THE BURDEN OF CARDIOVASCULAR DISEASE IN MINNESOTA

MORTALITY AND RISK FACTOR UPDATE

May 2004 REPORT

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Executive Summary

Cardiovascular disease (CVD, including coronary heart disease and stroke) is the leading cause of death in Minnesota. In 2002, cardiovascular diseases accounted for 32 percent of all deaths in Minnesota. Moreover, over 11 percent of all hospital discharges recorded in the state in 2002 had a primary diagnosis of CVD, incurring a total in-patient cost of over $1.6 billion.

Coronary heart disease mortality declined over 58 percent and stroke mortality declined 42 percent in MN between 1982 and 2002. While mortality rates for CVD in Minnesota have been declining for several years, it remains a serious problem on several fronts, including the trends for several major risk factors:

- Approximately one in five adults are **current cigarette smokers;** this proportion has not changed substantially since 1990.
- Nearly one in six adults do not participate in any leisure time **physical activity.**
- We have a long way to go towards improving our **eating habits.** Only 1 in 5 adults report that they consume at least five fruits and vegetables per day, the recommended daily amount.
- Approximately 20 percent of adults in Minnesota report that they have been diagnosed with **high blood pressure;** this proportion has not changed over the last decade.
- A similar proportion of adults have **high blood cholesterol:** the Minnesota Heart Survey, a surveillance study of Twin Cities (Minneapolis-St. Paul) found that 18 percent of of adults with high total cholesterol levels was 18 percent in men and women between 1995-1997.
- Approximately 276,000 people in Minnesota (1 in 18) have **diabetes,** and one-third of these individuals are unaware that they have the disease. Moreover, the prevalence of diagnosed diabetes has been rising since 1990.
- Our population has not escaped the national epidemic of **obesity.** Approximately 59 percent of adults in Minnesota are overweight; 22 percent of adults are obese. These proportions of overweight and obesity in adults have been rising over the last decade.

Clearly, we have much work ahead in order to reduce the prevalence of several risk factors for CVD.

In addition, disparities in coronary heart disease and stroke mortality rates remain between race and ethnic populations in Minnesota. Between 1998-2002:

- African American women had a 53 percent higher age-adjusted stroke mortality rate than non-Hispanic white women.
- African American men had a 53 percent higher age-adjusted stroke mortality rate compared to non-Hispanic white men.
- The age-adjusted heart disease death rate in American Indians was 36 percent higher than in non-Hispanic whites.
- Asian Americans had a 24 percent higher age-adjusted stroke mortality rate than non-Hispanic whites.

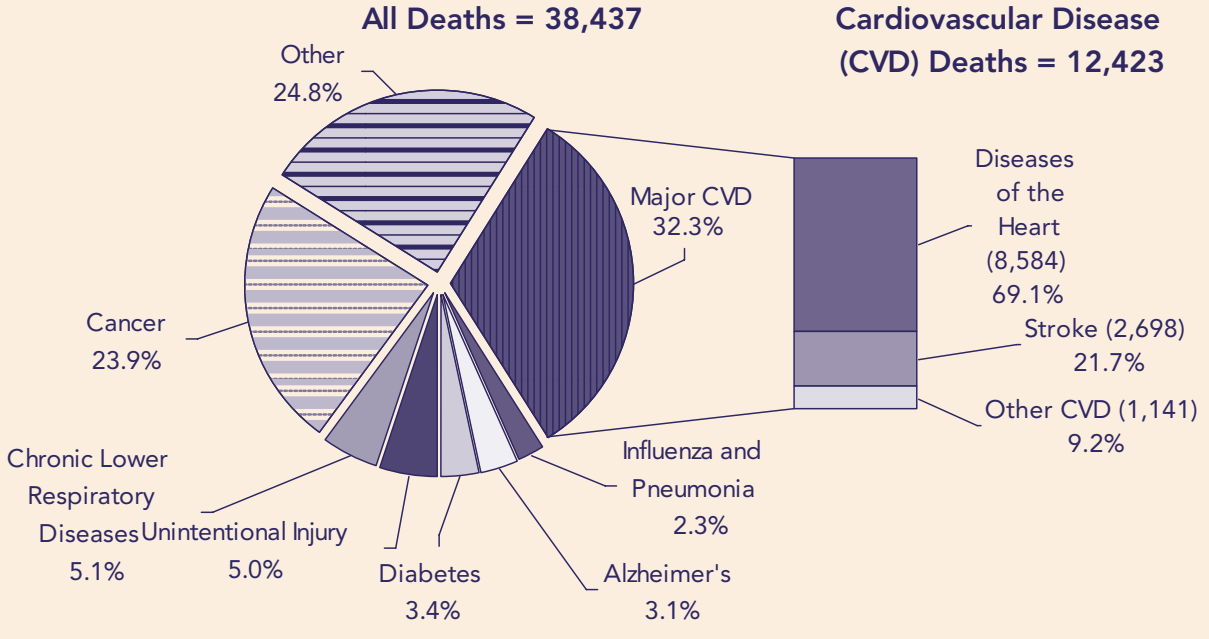
While the state has low CVD mortality rates compared to the rest of the nation, our populations of color are suffering disproportionately from cardiovascular diseases.

Introduction

Cardiovascular disease (CVD) is the leading cause of death and disability in the United States and in Minnesota. Approximately 1 in 5 individuals has some form of CVD, and CVD claimed 1 of every 2.5 deaths in the United States in 2001.[1] CVD is defined as all diseases of the heart and blood vessels, including ischemic (also known as coronary) heart disease, cerebrovascular disease (stroke), congestive heart failure, hypertensive disease, and atherosclerosis.

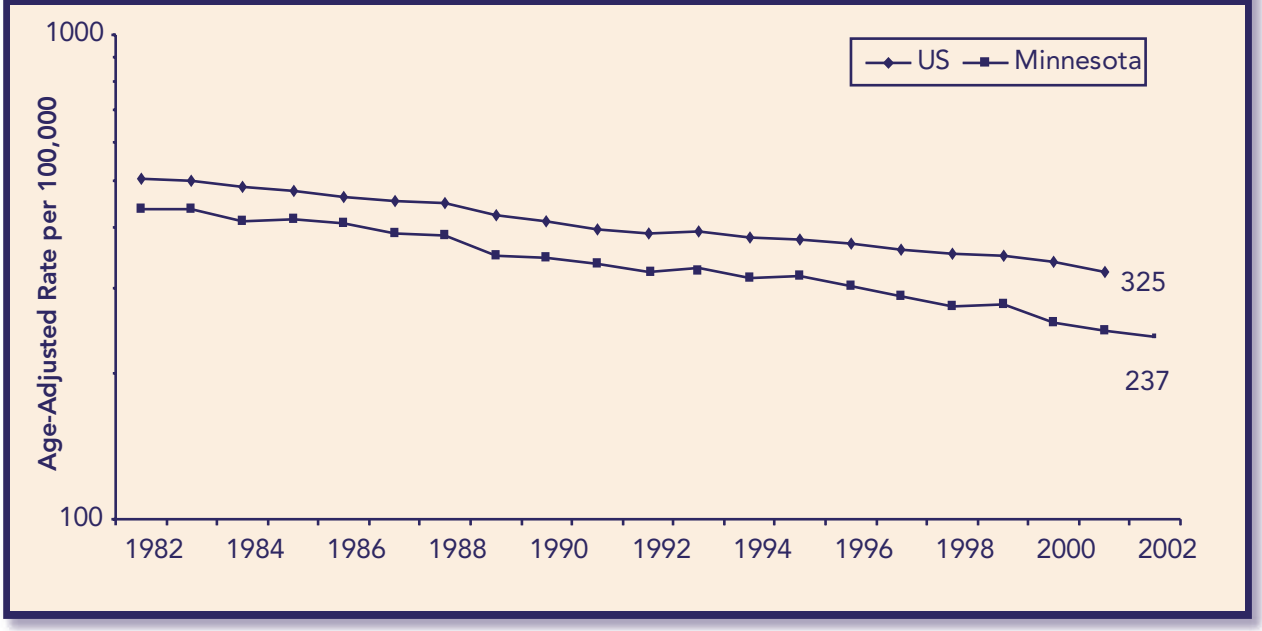
CVD is by far the leading cause of death in Minnesota, accounting for 12,423 deaths (34 percent of all deaths) in 2002 (Figure 1). This includes 8,584 deaths from coronary heart disease and 2,698 deaths due to stroke.[2] In addition, there were over 70,000 hospitalizations for CVD (as a primary reason for the hospitalization) in Minnesota in 2002, accounting for over $1.6 billion in charges.[3] Clearly, CVD is a major public health problem for the people of Minnesota.

Figure 1. Leading causes of death-Minnesota, 2001.



Source: Minnesota Department of Health

Figure 2. Age-adjusted cardiovascular disease mortality rates in Minnesota and the United States, 1982-2002.



Death rates from CVD have been declining overall in the United States and Minnesota for several years (Figure 2). Compared to the rest of the United States, the age-adjusted rate of death due to CVD in Minnesota is very low, but not optimal.

The burden of CVD, however, is significant despite the decline in mortality rates. More individuals die from CVD in Minnesota than from any other cause (Figure 1). Moreover, the stroke mortality rate in Minnesota is virtually the same as the national average. Minnesota ranks 15th among all states in the U.S. in stroke mortality rates-that is, 14 states have lower stroke death rates than Minnesota.[4] In addition, modifiable risk factors such as physical inactivity, poor diet and nutrition, and cigarette smoking remain pervasive in our state. These behaviors are related to obesity, diabetes, high cholesterol and high blood pressure. Of particular concern in Minnesota is the issue of disparities in CVD risk factors and mortality in populations of color and American Indians.

The Minnesota Heart Disease and Stroke Prevention Initiative is a collaborative partnership coordinated by the Minnesota Department of Health, bringing together individuals and organizations in an effort to prevent and reduce CVD in Minnesota. The Initiative was formed after the Centers for Disease Control and Prevention Cardiovascular Health State Program awarded funding for the Minnesota Department of Health to develop a state-based plan for preventing CVD.

This report examines the burden of CVD in Minnesota. The statewide data presented in this report are from several sources, including the Minnesota Behavioral Risk Factor Surveillance Survey, Minnesota death certificates, the Minnesota Heart Survey, and the Minnesota Student Survey. CVD risk factor data from other local data sources are also cited in this report. The emphasis in this report is on coronary heart disease and stroke. The purpose of this report is to present the burden of CVD prevalence and mortality, cost, risk factors, and disparities in Minnesota.

Coronary Heart Disease

What is coronary heart disease and why is it important?

Coronary heart disease is a condition in which the arteries which supply blood to the heart muscle develop atherosclerosis. When the blood flow is reduced, the heart muscle does not receive adequate oxygen, resulting in angina (chest pain), acute myocardial infarction (heart attack), or other complications, such as sudden cardiac arrest.

An estimated 12.9 million people in the United States have coronary heart disease. Coronary heart disease is the leading cause of death among American men and women, causing more than 1 of every 5 deaths in the United States in 2000. Direct and indirect costs for coronary heart disease are estimated to reach $130 billion for 2003.[1]

What is the scope of the problem in Minnesota?

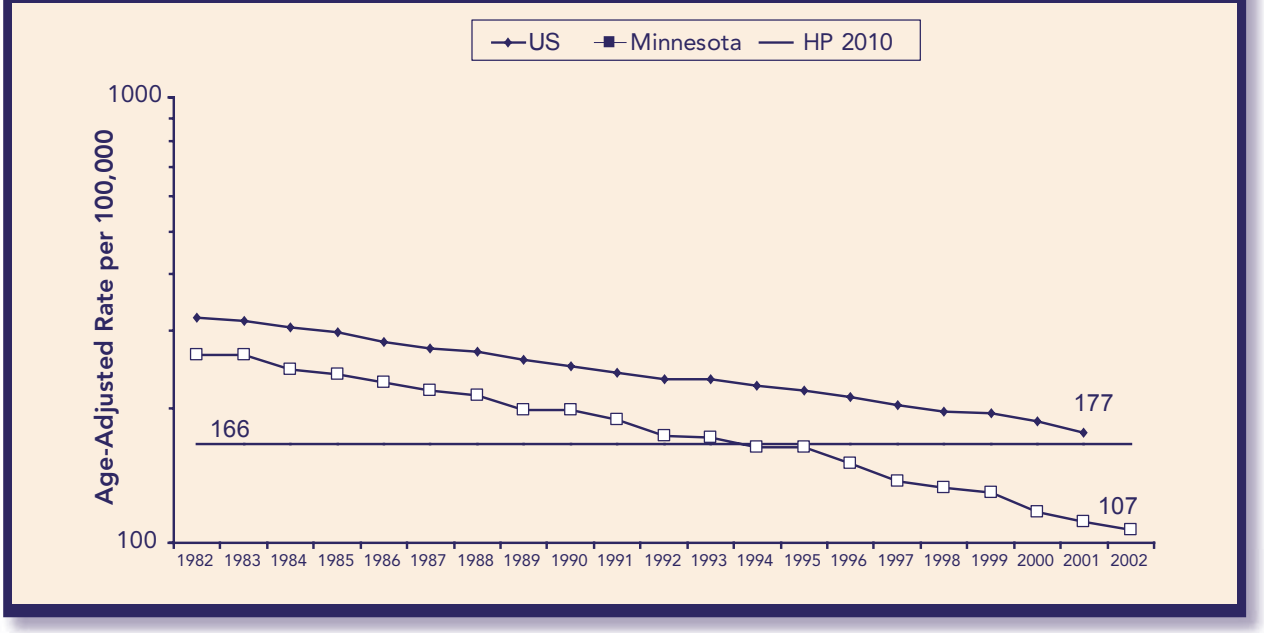
Mortality Trends

Coronary heart disease is the major component of CVD morbidity and mortality, accounting for nearly half of all CVD deaths in Minnesota.

