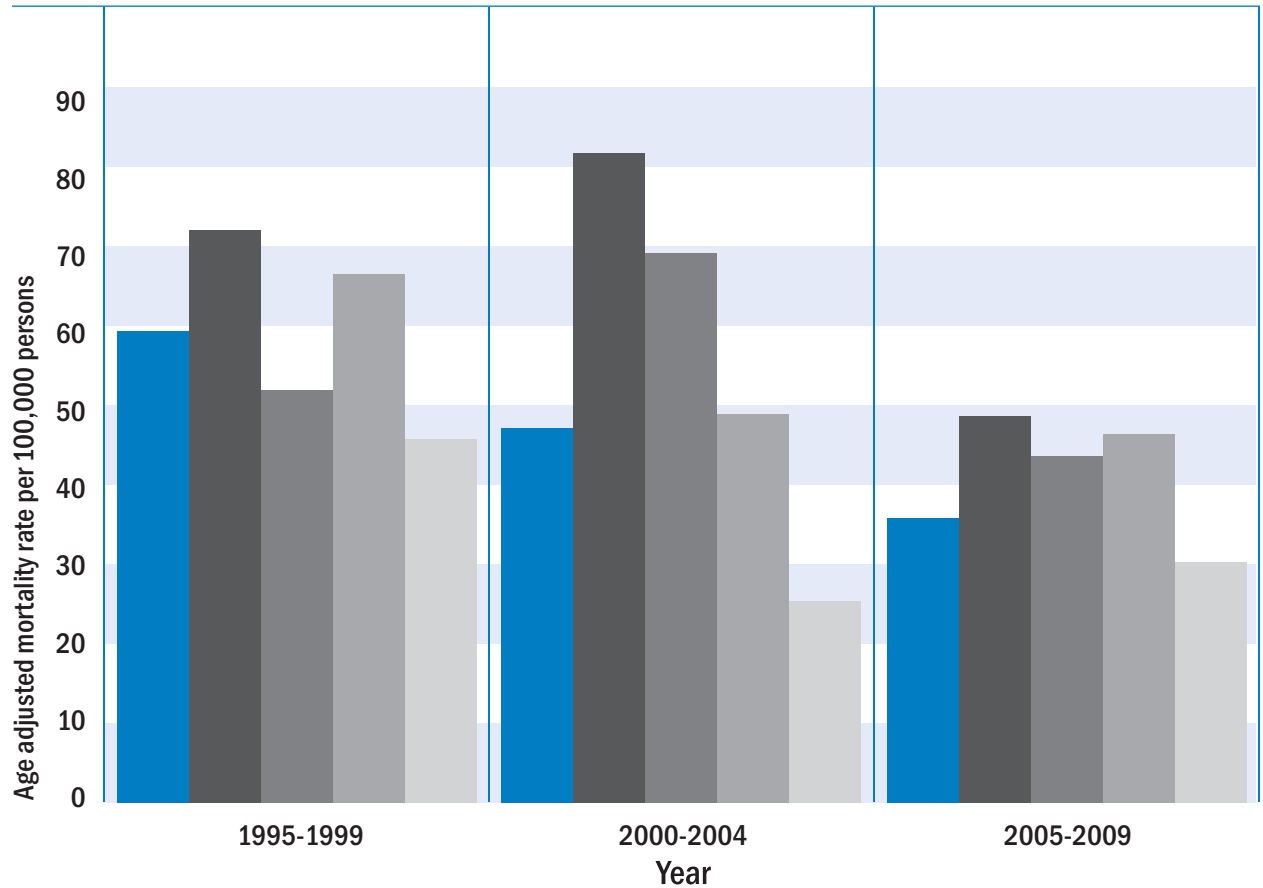


\* Note - Rates based on 20 or less deaths not produced.

Data Source: Minnesota Department of Health Center for Health Statistics.  
Stroke was defined as ICD-9 codes 430-438 and ICD-10 codes I60-I69.  
Age adjusted to the 2000 U.S. standard population.

- White, Not Hispanic
- Black, Not Hispanic
- American Indian, Not Hispanic
- Asian/Pacific Islander, Not Hispanic
- Hispanic

**Figure 5.6. Age adjusted mortality rates for stroke in Minnesota women, by race and ethnicity, all ages, 1995-2009.**



Data Source: Minnesota Department of Health Center for Health Statistics.  
Stroke was defined as ICD-9 codes 430-438 and ICD-10 codes I60-I69.  
Age adjusted to the 2000 U.S. standard population.

- White, Not Hispanic
- Black, Not Hispanic
- American Indian, Not Hispanic
- Asian/Pacific Islander, Not Hispanic
- Hispanic

