

HEART DISEASE AND STROKE IN MINNESOTA

2007 Burden Report



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Introduction

Heart disease and stroke are the second and third leading causes of death in Minnesota (Table 1). In 2005, 37,498 Minnesotans died, of which 11,424 deaths (over 30%) were due to some form of cardiovascular disease. These included 7,915 deaths from heart disease and 2,372 from stroke.

Table 1. Leading causes of death – Minnesota, 2005.

Cause of Death	Number of Deaths	Crude Death Rate	Age Adjusted Mortality Rate
Cancer	8,822	171.8	167.5
Heart Disease	7,915	154.2	140.8
Stroke	2,372	46.2	41.9
Chronic Lower Respiratory Disease	1,961	38.2	36.8
Unintentional Injury	1,915	37.3	35.2
Alzheimers Disease	1,319	25.7	22.3
Diabetes	1,259	24.5	23.2
Pneumonia and Influenza	845	16.5	14.4
Nephritis	659	12.8	11.8
Suicide	544	10.6	10.3
Cirrhosis	320	6.2	6.1
Septicemia	262	5.1	4.8
Congenital Anomalies	201	3.9	4.0
Perinatal Conditions	161	3.1	3.3
Homicide	139	2.7	2.6
Atherosclerosis	136	2.6	2.3
AIDS/HIV	51	1.0	1.0
SIDS	45	0.9	0.9
Other	8,572	167.0	152.1
Total	37,498		

Source: Minnesota Department of Health

In 2005, there were over 52,000 hospitalizations for heart disease and 11,000 for stroke among Minnesota residents. These and other cardiovascular diseases accounted for over \$2.1 billion in associated charges. Deaths and disability from heart disease and stroke are influenced by modifiable risk factors such as cigarette smoking, physical inactivity, poor nutrition, high blood pressure, and high cholesterol, and related conditions such as diabetes, overweight, and obesity – all of which are highly prevalent in Minnesota.

This report presents current mortality rates, hospitalizations, and prevalence of risk factors for heart disease and stroke in Minnesota. The Heart Disease and Stroke Prevention (HDSP) Unit at the Minnesota Department of Health provide 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.

Requests for additional information may be addressed to:

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Executive Summary

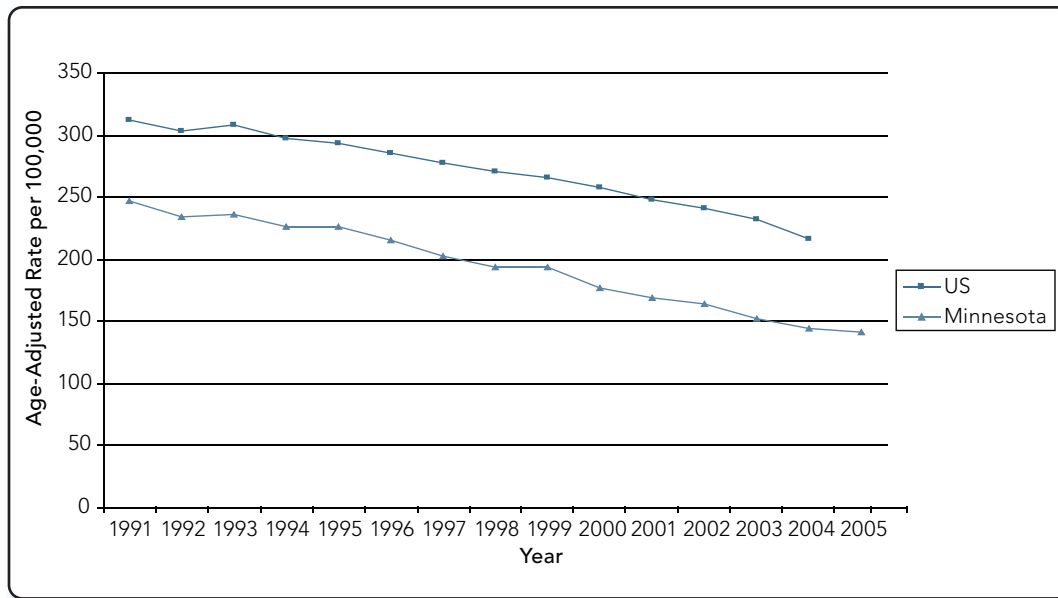
- Heart disease and stroke are the second and third leading causes of death in Minnesota, respectively.
- Approximately 139,000 Minnesotans have coronary heart disease or angina, and over 71,000 have had a stroke.
- In 2005, there were 37,498 deaths among Minnesota residents. Heart disease accounted for 7,915 deaths (21%), while stroke accounted for 2,372 (7%) deaths.
- In 2005, there were over 73,000 hospitalizations for cardiovascular disease among Minnesota residents. Total charges amounted to over \$2.1 billion.
- Between 1991 and 2005, the overall heart disease mortality (death) rate declined approximately 34%.
 - Smaller declines in heart disease deaths were experienced by American Indians (-28%), Asians (-19%), and Hispanics (-18%) than whites (-34%) and African Americans (-37%).
- Between 1991 and 2005, the overall stroke death rate declined approximately 27%.
 - Smaller declines in stroke deaths were experienced by African Americans (-16%), Asians (-21%), and Hispanics (-24%) than whites (-28%) – and the rate in American Indians actually rose (+3%).
- Cardiovascular disease risk factors are prevalent among adults ages 18 and older in Minnesota:
 - 18% of adults are **current cigarette smokers**
 - 14% of adults do not participate in any leisure time **physical activity**
 - 75% of adults consume less than five **fruits and vegetables** per day
 - 22% of adults have **high blood pressure**
 - 32% of adults have **high cholesterol**
 - 6% of adults have **diabetes**
 - 61% of adults are **overweight or obese**
 - 24% of adults are **obese**
- Disparities in heart disease and stroke are a problem in Minnesota:
 - American Indian men have a 66% higher heart disease death rate than white men, and American Indian women have a 33% higher heart disease death rate than white women.
 - African American men have a 34% higher stroke death rate than white men, and African American women have a 61% higher stroke death rate than white women.
 - Asian Americans have an 11% higher stroke death rate than whites.
 - Geographic disparities also exist – several areas of rural Minnesota experience higher rates than the rest of the state.

Heart Disease

(ICD-9: 390-398, 402, 404-429/ICD-10: I00-I78)

The heart disease mortality rate in Minnesota was 141 per 100,000 persons in 2005 and 232 per 100,000 persons in the United States in 2004 (latest available data). These rates have been declining for several years (Figure 1). County-specific heart disease mortality rates for 2001-2005 are listed Appendix A.

Figure 1. Heart disease mortality – Minnesota and United States, 1991-2005.



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

Prevalence of self-reported angina or coronary heart disease among adults in Minnesota is 3.7%, which translates into an estimated 139,000 Minnesota adults (Table 2).

Table 2. Self-reported angina or coronary heart disease – Minnesota, 2006.[†]

	Percent	Estimated Prevalence
Male	4.7	88,000
Female	2.7	51,000
Overall	3.7	139,000

[†]Please see Appendix for notes regarding these data.
Source: Minnesota Behavioral Risk Factor Surveillance System (BRFSS) survey

In 2006, 3.4% of all adults aged reported having had heart attack, which translates into an estimated 129,000 Minnesota adults (Table 3).

Table 3. Self-reported heart attack – Minnesota, 2006.[†]

	Percent	Estimated Prevalence
Male	5.0	92,000
Female	2.0	37,000
Overall	3.4	129,000

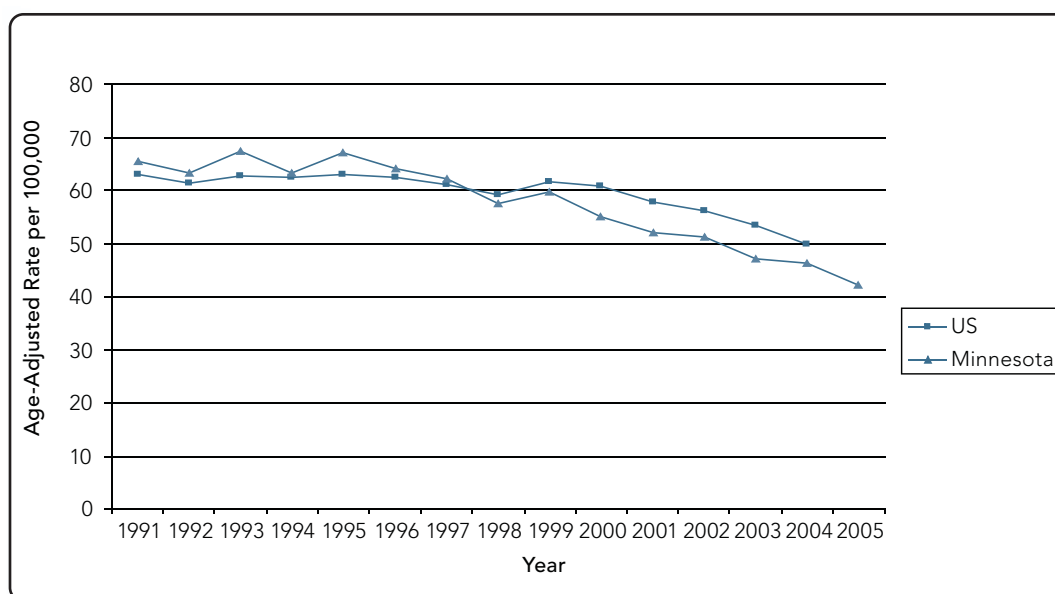
[†]Please see Appendix for notes regarding these data.
Source: Minnesota Behavioral Risk Factor Surveillance System (BRFSS) survey

Stroke

(ICD-9: 430-438/ICD-10: I60-I69)

The stroke mortality rate in Minnesota was 42 per 100,000 persons in 2005 and 50 per 100,000 in the United States in 2004 (latest available data). The stroke mortality rate has been declining in Minnesota and the nation; Minnesota's stroke mortality rates have been lower than the national average since 1998 (Figure 2). County-specific stroke mortality rates for 2001-2005 are listed Appendix B.