The age-adjusted coronary heart disease mortality rate in 2001 was 116.8 per 100,000 persons. In the United States, the overall rate was 186.7 per 100,000 persons.[5]

Rates of CHD have been declining in the United States and Minnesota over the last several decades (data from 1982-2002 shown in Figure 3).

Figure 3. Age-adjusted coronary heart disease mortality rates for Minnesota, United States (1982-2002), and the Healthy People 2010 goal.

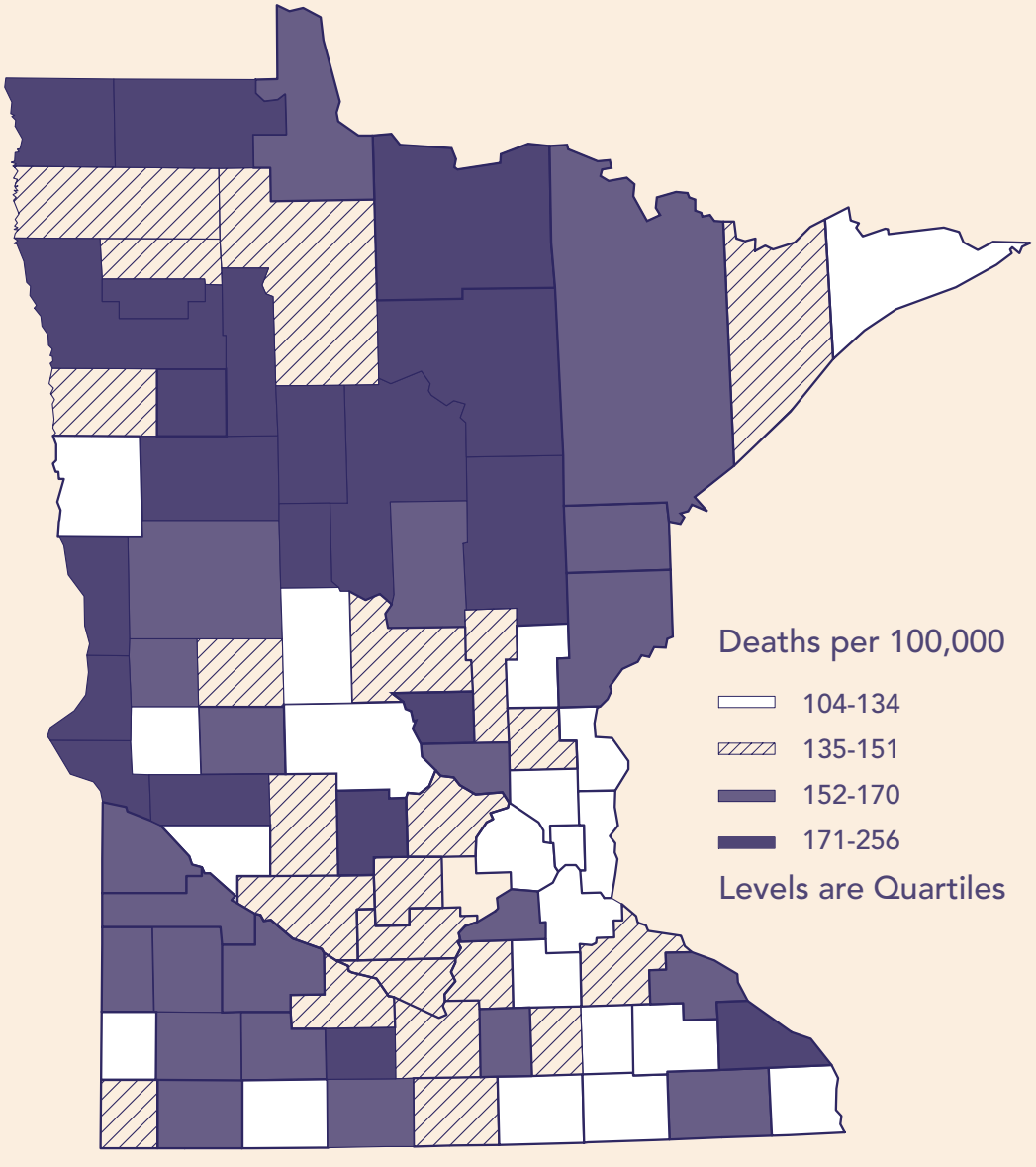


Regional Distribution

The majority of counties with the lowest CHD mortality rates are in the east and southeastern regions of the state. In contrast, the northern and northwest region of Minnesota includes several counties with the highest CHD mortality rates in the state. (Figure 4)

Numerical data for coronary heart disease deaths by county are located in Appendix B.

Figure 4. Age-adjusted coronary heart disease death rates by Minnesota county, 1993-2002.



Source: Minnesota Department of Health

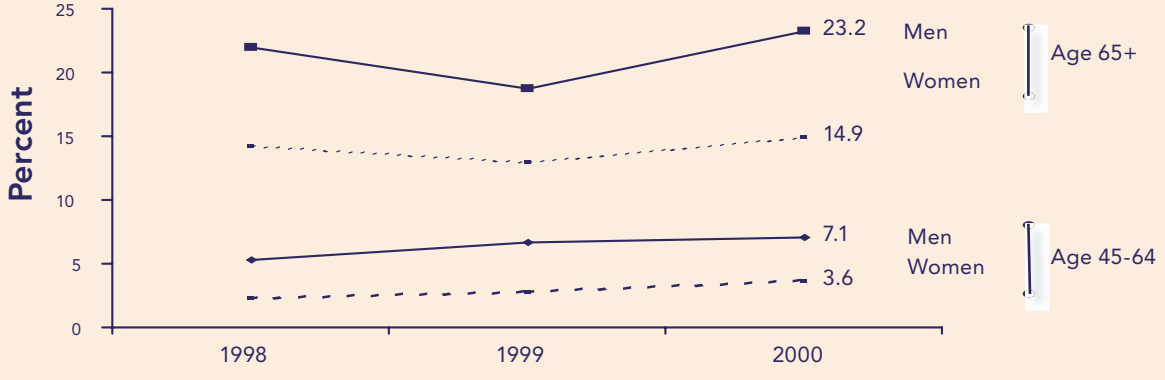
Prevalence

Figure 5 shows the prevalence of self-reported angina pectoris or coronary heart disease among adults in Minnesota between 1998-2000. Angina pectoris is the medical term for chest pain or discomfort due to coronary heart disease. It is a symptom that occurs when the heart muscle (myocardium) does not get as much blood (hence as much oxygen) as it needs. This usually happens because one or more of the heart's arteries (blood vessels that supply blood to the heart muscle) is narrowed or blocked.[8]

Approximately 1 in every 20 adults in Minnesota reports a history of coronary heart disease or angina. The prevalence of coronary heart disease increases with age and is more prevalent in men than women. One of the outcomes of coronary heart disease is an acute myocardial infarction, otherwise known as

A recent population-based study[6] from Olmsted County, Minnesota assessed the long-term outcome and quality of life of survivors from out-of-hospital cardiac arrest. Individuals who survived their cardiac arrest were shocked by an automated external defibrillator on average 5.7 minutes after a 9-1-1 call was made. In contrast, non-survivors were shocked on average 6.6 minutes after the emergency call was made. This average difference of one minute was statistically significant. In addition, those who survived their event and made it to a hospital alive had a long-term survival rate as those in the general population. Furthermore, most of these people returned to a normal quality of life. This study illustrates the importance of early detection of heart attack, calling 911 as quickly as possible, and the ready availability of automated external defibrillators.

Figure 5. Prevalence of self-reported angina or coronary heart disease among adults*, Minnesota 1998-2000.

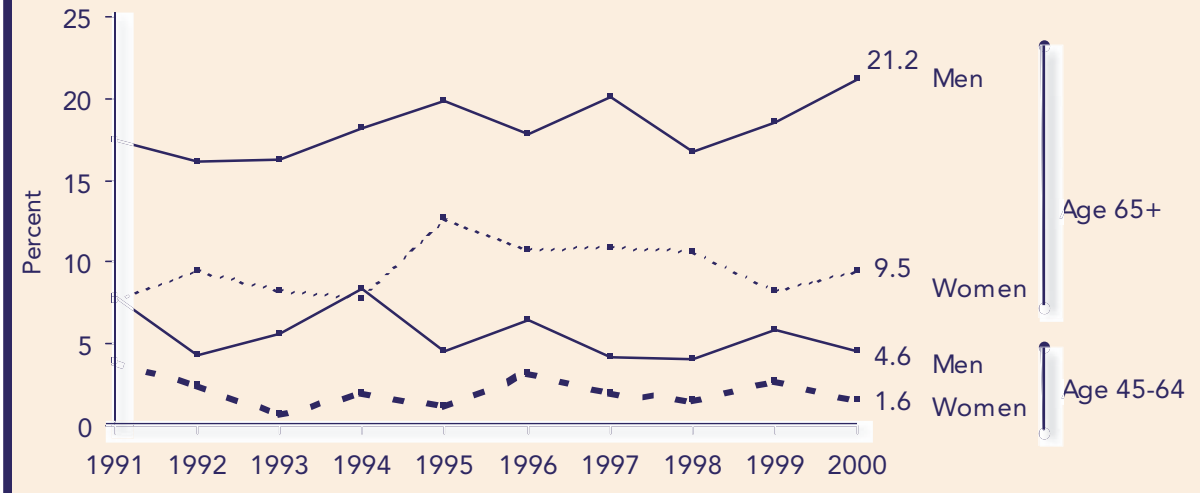


Source: Minnesota Behavioral Risk Factor Surveillance System (BRFSS) survey.

* Prevalence of angina or coronary heart disease is defined by the percentage of adults who positively answered the question "Have you ever been told by a doctor that you had angina or coronary heart disease?"

heart attack. Since the early 1990s, the prevalence of adults who have been told by a doctor that they have had a heart attack has declined slightly in men and women 45-64 years of age and risen slightly in men and women age 65 years and older. (Figure 6) In 2000, 3.5 percent of all adults aged reported having had heart attack. While the percentage of men who experienced a heart attack is greater than women, nearly 10 percent of women age 65 years and older have had a heart attack.

Figure 6. Prevalence of self-reported heart attack among adults, Minnesota 1991-2000.



Source: Minnesota Behavioral Risk Factor Surveillance System (BRFSS) survey.

* Prevalence of heart attack is defined by the percentage of adults who positively answered the question "Have you ever been told by a doctor that you had a heart attack?"

Incidence of Myocardial Infarction

The Rochester Epidemiology Project
Incidence, or the rate of new events over a period of time, of heart attack has been on the decline for several decades. The Rochester Epidemiology Project was able to track incidence of heart attack in the Olmsted County population through its extensive and comprehensive medical records system.[8] Researchers found that over time, the incidence of hospitalized myocardial infarction decreased in men, but increased in women and elderly persons. The investigators reported that survival rates for people who experienced a heart attack improved among a younger population. These data reflect the shift of the burden of coronary heart disease to the elderly, which may pose a greater public health burden as our population ages.

Stroke

What is stroke and why is it important?

Stroke is defined as the loss or alteration of bodily function that results from an insufficient supply of blood to part of the brain.

An estimated 4.7 million people in the United States have had a stroke. Stroke is the third-leading cause of death among American men and women, causing about than 1 of every 14 deaths in the United States in 2000. Direct and indirect costs for stroke in 2003 were estimated at $51.2 billion.[10]

What is the scope of the problem in Minnesota?

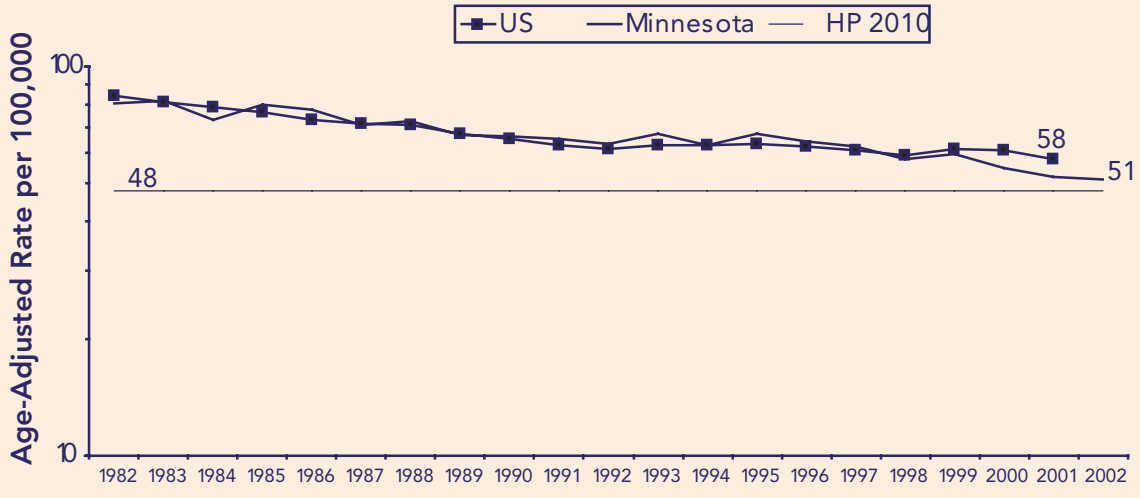
Mortality Trends

Stroke is a significant component of CVD morbidity and mortality, accounting for nearly 22% of all CVD deaths in Minnesota.

The age-adjusted stroke mortality rate in 2002 was 51.2 per 100,000 persons. The overall rate in 2001 in the United States was 57.7 per 100,000.[5]

The age-adjusted stroke mortality rate has been declining for several decades; over the last 20 years, Minnesota's stroke mortality rates have matched the national average (Figure 7).