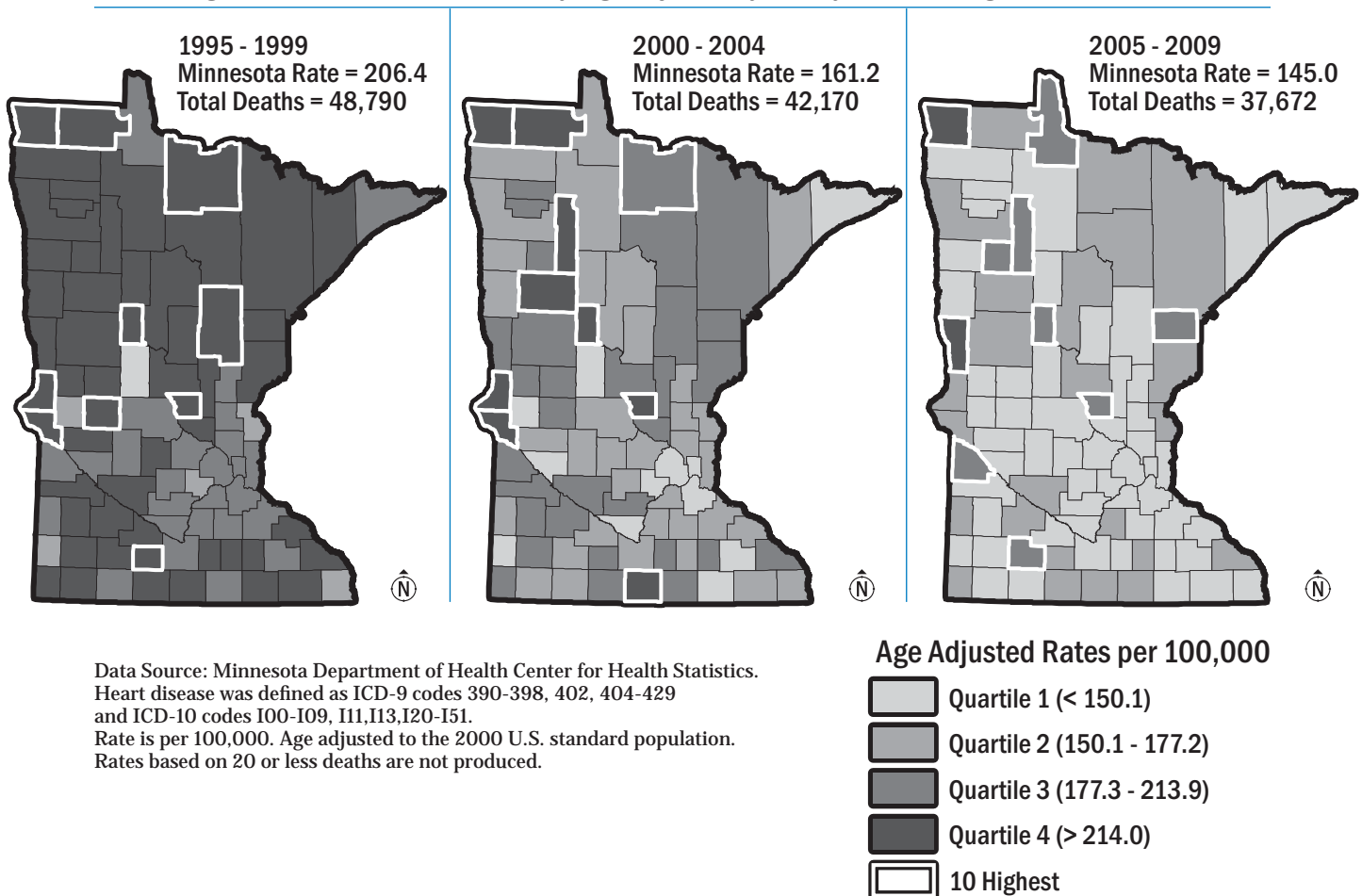


## IV. Rates by County

The mortality rate due to heart disease varies considerably across the state of Minnesota. Figure 5.7 illustrates the heart disease mortality rate by Minnesota county during three five year periods: 1995-1999; 2000-2004; and 2005-2009. Each map also highlights the ten counties with the highest mortality rates in each time period with thick white outlines. As can be seen in the maps, the overall heart disease mortality rate has declined substantially over the 15 year time period, with the lowest rates first appearing in the Twin Cities area by the middle time period and spreading throughout the state by the final time period from 2005 through 2009. Persistently high mortality counties include Kittson, Roseau, Clearwater, and Koochiching in the north; Wadena and Benton in central Minnesota, and Traverse and Big Stone on the western border. Despite the large decline in mortality rates, heart disease was still the primary cause of death for 37,672 Minnesotans in the period 2005 through 2009.

Appendix A provides the total number of deaths by sex and the overall heart disease mortality rates for each county for each five year time period, each county's statewide ranking from lowest to highest mortality rate in the 2005-2009 time period, and the total number of deaths by sex in 2009, the most recent year with complete mortality data.

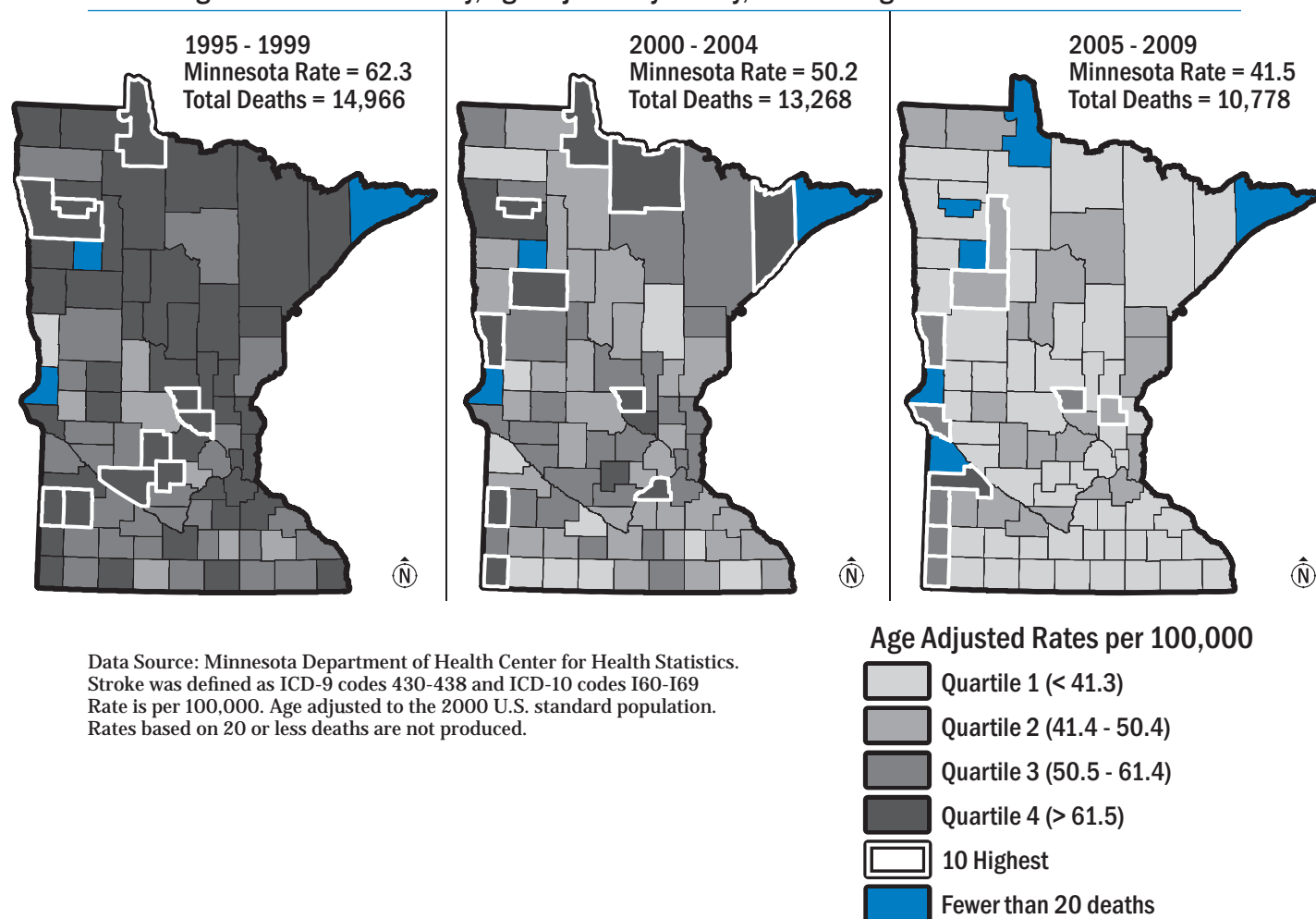
Figure 5.7. Heart Disease Mortality, Age Adjusted by County, 1995 through 2009



The mortality rate due to stroke varies considerably across the state of Minnesota. Figure 5.8 illustrates the stroke mortality rate by Minnesota county during three five year periods: 1995-1999; 2000-2004; and 2005-2009. Rates for counties with 20 deaths or fewer are suppressed. Each map also highlights the ten counties with the highest mortality rates in each time period with thick white outlines. As can be seen in the maps, the overall stroke mortality rate has declined substantially over the 15 year time period, with the lowest rates first appearing in southern Minnesota area by the middle time period and spreading throughout the state by the final time period from 2005 through 2009. Persistently high mortality counties include Lake of the Woods, Red Lake, Becker, and Wilkin in the north and west, Benton in central Minnesota, and Lincoln and Rock in the southwest. Despite the large decline in mortality rates, stroke was still the primary cause of death for 10,778 Minnesotans in the period 2005 through 2009.