Figure 2. Stroke mortality – Minnesota and United States, 1991-2005.



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

In 2006, 1.9% of adults in Minnesota reported that a doctor had ever told them that they had a stroke, which translates into an estimated 71,000 Minnesota adults (Table 4).

Table 4. Self-reported stroke – Minnesota, 2006.[†]

	Percent	Estimated Prevalence
Male	1.9	35,000
Female	1.9	36,000
Overall	1.9	71,000

[†]Please see Appendix for notes regarding these data.

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

Hospitalizations and Costs

The economic burden of heart disease and stroke can be described in part through associated charges for hospitalizations. In most cases, adults who experience a heart attack, stroke, or other cardiovascular disease events are hospitalized – and may have repeated hospitalizations. Over 12% of all hospitalizations in 2005 in Minnesota were principally for cardiovascular disease events, accounting for total charges of over \$2.1 billion. Heart disease was the principal reason for over 52,000 hospitalizations and \$1.6 billion in charges. Stroke was the principal reason for over 11,000 hospitalizations and \$266 million in charges. Other cardiovascular disease subtypes accounted for 9,500 hospitalizations and \$258 million in charges. (Table 5 and Table 6) Hospitalizations (Figure 3) and associated charges (Figure 4) for both heart disease and stroke have risen considerably since 1998.

Table 5. Number of hospital discharges, by age groups and sex, by principal diagnosis groups, Minnesota residents, 2005.

Principal Diagnosis Groups	<35		35-44		45-54		55-64		65-74		75+		All		Overall
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	
All Cardiovascular Diseases*	871	824	1,911	1,273	5,374	2,733	7,941	4,311	9,270	6,472	14,089	18,178	39,456	33,791	73,247
Diseases of the Heart**	589	455	1,442	823	4,170	1,826	6,122	3,003	6,848	4,510	10,112	12,633	29,283	23,250	52,533
Coronary Heart Disease	66	27	727	290	2,578	850	3,860	1,437	3,551	1,859	3,849	3,838	14,631	8,301	22,932
Congestive Heart Failure	48	36	149	99	403	198	735	447	1,310	979	3,278	4,330	5,923	6,089	12,012
Cerebrovascular Disease (Stroke)***	70	107	159	172	521	407	933	649	1,308	1,078	2,397	3,371	5,388	5,784	11,172
Hemorrhagic	21	18	29	47	88	66	91	77	99	119	207	309	535	636	1,171
Ischemic	20	28	56	49	203	124	350	239	485	418	1,117	1,764	2,231	2,622	4,853
Transient Ischemic Attack	7	20	27	33	78	78	138	98	205	182	404	683	859	1,094	1,953
Other Cardiovascular Diseases	212	262	310	278	683	500	886	659	1,114	884	1,580	2,174	47,858	4,757	9,542

*All cardiovascular diseases (ICD-9: 390-448) includes all diseases of the heart (ICD-9: 390-398, 402, 404-429, stroke (ICD-9: 430-438), and other cardiovascular diseases (ICD-9: 403, 439-459).

**Coronary Heart Disease (ICD-9: 410-414) and Congestive Heart Failure (ICD-9: 428) are included in Diseases of the Heart (ICD-9: 390-398, 402, 404-429). Other heart disease subtypes are not reported here.

*** Hemorrhagic (ICD-9: 430, 431), Ischemic (ICD-9: 434, 436), and Transient Ischemic Attack (ICD-9: 435) are included in Stroke (ICD-9: 430-438). Other stroke subtypes are not reported here.

Data exclude non-Minnesota residents.

Source: Minnesota inpatient hospitalization data, Center for Data Initiatives, Minnesota Department of Health

Table 6. Number of hospital discharges by principal diagnosis groups, with associated length of stay and charges, Minnesota residents, 2005.

Principal Diagnosis Groups	Total	Average Length of Stay (Days)	Total Inpatient Days	Average Charge per Stay	Total Charges of all Stays
All Cardiovascular Diseases*	73,247	3.7	268,855	\$29,228	\$2,140,862,894
Diseases of the Heart**	52,533	3.5	183,299	\$30,775	\$1,616,688,739
Coronary Heart Disease	22,932	3.1	71,166	\$36,488	\$836,732,176
Congestive Heart Failure	12,012	4.2	50,594	\$23,789	\$285,753,743
Cerebrovascular Disease (Stroke)***	11,172	4.1	47,716	\$23,852	\$266,478,806
Hemorrhagic	1,171	7.4	8,718	\$56,652	\$66,339,557
Ischemic	4,853	4.4	21,502	\$19,649	\$95,358,610
Transient Ischemic Attack	1,953	2.2	4,319	\$11,114	\$21,704,774
Other Cardiovascular Diseases	9,542	4.3	41,890	\$27,006	\$257,695,350

*All cardiovascular diseases (ICD-9: 390-448) includes all diseases of the heart (ICD-9: 390-398, 402, 404-429, stroke (ICD-9: 430-438), and other cardiovascular diseases (ICD-9: 403, 439-459).

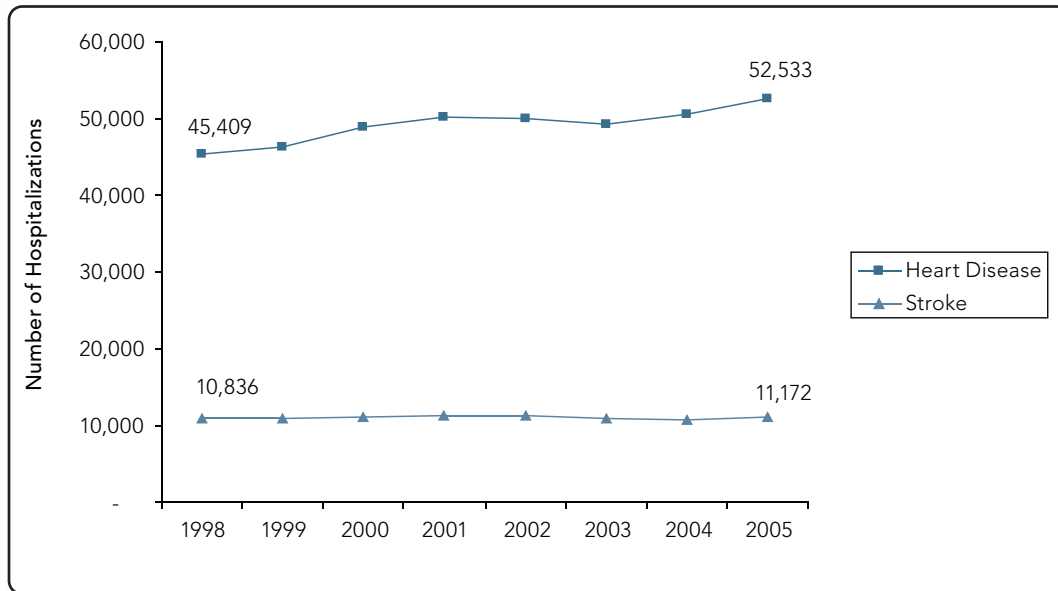
**Coronary Heart Disease (ICD-9: 410-414) and Congestive Heart Failure (ICD-9: 428) are included in Diseases of the Heart (ICD-9: 390-398, 402, 404-429). Other heart disease subtypes are not reported here.

*** Hemorrhagic (ICD-9: 430, 431), Ischemic (ICD-9: 434, 436), and Transient Ischemic Attack (ICD-9: 435) are included in Stroke (ICD-9: 430-438). Other stroke subtypes are not reported here.

Data exclude non-Minnesota residents.