Figure 7. Age-adjusted stroke mortality rates for Minnesota, United States (1982-2002), and Healthy People 2010 goal.



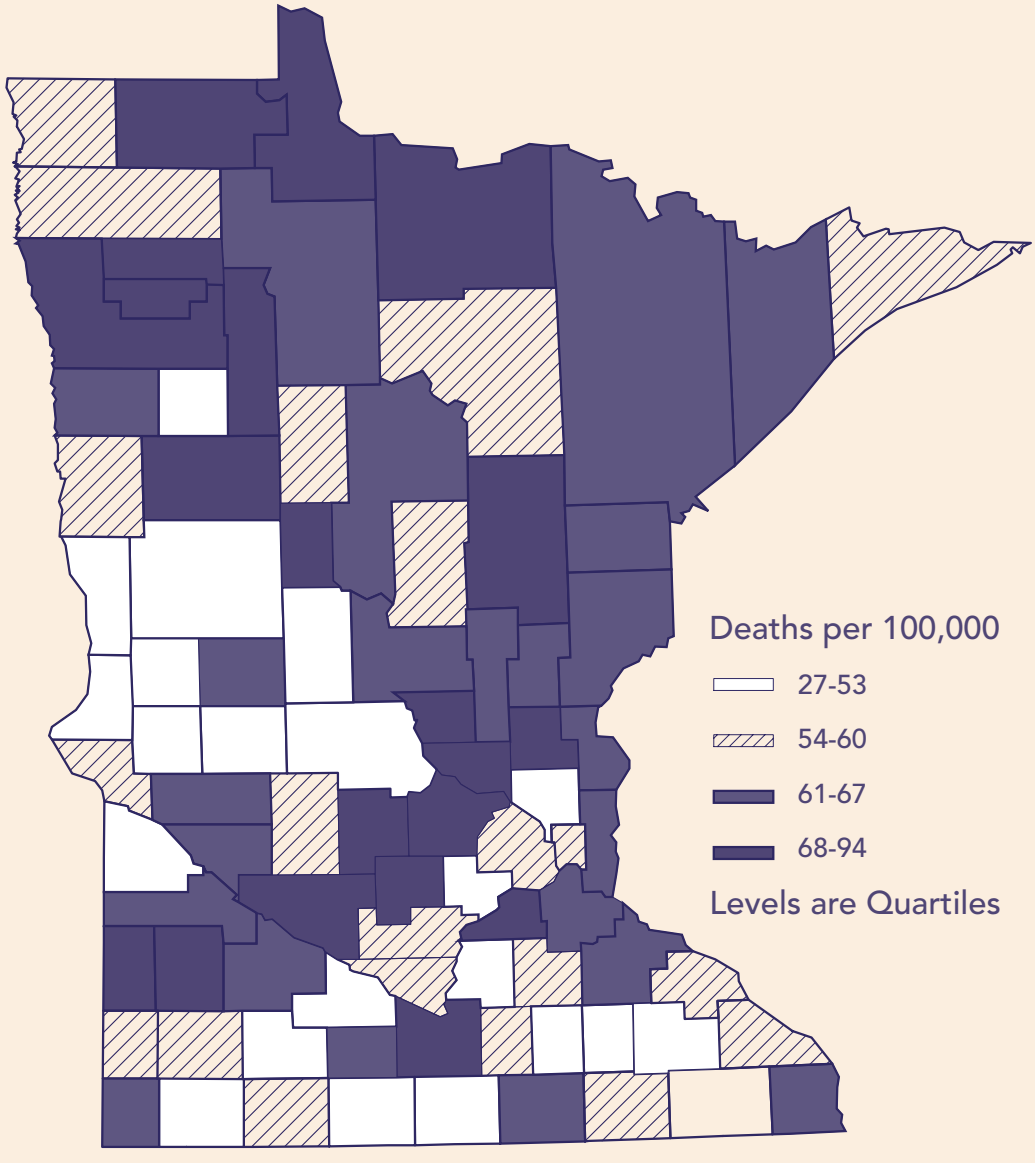
Source: Minnesota Department of Health, Centers for Disease Control and Prevention

Regional Distribution

The lowest stroke mortality rates are found in the many counties in the western region of Minnesota and scattered across the southern area of the state. In contrast, the northern and northwest region of Minnesota includes several counties with the highest stroke rates in the state. (Figure 8)

Numerical data for stroke deaths by county are located in Appendix C.

Figure 8. Age-adjusted stroke death rates by Minnesota county, 1993-2002.

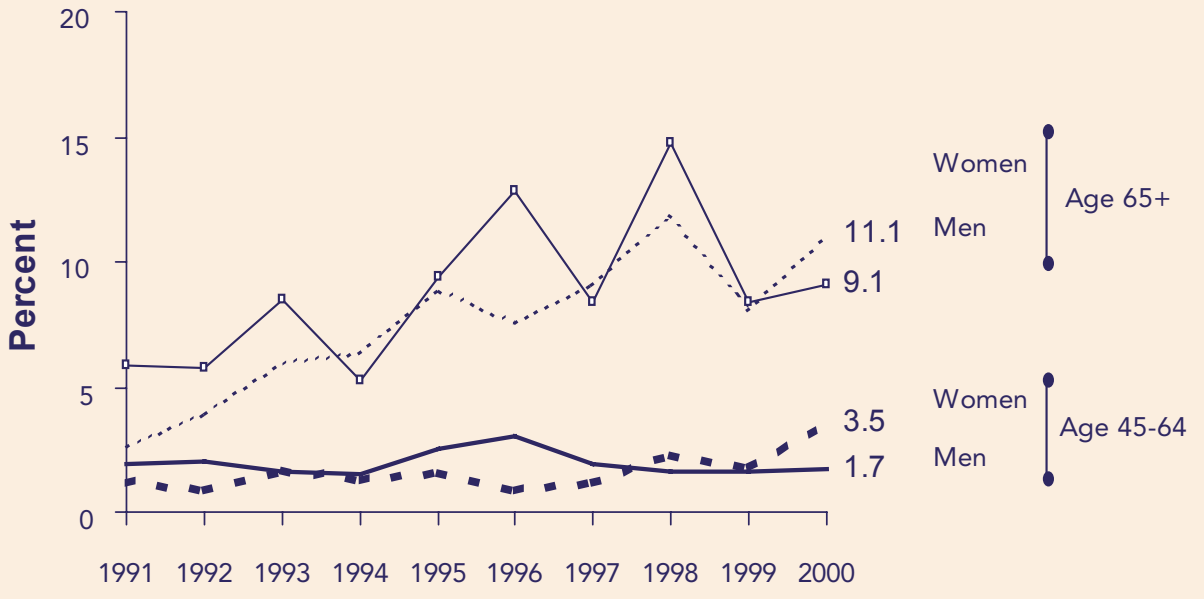


Source: Minnesota Department of Health

Prevalence

In 2000, 2.7 percent of adults in Minnesota reported that a doctor had ever told them that they had a stroke. Stroke prevalence increases with age, with 2.6 percent of 45-64 year olds living with stroke compared to 10.3 percent of individuals 65 years and older. Gender differences in stroke prevalence are slight (Figure 9).

Figure 9. Prevalence of self reported stroke among adults* Minnesota, 1991-2000



Source: Minnesota Behavioral Risk Factor Surveillance System (BRFSS) survey.

* Prevalence of stroke is defined by the percentage of adults who positively answered the question "Have you ever been told by a doctor that you had a stroke?"

Heart Failure

One of the negative consequences of improved survival after acute cardiovascular events is the increasing prevalence of heart failure. This is an important outcome that has the potential to increase the burden of CVD in Minnesota.

What is heart failure and why is it important?

Heart failure can be described generally as the inability of the heart to keep up with its workload. The American Heart Association describes heart failure as a condition in which the heart cannot pump enough blood to the lungs and the rest of the body.[7] Heart failure is often a chronic condition that can be treated with medications, diet, and other lifestyle changes, and in some cases, surgery.

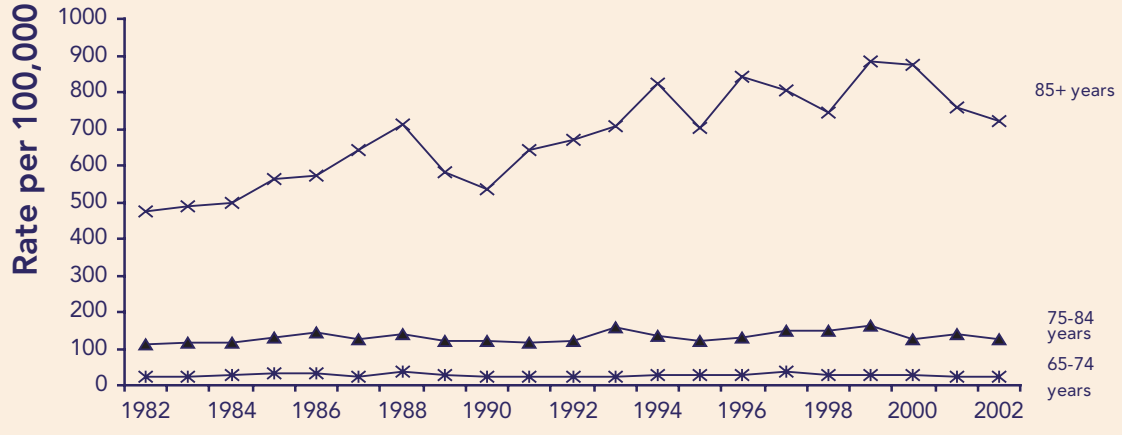
An estimated 4.9 million people in the United States have congestive heart failure. Over 51,000 people died from heart failure in the United States in 2000. Direct and indirect costs for congestive heart failure are estimated to reach $24.3 billion for 2003.[1]

What is the scope of the problem in Minnesota?

In 2001, 985 individuals died of heart failure in Minnesota. Older age is a major risk factor for heart failure. Approximately 97 percent of deaths due primarily to heart failure occur in persons 65 years and older; over half of all heart failure deaths occur in persons aged 85 years and older.

The death rate due to heart failure has been increasing in the both the United States and Minnesota over the past 20 years. Increases in both the number of heart failure deaths and the heart failure death rate in Minnesota have been seen in those aged 85 years and older (Figure 10).

Figure 10. Age-specific death rate for heart failure* for persons aged 65 years and older, by age group and year-Minnesota, 1982-2002.



Source: Minnesota Department of Health

* Heart failure deaths were defined as a primary cause of death coded as ICD-9 code 428.0, 428.1, or 428.9 (1979-1998) or ICD-10 code I50.0, I50.1, or I50.9 (1999-2000).

Risk Factors for Cardiovascular Disease

Cardiovascular risk factors are characteristics that increase a person's chance of developing CVD. Some of these risk factors are not modifiable, such as older age, male sex, and family history of CVD. However, many are modifiable, and with lifestyle and behavioral changes, can be changed to reduce the risk of CVD. These modifiable risk factors include cigarette smoking, physical inactivity, a poor diet, high blood pressure, and elevated blood cholesterol. Other potentially modifiable risk factors include diabetes mellitus and obesity.

Cigarette Smoking

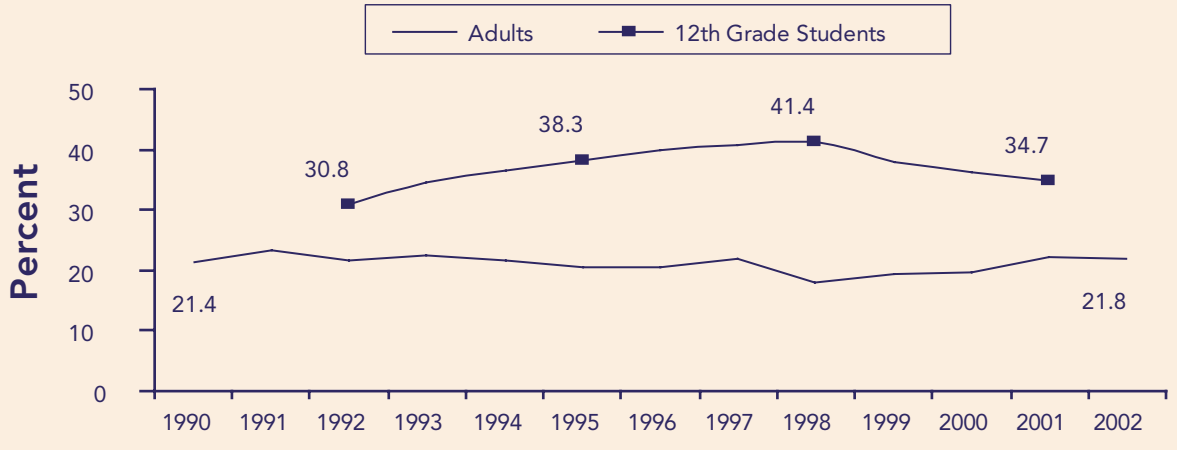
What is the relevance of cigarette smoking to cardiovascular disease?

Cigarette smoking is the biggest risk factor for sudden cardiac death; smokers have two to four times the risk of nonsmokers. Smokers who have a heart attack are more likely to die and die suddenly (within an hour) than nonsmokers. Cigarette smoking also acts with other risk factors to greatly increase the risk for coronary heart disease.[7]

How big is the problem in Minnesota?

The prevalence of cigarette smoking in Minnesota has remained virtually unchanged, from 21.4 percent in 1990 to 21.8 percent in 2002 (Figure 11). Based on a longer perspective, the Minnesota Heart Survey found that cigarette smoking in the Twin Cities declined between 1980-1982 and 1995-1997 from 34.2 percent to 21.2 percent in men and 33.9 percent to 20.1 percent in women.

