The Impact of Heart Disease and Stroke in Colorado

Colorado Department
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Acknowledgments

Primary Contributor:

Mario M. Rivera, M.S., Colorado Department of Public Health and Environment

With Thanks to:

- Carsten Baumann, M.A., Colorado Department of Public Health and Environment
- Terry Bryant, M.S., Colorado Department of Public Health and Environment
- Mary Chase, B.A., Colorado Department of Public Health and Environment
- Tessa Crume, M.S.P.H., Colorado Department of Public Health and Environment
- Melissa Francis, B.A. Spalding Rehabilitation Hospital
- Jillian M. Jacobellis, Ph.D., M.S., Division Director, Colorado Department of Public Health and Environment
- Laurie Konsella, M.P.A., Office of Public Health and Science, Office on Women's Health
- Gloria Latimer, M.S.E., Ed.S., Colorado Department of Public Health and Environment
- Matthew P. Malcolm, Ph.D., OTR, Colorado State University
- Wenfang Muhr, M.S., Colorado Department of Public Health and Environment
- Andrea Poniers, M.S.S.W., Colorado Department of Public Health and Environment
- Kendra Price, B.A.,Colorado Department of Public Health and Environment
- Becky Rosenblatt, M.A., Colorado Department of Public Health and Environment
- Don Smith, M.D., Colorado Neurological Institute
- Stephanie Stevens, B.S., Colorado Department of Public Health and Environment
- Kendra Vehik, M.P.H., University of Colorado Health Sciences Center
- Normie Morin Voillequé, Ph.D., M.P.H., Chronic Disease Section Chief, Colorado Department of Public Health and Environment

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Cardiovascular disease is a broad term that includes ischemic heart disease, commonly known as heart attack, stroke, heart failure, hypertensive heart disease, and diseases of the arteries, veins, and circulatory system. Colorado's public health initiative to reduce cardiovascular disease is funded by the Centers for Disease Control and Prevention and follows guidelines set forth for all states. The Prevention Services Division of the Colorado Department of Public Health and Environment (CDPHE) houses the Cardiovascular Disease and Stroke Prevention Program.

Colorado has made a significant impact upon the public health issue of cardiovascular disease (CVD) by realizing a 30 percent reduction in the death rate between 1990 and 2003. This change includes a 68 percent decline in the death rate associated with heart attacks (ischemic heart disease). Progress has been made in lowering the prevalence of risk factors as well. Colorado's smoking rate has decreased to 18.5 percent. Additionally, there has been a reduction in the prevalence of high blood pressure and physical inactivity to 19.8 percent and 16.8 percent, respectively.

While this is significant progress, the mortality, morbidity, and economic costs associated with cardiovascular disease remain a major concern for public health. Cardiovascular disease continues to be the number one killer of Colorado residents, accounting for 32 percent of all adult deaths during 2002. There has been little change in the death rate associated with stroke. The number of hospitalizations for which CVD is the primary diagnosis exceeds 44,000 per year, based on annual averages from 1998 to 2002. Additionally, the cost associated with the treatment of cardiovascular disease has increased by 45 percent since 1990.

Risk factors associated with CVD need consistent attention. Although Colorado has a low obesity rate in comparison to the nation as a whole, the trend in the prevalence of obesity is increasing rather than decreasing. Diabetes prevalence has also increased and will continue to as long as weights (BMI) increase. Health disparities continue to exist among different groups in relation to cardiovascular disease and its associated risk factors.

This report details the many aspects associated with cardiovascular disease and its related risk factors within Colorado. In 2002, the Cardiovascular Health Coalition was established to enhance the CDPHE's ability to address the issues associated with cardiovascular disease in Colorado. The coalition remains a strong and vital part of the CDPHE's efforts to reduce cardiovascular disease.

The Colorado Department of Public Health and Environment encourages you to use this information in your efforts to identify high-risk target populations, promote positive behavior changes, and treat cardiovascular diseases. For more information about the Cardiovascular Disease and Stroke Prevention Program, please contact:

Gloria Latimer, Program Manager
Cardiovascular Disease and Stroke Prevention Program
Colorado Department of Public Health and Environment
Gloria.Latimer@state.co.us, phone 303-692-2562

Overview of Findings

Death Rates in Colorado:

- Cardiovascular disease was the leading cause of death in Colorado during 2002 despite a 30 percent decline in the age-adjusted death rates in the past thirteen years.

- Ischemic heart disease and stroke accounted for 45 percent and 20 percent of all cardiovascular deaths respectively. Although the death rate due to ischemic heart disease has decreased since 1990, the rate of death due to stroke has shown little change.

- Blacks have consistently had higher death rates than other racial and ethnic groups for cardiovascular disease, including ischemic heart disease and stroke.

- Death rates due to cardiovascular disease have declined more for men (38 percent) than for women (25 percent) between 1990 and 2003.

Hospitalization for CVD in Colorado:

- Between 1998 and 2002, cardiovascular disease accounted for more than a quarter of all hospitalizations of men ages 55-84 and about 20 percent of all hospitalizations for women ages 65 and over.

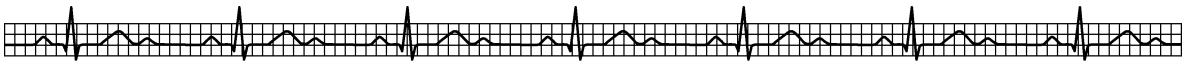
- The cost of hospitalizations due to cardiovascular disease is very high and is rising. The total cost for all hospitalizations for which cardiovascular disease was the primary diagnosis was over $700 million in 1993 and rose to more than $1.3 billion in 2002, an 87 percent increase.