Source: Minnesota inpatient hospitalization data, Center for Data Initiatives, Minnesota Department of Health

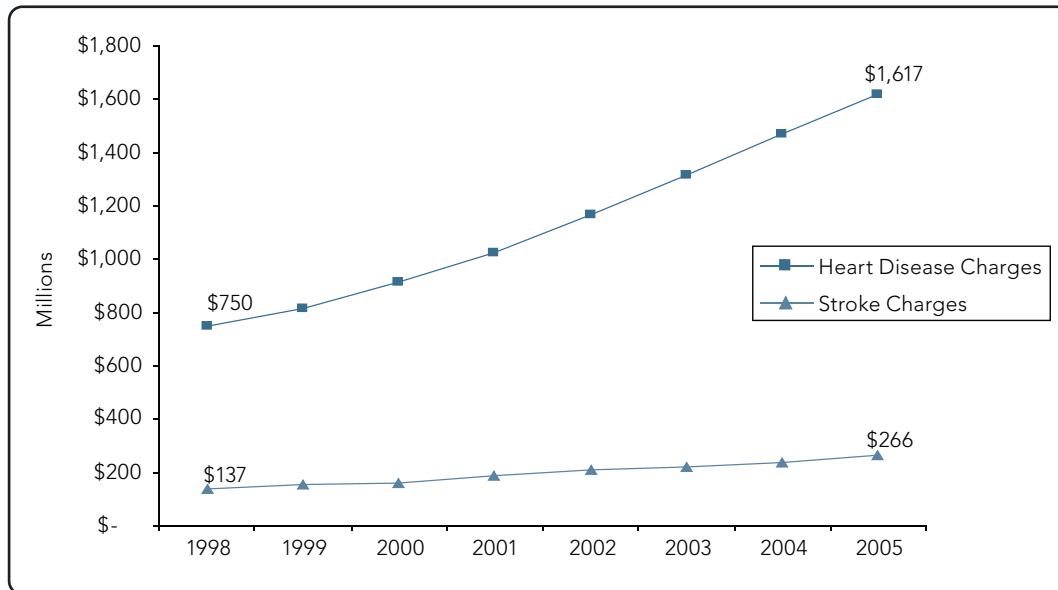
Figure 3. Hospitalizations for heart disease and stroke in Minnesota residents, 1998-2005.†



†Heart Disease is defined by ICD-9 codes: 390-398, 402, 404-429. Stroke is defined by ICD-9 codes: 430-438.

Source: Minnesota inpatient hospitalization data, Center for Data Initiatives, Minnesota Department of Health

Figure 4. Total hospitalization charges for heart disease and stroke, Minnesota residents, 1998-2005.†



†Heart Disease is defined by ICD-9 codes: 390-398, 402, 404-429. Stroke is defined by ICD-9 codes: 430-438.

Source: Minnesota inpatient hospitalization data, Center for Data Initiatives, Minnesota Department of Health

Risk Factors for Heart Disease and Stroke

The major modifiable risk factors for heart disease and stroke include cigarette smoking, physical inactivity, a poor diet, high blood pressure, elevated blood cholesterol, diabetes, overweight, and obesity. Prevalence of the major modifiable risk factors among adults in the United States and Minnesota are noted in Table 7.

Table 7. Prevalence of cardiovascular disease risk factors – United States and Minnesota, 2005-2006.[†]

Risk Factor*	United States	Minnesota
Cigarette Smoking	19.5%	18.3%
Physical Inactivity	24.1	14.2
Less than 5 fruits/veggies daily	73.7	75.2
High Blood Pressure	26.1	21.9
High Blood Cholesterol	35.7	32.4
Diabetes	8.1	5.7
Overweight or Obese	58.4	60.9
Obese	23.9	24.0

* Current cigarette smoking, physical inactivity, diabetes, overweight, and obesity data are from the 2006 BRFSS Survey. Fruits and vegetable consumption, high blood pressure awareness, and high blood cholesterol awareness data are from the 2005 BRFSS Survey.

[†]Please see Appendix for additional notes regarding these data.

Source: Behavior Risk Factor Surveillance System (BRFSS) Survey, 2005 and 2006

Heart Disease and Stroke Disparities

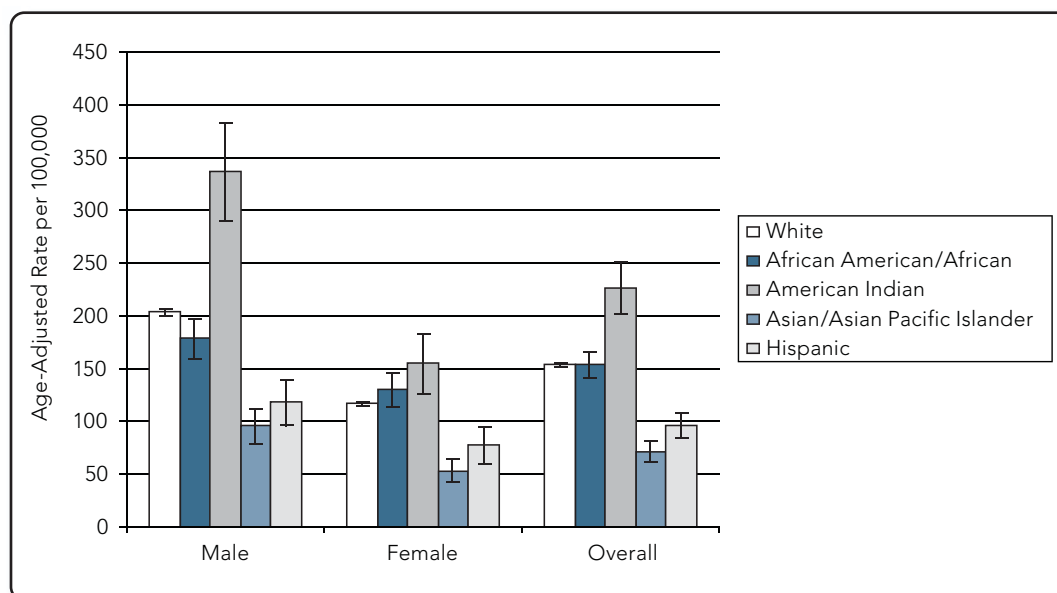
Of great concern are disparities in stroke and heart disease in Minnesota. Disparities exist across racial and ethnic groups, geographic regions of the state, and socioeconomic and education level groups. Highlighted here specifically are disparities in mortality rates between racial and ethnic groups. (See Appendix C and D for complete data on mortality and risk factor disparities across racial, geographic, socioeconomic and education level groups.)

Age-adjusted heart mortality rates for American Indians are considerably higher than the rates for all other race/ethnic populations in Minnesota. In 2001-2005, compared to whites, the mortality rate was 33 percent higher among American Indian women and 66 percent higher among American Indian men (see Table 8 and Figure 5).

Table 8. Age-adjusted heart disease mortality per 100,000, by race/ethnicity – Minnesota, 2001-2005.[†]

Race/Ethnicity	Male	% Different than Whites	Female	% Different than Whites	Overall	% Different than Whites
White	203	-	117	-	153	-
African American/African	179	-12%	130	+11%	154	0%
American Indian	337	+66%	155	+33%	226	+48%
Asian/Asian Pacific Islander	95	-53%	53	-54%	71	-54%
Hispanic	118	-42%	77	-34%	96	-37%

[†]Please see Appendix for notes regarding these data.
Source: Minnesota Department of Health

Figure 5. Heart disease mortality by race and ethnicity – Minnesota 2001-2005.[†]

[†]95% confidence limits are represented by the vertical bars. These limits are included to assess whether or not observed differences in mortality rates are statistically significant. Please see Appendix for additional notes regarding these data. This figure is a graphical illustration of data in Table 8.

Source: Minnesota Department of Health

Disparities exist in the rate of decline in heart disease mortality as well. Asians/Asian Pacific Islanders and Hispanics have experienced a lower rate of decline than other race groups (Table 9).

Table 9. Age-adjusted heart disease mortality per 100,000, by race/ethnicity – Minnesota, 1991-2005.[†]

Race/Ethnicity	1991-1995	% Different than Whites	1996-2000	% Different than Whites	2001-2005	% Different than Whites	% Change 1991 to 2005
White	234	-	195		153		-34%
African American/African	243	+4%	202	+3%	154	0%	-37%
American Indian	314	+34%	247	+27%	226	+48%	-28%
Asian/Asian Pacific Islander	88	-62%	103	-47%	71	-54%	-19%
Hispanic	117	-50%	147	-25%	96	-37%	-18%

*Percent change measures change from 1991-1995 to 2001-2005.

[†]Please see Appendix for notes regarding these data.

Source: Minnesota Department of Health

In 2001-2005, compared to white women, the stroke mortality rate was 61 percent higher among African American women and 39 percent higher among American Indian women. Among men, the greatest disparity was seen for African American men, who experienced a 34 percent higher stroke mortality rate than white men. Asian/Asian Pacific Islander men experienced a 25 percent higher stroke mortality rate than white men (Table 10 and Figure 6).