Figure 11. Prevalence of self-reported cigarette smoking among adults and 12th grade students, 1990-2001.



Source: Minnesota Student Survey (1992, 1995, 1998, 2001), Minnesota Behavioral Risk Factor Surveillance System (BRFSS) Survey.

* Prevalence of cigarette smoking is defined as the percentage of respondents 18 years and older who have ever smoked 100 cigarettes in their lifetime and reported smoking every day or some days. In youth (12th Grade Students), prevalence of cigarette smoking is defined as positively indicating any cigarette use in the past 30 days.

How does Minnesota compare to the United States?

In the United States, 23% of adults are current cigarette smokers. Minnesota ranks 17th in terms of percentage of the population that smokes cigarettes. [10] That is, 16 states have a lower percentage of smokers than Minnesota.

What is the scope of the problem in Minnesota youth?

While smoking prevalence has not changed substantially in adults, the rates of smoking in adolescents appear to be declining (Figure 11). Still, 35 percent of 12th grade students in Minnesota smoked cigarettes once in the past 30 days. [11] Importantly, there are still 13,000 kids (under the age of 18) become daily smokers each year.[12]

Other Data Highlights

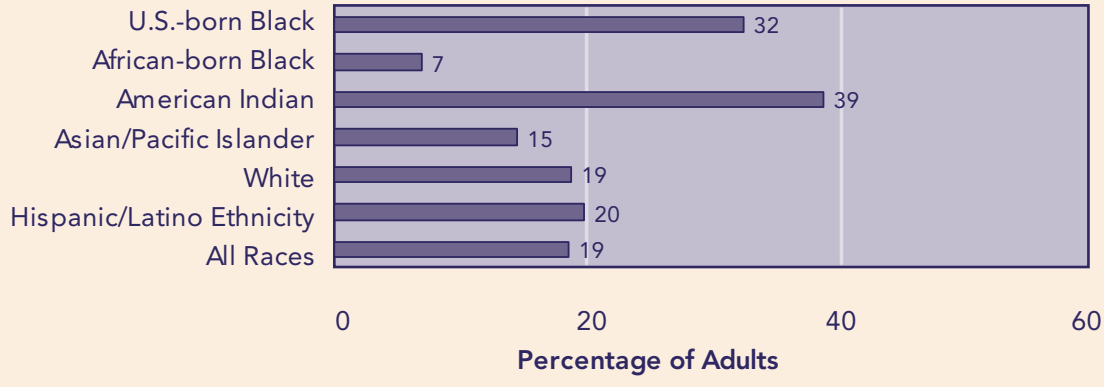
- In addition, environmental tobacco smoke (ETS) is a major problem in Minnesota, with at least one-third (33.1%) of middle school and nearly one-half (45.7%) of high school students repeatedly exposed to secondhand smoke. Most students are exposed to ETS at least weekly.[13]

- Annual health care costs for all diseases (including CVD) in Minnesota directly caused by smoking are an astounding $1.61 billion. Of these costs, $363 million are covered by the state Medicaid program. An additional $1.02 billion is lost in productively lost due to smoking-related causes each year.[14]

The Survey on the Health of Adults, the Population and the Environment (SHAPE)

The SHAPE survey found that 39 percent of American Indians in Hennepin County are current smokers. Approximately 32 percent of U.S.-born African Americans are current smokers. In contrast, 19 percent of whites are current smokers (Figure 12).

Figure 12. Percentage who are Current Smokers, Hennepin County, 2002.



Source: SHAPE, Hennepin County Community Health Department

Physical Inactivity

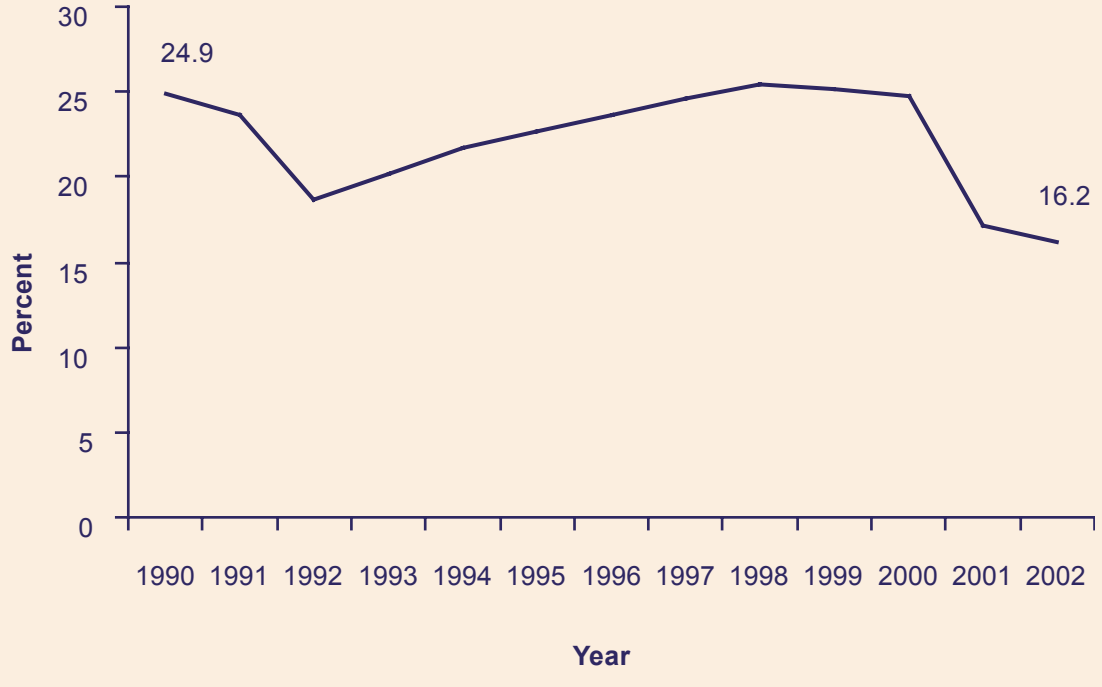
What is the relevance of physical inactivity to cardiovascular disease?

Physical inactivity is associated with increased risk of obesity, adverse blood cholesterol profile, high blood pressure, and diabetes mellitus.[15] In contrast, regular exercise can help control blood cholesterol, diabetes and obesity, as well as help to lower blood pressure in some people.[7]

How big is the problem in Minnesota?

Approximately one in six (16.2%) adults in Minnesota reported not being physically active (no leisure time physical activity in the past 30 days). Through the 1990s, the proportion of Minnesotans who were inactive has remained relatively constant (Figure 13).

Figure 13. Prevalence of self-reported physical inactivity among adults,* Minnesota 1990-2002.



Source: Minnesota Behavioral Risk Factor Surveillance System (BRFSS) Survey

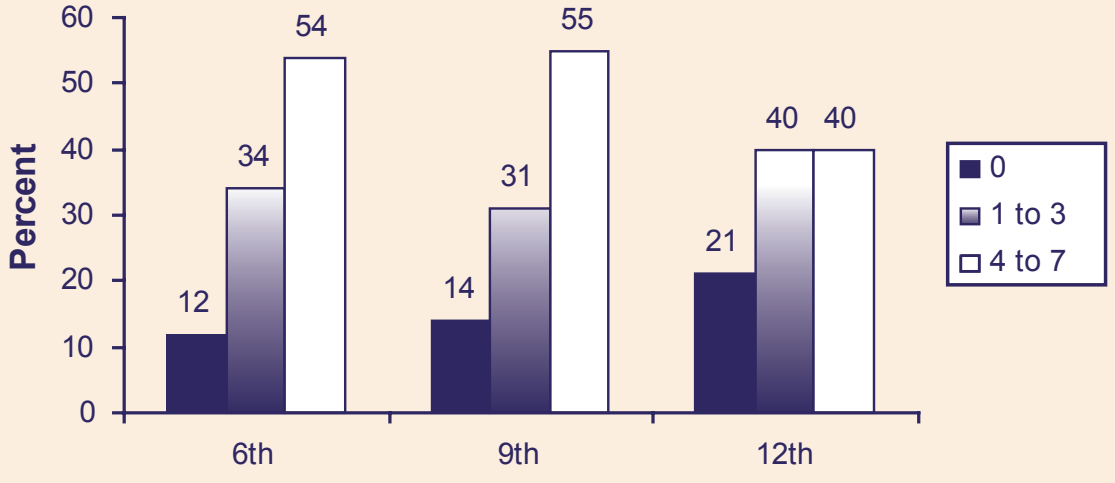
How does Minnesota compare to the United States?

In the United States, 24% of adults are physically inactive-that is, they report not having done any leisure-time physical activity in the last 30 days. In 2002, Minnesota ranked 3rd in terms of percentage of the population that is physically inactive.[16] That is, 2 other states reported a smaller proportion of physically inactive people than Minnesota.

What is the scope of the problem in Minnesota youth?

Physical inactivity is a serious problem in children and adolescents. Figure 14 shows the percentage of students answering the question "On how many of the last 7 days did you exercise or play sports that made you sweat or breathe hard for at least 20 minutes?" Over one in five 12th grade students reported that they had not exercised or played sports on any day within the last week.[11]

Figure 14. Number of days within the last 7 days that student exercised or played sports among 6th, 9th and 12th grade students, Minnesota Student Survey, 2001.



Source: Minnesota Behavioral Risk Factor Surveillance System (BRFSS) Survey, 2000.

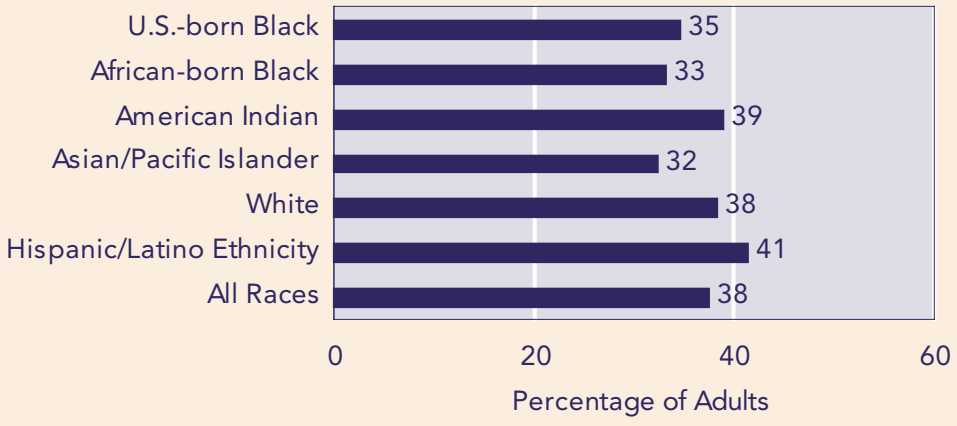
* Average fruit and vegetable consumption was calculated from six questions concerning fruit and vegetable consumption.

Other Data Highlights

The **Survey of the Health of Adults, the Population and the Environment (SHAPE)**

The SHAPE survey found that 32 percent of Southeast Asians in Hennepin County are getting at least 30 minutes of moderate physical activity five to seven days a week. Approximately 35 percent of U.S.-born African Americans get this much physical activity, compared to 38 percent of whites. The differences in physical activity between most race and ethnic groups are modest.

Figure 15. Percentage who are getting 30 minutes of moderate exercise 5 to 7 days per week, Hennepin County, 2002.



Source: SHAPE, Hennepin County Community Health Department

Poor Dietary Habits and Nutrition

What is the relevance of diet and nutrition to cardiovascular disease?

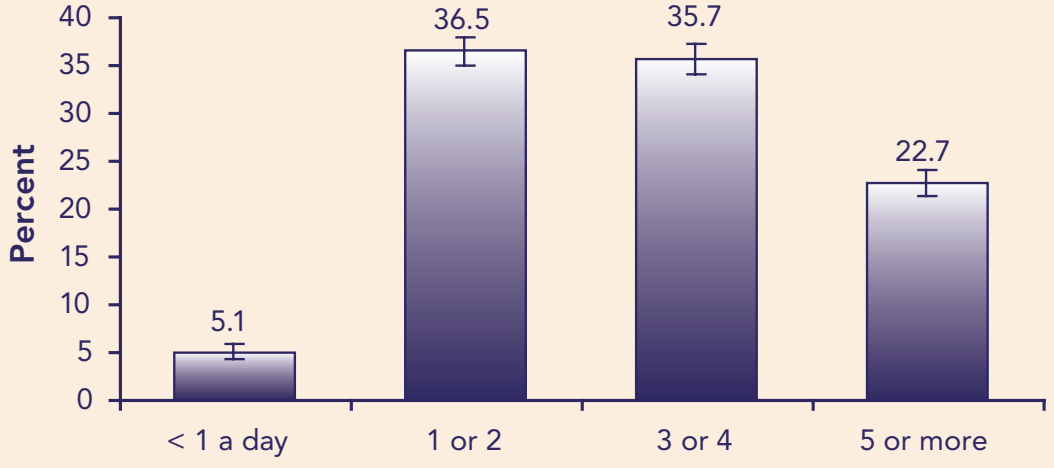
Good nutrition helps prevent heart disease and stroke. Dietary habits which are heart-healthy can help maintain normal blood pressure, a desirable blood cholesterol profile, and healthy body weight. In contrast, a poor diet can contribute to high blood pressure, high blood cholesterol, and excess body weight. These risk factors in turn can lead to the development of overweight and obesity, diabetes, cholesterol disorders, and high blood pressure.

The American Heart Association has made several dietary recommendations to improve individuals'cardi ovascular risk profiles. These recommendations include low saturated fat, trans-fat, cholesterol and sodium consumption, and high vegetable, fruits, whole grains, legumes fat-free or low-fat dairy products, and dietary fiber.