Prevalence of Modifiable Risk Factors in Colorado:

- The prevalence of modifiable risk factors including inadequate nutrition, high cholesterol, obesity, and diabetes has increased (worsened) in the past eight years, while the prevalence of high blood pressure, current smokers, and physical inactivity decreased (improved).

- Blacks were highest in prevalence of high blood pressure, diabetes, overweight, and inadequate nutrition. Whites had the highest prevalence of high cholesterol, Hispanics had the highest prevalence of physical inactivity, and 'Other' had the highest prevalence of current smokers.

- Males had a higher prevalence of six of the seven risk factors including high blood pressure, high cholesterol, current smokers, diabetes, obesity and overweight, and inadequate nutrition. Females had a higher prevalence of physical inactivity.



Prevalence of Modifiable Risk Factors in Colorado Compared to the U.S.:

- The prevalence of high cholesterol and inadequate nutrition in Colorado is nearly equal to the prevalence of these risk factors in the U.S. For both Colorado and the U.S., the prevalence of high cholesterol and inadequate nutrition increased from 1995 to 2003.

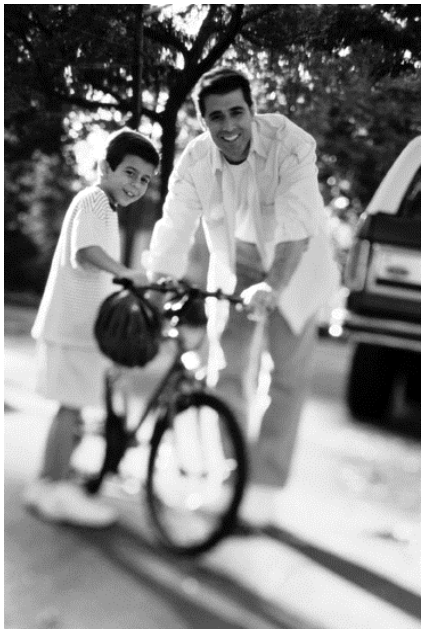
- Coloradans have a lower prevalence of high blood pressure compared to the U.S. Between 1995 and 2003, the overall trend in Colorado fluctuated while the trend in the U.S. has been rising.

- The prevalence of current smokers is lower in Colorado than the U.S. In addition, the percentage of current smokers decreased more in Colorado than the U.S.

- The trends in the prevalence of diabetes have been increasing in both Colorado and the U.S. although diabetes is lower in Colorado than in the U.S.

- Coloradans have a lower prevalence of obesity compared to the U.S. although trends in the prevalence of obesity have been increasing for both Colorado and the U.S. The prevalence of overweight in Colorado is slightly lower than the U.S.

- The prevalence of physical inactivity is lower in Colorado compared to the U.S. The trends are decreasing for both Colorado and the U.S.



Methods

Mortality
Mortality data are compiled from information reported on the Certificate of Death, which are filed with the Health Statistics Section at the Colorado Department of Public Health and Environment. National data are available from the National Vital Statistics System, which contains data compiled by the Centers for Disease Control and Prevention's National Center for Health Statistics.

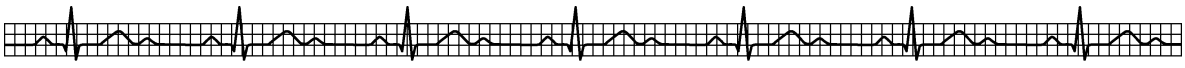
Rates are deaths per 100,000 population. Age-adjusted rates are adjusted to the 2000 U.S. standard population using the direct method applied to 10-year age groups. Using the direct method, the age-specific rate for each group is multiplied by the portion of the U.S. standard population within that age group. The resulting numbers are summed, yielding an age-adjusted rate. Age-adjusted rates allow for comparisons of rates in different populations and between different time periods.

Morbidity
Hospitalizations provide one method to measure the morbidity associated with cardiovascular disease. The Colorado Health and Hospital Association compiles hospital discharge records regarding demographic, diagnostic, procedural, payment, and length-of-stay information on all inpatient admissions.

Modifiable Risk Factors
The Behavioral Risk Factor Surveillance System (BRFSS) was used to report on seven modifiable risk factors for cardiovascular disease. The BRFSS is an ongoing state-based, random-digit-dialed telephone survey of the U.S. non-institutionalized civilian population. Respondents include persons age 18 years and older. The specific BRFSS modules included in this report are hypertension awareness, fruits and vegetables, and cholesterol awareness. These data were collected every other year from 1995 to 2003 plus 2002. Also included were the exercise module (collected during 1996, 1998, and 2000 through 2003), tobacco use, diabetes, and demographics including height and weight data used to calculate overweight/obesity (collected from 1995 to 2003). Reporting includes state comparisons to the U.S., trends in the prevalence of risk factors, and data by race/ethnicity, gender, and age group. Please note that due to overall sample size, some data by race/ethnicity may be based on fewer than fifty cases.

The BRFSS defines the risk factors as follows:

- High Blood Pressure: Persons who were told by a doctor, nurse, or other health professional that they have high blood pressure.
- High Cholesterol: Persons who were told by a doctor, nurse, or other health professional that their blood cholesterol was high.
- Tobacco Use: Persons who have ever smoked at least 100 cigarettes (5 packs) in their lifetime and currently smoke everyday or some days.
- Diabetes: Persons that have ever been told by a doctor that they have diabetes.
- Overweight/Obesity: Persons with a Body Mass Index (BMI) between 25.0 and 29.9 for overweight and 30.0 or more for obese.



- Physical Inactivity: Persons who have not participated in any physical activities (such as running, calisthenics, golf, gardening, or walking for exercise) in the past month.
- Inadequate Nutrition: Persons who consume fewer than five servings of fruits and vegetables per day.