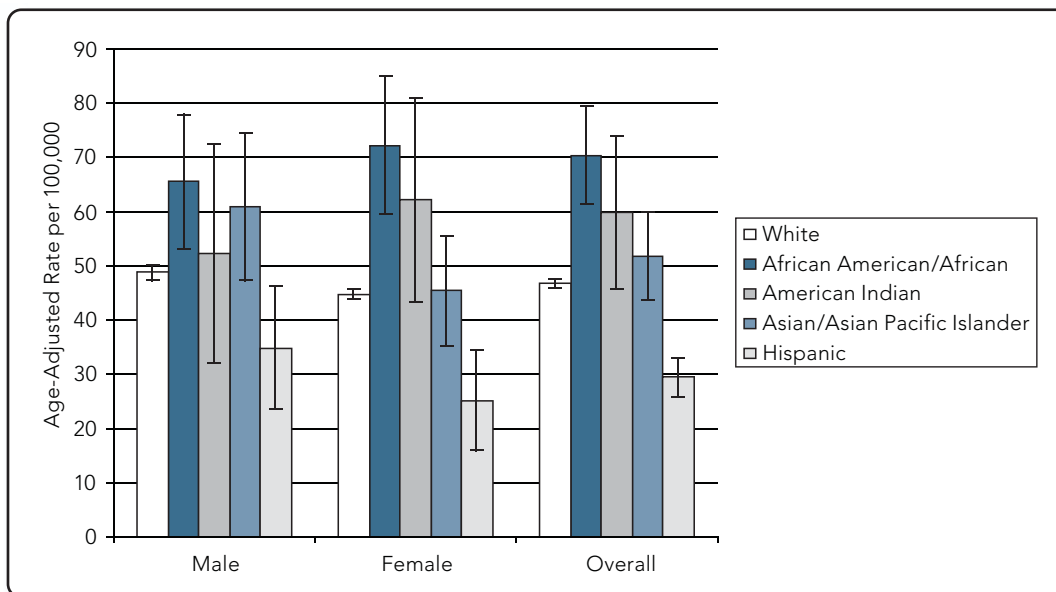
Table 10. Age-adjusted stroke mortality per 100,000, by race/ethnicity – Minnesota, 2001-2005.[†]

Race/Ethnicity	Male	% Different than Whites	Female	% Different than Whites	Overall	% Different than Whites
White	49		45		47	
African American/African	66	+34%	72	+61%	70	+51%
American Indian	52	+7%	62	+39%	60	+28%
Asian/Asian Pacific Islander	61	+25%	45	+1%	52	+11%
Hispanic	35	-29%	25	-44%	29	-37%

[†]Please see Appendix for notes regarding these data.

Source: Minnesota Department of Health

Figure 6. Stroke mortality by race and ethnicity – Minnesota 2001-2005.[†]



[†]95% confidence limits are represented by the vertical bars. These limits are included to assess whether or not observed differences in mortality rates are statistically significant. Please see Appendix for additional notes regarding these data. This figure is a graphical illustration of data in Table 10.

Source: Minnesota Department of Health

Overall stroke mortality has declined in Minnesota over the past several years. However, African Americans experienced the lowest rate of decline, and the rate in American Indians increased slightly since 1991 (Table 11).

Table 11. Age-adjusted stroke mortality per 100,000, by race/ethnicity – Minnesota, 1991-2005.[†]

Race/Ethnicity	1991-1995	% Different than Whites	1996-2000	% Different than Whites	2001-2005	% Different than Whites	% Change 1991 to 2005
White	65	-	59	-	47	-	-28%
African American/ African	84	+30%	78	+32%	70	+51%	-16%
American Indian	58	-10%	49	-17%	60	+28%	+3%
Asian/Asian Pacific Islander	66	+2%	75	+27%	52	+11%	-21%
Hispanic	39	-40%	50	-15%	29	-37%	-24%

**Percent change measures change from 1991-1995 to 2001-2005.*

[†]Please see Appendix for notes regarding these data.

Source: Minnesota Department of Health

Children and Youth

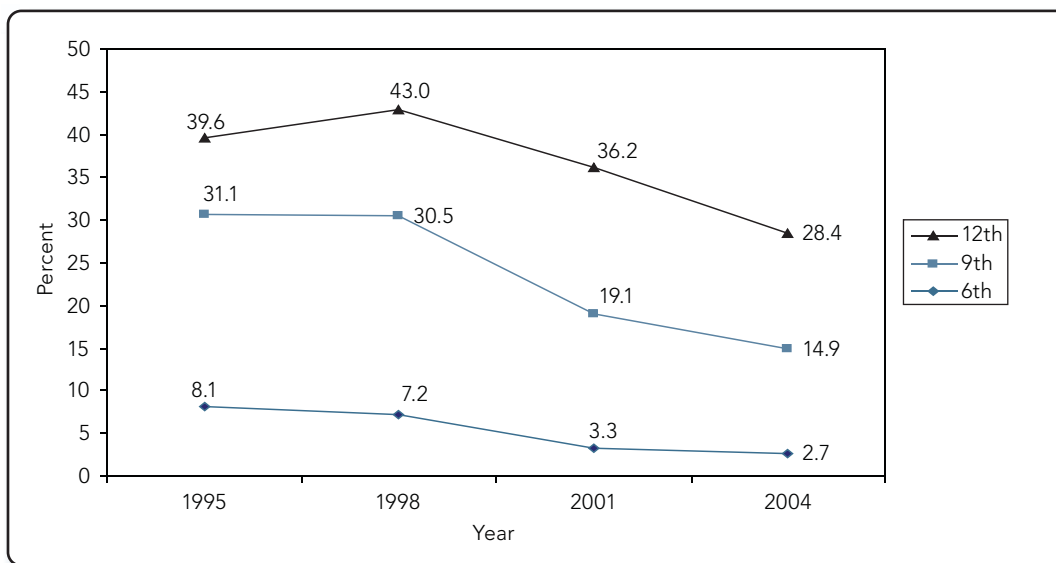
Heart disease and stroke risk factors begin developing as early as childhood. Prevalence of cigarette smoking, physical inactivity, and less than five fruits or vegetables eaten per day among Minnesota children are noted in Table 12, with graphical illustration of these data in Figures 7-9.

Table 12. Cardiovascular Disease Risk Factors in Children – Minnesota 2005-2006.

6th Grade	Cigarette Smoking				1995	Physical Inactivity				1995	Less than 5 fruits/veggies daily			
	1995	1998	2001	2004		1995	1998	2001	2004		1995	1998	2001	2004
Males	9.2	7.7	3.8	2.8	-	50.5	50.3	47.9	-	79.8	78.7	80.2		
Females	7.0	6.6	2.8	2.6	-	61.0	61.5	59.0	-	78.1	77.7	78.3		
Total	8.1	7.2	3.3	2.7	-	55.7	55.9	53.4	-	78.9	78.2	79.2		
9th Grade	Cigarette Smoking				1995	Physical Inactivity				1995	Less than 5 fruits/veggies daily			
	1995	1998	2001	2004		1995	1998	2001	2004		1995	1998	2001	2004
Males	30.6	29.8	18.2	13.7	-	42.0	43.0	40.8	-	85.1	83.4	84.0		
Females	31.5	31.3	20.0	15.9	-	53.9	55.2	53.7	-	86.3	87.0	86.3		
Total	31.1	30.5	19.1	14.9	-	48.0	49.2	47.4	-	85.7	85.2	85.2		
12th Grade	Cigarette Smoking				1995	Physical Inactivity				1995	Less than 5 fruits/veggies daily			
	1995	1998	2001	2004		1995	1998	2001	2004		1995	1998	2001	2004
Males	40.6	43.2	36.4	28.6	-	53.3	53.3	54.2	-	87.9	86.6	86.8		
Females	38.7	42.7	35.9	28.1	-	71.2	72.1	71.6	-	89.5	89.0	88.3		
Total	39.6	43.0	36.2	28.4	-	62.3	62.9	63.1	-	88.7	87.8	87.6		

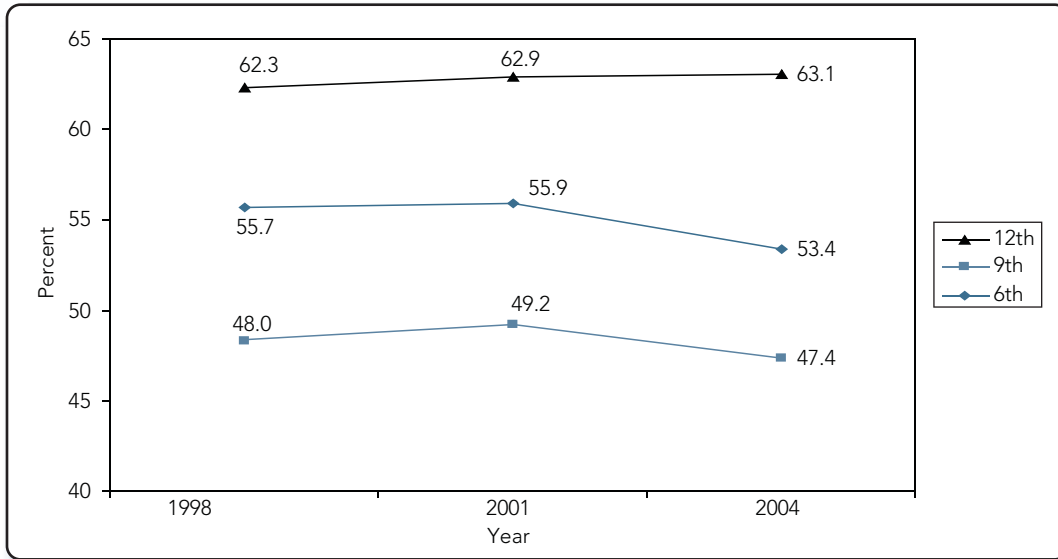
Source: Minnesota Student Survey - Minnesota Department of Education