How big is the problem in Minnesota?

In 2002 less than one in four (22.7%) of Minnesota adults reported eating at least five fruits and vegetables per day (Figure 16).

Figure 16. Average fruit and vegetable consumption, Minnesota 2002.



Source: Minnesota Behavioral Risk Factor Surveillance (BRFSS) Survey, 2002
Average fruit and vegetable consumption was calculated from six questions concerning fruit and vegetable consumption.

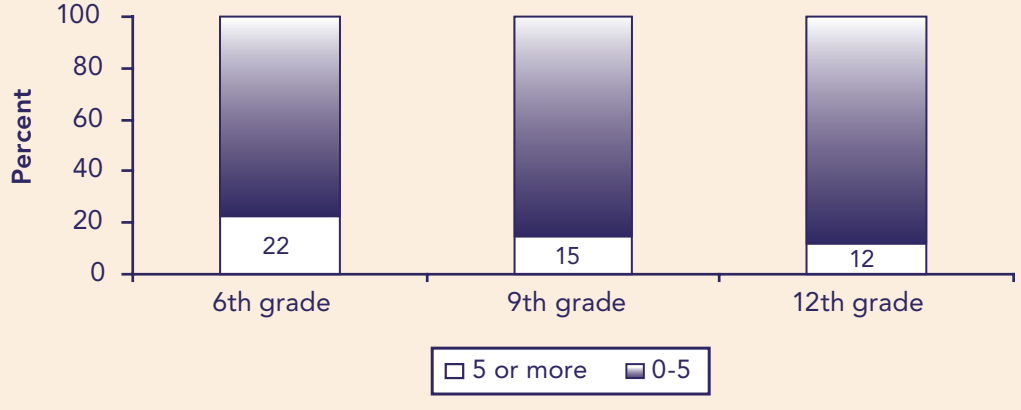
How does Minnesota compare to the United States?

In the United States, only 23.1% of adults eat at least five fruits and vegetables per day-most do not consume the recommended amount of fruits and vegetables. Minnesota ranks 18th in terms of percentage of the population that consumes at least five fruits and vegetables per day.[17] That is, 17 states report a greater percentage of adults who consume at least the recommended daily amount of fruits and vegetables than Minnesota.

What is the scope of the problem in Minnesota youth?

In Minnesota, only 22% of 6th grade students, 15% of 9th grade students, and 12% of 12th grade students report eating the recommended five or more fruits and vegetables in the previous day.[11]

Figure 17. Percentage of sudents eating five or more servings of fruits, fruit juices, a vegetables on previous day, Minnesota Student Survey, 2001



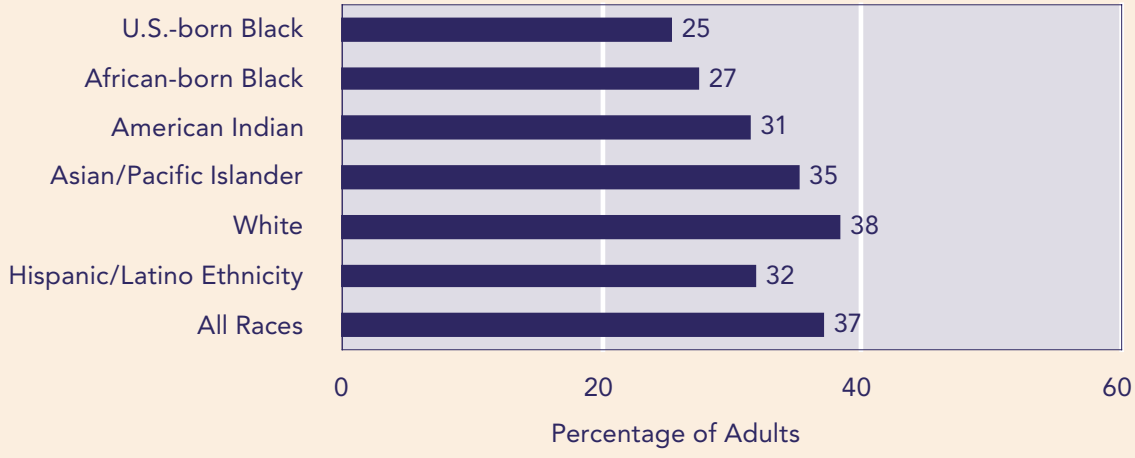
Source: Minnesota Student Survey, 2001.

Other Data Highlights

The **Survey of the Health of Adults, the Population and the Environment (SHAPE)**

The SHAPE survey found that 38 percent of whites in Hennepin County report eating five or more fruits or vegetables the prior day. Fewer Asian/Pacific Islanders (35%) and American Indians (31%) eat this many fruits and vegetables. In contrast, only 25 percent of U.S.-born African Americans eat this many fruits and vegetables.

Figure 18. Percentage who are consuming 5 or more servings of fruits and vegetables per day, Hennepin County, 2002



Source: SHAPE, Hennepin County Community Health Department

High Blood Pressure (Hypertension)

What is the relevance of high blood pressure to cardiovascular disease?

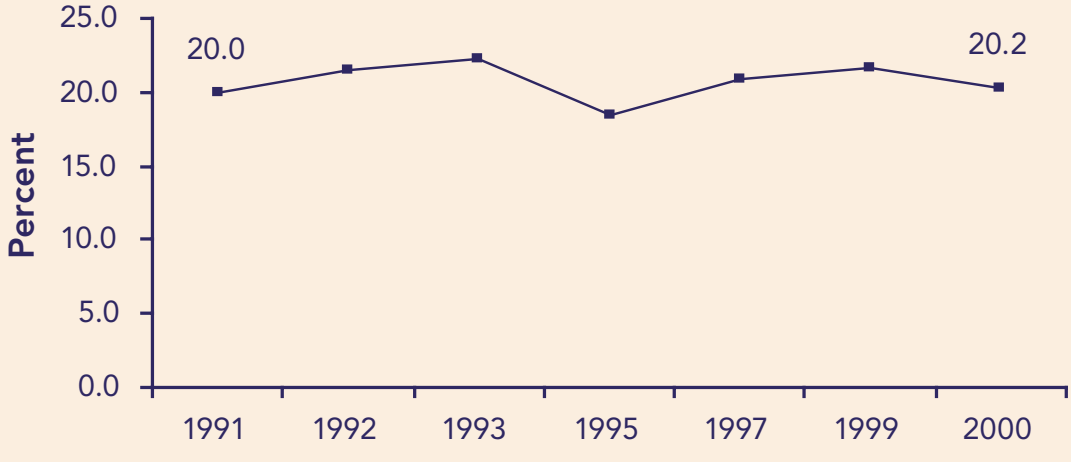
High blood pressure can lead to serious CVD complications such as heart attack, stroke, and congestive heart failure. High blood pressure, defined in this report as a systolic blood pressure over 140 mmHg or diastolic blood pressure over 90 mmHg, or taking a blood pressure-lowering medication, is very prevalent in Minnesota.

How big is the problem in Minnesota?

Approximately 1 in 5 (20.2%) of adults in 2000 reported that they have been told by a health care provider that they have high blood pressure. (Figure 19) This proportion of Minnesota adults with self-reported high blood pressure has remained stable over the last decade.

Self-reported high blood pressure prevalence for the entire state corroborates the findings from the Minnesota Heart Survey. According to the measured blood pressures of the Minnesota Heart Survey, approximately 26 percent of men and 18 percent of women in the Twin Cities aged 25-74 in 1995-97 were hypertensive.[9]

Figure 19. Prevalence of self-reported high blood hypertension among adults*, Minnesota 1991-2000.



Source: Minnesota Behavioral Risk Factor Surveillance System (BRFSS) survey

How does Minnesota compare to the United States?

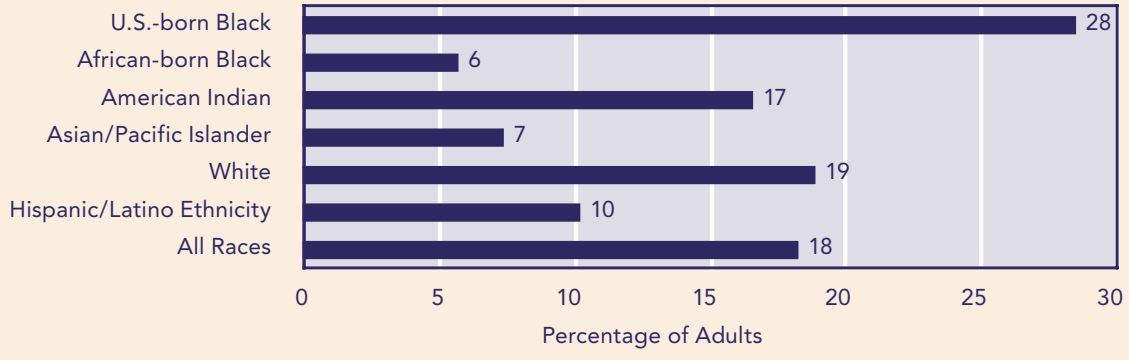
In the United States, 25.6% of adults report that they have been told by a health professional that they have high blood pressure. Minnesota ranks 5th in terms of percentage of the population that has high blood pressure.[16]

Other Data Highlights:

The **Survey of the Health of Adults, the Population and the Environment (SHAPE)**

The SHAPE survey found that 19 percent of whites in Hennepin County report that a doctor or health professional has told them that they have hypertension. Fewer Asian/Pacific Islanders (35%) and American Indians (31%) eat this many fruits and vegetables. In contrast, only 25 percent of U.S.-born African Americans eat this many fruits and vegetables.

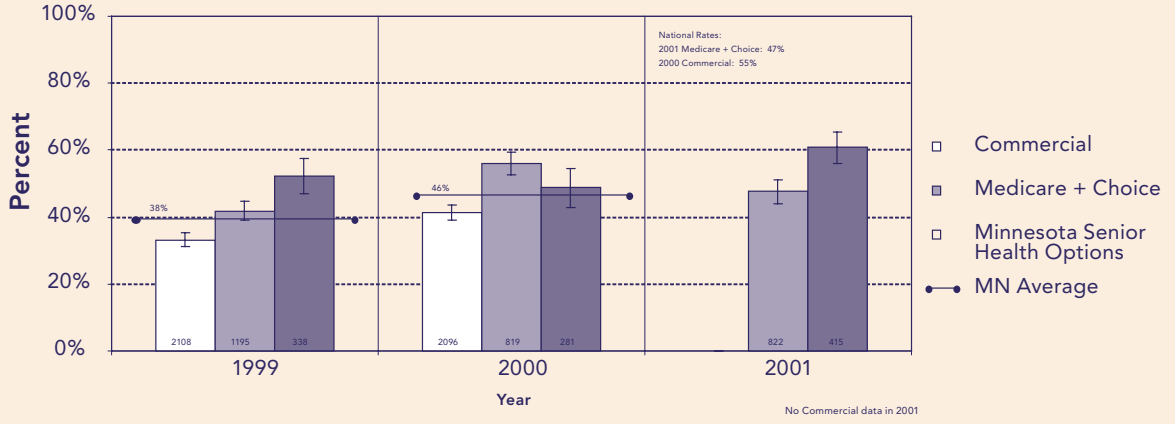
Figure 20. Percentage who had been told that they have high blood pressure, Hennepin County, 2002.



Source: SHAPE, Hennepin County Community Health Department

The Health Plan Employer Data and Information Set (HEDIS) provides an indicator on how populations within health maintenance organizations in Minnesota are doing regarding control of high blood pressure among those diagnosed with hypertension. Overall, in 2000, only 46% of individuals with diagnosed hypertension had their high blood pressure under control.

Figure 21. Controlling High Blood PressureMinnesota HMO Performance, 1999-2000



Source: SHAPE, Hennepin County Community Health Department

Elevated Blood Cholesterol

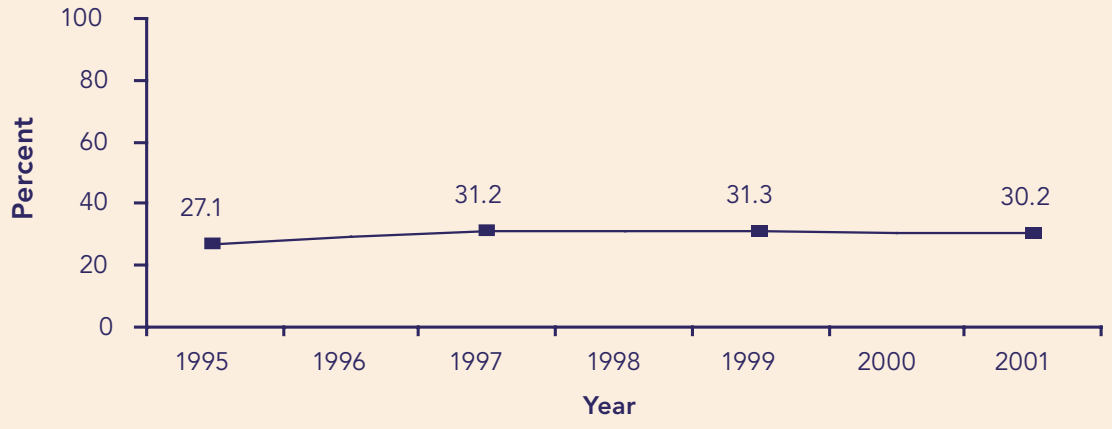
What is the relevance of elevated blood cholesterol to cardiovascular disease?

The risk of coronary heart disease rises as blood cholesterol levels increase. When other risk factors (such as high blood pressure and tobacco smoke) are present, this risk increases even more. A person's cholesterol level is affected by age, sex, heredity and diet.[1]

How big is the problem in Minnesota?