Appendix B provides the total number of deaths by sex and the overall stroke mortality rates for each county for each five year time period, each county's statewide ranking from best to worst mortality in the 2005-2009 time period, and the total number of deaths by sex in 2009, the most recent year with complete mortality data.

Figure 5.8. Stroke Mortality, Age Adjusted by County, 1995 through 2009



## V. Premature Deaths

Heart disease and stroke are the cause of premature death in thousands of Minnesotans each year. Premature deaths are defined as those that occur before a certain age. For this report, two age cutpoints for premature death are defined; before 65 years of age and before 75 years of age. During the five year period from 2005 through 2009, 16 percent of heart disease deaths occurred in those younger than 65 and 28 percent in those younger than 75 (includes deaths before 65). Another measure of premature death is the calculated years of potential life lost before a certain age. Using a national life expectancy standard of 75 years, Minnesotans cumulatively lost 158,643 years of potential life (YPLL) due to heart disease, at a rate of 6.5 years per 1,000 persons per year (Table 5.4). For these tables, Hispanics are not categorized separately, but included under the four major race groups, when appropriate.

Deaths due to heart disease occur at younger ages in non-white Minnesotans than in whites. In the five year period from 2005 through 2009, 69 percent of black men in Minnesota who died of heart disease were under the age of 65, and 81 percent were under the age of 75. For American Indian men the figures were 53 percent before age 65 and 78 percent before age 75, and for Asian/ Pacific Islander men the figures were 43 percent before age 65 and 70 percent before age 75. A similar trend was observed in females, with 49 percent of heart disease deaths in blacks occurring before age 65 and 67 percent before age 75. For American Indian women the figures were 38 percent before age 65 and 63 percent before age 75, and for Asian/Pacific Islander women the figures were 22 percent before age 65 and 38 percent before age 75.

American Indian men had the highest annual YPLL rate, at 15.8 years per 1,000 persons, almost 9 times more than the annual YPLL rate for Asian/Pacific Islander women at 1.8 years per 1,000 persons. Black men had the second highest annual YPLL rate at 11.1 years per 1,000 persons. White men had an annual YPLL rate of 9.2 years per 1,000 persons, approximately 2.5 times higher than the annual YPLL rate for white women at 3.6 years per 1,000 persons.

**Table 5.4. Premature heart disease deaths by race and sex, all ages, Minnesota, 2005-2009.**

Sex	Race	% of Heart Disease Deaths Under Age 65	% of Heart Disease Deaths Under Age 75	YPLL <sup>1</sup> for deaths before 75 years of age	Annual YPLL <sup>1</sup> Rate per 1,000 persons
Male	White	22%	37%	101,000	9.2
	Black	69%	81%	7,395	11.1
	American Indian	53%	78%	2,745	15.8
	Asian/Pacific Islander	44%	71%	1,673	3.4
Female	White	8%	16%	38,255	3.6
	Black	49%	66%	3,333	5.5
	American Indian	38%	63%	1,335	7.7
	Asian/Pacific Islander	21%	37%	893	1.8
All	All	16%	28%	158,643	6.5

Data Source: Minnesota Department of Health Center for Health Statistics.

Heart disease was defined as ICD-10 codes I00-I09, I11, I13, I20-I51.

<sup>1</sup>YPLL=Years of Potential Life Lost.

Deaths due to stroke typically occur at older ages than deaths due to heart disease, but the same pattern holds true, with non-white Minnesotans dying of stroke at younger ages than whites (Table 5.5). In the five year period from 2005 through 2009, 57 percent of black men in Minnesota who died of stroke were under the age of 65, and 75 percent were under the age of 75. For American Indian men the figures were 48 percent before age 65 and 77 percent before age 75, and for Asian/Pacific Islander men the figures were 40 percent before age 65 and 64 percent before age 75. A similar trend was observed in females, with 40 percent of stroke deaths in blacks occurring before age 65 and 58 percent before age 75. For American Indian women the figures were 34 percent before age 65 and 50 percent before age 75, and for Asian/Pacific Islander women the figures were 11 percent before age 65 and 21 percent before age 75.

Black men had the highest annual YPLL rate, at 2.5 years per 1,000 persons, more than double the annual YPLL rate for white women at 1.1 years per 1,000 persons. Black women and American Indian men had the second highest annual YPLL rate at 2.3 years per 1,000 persons. White men had an annual YPLL rate of 1.3 years per 1,000 persons, less than 20 percent higher than the annual YPLL rate for white women.

**Table 5.5. Premature stroke deaths by race and sex, all ages, Minnesota, 2005-2009.**

Sex	Race	% of Stroke Deaths Under Age 65	% of Stroke Deaths Under Age 75	YPLL <sup>1</sup> for deaths before 75 years of age	Annual YPLL <sup>1</sup> Rate per 1,000 persons
Male	White	13%	27%	14,425	1.3
	Black	57%	75%	1,635	2.5
	American Indian	48%	77%	405	2.3
	Asian/Pacific Islander	40%	64%	920	1.9
Female	White	6%	14%	11,698	1.1
	Black	40%	58%	1,378	2.3
	American Indian	34%	50%	385	2.2
	Asian/Pacific Islander	28%	51%	783	1.6
All	All	11%	21%	32,368	1.3

Data Source: Minnesota Department of Health Center for Health Statistics.

Stroke was defined as ICD-10 codes I60-I69.

<sup>1</sup>YPLL=Years of Potential Life Lost.

Mortality rates for heart disease and stroke increase significantly in older age groups (Tables 5.6 and 5.7). Over the past 15 years, there has been a much more significant decline in the mortality rate of both heart disease and stroke in the oldest age groups, with declines in heart disease mortality of greater than 40 percent for 55-74 year olds, and similar declines in stroke mortality for all persons 65 years and older. While overall mortality rates are much lower in middle-aged Minnesotans, the rates of decline in overall mortality have been much less pronounced.