Report Organization

Sections of the report are formatted similarly so that risk factor data are quick and easy to find. The outline is:

- Colorado and U.S. Data Comparisons;
- Colorado Trends Over Time from 1995 to 2003; and
- Health Disparities:
  - Age-Adjusted Prevalence of Risk Factors by Race
  - Prevalence of Risk Factors by Gender and Age

Race/Ethnicity

Mortality data are reported using five categories to define race/ethnicity whereas the BRFSS data use four categories. Both include the following:

- White- includes non-Hispanic White;
- Black- includes non-Hispanic Black or African American; and
- Hispanic- includes Hispanic or Latino.

Mortality data also includes Asian and American Indian while the BRFSS data includes 'Other' (comprised of Asian, Native Hawaiian or Other Pacific Islander, American Indian, Alaska Native, and Other).

Useful Definitions

Age-Adjusted Rate- a rate that has been standardized to the age distribution of a particular population so that it is, in effect, independent of the age distribution it represents. Age-adjusted rates are used to compare rates over time or among different geographical areas or among different groups based on race or gender.

Cardiovascular Disease (CVD)- may refer to any of the disorders that can affect the circulatory system, but often means coronary heart disease, heart failure, and stroke, taken together.

Health Disparities- differences in the burden and impact of disease among different populations such as by sex, race or ethnicity, education or income.

Healthy People 2010- a document published by the U.S. Department of Health and Human Services that serves as a health promotion and disease prevention agenda for the nation.

Modifiable Risk Factors- factors related to CVD risks that are amenable to change (e.g. diet, physical activity, smoking), in contrast to those risk factors that are intrinsic to the individual (e.g. age, sex, race, genetic traits).

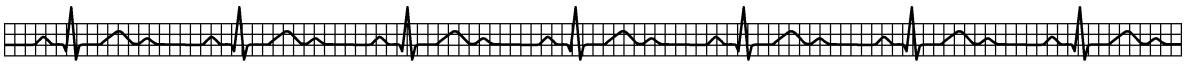
Morbidity- numbers of people living with a particular disease within a population.

Mortality Rate- the ratio of the total number of deaths to a total population during a specific time period.

Prevalence- the percentage of a population that has a disease or a risk factor at a specific point in time.

Rate- the number of some event, disease, or condition in relation to a unit of population (i.e. per 100,000 persons in Colorado).

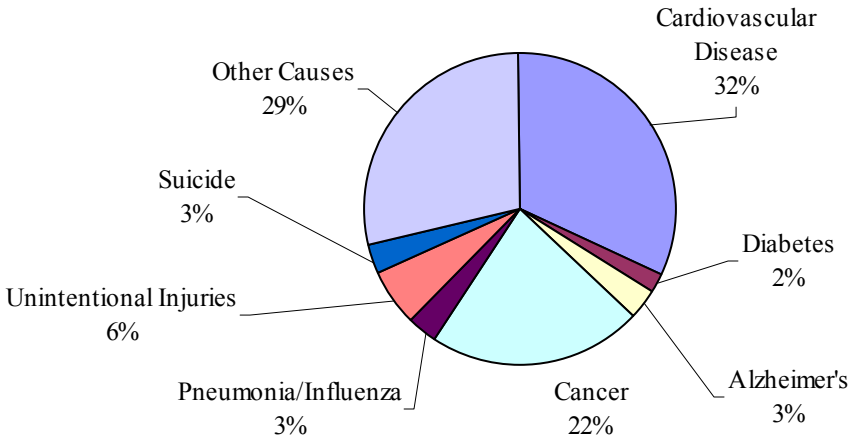
Risk Factor- factors whose presence is associated with an increased probability that disease will develop later.



Deaths

Cardiovascular disease (CVD) is the number one killer of Americans. Despite a 30 percent decline in the age-adjusted death rates in the past 13 years, cardiovascular disease was the leading cause of death in Colorado during 2002. CVD claimed the lives of 9,325 Coloradans[i] and accounted for 32 percent of all deaths (Figure 1). On average, one person in Colorado dies every hour due to cardiovascular disease.

Figure 1: Leading Causes of Death Among Colorado Residents, 2002



Source: CDPHE, Vital Statistics Section, 2004

Table 1 presents the ranking of Colorado's top causes of death. The top five causes of death in Colorado correspond to the U.S. rankings; however, the age-adjusted death rate for heart disease is notably lower for Colorado compared to the U.S.