Just under 1 in 3 (30.2%) of adults reported in 2001 that they have been told by a health care provider that they have high blood cholesterol. (Figure 22) This proportion of Minnesota adults with self-reported high blood cholesterol has risen slightly, but generally has remained relatively stable since 1995.

Figure 22. Prevalence of self-reported high blood cholesterol among adults*, Minnesota 1995-2001.



Source: Minnesota Behavioral Risk Factor Surveillance System (BRFSS) Survey

The Minnesota Heart Survey found that age-adjusted serum total cholesterol levels in the Twin Cities declined from the 1980s to the early 1990s, but flattened through the mid 1990s (Table 2). The prevalence of hypercholesterolemia (high blood cholesterol), defined here as serum total cholesterol greater than or equal to 240 mg/dl or current use of cholesterol-lowering medication, decreased between 1980 through 1992, but increased between 1990 and 1997.[9] Currently, no statewide data on cholesterol levels are available.

Table 2. Serum total cholesterol and percent with hypercholesterolemia, Minnesota Heart Survey, 1980-1997.

	Men				Women			
	1980-1982	1985-1987	1990-1992	1995-1997	1980-1982	1985-1987	1990-1992	1995-1997
Serum total cholesterol (mean, mg/dl)	212.2	208.9	203.2	204.8	207.6	204.2	200.6	200.5
Hypercholesterolemia (%)	22.2	20.5	19.9	21.2	20.3	18.1	17.2	19.3

Source: Minnesota Heart Survey. (Arnett, 2002)

How does Minnesota compare to the United States?

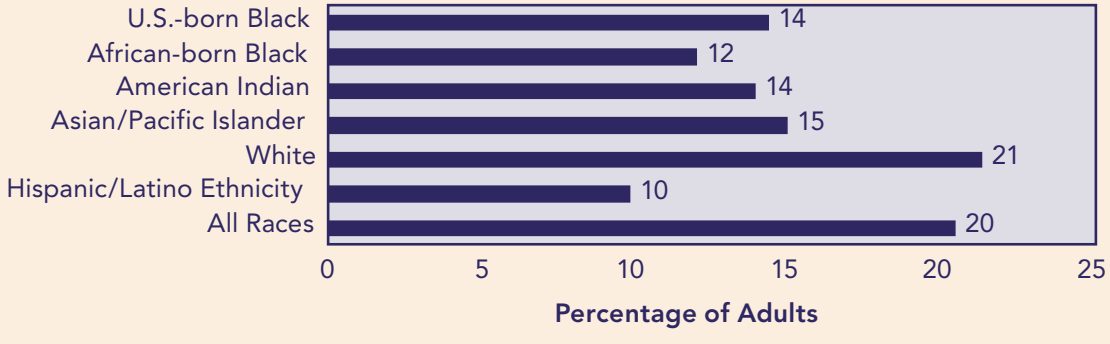
In the United States, 30.2% of adults report that they have been told by a health professional that they have high blood cholesterol. Minnesota ranks 26th among the states and US territories in terms of percentage of the population that reports being told by a health professional that they have high blood cholesterol.[16]

Other Data Highlights

The Survey of the Health of Adults, the Population and the Environment (SHAPE)

The SHAPE survey found that 21 percent of whites in Hennepin County report that a doctor or health professional has told them that they have high cholesterol or triglycerides. Fewer Asian/Pacific Islanders (15%) and American Indians (14%), and African Americans (14%) report having high cholesterol or triglycerides.

Figure 23. Percentage who had been told that they have high blood cholesterol, Hennepin County, 2002



Source: SHAPE, Hennepin County Community Health Department

The Health Plan Employer Data and Information Set (HEDIS) provides an indicator on how populations within health maintenance organizations in Minnesota are doing regarding control of high blood pressure among those diagnosed with hypertension. Overall, in 2000, only 46% of individuals with diagnosed hypertension had their high blood pressure under control.

Figure 24. HEDIS Cholesterol Controlled after Acute Cardiovascular Event, 1999-2000

Source: Minnesota Department of Health, Managed Care Systems

Diabetes Mellitus

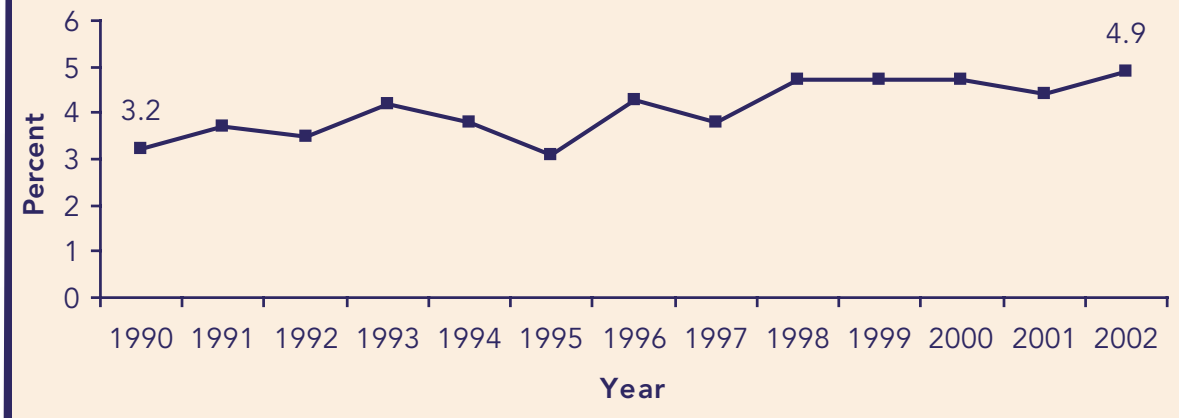
What is the relevance of diabetes to cardiovascular disease?

Approximately 17 million people in the US have diabetes. Diabetes mellitus is a significant comorbid condition and an independent risk factor for CVD. Two-thirds of people with diabetes die of some form of heart or blood vessel disease. Those with diabetes have a two to four times greater risk of CVD and stroke versus people without diabetes.[18]

How big is the problem in Minnesota?

In Minnesota, approximately 1 in 18 people have diabetes-276,000 Minnesotans; it is estimated that one-third of these are unaware that they have the disease. Of those with diagnosed diabetes, 5 to 10 percent have type 1 diabetes and 90 to 95 percent have type 2 diabetes.[19] The prevalence of diabetes has been rising over the last decade (Figure 25).

Figure 25. Prevalence of self-reported diagnosed diabetes among adults, Minnesota, 1990-2002.



Source: Minnesota Behavioral Risk Factor Surveillance System (BRFSS) Survey

How does Minnesota compare to the United States?

In the United States, 5.4% of adults have diagnosed diabetes. Minnesota ranks 3rd in terms of percentage of the population that has diabetes.[16]

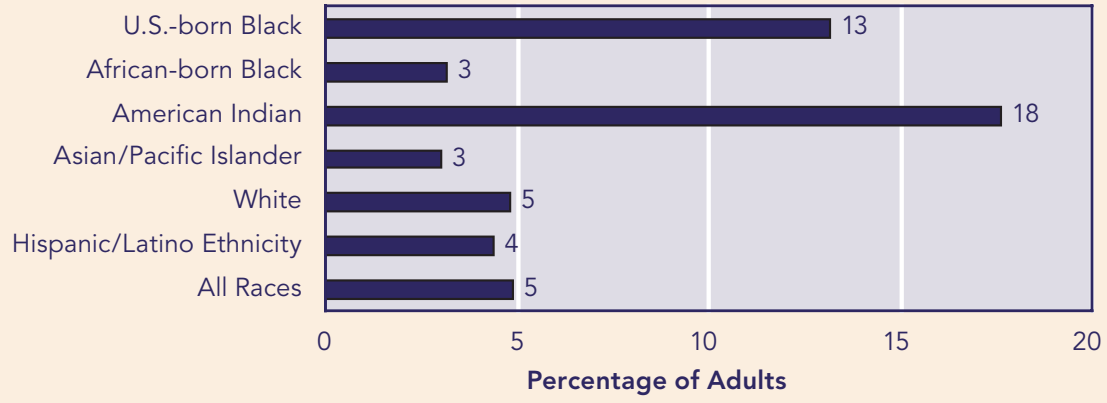
Other Data Highlights:

- By itself, diabetes is the 6th leading cause of death in Minnesota. Major CVD is present in approximately 80 percent of diabetes-related deaths in Minnesota.[20]
- In 2001, 87% of all hospital discharge claims among the 65-74 year old Medicare beneficiary population in Minnesota with diagnosed diabetes were associated with a major CVD diagnosis.[20]
- While the risk for CVD in people diabetes is very high, knowledge of this associated risk is relatively low-even among people with diabetes. Based on a RoperASW survey, 68 percent of people with diabetes do not consider CVD to be a serious complication of diabetes.[21]

The Survey of the Health of Adults, the Population and the Environment (SHAPE)

The SHAPE survey found that 4.8 percent of whites in Hennepin County report that a doctor or health professional has told them that they have diabetes (excluding gestational). Fewer Asian/Pacific Islanders (3.0%) have diabetes . However, a much larger proportion of U.S.-Born African Americans (13.2%) and American Indians (17.6%) report having diabetes.

Figure 26. Percentage who had been told that they have diabetes (excluding gestational), Hennepin County, 2002.



Source: SHAPE, Hennepin County Community Health Department

Overweight and Obesity

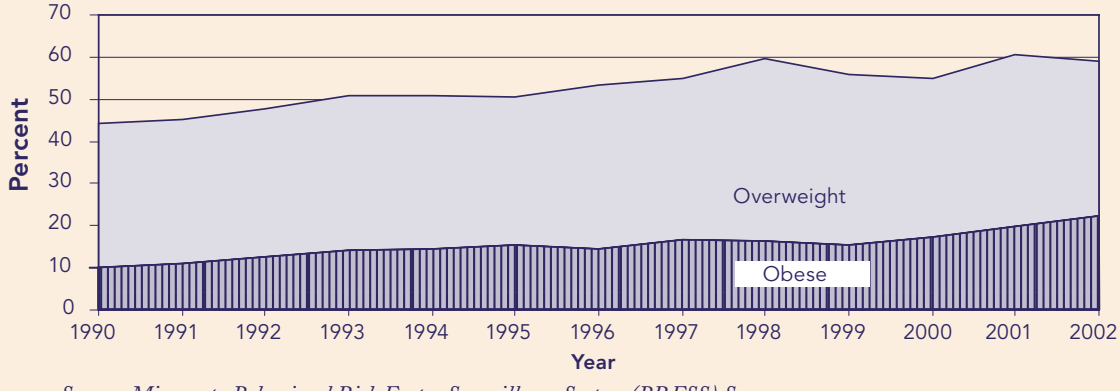
What is the relevance of overweight and obesity to cardiovascular disease?

Being overweight can affect an individual's health, longevity, and risk of heart disease. Among other conditions, excessive weight is associated with elevated blood cholesterol, elevated blood pressure, and non-insulin dependent diabetes.[7]

How big is the problem in Minnesota?

In Minnesota, 59 percent of adults are overweight (body mass index (BMI) greater than or equal to 25 kg/m^2, self-reported); approximately 22 percent of all adults are obese (BMI greater than or equal to 30 kg/m^2. The percentage of adults who are overweight has grown over time (Figure 27).

Figure 27. Prevalence of self-reported overweight and obesity*, Minnesota, 1990-2002.



Source: Minnesota Behavioral Risk Factor Surveillance System (BRFSS) Survey
** Weight and height information were obtained by self-report from adults age 18 and over for these measures. Overweight is defined as calculated body mass index greater then or equal to 25 kg/m2. Obesity is defined as calculated body mass index greater than or equal to 30kg/m2.*

How does Minnesota compare to the United States?

In the United States, approximately 59 percent of adults (18 years and older) are overweight (including those who are obese); 22 percent of adults are obese. Minnesota ranks 19th in terms of percentage of the population that is overweight and 29th in terms of the percentage of the population that is obese.[16]

What is the scope of the problem in youth?

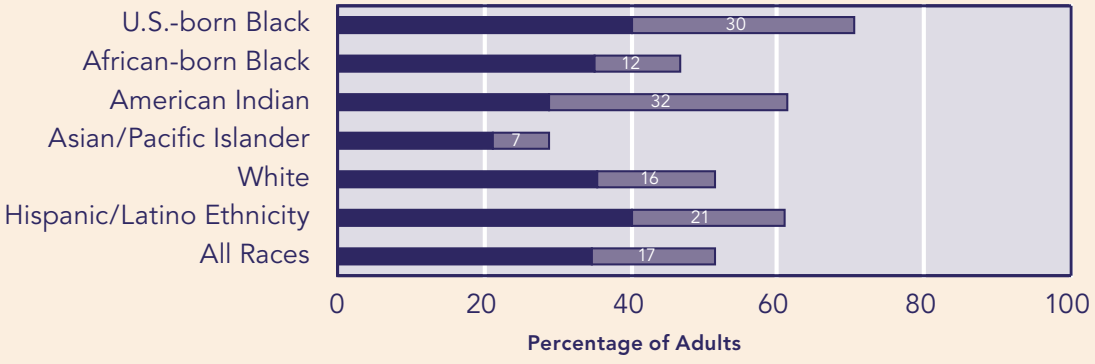
Among adolescents (aged 12-19 years), national data indicate that 15.5 percent of both boys and girls are overweight.[22] The prevalence of overweight among the youth in this country has been increasing for several decades. Weight information for adolescents in Minnesota is not currently available.

Other Data Highlights:

- A recent study from the 1995 National Health Interview Survey and the 1996 Medical Expenditure Panel Survey estimated that the 17 percent of the direct costs of treating CVD were related to overweight and obesity. This excess burden due to obesity was $31 billion (in 2001 dollars).[23]

The SHAPE survey found that 4.8 percent of whites in Hennepin County report that a doctor or health professional has told them that they have diabetes (excluding gestational). Fewer Asian/Pacific Islanders (3.0%) have diabetes. However, a much larger proportion of U.S.-Born African Americans (13.2%) and American Indians (17.6%) report having diabetes.