Figure 7. Cigarette smoking in Minnesota children and youth, 1995-2004



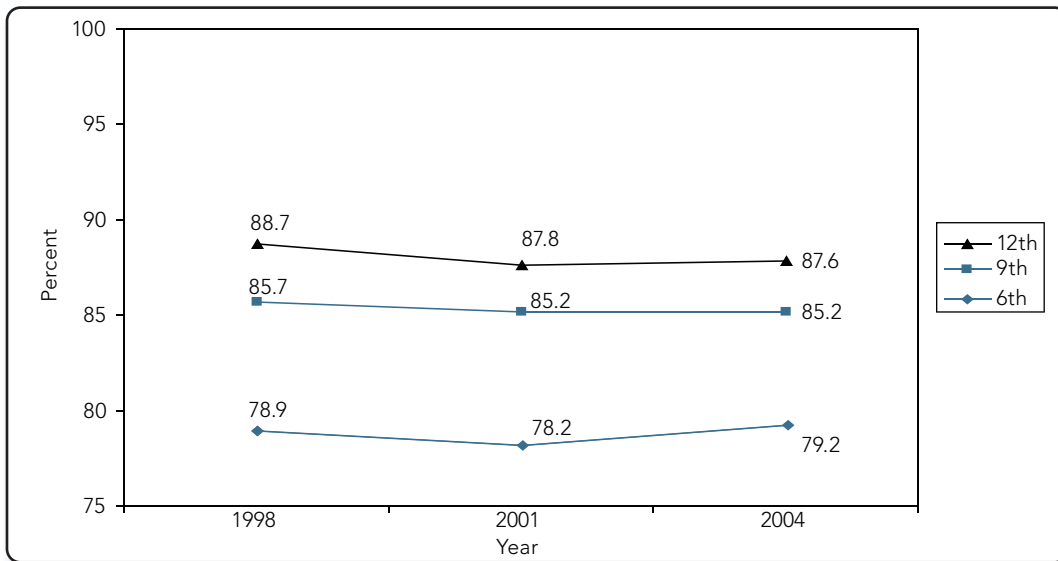
Source: Minnesota Student Survey - Minnesota Department of Education

Figure 8. Less than 5 days of 30 minutes of physical activity per week in Minnesota children and youth, 1995-2004



Source: Minnesota Student Survey - Minnesota Department of Education

Figure 9. Less than five fruits and vegetables daily in Minnesota children and youth, 1995-2004



Source: Minnesota Student Survey - Minnesota Department of Education

Conclusions

The burden of heart disease and stroke in Minnesota is high. Although mortality rates have been declining over the last several years, heart disease and stroke remain second and third leading causes of death in Minnesota. The economic impact of heart disease and stroke is significant, and risk factors are highly prevalent in the Minnesota population. In addition, disparities in heart disease and stroke mortality rates are of particular concern, and efforts must be made to eliminate these disparities. Much work is needed to improve morbidity, mortality and risk factor prevalence in the entire population of Minnesota.

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

- African Americans, particularly for stroke
- American Indians, for both heart disease and stroke
- Asians, particularly for stroke
- Children, for all cardiovascular disease risk factors
- Several areas of rural Minnesota, for both heart disease and stroke (please see Appendix A and B)
- Low socioeconomic status groups, for both heart disease and stroke (please see Appendix C and D)

Appendix A. Heart Disease in Minnesota Counties, 2001-2005

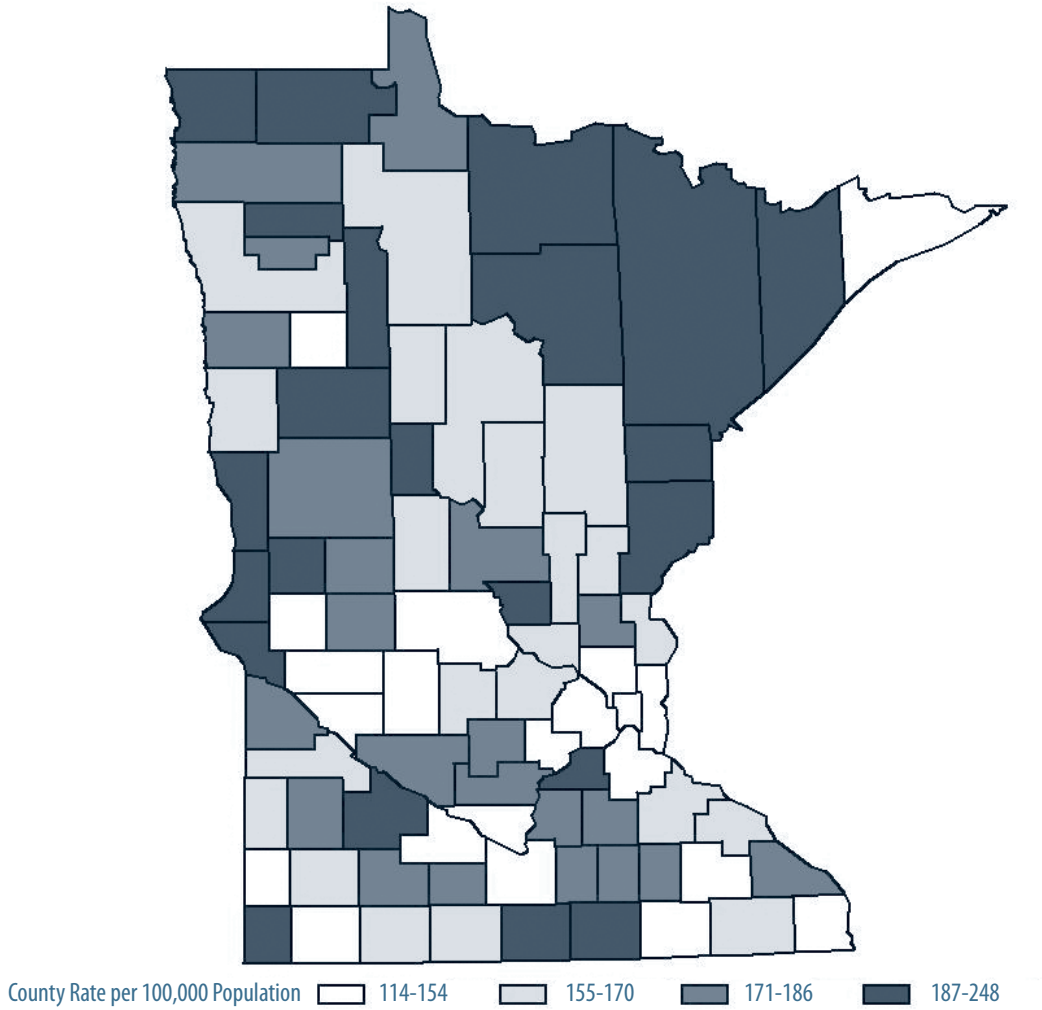
State	2005					2001-2005					
	Male	Female	Total Deaths	Crude	Age-Adjusted	Male	Female	Total Deaths	Crude	Age-Adjusted	Ranking
Minnesota	4,111	3,804	7,915	154	141	21,126	20,110	41,236	163	154	-
County	Male	Female	Total Deaths	Crude	Age-Adjusted	Male	Female	Total Deaths	Crude	Age-Adjusted	Ranking
AITKIN	23	13	36	223	122	123	103	226	286	165	34
ANOKA	135	119	254	78	119	790	613	1,403	89	142	12
BECKER	45	37	82	257	195	236	204	440	282	220	82
BELTRAMI	39	28	67	156	157	180	174	354	169	171	43
BENTON	39	60	99	257	273	197	218	415	225	243	86
BIG STONE	15	11	26	474	216	66	70	136	481	221	83
BLUE EARTH	40	49	89	153	136	218	259	477	166	151	17
BROWN	23	33	56	211	120	156	180	336	254	153	18
CARLTON	42	37	79	232	187	209	182	391	237	192	73
CARVER	37	32	69	81	121	170	152	322	82	123	2
CASS	41	24	65	225	163	198	121	319	226	169	39
CHIPPEWA	16	19	35	273	146	70	94	164	256	135	8
CHISAGO	37	26	63	128	158	180	141	321	139	171	42
CLAY	50	46	96	178	151	264	231	495	190	168	37
CLEARWATER	13	13	26	307	208	81	71	152	361	238	85
COOK	4	4	8	149	92	25	22	47	178	126	3
COTTONWOOD	18	24	42	355	161	93	131	224	373	174	47
CROW WING	55	57	112	187	135	336	278	614	210	157	24
DAKOTA	173	180	353	92	135	881	834	1,715	92	141	11
DODGE	15	14	29	148	143	79	99	178	188	185	63
DOUGLAS	56	42	98	279	175	245	227	472	277	179	55
FARIBAULT	29	35	64	413	203	171	169	340	432	219	81
FILLMORE	28	26	54	253	145	141	158	299	281	160	29
FREEBORN	56	50	106	332	190	255	248	503	315	189	71
GOODHUE	54	45	99	217	151	232	258	490	217	158	26
GRANT	9	13	22	360	159	60	72	132	423	189	72
HENNEPIN	699	621	1,320	118	116	3,533	3,434	6,967	124	126	4
HOUSTON	21	16	37	186	115	110	100	210	210	141	10
HUBBARD	20	22	42	223	146	122	103	225	241	166	35
ISANTI	32	28	60	159	178	129	161	290	164	175	49
ITASCA	59	50	109	246	174	306	259	565	255	187	66
JACKSON	12	21	33	295	155	81	88	169	303	165	33
KANABEC	18	17	35	216	179	78	59	137	173	161	30
KANDIYOHI	41	31	72	175	132	211	183	394	192	142	13
KITSON	15	14	29	605	285	61	56	117	471	226	84
KOOCHICING	34	17	51	367	220	118	96	214	305	207	79
LAC QUI PARLE	15	11	26	342	154	79	74	153	389	177	51
LAKE	16	17	33	296	184	93	66	159	285	194	74
LAKE OF THE WOODS	8	8	16	362	217	30	28	58	265	181	57
LE SUEUR	32	35	67	244	192	149	133	282	211	172	45
LINCOLN	13	10	23	380	162	64	52	116	377	162	31