**Table 5.6. Mortality rates for heart disease in Minnesota, by age group, 1995-2009.**

Mortality Rate <sup>1</sup>				
Age Group	1995-1999	2000-2004	2005-2009	Change in Rate
0-34	2.8	2.4	2.4	-14%
35-44	21.1	19.4	16.7	-21%
45-54	71.4	56.0	51.3	-28%
55-64	198.8	139.5	114.6	-42%
65-74	546.1	388.9	277.6	-49%
75-84	1483.7	1138.6	911.3	-39%
85+	4643.1	3895.1	3293.6	-29%

Data Source: Minnesota Department of Health Center for Health Statistics.

Heart disease was defined as ICD-9 codes 390-398, 402, 404-429 and ICD-10 codes I00-I09, I11, I13, I20-I51.

<sup>1</sup>Rate is per 100,000.

**Table 5.7. Mortality rates for stroke in Minnesota, by age group, 1995-2009.**

Mortality Rate <sup>1</sup>				
Age Group	1995-1999	2000-2004	2005-2009	Change in Rate
0-34	0.6	0.5	0.6	0%
35-44	3.9	3.4	3.5	-10%
45-54	12.2	9.6	9.2	-25%
55-64	29.9	23.5	20.0	-33%
65-74	121.5	95.5	72.6	-40%
75-84	478.5	401.2	283.6	-41%
85+	1,780.2	1,401.9	1,035.9	-42%

Data Source: Minnesota Department of Health Center for Health Statistics.

Stroke was defined as ICD-9 codes 430-438 and ICD-10 codes I60-I69.

<sup>1</sup>Rate is per 100,000.

## Conclusions



The burden of heart disease and stroke in Minnesota is high. Although there have been significant declines in mortality rates for many years, heart disease and stroke combined remain the second leading cause of death in Minnesota. Although the number of hospitalizations is remaining steady or slowly declining, the total charges associated with these hospitalizations continue to increase. Risk factors for heart disease and stroke are highly prevalent in Minnesota adults, and data show these poor risk factor profiles to be evident even in school-age children. Disparities in mortality due to heart disease and stroke in Minnesota are quite striking,

with particular concern for blacks, American Indians, and Asians/Pacific Islanders when compared to whites. Due to limitations with survey sample sizes, it is not possible to adequately assess disparities in all risk factors by race and ethnicity, however there are notably higher rates of hypertension, cigarette smoking and physical activity reported by blacks compared to whites.

There are several populations to focus on to reduce the burden of heart disease and stroke in Minnesota:

- Blacks, particularly for stroke and risk factors
- American Indians, for both heart disease and stroke
- Asians/Pacific Islanders, particularly for stroke
- Children, for all heart disease and stroke risk factors
- Women, for rehabilitation services after heart attack and stroke
- Several areas of rural Minnesota, for both heart disease and stroke
- Lower income and lower education groups, for heart disease, stroke, and risk factors
- All Minnesotans, for increasing recognition of the signs and symptoms of heart attack and stroke

## Appendix A. Heart disease deaths in Minnesota counties, all ages, 1995-2009.

	1995-1999			2000-2004			2005-2009				2009	
State/ County	Male Deaths	Female Deaths	Age Adjusted <sup>1</sup> Mortality Rate	Male Deaths	Female Deaths	Age Adjusted <sup>1</sup> Mortality Rate	Male Deaths	Female Deaths	Age Adjusted <sup>1</sup> Mortality Rate	Ranking from Lowest to Highest	Male Deaths	Female Deaths
Minnesota Statewide	25,045	23,745	206.4	21,442	20,728	161.2	19,510	18,162	131.1	-	3,836	3,396
Aitkin	180	111	256.0	129	112	180.6	122	102	146.4	43	28	27
Anoka	814	641	189.7	792	651	154.4	671	553	110.8	5	138	96
Becker	273	201	250.8	242	218	231.4	183	158	155.6	60	45	24
Beltrami	207	192	223.8	178	173	175.0	182	151	146.0	40	40	32
Benton	210	251	268.4	201	210	238.9	181	219	207.6	84	33	33
Big Stone	101	97	333.1	75	73	245.1	47	53	156.6	61	12	9
Blue Earth	277	286	196.8	238	288	170.5	209	207	121.7	8	48	41
Brown	220	233	225.2	168	184	161.8	149	176	144.6	39	37	31
Carlton	231	221	252.6	216	182	198.5	202	197	182.8	80	37	39
Carver	200	188	172.8	169	152	129.1	207	181	125.4	12	38	48
Cass	236	160	228.8	199	113	170.4	187	109	150.8	54	32	17
Chippewa	115	100	184.6	67	99	138.2	84	92	146.8	45	17	16
Chisago	168	151	173.6	179	134	172.0	170	150	151.2	55	37	28
Clay	283	294	219.1	262	235	170.2	217	244	141.4	33	44	50
Clearwater	100	56	239.3	81	80	250.5	60	58	181.3	79	12	14
Cook	25	25	178.5	27	23	138.0	30	27	143.5	37	8	5
Cottonwood	143	146	234.7	95	123	173.7	100	131	187.4	81	19	36
Crow Wing	399	341	225.3	361	286	170.3	302	274	131.1	20	65	46
Dakota	928	792	193.5	884	825	149.0	856	846	127.5	15	178	170
Dodge	103	102	224.3	80	99	186.4	67	84	143.1	35	14	14
Douglas	268	241	219.1	237	247	186.9	227	211	146.2	41	46	43
Faribault	146	175	218.1	177	170	226.0	141	116	167.3	70	28	17
Fillmore	199	200	216.4	140	157	161.6	125	133	138.7	31	23	25
Freeborn	264	233	209.9	248	246	187.9	235	199	160.3	65	45	46
Goodhue	290	331	211.9	240	266	168.1	210	220	132.4	23	42	45
Grant	68	57	214.6	62	72	200.6	49	42	147.6	46	6	6
Hennepin	4,391	4,427	178.0	3,618	3,560	132.3	3,231	2,934	106.6	2	584	555
Houston	111	111	169.9	112	107	152.8	105	85	123.2	9	25	16
Hubbard	157	117	246.8	132	98	176.3	94	92	127.1	14	20	12
Isanti	152	144	210.0	122	159	170.5	151	118	148.0	49	31	15