Figure 28. Percentage who are Overweight (BMI >25) or Obese (BMI > 30), Hennepin County, 2002



Source: SHAPE, Hennepin County Community Health Department
** Numbers on bars indicate percentage of population who are obese.*

Health Disparities in Cardiovascular Disease

Of great concern are disparities in coronary heart disease and stroke mortality rates between racial and ethnic groups. Although populations of color and American Indians comprise a relatively small proportion of Minnesota residents, there are disparities in heart disease and stroke mortality between different racial and ethnic populations. The various racial and ethnic population sizes in Minnesota (2000) are shown in Table 3.[24]

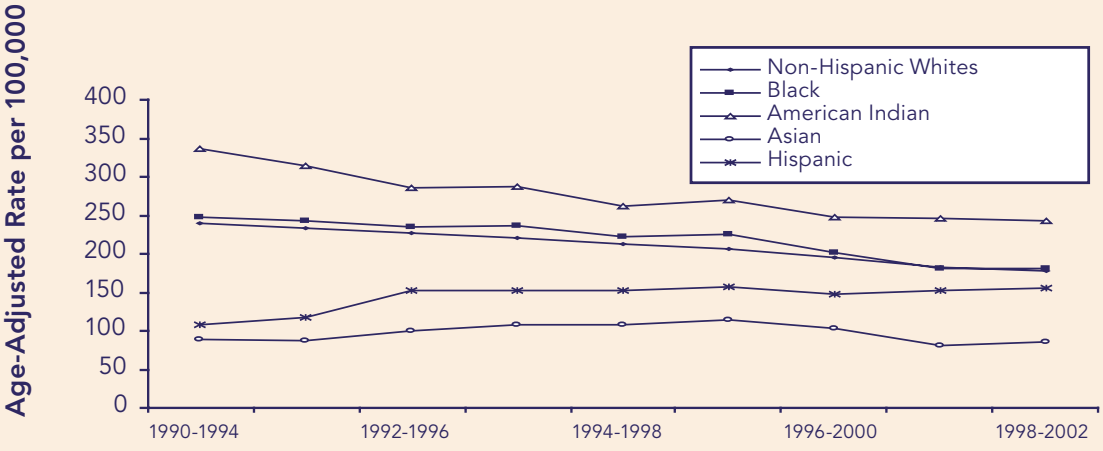
Table 3. Race and Ethnicity in Minnesota, 2000.

Race	Population in 2000	Percent of Population
White	4,400,282	89.4
Black or African American	171,731	3.5
American Indian/Alaska Native	54,967	1.1
Asian, Native Hawaiian or other Pacific Islander	143,947	2.9
Other Race	65,810	1.3
Two or more races	82,742	1.7
Total	4,919,479	100.0
Race/Ethnicity		
Hispanic	143,382	2.9
Non-Hispanic	4,776,097	97.1

Source: United States Census Bureau, 2000

Age-adjusted CHD mortality rates for American Indians are considerably higher than the rates for all other race/ethnic populations in Minnesota (Figure 29). Between 1998-2002, American Indians experienced a 39 percent higher heart disease mortality rate than whites.

Figure 29. Age-adjusted coronary heart disease mortality rates by race and ethnicity, Minnesota 1990-2002.



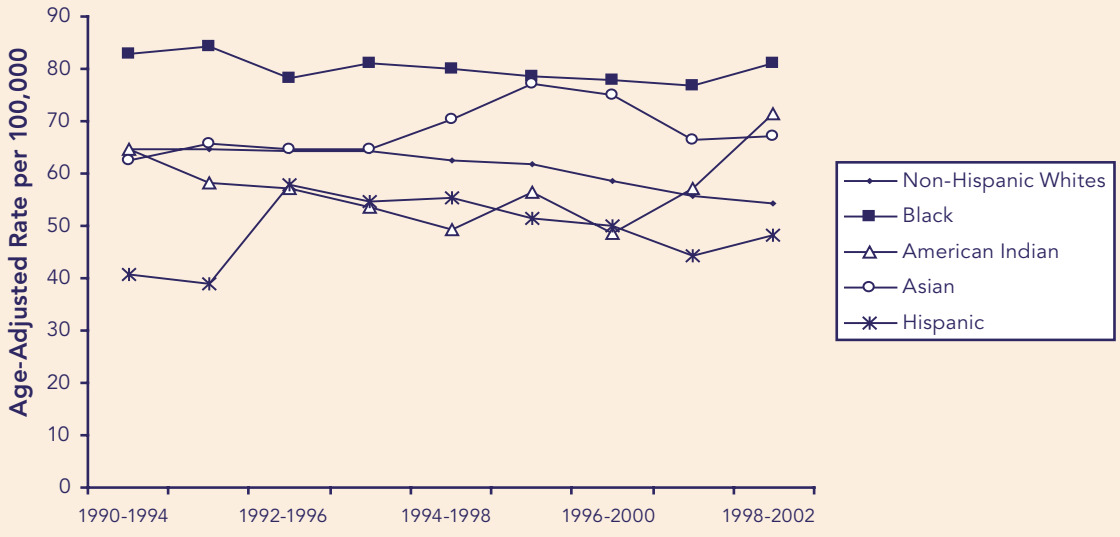
Source: Minnesota Department of Health

In addition, stroke death rates are higher in African-Americans and Asians than other racial/ethnic groups in Minnesota. In fact, rates of stroke have been increasing in the Asian population in Minnesota, contrary to the trends in other race/ethnic groups (Figure 30).

Between 1998-2002, compared to white women, the stroke mortality rate was 53 percent higher among African American women, 46 percent higher among American Indian women, and 28 percent higher among Asian women. Among men, African Americans experienced a 53 percent higher stroke mortality rate, than whites, and Asians experienced 21 percent higher rate than whites.

Important to note are the relatively low coronary heart disease and stroke mortality rates in the Hispanic population. Data prior to 1989 on Hispanic ethnicity were not available on death certificates. Paradoxically, while national data have indicated that the prevalence of diabetes is higher in Hispanics than in non-Hispanic whites,[18] the heart disease mortality is lower.

Figure 30. Age-adjusted stroke mortality rates by race and ethnicity, Minnesota 1990-2002.

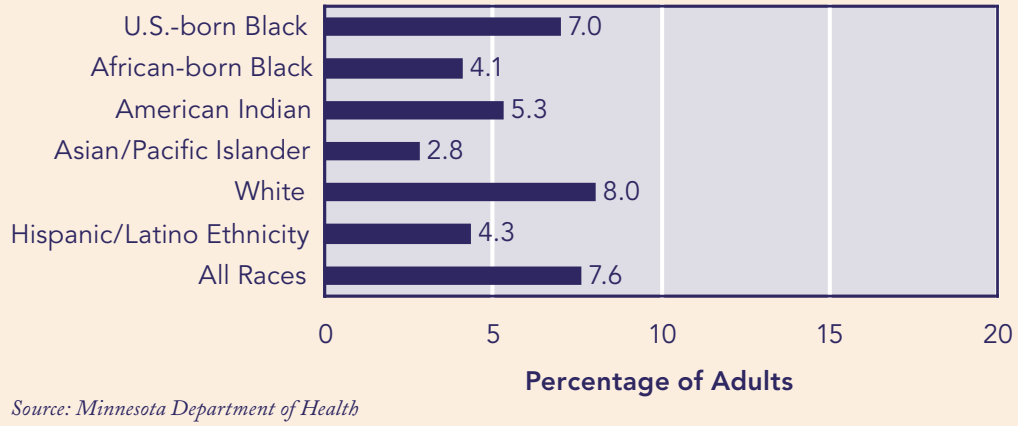


Source: Minnesota Department of Health

The Survey of the Health of Adults, the Population and the Environment (SHAPE)

The SHAPE survey found that 8.0% percent of whites in Hennepin County had been told by a doctor or health professional that they had heart trouble or angina, compared to 7.0% of U.S.-born African American report heart trouble or angina. Approximately 5.3% of American Indians report heart trouble or angina. While the proportion reporting heart problems among African Americans and American Indians is smaller than that in whites, the mortality rates from heart disease in these populations remains as high or higher than in whites.

Figure 31. Percentage who had been told that they have heart trouble or angina, Hennepin County, 2002



Source: Minnesota Department of Health

Summary

Cardiovascular disease is a serious epidemic in Minnesota and continues to be the leading cause of death in the state. Although CVD mortality rates have been declining over the last several decades, much work is still needed to further reduce morbidity and mortality rates.

Several cardiovascular risk factors remain prevalent and some are increasing in the Minnesota population. In addition, large differences in coronary heart disease and stroke mortality rates between race and ethnic groups are of particular concern, and efforts must be made to eliminate these disparities. Much work is needed to improve morbidity, mortality and risk factor status in the entire population of Minnesota.

Cardiovascular disease mortality rates, prevalence of CVD outcomes and risk factors, and limited data on health care costs are described in this report. However, statewide data on heart disease and stroke case fatality rates and survival, quality and costs of medical care, and incidence are lacking. These are important measures for which data collection systems need to be developed in order to help determine areas of focus to improve the profile of CVD in Minnesota.

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Appendix A:

Number of deaths and average annual age-adjusted rate, per 100,000, Total Cardiovascular Disease, by County, Minnesota, 1993-2002.

	CVD Deaths, 1993-2002	Age-adjusted CVD Mortality Rate, 1993-2002
Aitkin	772	335
Anoka	4,074	325
Becker	1,303	337
Beltrami	1,084	299
Benton	1,252	343
Big Stone	481	387
Blue Earth	1,707	297
Brown	1,113	272
Carlton	1,341	371
Carver	1,029	223
Cass	1,046	296
Chippewa	599	253
Chisago	910	236
Clay	1,543	292
Clearwater	448	322
Cook	142	254
Cottonwood	730	291
Crow Wing	1,924	289
Dakota	4,984	300
Dodge	519	271
Douglas	1,425	304
Faribault	910	305
Fillmore	1,081	288
Freeborn	1,527	323
Goodhue	1,737	284
Grant	385	306
Hennepin	25,886	262
Houston	695	262
Hubbard	681	300
Isanti	842	290
Itasca	1,666	338
Jackson	544	268

	CVD Deaths, 1993-2002	Age-adjusted CVD Mortality Rate, 1993-2002
Kanabec	449	280
Kandiyohi	1,375	269
Kittson	360	360
Koochiching	693	390
Lac qui Parle	491	297
Lake	456	336
Lake of the Woods	173	302
Le Sueur	823	270
Lincoln	414	282
Lyon	1,074	322
McLeod	1,291	302
Mahnomen	206	300
Marshall	454	298
Martin	1,059	281
Meeker	938	315
Mille Lacs	890	315
Morrison	1,162	307
Mower	1,683	282
Murray	471	306
Nicollet	699	245
Nobles	838	273
Norman	448	300
Olmsted	2,508	249
Otter Tail	2,506	290
Pennington	576	292
Pine	927	318
Pipestone	481	262
Polk	1,442	302
Pope	647	327
Ramsey	13,865	285
Red Lake	224	358
Redwood	893	307
Renville	926	314
Rice	1,501	273
Rock	500	302
Roseau	570	327

	CVD Deaths, 1993-2002	Age-adjusted CVD Mortality Rate, 1993-2002
St. Louis	8,494	337
Scott	1,289	278
Sherburne	1,084	319
Sibley	593	275
Stearns	2,762	255
Steele	1,010	275
Stevens	351	247
Swift	598	322
Todd	739	229
Traverse	303	340
Wabasha	763	285
Wadena	755	374
Waseca	714	299
Washington	2,867	289
Watonwan	611	337
Wilkin	347	327
Winona	1,764	312
Wright	1,881	289
Yellow Medicine	623	301

Appendix B:

Number of deaths and average annual age-adjusted rate, per 100,000, Coronary Heart Disease, by County, Minnesota, 1993-2002.

	CHD Deaths, 1993-2002	Age-adjusted CHD Mortality Rate, 1993-2002
Aitkin	435	188
Anoka	1,997	151
Becker	673	177
Beltrami	522	145
Benton	672	190
Big Stone	285	240
Blue Earth	805	144
Brown	581	143
Carlton	600	166
Carver	517	112
Cass	583	165
Chippewa	284	123
Chisago	426	111
Clay	673	128
Clearwater	226	171
Cook	65	115
Cottonwood	403	162
Crow Wing	973	146
Dakota	2,380	139
Dodge	252	136
Douglas	711	154
Faribault	445	156
Fillmore	531	144
Freeborn	687	148
Goodhue	792	134
Grant	184	154
Hennepin	11,147	114
Houston	290	112
Hubbard	391	172
Isanti	396	139
Itasca	886	179
Jackson	245	125

	CHD Deaths, 1993-2002	Age-adjusted CHD Mortality Rate, 1993-2002
Kanabec	186	117
Kandiyohi	697	137
Kittson	169	184
Koochiching	354	198
Lac qui Parle	273	170
Lake	229	167
Lake of the Woods	74	132
Le Sueur	427	141
Lincoln	221	155
Lyon	546	166
McLeod	593	143
Mahnomen	112	164
Marshall	204	137
Martin	648	173
Meeker	503	172
Mille Lacs	412	149
Morrison	537	144
Mower	677	114
Murray	269	176
Nicollet	326	115
Nobles	466	154
Norman	186	129
Olmsted	1,407	141
Otter Tail	1,331	156
Pennington	256	137
Pine	468	161
Pipestone	194	113
Polk	771	165
Pope	360	186
Ramsey	6,415	133
Red Lake	108	179
Redwood	448	160
Renville	440	152
Rice	698	130
Rock	267	165
Roseau	336	195

	CHD Deaths, 1993-2002	Age-adjusted CHD Mortality Rate, 1993-2002
St. Louis	4,104	164
Scott	666	143
Sherburne	531	155
Sibley	329	151
Stearns	1,414	131
Steele	529	147
Stevens	166	117
Swift	351	189
Todd	330	104
Traverse	232	256
Wabasha	397	151
Wadena	439	221
Waseca	384	162
Washington	1,312	128
Watonwan	376	211
Wilkin	224	211
Winona	972	172
Wright	866	132
Yellow Medicine	339	168

Appendix C:

Number of deaths and average annual age-adjusted rate, per 100,000, Cerebrovascular Disease (Stroke), by County, Minnesota, 1993-2002.