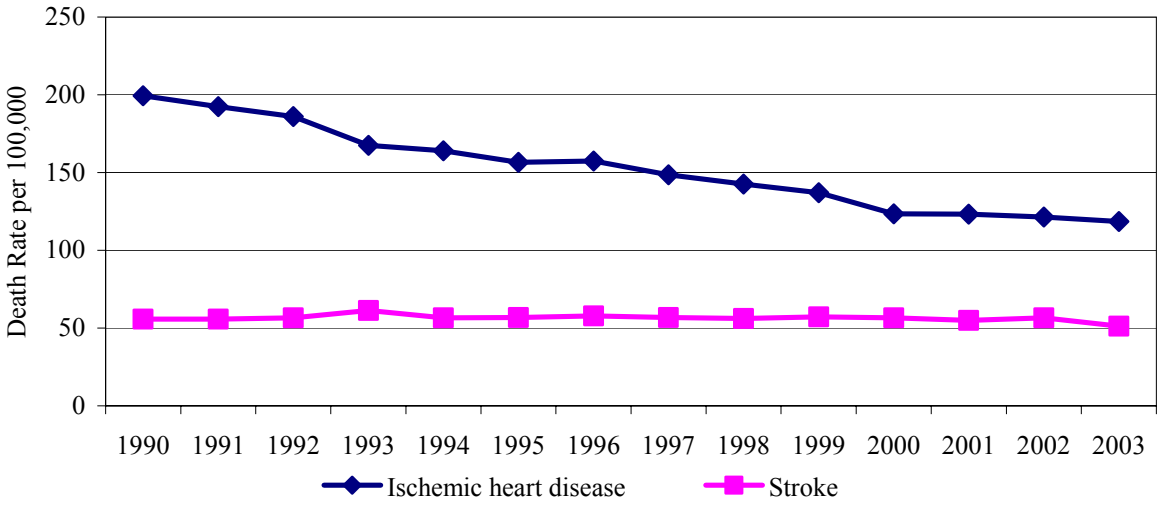
Table 1: Top Causes of Death

Cause of Death-Colorado Rankings	2002 CO Deaths	2002 CO Age-Adjusted Rate	2001 U.S. Age-Adjusted Rate	US Rank
1. Heart Disease	6,403	184.9	247.8	1
2. Cancer	6,372	175.0	196.0	2
3. Stroke	1,907	56.5	57.9	3
4. Chronic Lower Respiratory Disease	1,847	53.7	43.7	4
5. Unintentional Injuries	1,803	43.0	35.7	5
6. Alzheimer's Disease	953	29.6	19.1	8
7. Pneumonia, Influenza	748	22.2	22.0	7
8. Suicide	724	16.1	10.7	11
9. Diabetes	657	18.1	25.3	6
10. Atherosclerosis	503	15.5	5.0	-

Sources: CDPHE, Vital Statistics Section, 2004; CDC NCHS, National Vital Statistics, 2004

Cardiovascular disease is a broad term that includes ischemic heart disease (commonly known as heart attack), stroke, heart failure, hypertensive heart disease, and diseases of the arteries, veins and circulatory system. The two major causes of death among the many diagnoses categorized as cardiovascular disease are ischemic heart disease and stroke, accounting for 45 percent and 20 percent of all cardiovascular deaths respectively. Although the death rate due to ischemic heart disease has decreased in Colorado since 1990, the rate of death due to stroke has shown little change (Figure 2). In 1990, the death rate due to ischemic heart disease was 199.4 compared to a rate of 118.6 in 2003. By contrast, the death rate due to stroke was 55.8 in 1990 and was 51.3 in 2003.

Figure 2: Age-adjusted Ischemic Heart Disease and Stroke Death Rates, Colorado Residents, 1990-2003

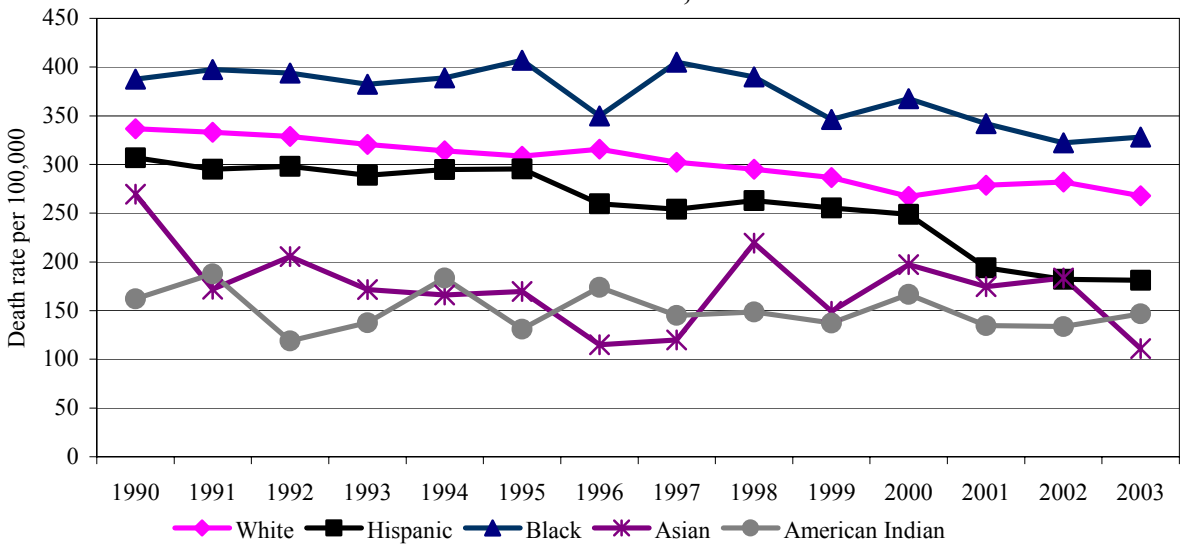


Source: CDPHE, Vital Statistics Section, 2004

Race/Ethnicity

Figure 3 shows the age-adjusted cardiovascular disease death rates by race and ethnicity from 1990-2003. Blacks have consistently had higher rates than other racial and ethnic groups. In 2003, the death rate was 328.3 for Blacks. During the same year, the rate for Whites was 267.7, for Hispanics the rate was 181.2, for American Indians the rate was 146.6, and for Asians the rate was 110.8. The rates for Whites, Blacks, and Hispanics have followed a similar pattern of gradual decline over the 13-year period. Although the rates for Asians and American Indians have been the lowest, these show more fluctuation since they were based on smaller numbers.