## Appendix A. Heart disease deaths in Minnesota counties, all ages, 1995-2009 (continued).

	1995-1999			2000-2004			2005-2009				2009	
State/ County	Male Deaths	Female Deaths	Age Adjusted <sup>1</sup> Mortality Rate	Male Deaths	Female Deaths	Age Adjusted <sup>1</sup> Mortality Rate	Male Deaths	Female Deaths	Age Adjusted <sup>1</sup> Mortality Rate	Ranking from Lowest to Highest	Male Deaths	Female Deaths
Itasca	308	282	236.5	299	265	188.9	313	250	175.8	75	59	51
Jackson	91	97	192.7	87	85	165.7	61	86	134.4	26	12	20
Kanabec	89	68	201.5	77	55	158.7	71	70	149.6	52	20	15
Kandiyohi	256	237	196.3	238	201	161.8	179	192	126.9	13	41	35
Kittson	72	72	294.7	60	51	218.2	61	48	222.1	86	5	6
Koochiching	143	126	294.0	110	108	214.0	115	81	176.9	77	16	16
Lac qui Parle	95	79	212.5	77	80	182.3	81	78	189.1	82	17	16
Lake	92	75	233.4	87	61	176.2	76	57	146.2	42	16	5
Lake of the Woods	28	23	183.7	30	26	169.2	38	34	200.5	83	10	5
Le Sueur	168	147	205.4	147	126	172.8	145	127	157.1	62	29	27
Lincoln	73	64	200.2	62	57	163.5	57	55	160.6	67	14	11
Lyon	202	194	242.3	153	176	191.9	105	131	135.5	28	30	23
McLeod	220	227	213.4	179	182	165.8	184	144	136.1	30	44	31
Mahnomen	45	37	239.4	46	23	178.1	37	32	181.0	78	8	6
Marshall	94	86	240.0	77	60	176.6	71	39	132.4	24	11	9
Martin	200	204	216.7	171	180	177.3	174	179	170.0	74	27	35
Meeker	184	154	232.3	139	139	168.6	112	126	135.6	29	22	19
Mille Lacs	161	149	223.7	145	144	184.3	134	117	141.0	32	26	22
Morrison	222	198	227.1	212	195	195.0	186	166	157.9	63	30	36
Mower	338	331	226.1	213	233	138.2	212	205	124.8	11	44	34
Murray	92	89	238.1	89	71	186.3	60	70	146.5	44	14	8
Nicollet	130	136	198.6	113	91	144.4	117	106	135.0	27	24	15
Nobles	176	159	220.8	117	125	152.3	106	81	115.2	6	18	10
Norman	80	83	225.4	59	48	165.8	49	44	148.3	50	11	4
Olmsted	492	463	185.0	446	460	144.7	481	430	123.4	10	95	75
Otter Tail	497	418	217.0	447	375	178.9	413	327	153.1	58	78	73
Pennington	115	96	224.1	107	83	201.1	83	61	149.3	51	11	11
Pine	207	132	237.1	189	142	205.6	138	138	154.8	59	32	16
Pipestone	75	81	176.1	69	56	130.8	58	67	131.0	19	14	12
Polk	265	244	222.7	194	204	169.9	194	179	152.3	56	41	36
Pope	139	116	263.3	100	95	184.2	77	96	150.1	53	15	15

## Appendix A. Heart disease deaths in Minnesota counties, all ages, 1995-2009 (continued).

	1995-1999			2000-2004			2005-2009				2009	
State/ County	Male Deaths	Female Deaths	Age Adjusted <sup>1</sup> Mortality Rate	Male Deaths	Female Deaths	Age Adjusted <sup>1</sup> Mortality Rate	Male Deaths	Female Deaths	Age Adjusted <sup>1</sup> Mortality Rate	Ranking from Lowest to Highest	Male Deaths	Female Deaths
Ramsey	2,274	2,631	196.7	1,837	1,956	143.6	1,613	1,601	109.1	4	334	309
Red Lake	48	28	253.1	33	30	197.6	30	17	142.7	34	4	4
Redwood	178	169	246.6	156	124	191.1	116	126	162.2	68	17	19
Renville	163	152	215.1	129	149	194.7	107	114	160.4	66	19	24
Rice	252	259	187.8	253	250	175.4	206	225	132.2	22	31	46
Rock	89	90	217.8	95	83	203.0	81	61	165.1	69	17	18
Roseau	123	96	262.9	112	99	221.1	85	76	169.4	72	24	9
St. Louis	1,593	1,579	254.7	1,315	1,372	195.6	1,216	1,197	170.0	73	232	200
Scott	242	205	195.8	231	196	161.1	212	220	129.8	17	36	38
Sherburne	170	221	232.2	194	219	185.0	194	190	147.9	48	40	33
Sibley	111	82	183.1	101	122	203.8	81	85	144.4	38	14	12
Stearns	627	435	191.3	519	440	155.6	526	369	118.3	7	112	77
Steele	213	188	219.8	164	192	177.3	161	170	152.4	57	33	34
Stevens	65	56	167.7	42	57	130.4	38	37	93.8	1	10	7
Swift	117	105	243.7	82	91	168.8	70	75	143.1	36	9	16
Todd	149	103	163.1	126	105	145.1	124	94	130.6	18	25	20
Traverse	56	82	307.1	52	65	215.9	34	42	176.1	76	8	4
Wabasha	159	140	227.8	128	113	170.2	111	86	128.5	16	21	10
Wadena	149	152	295.4	135	136	239.2	128	115	211.8	85	22	26
Waseca	145	131	234.2	112	117	188.0	86	105	147.8	47	15	16
Washington	532	423	184.8	551	470	157.0	554	468	133.4	25	105	95
Watonwan	104	124	255.7	89	92	193.4	83	73	169.3	71	15	12
Wilkin	55	74	247.2	42	55	192.2	59	66	248.6	87	17	15
Winona	337	315	234.5	278	304	201.8	269	237	160.3	64	54	48
Wright	367	289	206.2	298	271	156.8	279	279	132.2	21	46	55
Yellow Medicine	118	125	227.8	96	80	188.0	61	55	107.2	3	10	6

Data Source: Minnesota Department of Health Center for Health Statistics.

Heart disease was defined as ICD-9 codes 390-398, 402, 404-429 and ICD-10 codes I00-I09, I11, I13, I20-I51.

<sup>1</sup>Rate is per 100,000. Age adjusted to the 2000 U.S. standard population. Rates based on 20 or less deaths are not produced.