	Stroke Deaths, 1993-2002	Age-adjusted Stroke Mortality Rate, 1993-2002
Aitkin	146	61
Anoka	769	66
Becker	285	71
Beltrami	223	61
Benton	268	71
Big Stone	84	61
Blue Earth	415	70
Brown	215	51
Carlton	251	69
Carver	189	41
Cass	216	61
Chippewa	146	60
Chisago	214	55
Clay	315	58
Clearwater	101	68
Cook	27	48
Cottonwood	141	54
Crow Wing	374	55
Dakota	1,116	70
Dodge	94	47
Douglas	295	61
Faribault	167	53
Fillmore	182	48
Freeborn	318	66
Goodhue	374	59
Grant	65	51
Hennepin	6,003	60
Houston	156	56
Hubbard	123	54
Isanti	213	71
Itasca	297	60

	Stroke Deaths, 1993-2002	Age-adjusted Stroke Mortality Rate, 1993-2002
Jackson	119	57
Kanabec	97	60
Kandiyohi	289	55
Kittson	69	62
Koochiching	144	82
Lac qui Parle	84	49
Lake	107	81
Lake of the Woods	46	80
Le Sueur	165	53
Lincoln	121	77
Lyon	250	72
McLeod	328	74
Mahnomen	23	35
Marshall	90	59
Martin	163	42
Meeker	215	70
Mille Lacs	191	67
Morrison	246	63
Mower	355	57
Murray	89	56
Nicollet	140	48
Nobles	158	50
Norman	98	63
Olmsted	488	48
Otter Tail	480	54
Pennington	137	67
Pine	158	54
Pipestone	131	67
Polk	346	69
Pope	128	62
Ramsey	3,154	64
Red Lake	62	94
Redwood	190	61
Renville	239	79
Rice	323	58
Rock	111	66

	Stroke Deaths, 1993-2002	Age-adjusted Stroke Mortality Rate, 1993-2002
Roseau	106	59
St. Louis	1,658	65
Scott	305	67
Sherburne	240	72
Sibley	117	54
Stearns	521	48
Steele	194	52
Stevens	71	49
Swift	112	60
Todd	154	46
Traverse	23	27
Wabasha	155	56
Wadena	156	74
Waseca	138	56
Washington	657	69
Watonwan	119	64
Wilkin	63	58
Winona	325	56
Wright	440	68
Yellow Medicine	134	61

Appendix D: Data Souces and Methods

Statewide:

Mortality: Death Certificates - Minnesota Center for Health Statistics
Risk Factors: Behavioral Risk Factor Surveillance System (BRFSS)
Adolescents: Minnesota Student Survey (Coordinated School Health)

Additional Data Sources:

Minnesota Heart Survey (University of Minnesota)
Survey on the Health of Adults, the Population, and the Environment (SHAPE, Hennepin County)
Health Plan Employer Data and Information Set (Minnesota Department of Health)
Minnesota Community Measurement Project (Minnesota Council of Health Plans)

* This list is meant to evolve and grow. If you are a researcher, health care professional, or involved with data collection in any way, please consider adding to the body of cardiovascular disease information for the state of Minnesota.

Data Source Descriptions

1. Mortality (death certificates). Data on causes of death come from a database of death certificates, collected and maintained by the Minnesota Department of Health Center for Health Statistics. The primary cause of death is indicated by an International Classification of Diseases (ICD) code. The International Classification of Diseases (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 then translated into medical codes through use of the classification structure and the selection and modification rules contained in the applicable revision of the ICD, published by the World Health Organization (WHO). These coding rules improve the usefulness of mortality statistics by giving preference to certain categories, by consolidating conditions, and by systematically selecting a single cause of death from a reported sequence of conditions.

   The single selected cause for tabulation is called the underlying cause of death, and the other reported causes are the non-underlying causes of death.

   (Source: Centers for Disease Control and Prevention, National Center for Health Statistics, *http://www.cdc.gov/nchs/about/major/dvs/icd10des.htm*)

2. Behavioral Risk Factor Surveillance System (BRFSS). The BRFSS 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 US States and territories. Minnesota began participating in the BRFSS survey in 1984. Statewide prevalence estimates for several CVD-related behaviors are derived from this survey, including high blood pressure, high blood cholesterol, overweight and obesity, cigarette smoking, poor dietary habits, and physical inactivity. For more information about the BRFSS survey, please visit the CDC website: *http://www.cdc.gov/brfss/index.htm*

3. Minnesota Student Survey. The Minnesota Student Survey is voluntary, confidential and anonymous on the part of students. It is designed to be given to sixth, ninth and twelfth graders. It asks students questions about their activities, opinions and behaviors. The broad array of issues addressed include substance abuse (tobacco, alcohol and street drugs), school climate, weapons and other safety issues, nutrition, academics, connections with school, family and community and many other topics. At the senior high level, there are also questions about sexual activity.

   The survey is offered to the traditional public elementary and secondary schools, alternative learning centers, charter schools, tribal schools and to youth in juvenile correctional facilities and residential treatment facilities. Itis offered to all school districts every three years; 2004 will be the sixth administration. There have been high levels of participation on the part of school districts in the past and high participation rates among students within those districts, making the data a very strong depiction of the factors that bolster Minnesota students during their teen years as well as those that put them at risk for health, social or learning problems. Statewide in 2001, there were 134,000 students participating.

4. Minnesota Heart Survey. The Minnesota Heart Survey is a population-based surveillance of CVD risk factors in adults aged 25-74 in the Minneapolis-St. Paul metropolitan area. The first survey was conducted in 1980-1982, and was repeated in similar fashion (sampling and survey methods) in 1985-1987, 1990-1992, 1995-1997, and most recently in 2000-2002. Results from this study provide cross-sectional snapshots of cardiovascular risk factors for the metropolitan population, which comprises over half the population of the state. This study is conducted by the University of Minnesota School of Public Health, Division of Epidemiology.

5. The Rochester Epidemiology Project. Olmsted County is relatively isolated from other urban centers, and nearly all medical care is delivered to local county residents by a few providers. The Mayo Clinic in Rochester, Minnesota is the largest provider of primary care and provides nearly all of the specialty care for this community. Each provider uses a medical record system that is linked together, resulting in a rich database of information that can be used to analyze disease rates, determinants and outcomes.

6. Survey on the Health of Adults, the Population, and the Environment (SHAPE). The Survey of the Health of Adults, the Population and the Environment (SHAPE) is a health surveillance project that monitors the health of adults in Hennepin County, Minnesota's most populated county. The Hennepin County Community Health Department collaborated with the Minneapolis Department of Health and Family Support and the Bloomington Division of Public Health for this project. Data from this project include important information from racial and ethnic communities. The information in this survey include questions concerning key health indicators; CVD-related data include prevalence of heart trouble or angina (heart disease), physical activity, dietary habits, cigarette smoking, high blood pressure, high blood cholesterol, overweight and obesity, and diabetes. The survey was designed specifically to report on six racial and ethnic groups: American Indians, Southeast Asians, Black and African Americans, Hispanic/Latinos, and Whites. Of the 9,959 survey respondents in 2002, 2,794 were people of color or American Indians. This project provides a rich source of racial and ethnic data representing a significant proportion of most populations of color in

Minnesota.

7. Health Plan Employer Data and Information Set (HEDIS). The Health Plan Employer Data and Information Set (HEDIS) is a set of data collection indicators developed to assist purchasers of health care (such as employers or the state government) in evaluating the effectiveness of care provided to health plan enrollees. Minnesota HMOs are required to collect data and report on standard clinical performance measures developed by the National Committee for Quality Assurance. Reporting requirements include all fully-insured members consisting of the following products: commercial, Prepaid Medical Assistance Program (PMAP), Prepaid General Assistance Medical Care (PGAMC), Minnesota Care, Minnesota Senior Health Options and Medicare Plus Choice.

   Thirty-nine percent of Minnesotans were enrolled in HMOs in 2000. HMO's provided fully-insured health insurance coverage for 25% of all Minnesotans, while HMOs administered self-insured group plans covered another 14 percent of the population. Methodologies utilized by HMOs for data collection include administrative records (claims) or medical record audits. Measures based on administrative records are reflective of the status of every eligible member. Medical record audits are reflective of a sample of eligible members.

8. Hospital Discharge Data. Data from in-patient hospital admissions were provided voluntarily by 121 of 142 hospitals in 2001 to the Minnesota Department of Health, via the Minnesota Hospital Association. Participation of reporting from these hospitals represented 98 percent of all admissions, not including federal hospitals (Veterans Administration). Charges and admissions for cardiovascular disease were based on claims with cardiovascular disease ICD-10 codes 100-I99 in the primary diagnosis field. Charges and admissions for coronary heart disease and stroke included claims with ICD-10 codes I20-I25 and I60-I69, respectively.

Appendix E: Definitions and Codes

Coding for cause of death

Data on causes of death come from a database of death certificates, collected and maintained by the Minnesota Department of Health Center for Health Statistics. The primary cause of death is indicated by an *International Classification of Diseases (ICD)* code. The International Classification of Diseases (ICD) is designed to promote international comparability in the collection, processing, classification, and presentation of mortality statistics. The following are the ICD codes used in this report for classification of "cardiovascular disease," "diseases of the heart," (also referred to as "heart disease") "coronary heart disease," and "stroke."

Disease	ICD-9	ICD-10
Cardiovascular Disease	390-434, 436-448	I00-I78
Diseases of the Heart	390-398, 402, 404, 410-429	I00-I09, I11, I13, I20-I51
Coronary Heart Disease	410-414, 429.2	I20-I25
Stroke	430-434, 436-438	I60-I69

Age-adjustment methodology

Age-adjusting a rate is a way to make fairer comparisons between groups with different age distributions. For example, a county having a higher percentage of elderly people may have a higher rate of death than a county with a younger population, merely because the elderly are more likely to die. Age adjustment can make the different groups more comparable. A "standard" population distribution is used to adjust death rates. The age-adjusted rates are rates that would have existed if the population under study had been distributed by age the same way as in the "standard" population. Therefore, they are rates adjusted for differences in age distributions.

More information on age adjusting is available at *http://www.cdc.gov/nchs/data/statnt/statnt06rv.pdf* and on Age Adjustment Using the 2000 Standard Population at *http://www.cdc.gov/nchs/data/statnt/statnt20.pdf*

Risk Factor Definitions

Current smoking is defined in adults as having smoked at least 100 cigarettes in one's lifetime and reported smoking every day or some days (BRFSS); in youth, current smoking is defined as smoking any cigarettes during the past 30 days (Minnesota Student Survey).

Physical inactivity, in adults, is defined in this report as a negative answer to the question, "During the past 30 days, other than your regular job, did you participate in any physical activities or exercise such as running, calisthenics, golf, gardening, or walking for exercise?" Source: Minnesota Behavioral Risk Factor Surveillance System Survey. In youth, physical inactivity is described by enumerating the results

from the question, "On how many of the last 7 days did you exercise or play sports that made you sweat or breathe hard for at least 20 minutes?" Source: Minnesota Student Survey (2001)

High blood pressure (hypertension) is defined in this report as resting systolic blood pressure above 140 mmHg or diastolic blood pressure above 90 mmHg, or current use of anti-hypertensive medication (Minnesota Heart Survey). An additional measure of prevalence of hypertension is a positive answer to the question, "Have you ever been told by a doctor, nurse, or other health professional that you have hypertension?" on the Minnesota Behavioral Risk Factor Surveillance System (BRFSS) survey.

High blood cholesterol (hypercholesterolemia) is defined in this report as serum total cholesterol greater than or equal to 240 mg/dl or current use of cholesterol-lowering medication (Minnesota Heart Survey). An additional measure of prevalence of high blood cholesterol is a positive answer to the question, "Have you ever been told by a doctor, nurse, or other health professional that you have high blood cholesterol?" on the Minnesota Behavioral Risk Factor Surveillance System (BRFSS) survey.

Diabetes Mellitus prevalence is defined in this report as the percentage of adults 18 years and older who self-reported a positive answer to the question, "Have you ever been told by a doctor that you have diabetes?" Source: Minnesota Behavioral Risk Factor Surveillance System Survey. Note: in 1994, the measure for this question changed in order to distinguish diabetes only during pregnancy.

Body mass index (BMI) is defined as weight (in kilograms) divided by height (in meters) squared.

Overweight is defined in this report as body mass index of 25 kg/m2 or greater, based on self-reported height and weight. Source: Minnesota Behavioral Risk Factor Surveillance System Survey.

Obesity is defined in this report as body mass index of 30 kg/m2 or greater, based on self-reported height and weight. Source: Minnesota Behavioral Risk Factor Surveillance System Survey.
National Institute of Diabetes and Digestive and Kidney Diseases, NIH Publication No. 95-1468, Chapter 32 (Stern MS and Mitchell BD, Diabetes in Hispanic Americans), 1995.
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Available on the web at: *http://www.health.state.mn.us/cvh*

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