Figure 3: Age-adjusted Cardiovascular Disease Death Rates by Race, Colorado Residents, 1900-2003

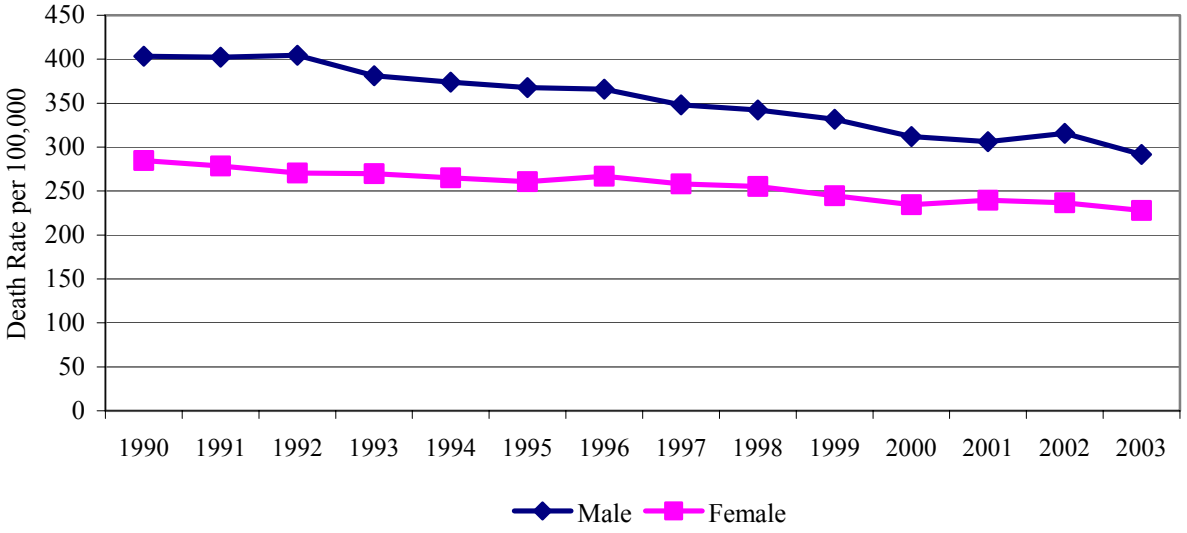


Source: CDPHE, Vital Statistics Section, 2004

Gender

Declines in cardiovascular disease death rates have been seen for both men and women over the past several years, although rates for men declined more (38 percent) than rates for women (25 percent) between 1990 and 2003 (Figure 4). During 1990, the death rate for males was 403.3 while the death rate in 2003 was 291.6. The death rate for women in 1990 was 284.8 compared to 227.8 in 2003. Because Colorado's population has grown rapidly during this time (1990-2003) and the population is aging, the actual number of deaths during the last 13 years has increased. The total number of deaths increased from 3,864 to 4,297 for males and from 4,239 to 4,931 for females.

Figure 4: Age-adjusted Death Rates for Cardiovascular Disease by Gender, Colorado Residents, 1990-2003

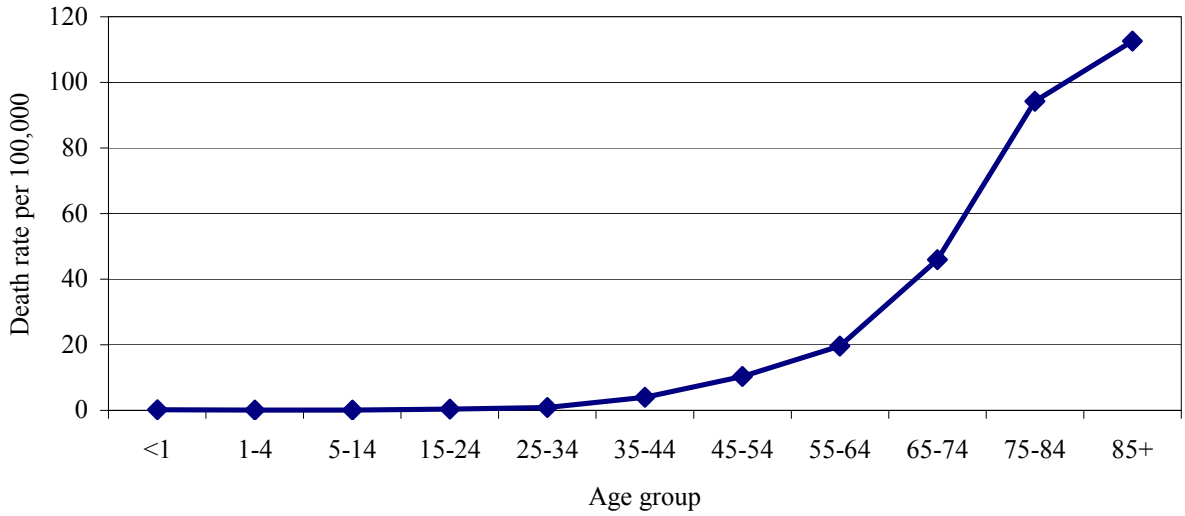


Source: CDPHE, Vital Statistics Section, 2004

Age

The death rate due to cardiovascular disease by age group shows an expected pattern in Colorado. Figure 5 demonstrates that rates begin to increase for those ages 45 to 54 (10.3) and those ages 55 to 64 (19.6). Death rates increased dramatically for those ages 65 to 74 (46.0). There were more dramatic increases for ages 75 to 84 (94.2) and 85 years plus (112.6).