## Appendix B. Stroke deaths in Minnesota counties, all ages, 1995-2009.

	1995-1999			2000-2004			2005-2009				2009	
State/ County	Male Deaths	Female Deaths	Age Adjusted <sup>1</sup> Mortality Rate	Male Deaths	Female Deaths	Age Adjusted <sup>1</sup> Mortality Rate	Male Deaths	Female Deaths	Age Adjusted <sup>1</sup> Mortality Rate	Ranking from Lowest to Highest	Male Deaths	Female Deaths
Minnesota Statewide	5,658	9,308	62.3	5,128	8,140	50.2	4,122	6,656	37.4	-	779	1,244
Aitkin	34	47	69.8	20	23	32.8	23	27	33.1	18	3	4
Anoka	168	209	54.0	154	230	46.7	156	216	34.8	25	45	44
Becker	56	86	71.8	44	86	64.5	51	53	48.5	73	12	13
Beltrami	40	88	71.1	42	48	45.0	48	47	41.1	52	7	15
Benton	54	89	78.9	53	90	78.9	35	66	52.0	77	6	10
Big Stone	15	34	73.0	12	24	53.3	10	25	52.8	79	1	2
Blue Earth	79	138	72.6	68	93	50.1	42	82	35.0	26	9	13
Brown	37	78	54.7	33	48	37.0	30	70	41.6	54	5	12
Carlton	54	76	71.7	48	65	54.6	36	59	41.8	56	10	12
Carver	40	62	46.2	48	57	42.0	32	67	33.2	19	8	11
Cass	53	69	69.6	37	47	45.5	39	47	43.7	61	7	10
Chippewa	27	42	57.4	35	35	51.7	15	27	32.6	16	3	6
Chisago	48	68	62.9	38	57	52.0	30	51	38.7	45	3	11
Clay	60	121	66.0	43	87	42.9	36	68	31.9	14	6	15
Clearwater	20	35	75.6	16	14	47.0	15	16	48.4	72	3	5
Cook	13	7	-	7	4	-	7	7	-	-	1	2
Cottonwood	33	47	60.7	24	35	46.9	14	31	35.2	29	3	6
Crow Wing	67	140	62.0	69	114	46.5	63	98	35.8	31	10	20
Dakota	218	345	67.4	233	357	53.2	230	321	42.2	57	51	59
Dodge	24	33	59.6	17	14	31.6	12	22	30.7	11	3	2
Douglas	55	97	63.4	43	84	48.5	37	80	36.8	36	8	17
Faribault	27	53	50.6	27	54	48.3	21	41	38.1	43	3	6
Fillmore	51	47	52.1	30	44	38.7	30	38	34.3	24	3	6
Freeborn	68	96	67.4	55	98	54.7	45	65	37.5	40	9	10
Goodhue	80	112	61.5	56	93	50.0	41	82	36.9	37	6	16
Grant	18	19	58.8	16	10	38.2	10	11	29.5	8	2	2
Hennepin	1,091	1,960	60.9	1,002	1,697	49.7	792	1,233	35.6	30	146	214
Houston	34	56	65.4	29	37	45.2	28	30	36.8	35	2	6
Hubbard	40	37	69.5	24	31	42.5	19	38	37.7	41	4	10
Isanti	38	64	68.7	21	66	51.2	33	51	49.7	74	12	7

## Appendix B. Stroke deaths in Minnesota counties, all ages, 1995-2009 (continued).

	1995-1999			2000-2004			2005-2009				2009	
State/ County	Male Deaths	Female Deaths	Age Adjusted <sup>1</sup> Mortality Rate	Male Deaths	Female Deaths	Age Adjusted <sup>1</sup> Mortality Rate	Male Deaths	Female Deaths	Age Adjusted <sup>1</sup> Mortality Rate	Ranking from Lowest to Highest	Male Deaths	Female Deaths
Itasca	72	70	56.1	55	102	52.0	41	95	41.4	53	7	10
Jackson	29	44	74.3	15	27	40.0	10	22	28.9	5	3	5
Kanabec	23	33	71.5	15	23	45.4	14	18	34.3	22	3	4
Kandiyohi	57	96	59.0	64	73	49.6	48	97	48.1	71	5	12
Kittson	15	24	70.6	17	17	61.2	13	15	45.9	66	1	3
Koochiching	27	40	73.5	31	44	71.7	18	28	40.3	49	1	5
Lac qui Parle	24	26	59.7	10	12	26.1	10	7	-	-	1	3
Lake	21	30	72.7	22	39	69.5	19	16	37.4	39	5	3
Lake of the Woods	13	14	96.7	6	17	69.8	5	5	-	-	2	0
Le Sueur	32	52	52.5	27	42	42.4	26	32	32.7	17	8	7
Lincoln	25	41	86.6	19	30	68.1	12	28	51.7	76	0	4
Lyon	56	81	79.3	42	68	56.1	34	47	44.4	64	7	10
McLeod	64	101	75.9	58	86	63.7	36	54	37.0	38	7	9
Mahnomen	7	5	-	4	6	-	3	8	-	-	1	3
Martin	39	56	50.2	23	38	29.1	27	31	27.1	4	10	6
Meeker	53	72	83.2	34	53	50.6	42	43	47.2	68	4	8
Mille Lacs	34	63	68.6	45	41	53.2	28	44	39.8	47	3	7
Morrison	55	88	73.7	45	63	50.6	34	59	41.0	51	5	15
Mower	67	115	58.6	55	98	44.1	34	62	29.0	6	6	8
Murray	11	34	55.5	12	24	43.4	9	17	29.0	7	3	4
Nicollet	29	43	53.4	26	38	45.7	24	48	43.5	59	5	12
Nobles	25	59	51.1	32	34	40.5	30	18	30.2	9	4	2
Norman	21	33	68.1	13	20	50.0	6	18	36.1	32	0	3
Olmsted	79	176	48.2	96	165	41.8	71	128	26.6	2	11	25
Otter Tail	95	139	52.7	109	152	53.4	70	141	40.5	50	11	23
Pennington	30	41	70.6	21	40	60.8	8	25	31.7	13	0	5
Pine	41	46	59.8	34	37	44.1	29	50	44.3	63	5	15
Pipestone	19	53	73.0	16	43	56.2	18	39	53.0	80	2	8
Polk	65	116	76.2	71	91	61.8	45	56	37.9	42	4	8
Pope	19	47	65.0	18	46	54.5	23	29	47.8	69	2	8