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County	2005					2001-2005					
	Male	Female	Total Deaths	Crude	Age-Adjusted	Male	Female	Total Deaths	Crude	Age-Adjusted	Ranking
LYON	21	31	52	212	148	145	173	318	256	184	61
MAHNOMEN	34	25	59	161	122	179	171	350	195	155	21
MARSHALL	4	9	13	254	165	43	27	70	274	183	60
MARTIN	17	10	27	271	168	80	53	133	266	168	36
MCLEOD	40	32	72	343	191	177	190	367	346	186	65
MEEKER	26	21	47	201	138	134	128	262	226	157	25
MILLE LACS	32	20	52	199	151	148	125	273	225	169	40
MORRISON	40	26	66	201	147	207	186	393	241	185	62
MOWER	40	64	104	268	147	207	221	428	220	131	6
MURRAY	8	20	28	316	147	73	68	141	314	156	23
NICOLLET	23	32	55	178	182	112	112	224	146	155	20
NOBLES	21	12	33	161	92	119	113	232	225	143	14
NORMAN	14	12	26	371	205	63	52	115	320	179	54
OLMSTED	98	79	177	131	130	458	434	892	136	137	9
OTTER TAIL	88	59	147	255	158	447	360	807	274	174	48
PENNINGTON	18	14	32	235	167	107	83	190	279	197	76
PINE	34	29	63	221	182	183	143	326	235	198	77
PIPESTONE	8	18	26	276	113	69	56	125	258	130	5
POLK	37	41	78	247	167	195	188	383	248	162	32
POPE	20	18	38	338	182	102	94	196	348	180	56
RAMSEY	351	317	668	135	118	1,793	1,833	3,626	143	134	7
RED LAKE	6	4	10	232	128	31	28	59	273	182	59
REDWOOD	25	28	53	331	169	159	125	284	350	187	68
RENVILLE	20	27	47	280	171	116	142	258	306	185	64
RICE	54	43	97	159	164	261	247	508	170	178	53
ROCK	13	6	19	200	108	93	67	160	333	187	67
ROSEAU	16	15	31	188	160	104	92	196	240	206	78
SCOTT	244	248	492	250	173	1,298	1,311	2,609	262	188	70
SHERBURNE	45	46	91	76	151	233	211	444	82	159	27
SIBLEY	38	38	76	93	159	201	218	419	112	177	52
ST. LOUIS	21	24	45	295	183	103	109	212	278	188	69
STEARNS	103	87	190	133	131	500	433	933	136	145	15
STEELE	27	32	59	165	142	169	184	353	203	176	50
STEVENS	4	9	13	132	74	38	52	90	182	114	1
SWIFT	16	9	25	221	124	77	81	158	271	154	19
TODD	30	24	54	219	157	135	111	246	202	155	22
TRAVERSE	3	13	16	420	170	48	61	109	557	195	75
WABASHA	27	19	46	207	154	131	114	245	221	168	38
WADENA	30	25	55	403	247	143	140	283	416	248	87
WASECA	18	23	41	212	164	102	114	216	222	173	46
WASHINGTON	113	98	211	96	147	545	468	1,013	95	148	16
WATONWAN	15	15	30	267	160	81	84	165	284	171	44
WILKIN	12	9	21	309	205	47	58	105	302	213	80
WINONA	45	50	95	193	156	246	286	532	215	182	58
WRIGHT	65	54	119	107	148	308	290	598	117	160	28
YELLOW MEDICINE	20	14	34	325	159	94	72	166	311	170	41

Map 1. Heart disease mortality by county of residence – 2001-2005.

Minnesota rate: 154 deaths per 100,000 population



Appendix B. Stroke in Minnesota Counties, 2001-2005

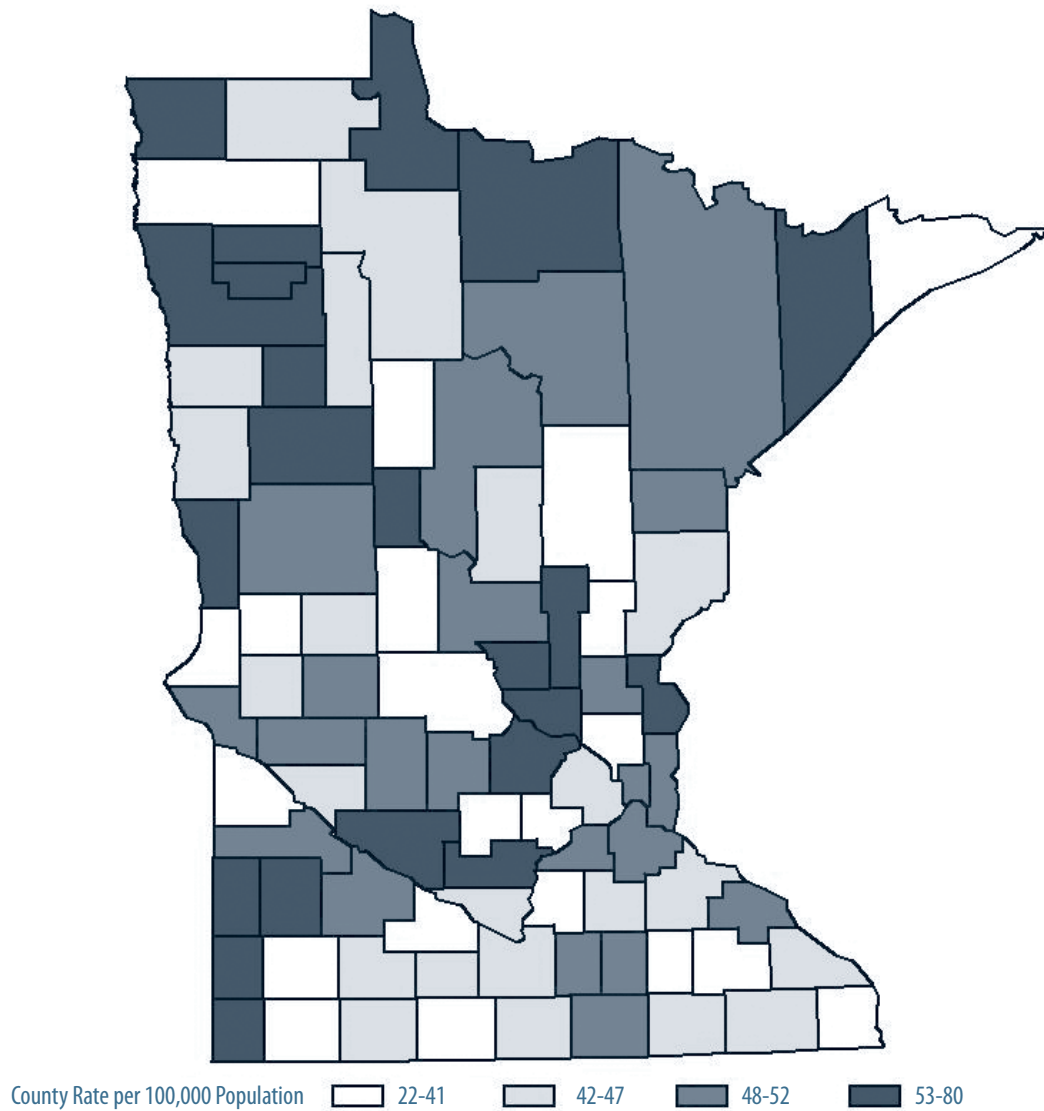
State	2005					2001-2005					
	Male	Female	Total Deaths	Crude	Age-Adjusted	Male	Female	Total Deaths	Crude	Age-Adjusted	Ranking
Minnesota	900	1,472	2,372	46	42	4,979	7,886	12,865	50	48	-
County	Male	Female	Total Deaths	Crude	Age-Adjusted	Male	Female	Total Deaths	Crude	Age-Adjusted	Ranking
AITKIN	4	11	15	93	45	21	31	52	66	38	12
ANOKA	29	47	76	23	35	153	235	388	25	41	21
BECKER	8	11	19	60	45	41	78	119	76	58	76
BELTRAMI	8	8	16	37	37	40	46	86	41	41	22
BENTON	7	13	20	52	54	52	91	143	77	80	87
BIG STONE	4	7	11	201	98	10	26	36	127	53	62
BLUE EARTH	6	16	22	38	30	59	90	149	52	45	37
BROWN	5	15	20	75	45	29	59	88	66	40	15
CARLTON	5	9	14	41	31	40	66	106	64	50	52
CARVER	6	15	21	25	39	43	63	106	27	41	18
CASS	8	13	21	73	54	38	55	93	66	48	45
CHIPPEWA	1	4	5	39	16	30	30	60	94	43	31
CHISAGO	9	13	22	45	52	40	63	103	45	54	67
CLAY	10	13	23	43	37	44	82	126	48	41	23
CLEARWATER	3	0	3	35	27	15	11	26	62	42	25
COOK	1	0	1	19	13	7	3	10	38	26	3
COTTONWOOD	5	3	8	68	31	20	34	54	90	42	24
CROW WING	14	24	38	63	44	72	116	188	64	46	41
DAKOTA	46	63	109	28	43	239	345	584	31	50	49
DODGE	3	4	7	36	32	18	14	32	34	32	7
DOUGLAS	7	20	27	77	46	39	81	120	70	45	36
FARIBAULT	2	11	13	84	36	25	53	78	99	46	39
FILLMORE	11	12	23	108	56	38	47	85	80	44	32
FREEBORN	9	17	26	81	41	51	98	149	93	51	56
GOODHUE	8	17	25	55	37	54	88	142	63	46	40
GRANT	3	1	4	65	22	18	8	26	83	36	10
HENNEPIN	170	266	436	39	39	969	1,586	2,555	46	46	42
HOUSTON	8	6	14	70	45	31	27	58	58	38	13
HUBBARD	5	3	8	42	27	26	28	54	58	39	14
ISANTI	8	14	22	58	68	22	67	89	50	53	63
ITASCA	8	21	29	65	44	57	103	160	72	52	57
JACKSON	2	9	11	98	51	15	31	46	82	44	34
KANABEC	2	2	4	25	21	16	19	35	44	41	19
KANDIYOHI	7	22	29	70	50	63	85	148	72	52	58
KITTSOON	5	3	8	167	62	20	16	36	145	63	81
KOOCHICING	8	4	12	86	52	30	41	71	101	65	83
LAC QUI PARLE	3	0	3	39	20	10	10	20	51	25	2
LAKE	3	3	6	54	32	17	35	52	93	61	78
LAKE OF THE WOODS	2	2	4	90	63	7	16	23	105	71	86
LE SUEUR	2	6	8	29	22	24	33	57	43	33	8
LINCOLN	3	7	10	165	65	17	31	48	156	66	84
LYON	11	12	23	94	65	45	62	107	86	55	71