Figure 5: Cardiovascular Disease Death Rates by Age Group, Colorado Residents, 1993-2003 (combined)

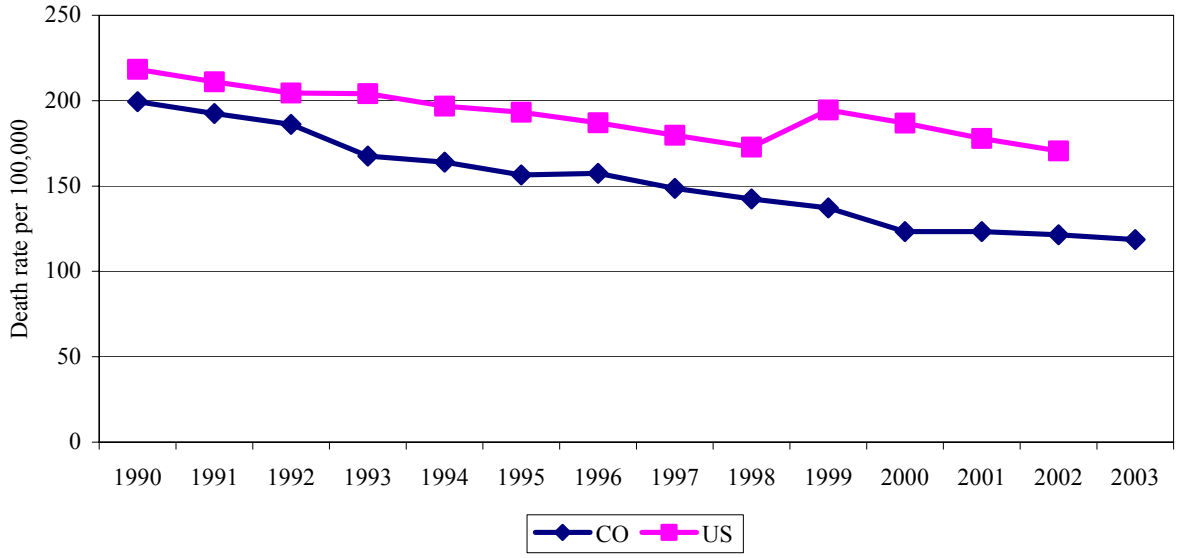


Source: CDPHE, Vital Statistics Section, 2004

Heart Disease

The trends in the age-adjusted death rates due to ischemic heart disease have been declining in Colorado and in the U.S. (Figure 6). Between 1990 and 2003, the death rate in Colorado decreased from 199.4 to 118.6, a decrease of 68 percent. Although death rates decreased between 1990 and 2003, the actual numbers of heart disease related deaths increased because of increases in the number of Coloradans.

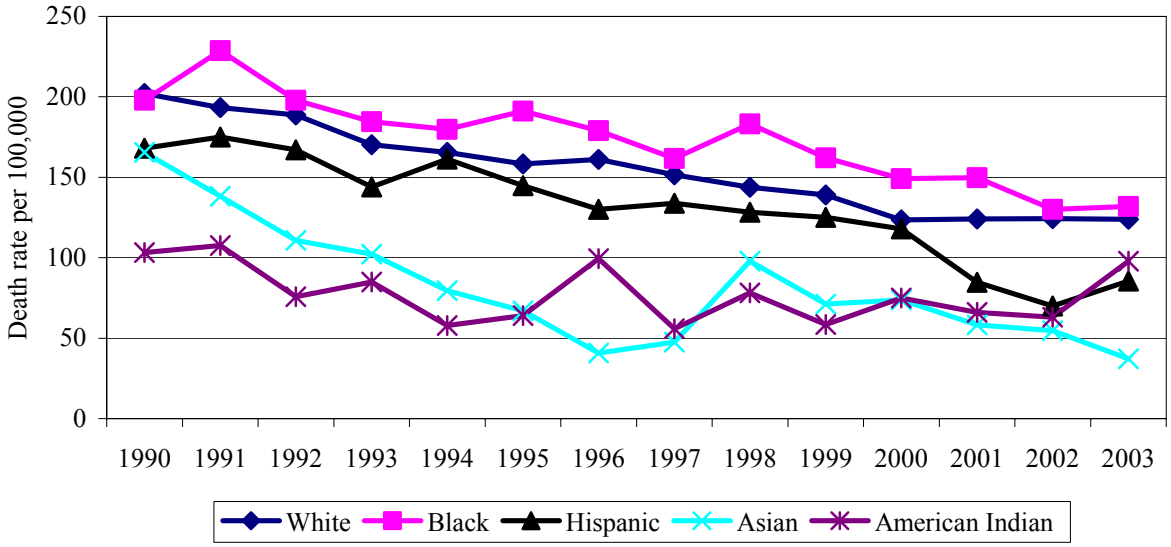
Figure 6: Trends in Heart Disease, Colorado and U.S., 1990-2003



Sources: CDPHE, Vital Statistics Section, 2004; CDC NCHS, National Vital Statistics, 2004

Figure 7 shows the age-adjusted death rates by race and ethnicity from 1990-2003. Blacks have consistently had higher death rates than other racial and ethnic groups. In 2003, the death rate for Blacks was 131.8, compared to 124.0 for Whites, 97.8 for American Indians, 85.6 for Hispanics, and 37.1 for Asians. The rates for Whites, Blacks, and Hispanics have declined over the 13-year period. Rates for Asians and American Indians have been the lowest but show more fluctuation due to smaller numbers.