## Appendix B. Stroke deaths in Minnesota counties, all ages, 1995-2009 (continued).

	1995-1999			2000-2004			2005-2009				2009	
State/ County	Male Deaths	Female Deaths	Age Adjusted <sup>1</sup> Mortality Rate	Male Deaths	Female Deaths	Age Adjusted <sup>1</sup> Mortality Rate	Male Deaths	Female Deaths	Age Adjusted <sup>1</sup> Mortality Rate	Ranking from Lowest to Highest	Male Deaths	Female Deaths
Ramsey	586	1,006	62.5	528	880	53.0	412	775	40.2	48	64	146
Red Lake	11	14	76.1	10	18	81.0	10	4	-	-	2	0
Redwood	31	52	53.7	39	48	56.1	26	38	43.1	58	2	12
Renville	61	86	96.4	36	56	59.9	14	36	32.4	15	4	7
Rice	64	111	62.9	60	78	47.1	36	77	34.3	23	3	19
Rock	21	30	64.3	30	35	68.6	23	20	51.6	75	2	2
Roseau	24	33	65.5	18	27	45.6	12	31	45.7	65	0	7
St. Louis	295	532	65.4	272	465	52.3	205	321	36.6	34	40	49
Scott	55	84	63.2	68	98	66.8	52	87	43.9	62	13	16
Sherburne	38	96	80.3	47	86	62.2	38	79	46.4	67	11	11
Sibley	30	30	56.7	25	33	55.0	19	24	38.1	44	4	4
Stearns	122	149	48.7	119	155	44.4	77	128	26.7	3	13	30
Steele	28	56	45.6	41	62	50.0	30	47	35.1	28	8	12
Stevens	17	21	50.2	11	23	44.4	14	15	34.1	21	5	2
Swift	24	29	57.4	25	39	61.4	16	26	36.2	33	3	3
Todd	33	35	43.0	26	42	41.9	12	32	25.4	1	1	7
Traverse	4	10	-	6	9	-	7	9	-	-	2	3
Wabasha	27	53	59.6	26	43	47.4	16	39	35.0	27	4	7
Wadena	24	53	69.4	26	47	61.3	25	33	48.1	70	4	4
Waseca	24	42	53.9	21	54	57.4	18	23	30.3	10	7	3
Washington	119	216	68.7	136	207	55.6	119	199	43.6	60	21	41
Watonwan	27	31	61.2	16	35	52.1	15	28	39.5	46	6	6
Wilkin	7	16	41.2	7	33	69.7	10	18	52.4	78	3	4
Winona	69	107	61.3	45	85	43.6	39	63	31.6	12	11	11
Wright	79	150	72.1	75	123	56.0	70	102	41.6	55	25	26
Yellow Medicine	30	48	68.7	19	36	47.9	23	40	59.4	81	2	7

Data Source: Minnesota Department of Health Center for Health Statistics.

Stroke was defined as ICD-9 codes 430-438 and ICD-10 codes I60-I69.

<sup>1</sup>Rate is per 100,000. Age adjusted to the 2000 U.S. standard population.

Rates based on 20 or fewer deaths are not produced.

## Appendix C. Heart Disease in Minnesota – At a Glance.

Mortality, 2009				
		Number of Deaths	Crude Death Rate per 100,000	Age Adjusted Death Rate per 100,000
Overall		7,233	137.3	121.8
Male	Overall	3,837	146.4	165.3
	White	3,636	155.7	163.2
	Black	83	58.1	142.9
	American Indian	41	112.7	241.3
	Asian	32	30.2	90.2
	Hispanic	17	-	-
Female	Overall	3,396	128.4	89.2
	White	3,274	138.1	88.0
	Black	52	39.8	100.4
	American Indian	17	-	-
	Asian	24	22.4	49.6
	Hispanic	15	-	-
Age	0-34	63	2.5	-
	35-44	118	17.0	-
	45-54	414	51.0	-
	55-64	672	111.5	-
	65-74	877	253.8	-
	75-84	1,736	791.7	-
	85+	3,353	3157.4	-

Data Source: Minnesota Department of Health Center for Health Statistics  
 Age adjusted to the 2000 U.S. standard population.  
 Rates for cells 20 respondents or fewer are not reported, as estimates are unstable.

## Appendix C. Heart Disease in Minnesota At a Glance (continued).

Prevalence of Coronary Heart Disease or Angina, 2009		
		Percent
Overall		3.5
Sex	Male	4.2
	Female	2.8
Race/Ethnicity	White	3.4
	Black	-
	Hispanic	-
	Other	-
	Multiracial	-
Age	18-24	-
	25-34	-
	35-44	-
	45-54	-
	55-64	5.6
	65+	12.9
Income	<\$15,000	8.4
	\$15,000-\$24,999	7.1
	\$24,000-\$34,999	6.7
	\$35,000-\$49,999	4.8
	\$50,000 +	2.0
Education	Less than HS	-
	HS or GED	5.2
	Some post HS	2.9
	College graduate	2.7

Data source: BRFSS - Behavioral Risk Factor Surveillance Survey, Centers for Disease Control &amp; Prevention

## Appendix D. Stroke in Minnesota – At a Glance.

Mortality, 2009				
		Number of Deaths	Crude Death Rate per 100,000	Age adjusted Death Rate per 100,000
Overall		2,023	38.4	34.1
Male	Overall	779	29.7	34.7
	White	722	30.9	33.5
	Black	26	18.2	56.8
	American Indian	4	-	-
	Asian	19	-	-
	Hispanic	6	-	-
Female	Overall	1,244	47.0	33.3
	White	1,184	49.9	32.5
	Black	20	-	-
	American Indian	6	-	-
	Asian	26	24.3	59.7
	Hispanic	8	-	-
Age	0-34	15	-	-
	35-44	23	3.5	-
	45-54	64	8.1	-
	55-64	107	18.0	-
	65-74	246	72.0	-
	75-84	516	237.3	-
	85+	1,029	976.1	-

Data Source: Minnesota Department of Health Center for Health Statistics  
 Age adjusted to the 2000 U.S. standard population.  
 Rates for cells 20 respondents or fewer are not reported, as estimates are unstable.



## Appendix D. Stroke in Minnesota - At a Glance (continued).

Prevalence of Stroke, 2009		
		Percent
Overall		2.3
Sex	Male	2.1
	Female	2.5
Race/Ethnicity	White	2.0
	Black	-
	Hispanic	
	Other	-
	Multiracial	-
Age	18-24	-
	25-34	-
	35-44	-
	45-54	1.5
	55-64	2.2
	65+	7.2
Income	<15,000	7.2
	\$15,000-\$24,999	4.3
	\$24,000-\$34,999	3.3
	\$35,000-\$49,999	2.8
	\$50,000 +	1.0
Education	Less than HS	7.7
	HS or GED	2.5
	Some post HS	2.0
	College graduate	1.8

Data Source: BRFSS – Behavioral Risk Factor Surveillance Survey, Centers for Disease Control &amp; Prevention

## Appendix E. Data Notes

### Race and Ethnicity Definitions

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The race and ethnicity categories used in this publication were defined according to standards first described by the United States Census Bureau for Census 2000. These definitions include one or more of the following:

**Race groups:**

- White
- Black or African American
- American Indian and Alaska Native
- Asian
- Native Hawaiian and Other Pacific Islander
- Some other race

**Ethnicity:**

- Hispanic or Latino (may be of any race)

For the purposes of this report, some race groups have been combined due to very small population sizes in the State of Minnesota (Native Hawaiian and Other Pacific Islander, Some other race). When data on Hispanics is presented, it is compared to race groups with Hispanics excluded. In addition, names of race and ethnic groups have been shortened for tables and graphs. These names are:

- White
- Black (includes African American and African)
- American Indian (includes Alaska Native)
- Asian/Pacific Islander (includes Asian and Native Hawaiian and Pacific Islander)
- Hispanic (can be of any race)

For more information:

United States Census Bureau: 2000 Census of Population, Public Law 94-171 Redistricting Data File: Race

### Mortality

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Data on causes of death come from a database of death certificate information, collected and maintained by the Minnesota Department of Health (MDH) Center for Health Statistics and the Centers for Disease Control and Prevention (CDC), National Center for Health Statistics.