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County	2005					2001-2005					
	Male	Female	Total Deaths	Crude	Age-Adjusted	Male	Female	Total Deaths	Crude	Age-Adjusted	Ranking
MAHNOMEN	7	13	20	55	44	49	77	126	70	55	68
MARSHALL	1	0	1	20	15	4	5	9	35	22	1
MARTIN	2	2	4	40	23	15	13	28	56	35	9
MCLEOD	8	4	12	57	29	25	32	57	54	27	4
MEEKER	11	10	21	90	61	37	52	89	77	51	55
MILLE LACS	2	16	18	70	50	43	49	92	76	55	69
MORRISON	9	15	24	73	53	50	64	114	70	52	59
MOWER	5	19	24	62	34	55	92	147	76	42	27
MURRAY	2	3	5	56	29	7	21	28	62	32	6
NICOLLET	4	7	11	36	35	27	36	63	41	44	33
NOBLES	10	4	14	68	46	35	31	66	64	40	16
NORMAN	1	3	4	57	27	11	19	30	83	46	38
OLMSTED	19	27	46	34	32	92	147	239	36	37	11
OTTER TAIL	16	34	50	87	47	102	150	252	86	50	51
PENNINGTON	1	7	8	59	43	19	39	58	85	56	73
PINE	9	7	16	56	44	36	35	71	51	43	28
PIPESTONE	4	7	11	117	58	19	41	60	124	58	75
POLK	9	11	20	64	42	68	80	148	96	57	74
POPE	5	6	11	98	51	20	43	63	112	53	64
RAMSEY	104	190	294	59	52	500	863	1,363	54	50	48
RED LAKE	3	1	4	93	65	9	11	20	93	62	79
REDWOOD	4	11	15	94	48	31	47	78	96	49	47
RENVILLE	2	7	9	54	26	30	53	83	99	53	66
RICE	7	16	23	38	38	57	78	135	45	47	43
ROCK	5	8	13	137	76	29	34	63	131	69	85
ROSEAU	2	6	8	48	44	16	27	43	53	44	35
SCOTT	46	76	122	62	41	265	456	721	73	50	50
SHERBURNE	8	13	21	18	37	60	88	148	27	56	72
SIBLEY	8	19	27	33	58	46	97	143	38	63	80
ST. LOUIS	3	9	12	79	47	25	30	55	72	49	46
STEARNS	24	25	49	34	33	117	148	265	39	41	20
STEELE	6	6	12	34	27	39	65	104	60	51	54
STEVENS	1	4	5	51	33	9	24	33	67	42	26
SWIFT	4	9	13	115	46	22	35	57	98	50	53
TODD	5	9	14	57	39	25	41	66	54	41	17
TRAVERSE	0	0	0	0	0	6	7	13	66	27	5
WABASHA	2	9	11	50	36	26	45	71	64	48	44
WADENA	7	10	17	125	66	28	46	74	109	60	77
WASECA	1	6	7	36	28	20	51	71	73	53	65
WASHINGTON	31	37	68	31	49	136	207	343	32	53	61
WATONWAN	5	2	7	62	30	18	27	45	77	43	30
WILKIN	1	4	5	74	51	6	30	36	104	64	82
WINONA	5	18	23	47	37	41	87	128	52	43	29
WRIGHT	15	27	42	38	54	75	124	199	39	55	70
YELLOW MEDICINE	7	8	15	144	69	24	36	60	112	53	60

Map 2. Stroke mortality by county of residence – 2001-2005.

Minnesota rate: 48 deaths per 100,000 population



Appendix C. Heart Disease in Minnesota - At a Glance

Mortality				
		Number of Deaths (2005)	Crude Death Rate per 100,000	Age-Adjusted Death Rate per 100,000
Overall		7,915	154	141
Male	Overall	4,111	161	188
	White	3,968	173	188
	Black	76	61	166
	American Indian	30	92	182
	Asian	23	25	77
	Hispanic	27	27	102
Female	Overall	3,804	147	106
	White	3,721	159	106
	Black	39	34	80
	American Indian	22	67	125
	Asian	18	-	-
	Hispanic	12	-	-
Age	0-34	49	2	-
	35-44	133	17	-
	45-54	422	55	-
	55-64	652	128	-
	65-74	979	323	-
	75-84	2,181	1,004	-
	85+	3,499	3,363	-

Note: Rates for cells with fewer than 20 respondents are not reported, as estimates are unstable.

Source: Minnesota Department of Health

Prevalence of Coronary Heart Disease or Angina		
		Percent
Overall		3.69
Gender	Male	4.74
	Female	2.68
Race/Ethnicity	White	3.55
	Black	-
	Hispanic	-
	Other	-
	Multiracial	-
Age	18-24	-
	25-34	-
	35-44	-
	45-54	-
	55-64	6.2
	65+	14.7
Income	<15,000	7.2
	15,000-24,999	7.5
	25,000-34,999	5.4
	35,000-49,999	3.9
	50,000+	2.2
Education	Less than HS	7.5
	HS or GED	4.7
	Some post HS	3.1
	College graduate	2.8

Note: Rates for cells with fewer than 20 respondents are not reported, as estimates are unstable.

Source: Minnesota Behavioral Risk Factor Surveillance System Survey 2006

Appendix D. Stroke in Minnesota - At a Glance

Mortality				
		Number of Deaths (2005)	Crude Death Rate per 100,000	Age-Adjusted Death Rate per 100,000
Overall		2,372	46	42
Male	Overall	900	35	42
	White	845	37	41
	Black	19	-	-
	American Indian	9	-	-
	Asian	22	24	73
	Hispanic	6	-	-
Female	Overall	1,472	60	41
	White	1,426	61	41
	Black	18	-	-
	American Indian	6	-	-
	Asian	22	23	50
	Hispanic	8	-	-
Age	0-34	15	-	-
	35-44	36	5	-
	45-54	81	11	-
	55-64	106	21	-
	65-74	256	85	-
	75-84	703	324	-
	85+	1,175	1,129	-

Note: Rates for cells with fewer than 20 respondents are not reported, as estimates are unstable.

Source: Minnesota Department of Health

Prevalence of Stroke		
		Percent
Overall		1.89
Gender	Male	1.91
	Female	1.88
Race/Ethnicity	White	1.83
	Black	-
	Hispanic	-
	Other	-
	Multiracial	-
Age	18-24	-
	25-34	-
	35-44	-
	45-54	-
	55-64	2.9
	65+	6.4
Income	<15,000	6.7
	15,000-24,999	3.8
	25,000-34,999	-
	35,000-49,999	-
	50,000+	0.9
Education	Less than HS	5.0
	HS or GED	2.7
	Some post HS	1.4
	College graduate	1.2

Source: Minnesota Behavioral Risk Factor Surveillance System Survey 2006

Note: Rates for cells with fewer than 20 respondents are not reported, as estimates are unstable.