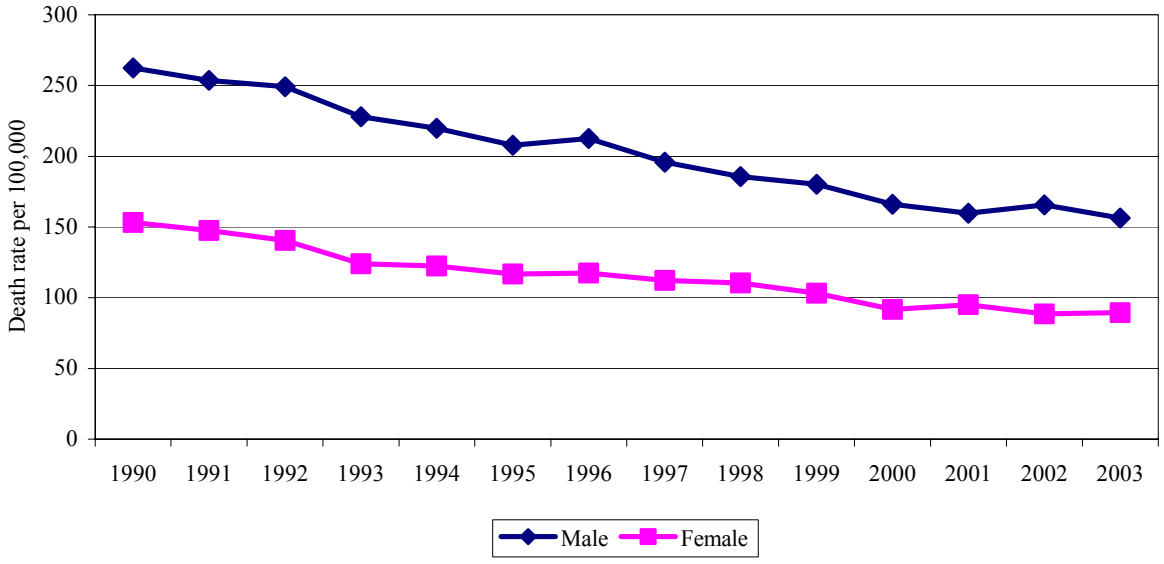
Figure 7: Trends in Heart Disease by Race, Colorado, 1990 - 2003



Source: CDPHE, Vital Statistics Section, 2004

Age-adjusted death rates for both males and females declined between 1990 and 2003. For males, the rate decreased from 262.4 to 156.4. For females, the rate decreased from 153.1 to 89.5 (Figure 8).

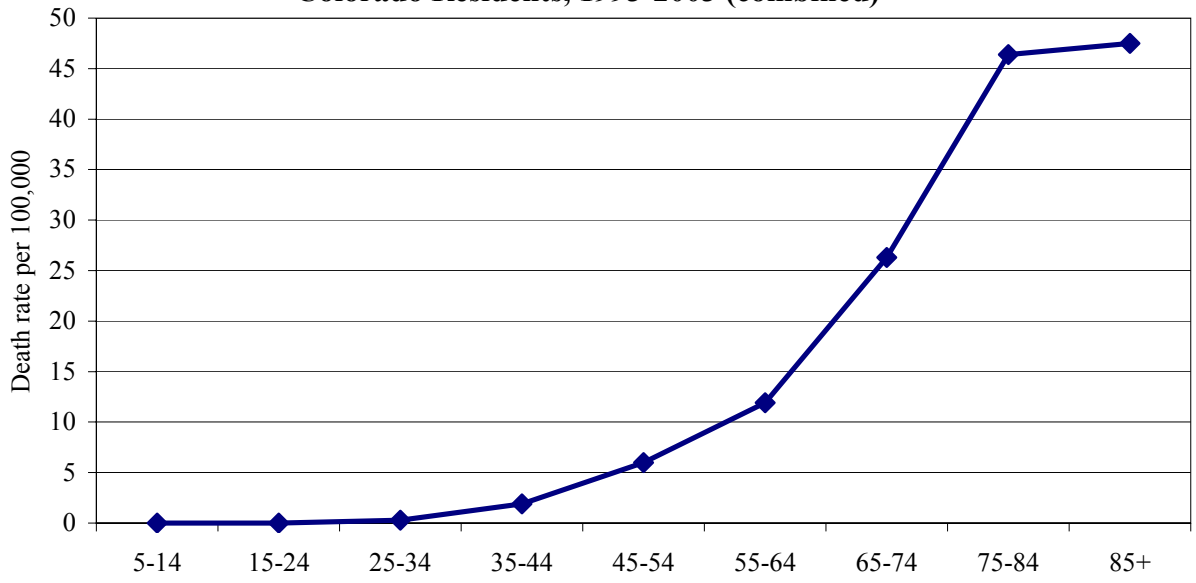
Figure 8: Trends in Heart Disease by Gender, Colorado, 1990-2003



Source: CDPHE, Vital Statistics Section, 2004

The age-adjusted death rate due to heart disease by age group is presented in Figure 9. Death rates increase dramatically for those ages 65 to 74 (26.3) and even more dramatic increases occur for those ages 75 to 84 (46.4) and 85 years plus (47.5).

Figure 9: Heart Disease Death Rates by Age Group, Colorado Residents, 1993-2003 (combined)