The primary cause of death is indicated by an International Classification of Diseases (ICD) code. The ICD is designed to promote international comparability in the collection, processing, classification, and presentation of mortality statistics. This includes providing a format for reporting causes of death on the death certificate. The reported conditions are translated into medical codes through the use of classification structure and the selection and modification rules contained in the applicable version of the ICD, published by the World Health Organization. The single selected cause for tabulation is called the underlying cause of death. The 9th revision of the ICD was used from 1979-1998 and the 10th revision has been in effect since 1999. (Source: CDC, <http://www.cdc.gov/nchs/icd/icd10.htm> , accessed 2 February 2011)

**Classification for Deaths:**

- Cardiovascular disease (CVD)
  - 1979-1998 – ICD-9: 390-459
  - 1999-2009 – ICD-10: I00-I99
- Diseases of the heart (Heart disease)
  - 1979-1998 – ICD-9: 390-398, 402, 404, 410-429
  - 1999-2009 – ICD-10: I00-I99, I11, I13, I20-I51
- Cerebrovascular disease (Stroke)
  - 1979-1998 – ICD-9: 430-438
  - 1999-2009 – ICD-10: I60-I69

For more information:

MDH Center for Health Statistics: <http://www.health.state.mn.us/divs/chs/>

CDC: <http://wonder.cdc.gov>

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**Hospitalizations**

Data from inpatient hospital admissions are from the Minnesota Department of Health, Health Economic Program. These Minnesota Hospital Uniform Billing (UB) claims data are provided voluntarily by hospitals to the Minnesota Hospital Association (MHA) and purchased by the Minnesota Department of Health. In 2009, there were 147 hospitals in Minnesota, including 133 acute care hospitals, 2 Veterans Administration Medical Centers, 2 United States Public Health Service (Indian Health Service) hospitals, and 10 state-owned treatment centers or other specialty hospitals. In 2005, all but 3 acute care hospitals provided data to this dataset, but all of these hospitals were contributing data to this dataset as of 2009. Data on non-Minnesota residents were excluded, and data on Minnesotans hospitalized in the bordering states of North Dakota, South Dakota, and Iowa, along with Colorado, Georgia, Michigan, Missouri, Nebraska, and Tennessee were included. No data was available for Minnesotans hospitalized in the bordering state of Wisconsin.

Classification for the principal reason of each hospitalization was based on the primary discharge ICD-9 diagnosis code. These categories are not exclusive. Discharges include people living and dead.

**Classification for Deaths:**

- Cardiovascular disease (ICD-9: 390-459)
- Diseases of the heart (Heart disease) (ICD-9: 390-398, 402, 404, 410-429)
  - Coronary Heart Disease (ICD-9: 410-414, 429.2)
  - Acute Myocardial Infarction (ICD-9: 410)
  - Heart Failure (ICD-9: 428)
- Cerebrovascular disease (Stroke) (ICD-9: 430-438)
  - Hemorrhagic Stroke (ICD-9: 430-431)
  - Ischemic Stroke (ICD-9: 434, 436)
  - Transient Ischemic Attack (TIA) (ICD-9: 435)
- Other Cardiovascular disease (ICD-9: 401, 403, 405-409, 439-459)

For more information:

MDH Health Economics Program: <http://www.health.state.mn.us/health/economics>

MHA: <http://www.mnhospitals.org>

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**Prevalence of Cardiovascular Disease and Risk Factors**

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The primary source of statewide data on cardiovascular disease prevalence and risk factors is the Behavioral Risk Factor Surveillance System (BRFSS) Survey, conducted by the Minnesota Department of Health. The BRFSS Survey is designed to measure health risk behavior in the non-institutionalized adult (aged 18 years or older) population. The survey is a collaborative project of the Centers for Disease Control and Prevention (CDC) and health departments from states and territories. Statewide prevalence estimates for heart attack (myocardial infarction), coronary heart disease and angina, stroke, and several cardiovascular disease-related behaviors and risk factors are derived from this survey, including high blood pressure, high blood cholesterol, overweight and obesity, cigarette smoking, poor dietary habits, and physical inactivity. In some years the survey asks about personal awareness of the signs and symptoms of heart attack and stroke, and utilization of rehabilitation services after having a heart attack or stroke.

For more information:

CDC: <http://www.cdc.gov/brfss>

Statewide data on cardiovascular disease risk factors in school-age children come from the Minnesota Student Survey, conducted every three years as the result of a collaboration between Minnesota schools and the Minnesota Departments of Education, Employment and Economic Development, Health, Human Services, and Public Safety. This voluntary written survey includes students in 6th, 9th, and 12th grade. This report includes data from the 2001, 2004, 2007, and 2010 surveys.

For more information:

MDH: <http://www.health.state.mn.us/divs/chs/mss/>

Statewide data on obesity and overweight in pre-school-age children come from the Pediatric Nutrition Surveillance System (PedNSS) which monitors the nutritional status of low-income infants and children in federally funded maternal and child health programs. Sponsored by the Centers for Disease Control and Prevention (CDC), PedNSS is a public health surveillance system based on data routinely collected from several federally funded public health programs serving low-income children. Approximately 85% of the data come from participants in the federally-funded WIC program, a health and nutrition program for women, infants, and children. PedNSS is not representative of all low-income children or children in the general population.

For more information:

CDC: <http://www.cdc.gov/pednss/>

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### Heart Disease and Stroke Quality of Care Measures

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Statewide data on heart disease and stroke risk factor management in the clinic come from the Minnesota Community Measurement Health Care Quality Report 2010. The two “Living with Illness: measures – Optimal Vascular Care and High Blood Pressure Control – are collected from clinics throughout Minnesota. These data are reported to the Minnesota Department of Health as part of Minnesota’s 2008 Health Reform Law requiring the Commissioner of Health to establish a standardized set of quality measures for health care providers across the state.

For more information:

Minnesota Community Measurement: <http://www.mncm.org>

MDH: <http://www.health.state.mn.us/healthreform/measurement/index.html>

Statewide data on the quality of inpatient hospital care for heart disease come from the National Healthcare Quality Report (NHQR) and the National Healthcare Disparities Report (NHDR), produced by the Agency for Healthcare Research and Quality (AHRQ) at the US Department of Health & Human Services. These summary measures of quality of care include hospital measures of care for five clinical conditions, including heart disease and are available by state through annual state snapshots which compare statewide performance to regional and national performance.

For more information:

AHRQ: <http://www.ahrq.gov/qual/qrdr09.htm>