Appendix E. Cardiovascular Disease Risk Factors in Minnesota – At a Glance

		Cigarette Smoking*	Physical Inactivity*	Less than 5 fruits/veggies daily**	High Blood Pressure**	High Blood Cholesterol**	Diabetes*	Overweight or Obese*	Obesity*
Overall		18.3	14.2	75.2	21.9	32.4	5.7	60.9	24.0
Gender	Male	18.4	14.2	80.6	21.7	32.8	6.7	72.0	27.0
	Female	18.2	14.2	70.0	22.0	32.0	4.8	50.3	21.1
Race/Ethnicity	White	17.9	13.6	75.0	22.5	32.6	5.7	61.3	23.7
	Black	23.7	24.9	81.5	-	-	-	66.1	28.2
	Hispanic	-	-	72.1	-	-	-	62.4	32.8
	Other	18.5	14.2	76.6	-	-	-	51.1	-
	Multiracial	-	-	72.3	-	-	-	-	-
Age	18-24	27.4	14.3	74.5	-	-	-	43.9	17.7
	25-34	20.2	9.5	76.4	8.6	15.2	-	60.8	25.3
	35-44	20.8	12.7	81.7	11.8	26.1	-	59.7	22.7
	45-54	20.2	13.1	71.6	19.2	32.9	5.3	65.7	26.0
	55-64	14.9	16.3	74.8	39.1	49.4	11.4	70.9	30.8
	65+	6.0	20.6	71.0	54.4	44.7	14.3	62.9	21.4
Income	<15,000	24.6	22.9	79.2	34.7	42.4	9.3	54.6	24.2
	15,000-24,999	26.8	22.5	71.3	29.3	37.7	10.0	66.2	28.5
	25,000-34,999	24.4	19.4	76.3	28.5	31.2	7.5	62.2	26.6
	35,000-49,999	22.1	15.6	81.9	18.0	32.8	5.5	66.4	29.5
	50,000+	12.9	8.6	73.1	17.6	30.9	4.0	61.7	22.2
Education	Less than HS	32.2	26.2	76.1	27.3	37.1	8.9	64.1	29.2
	HS or GED	26.9	21.0	79.7	27.2	39.0	7.2	62.6	26.9
	Some post HS	20.6	12.6	77.9	22.5	30.6	6.2	63.8	25.7
	College graduate	17.8	8.9	68.9	16.2	29.0	3.9	57.1	19.9

*Current cigarette smoking, physical inactivity, diabetes, overweight, and obesity data are from the 2006 BRFSS Survey.

**Fruits and vegetable consumption, high blood pressure awareness, and high blood cholesterol awareness data are from the 2005 BRFSS Survey.

Note: Rates for cells with fewer than 20 respondents are not reported, as estimates are unstable

Source: Minnesota Behavioral Risk Factor Surveillance System Survey

Appendix F. Data Notes

Mortality

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 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. The single selected cause for tabulation is called the underlying cause of death. The 9th revision of the ICD was used between 1979-1998 and the 10th revision has been in effect since 1999. (Source: CDC, www.cdc.gov/nchs/about/major/dvs/icd10des.htm)

Classifications for Deaths: Cardiovascular Disease

1979-1998 - ICD-9: 390-459
1999-2005 - ICD-10: I00-I99

Heart disease

1979-1998 - ICD-9: 390-398, 402, 404, 410-429
1999-2005 - ICD-10: I00-I09, I11, I13, I20-I51

Stroke

1979-1998 - ICD-9: 430-434, 436-438
1999-2005 - ICD-10: I60-I69

For more information:

MDH: www.health.state.mn.us
CDC: wonder.cdc.gov

Hospitalizations

Data from inpatient hospital admissions are from the Minnesota Department of Health Center for Data Initiatives. These data are provided voluntarily by hospitals to the Minnesota Hospital Association and purchased by the Minnesota Department of Health. In 2005, there were 149 hospitals in Minnesota, including 135 acute care hospitals, 2 Veterans Administration Medical Centers, 2 United States Public Health Service (Indian Health Services) hospitals, and 10 state-owned treatment centers or other specialty hospitals. The data used for these analyses did not include federal hospitals, specialty treatment centers, state institutions, and a handful of acute care hospitals. Between 112 and 126 Minnesota hospitals provided data to this database from 1998-2005. Thus, all hospitalizations and associated charges reported here are underestimates of the true totals. Data on non-Minnesota residents (who were hospitalized in Minnesota) were excluded (6.2% of hospitalizations from this dataset). Data on Minnesota residents hospitalized in North Dakota were included in this dataset.

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

Classifications for Hospitalizations: Cardiovascular Disease (ICD-9: 390-459)

Heart disease (Labeled as "Diseases of the Heart") (ICD-9: 390-398, 402, 404-429)

Coronary Heart disease (ICD-9: 410-414)
Congestive Heart Failure (ICD-9: 428)

Stroke (ICD-9: 430-438)

Hemorrhagic Stroke (ICD-9: 430-431)
Ischemic Stroke (ICD-9: 434, 436)
Transient Ischemic Attack (ICD-9: 435)

Other Cardiovascular Disease (ICD-9: 403, 405, 440-459)

Prevalence of Cardiovascular Disease and Risk Factors

The primary source of statewide data on cardiovascular disease prevalence and risk factors is the Minnesota Behavioral Risk Factor Surveillance System (BRFSS) Survey. 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 several cardiovascular disease-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.

Questions on some risk factors and risk behaviors are not asked every year of the survey. In this report, current cigarette smoking, physical inactivity, diabetes, overweight, and obesity data are from the 2006 BRFSS Survey. Fruits and vegetable consumption, high blood pressure awareness, and high blood cholesterol awareness data are from the 2005 BRFSS Survey.

For more information: www.cdc.gov/brfss

Statewide data on cardiovascular disease risk factors in children and youth come from the Minnesota Student Survey, held every three years. This voluntary written survey includes students in 6th, 9th and 12th grade. This report includes data from the 2004 survey.

For more information: www.education.state.mn.us

Data Notes

1. All crude and age-adjusted mortality rates are reported as rates per 100,000 persons.
2. Tables 2, 3 and 4: Data for estimated adult population estimates were obtained from the United States Census (www.census.gov). Weighted percentage of positive responses was multiplied by the 2005 population estimate of adults ages 18 and older in Minnesota (1,848,573 men, 1,914,556 women).
3. The 2005 Minnesota BRFSS survey included a sample size of 2,829 persons. The 2006 survey included a sample size of 4,254 persons.
4. Tables 8-11: 1991-1995, 1996-2000, and 2001-2005 race/ethnicity mortality rates were calculated by combining all deaths in the five year span, using the middle year population estimate for the denominator in each time period.
5. Figures 5 and 6: 95% confidence limit bars are included to gauge whether or not differences between race/ethnic groups are statistically significant.

Appendix G. Definitions

Age-adjustment A crude death rate (number of deaths divided by population total) is adjusted to account for different age distributions in populations. All mortality rates in this report were adjusted to the U.S. 2000 standard population, in order to be directly comparable to other populations also standardized to this population distribution. These numbers represent rates per 100,000 persons.

Body mass index (BMI) Weight (in kilograms) divided by height (in meters) squared.

Cardiovascular Disease All diseases of the heart and blood vessels, including ischemic heart disease, cerebrovascular disease (stroke), congestive heart failure, hypertensive disease, and atherosclerosis.

Current smoking In adults, having smoked at least 100 cigarettes in one's lifetime and reported smoking every day or some days on the Minnesota Behavioral Risk Factor Surveillance System (BRFSS) survey. In children and youth, ever having smoked at least one cigarette in the past 30 days on the Minnesota Student Survey.

Diabetes Self-reported positive answer to the question, "Have you ever been told by a doctor that you have diabetes?" on the Minnesota (BRFSS) survey.

High blood cholesterol Self-reported 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 BRFSS survey.

High blood pressure Self-reported 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 BRFSS survey.

Obesity Body mass index of 30 kg/m² or greater, based on self-reported height and weight on the Minnesota BRFSS survey.

Overweight or Obese Body mass index of 25 kg/m² or greater, based on self-reported height and weight on the Minnesota BRFSS survey.

Poor diet In adults, calculated variable of fewer than five fruits and vegetables per day, based on the questions, "Not counting juice, how often do you eat fruit?" and "Not counting carrots, potatoes, or salad, how many servings of vegetables do you usually eat?" on the Minnesota Behavioral Risk Factor Surveillance System (BRFSS) survey. In children and youth, percent answering fewer than five to the question, "How many servings of fruits, fruit juices, or vegetables did you eat yesterday?" on the Minnesota Student Survey.

Physical inactivity In adults, self-reported 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?" on the Minnesota BRFSS survey. In children and youth, percent answering fewer than five to the question, "On how many of the last 7 days were you physically active for a combined total of at least 30 minutes?" on the Minnesota Student Survey (2004).

Prevalence Percentage of a population that has a disease or a risk factor at a specified point in time.

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To request copies, please contact the Minnesota Heart Disease and Stroke Prevention Unit, Minnesota Department of Health.

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This report is also available on the web:

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