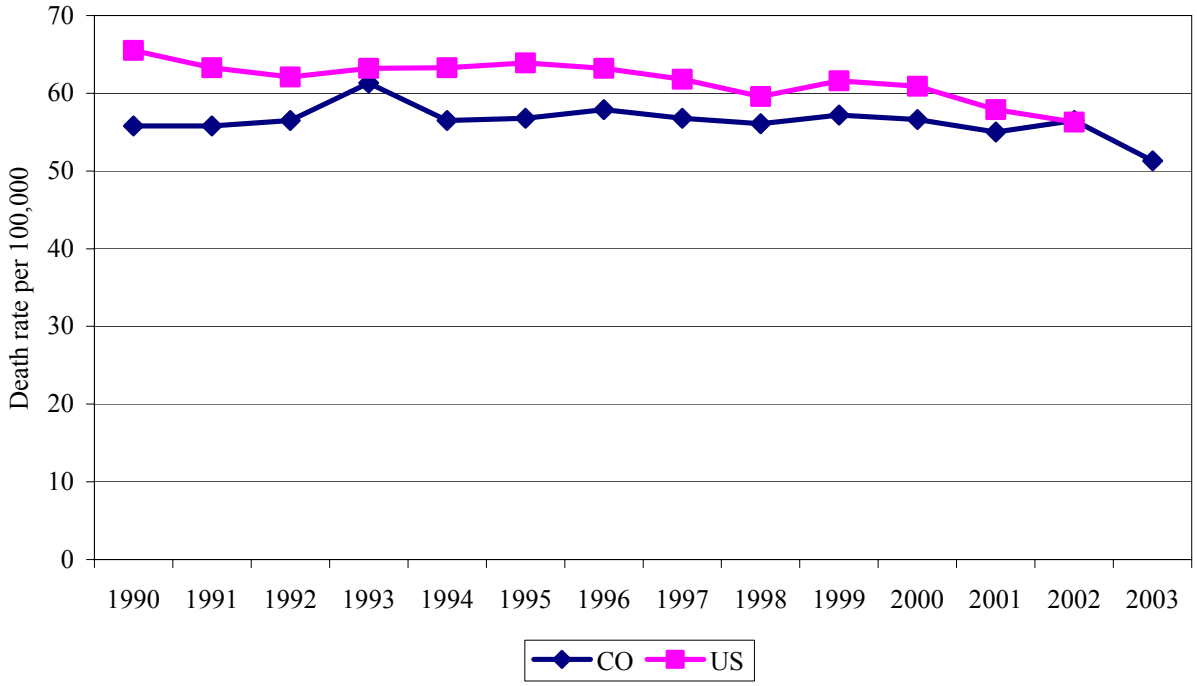


Source: CDPHE, Vital Statistics Section, 2004

Stroke

The trends in age-adjusted death rates due to stroke have shown little change in Colorado in the last decade (Figure 10). In the U.S., the rates decreased from 65.5 to 56.3 between 1990 and 2002, while the death rate in Colorado increased slightly from 55.8 to 56.5 during the same time period. However, in 2003, the rate in Colorado decreased to 51.3.

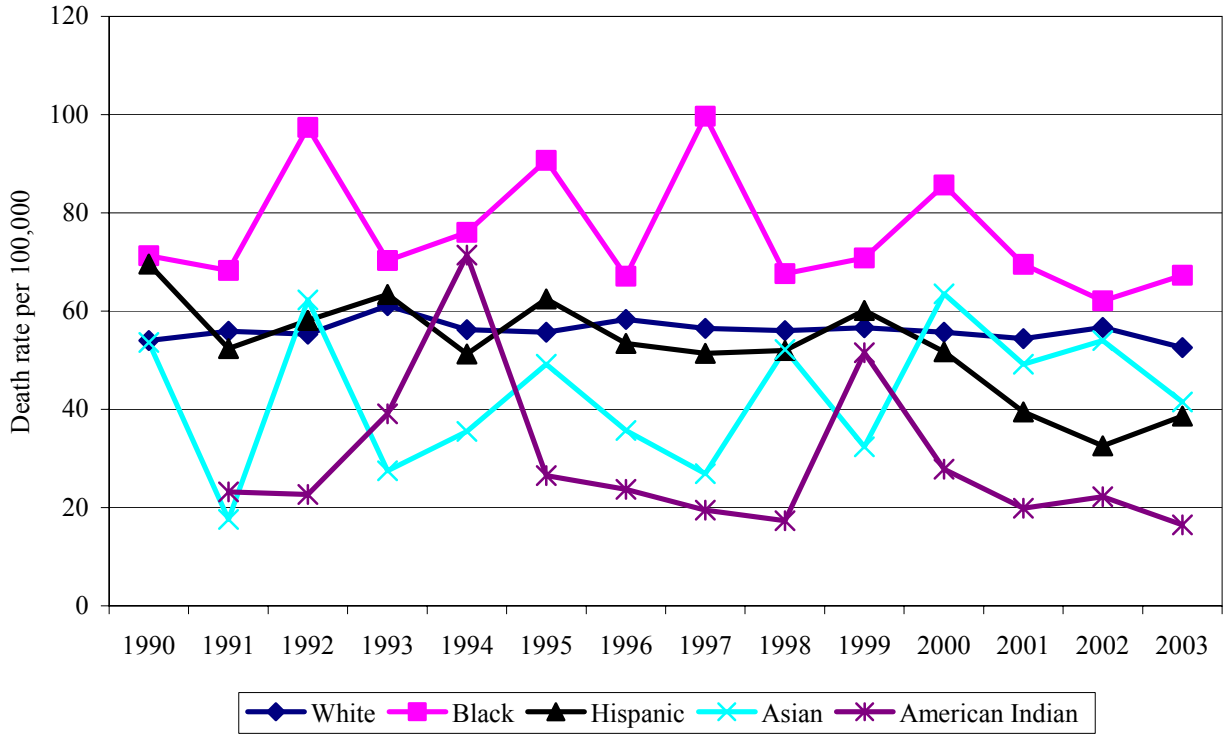
Figure 10: Trends in Stroke, Colorado and U.S., 1990-2003



Sources: CDPHE, Vital Statistics Section, 2004; CDC NCHS, National Vital Statistics, 2004

The age-adjusted death rates due to stroke by race and ethnicity from 1990-2003 are presented in Figure 11. Blacks have consistently had higher death rates than other racial and ethnic groups. Rates for Blacks, Asians, and American Indians show more fluctuation due to smaller numbers. In 2003, the rate for Blacks was 67.3 while the rate was 52.6 for Whites, 41.5 for Asians, 38.6 for Hispanics, and 16.5 for American Indians.

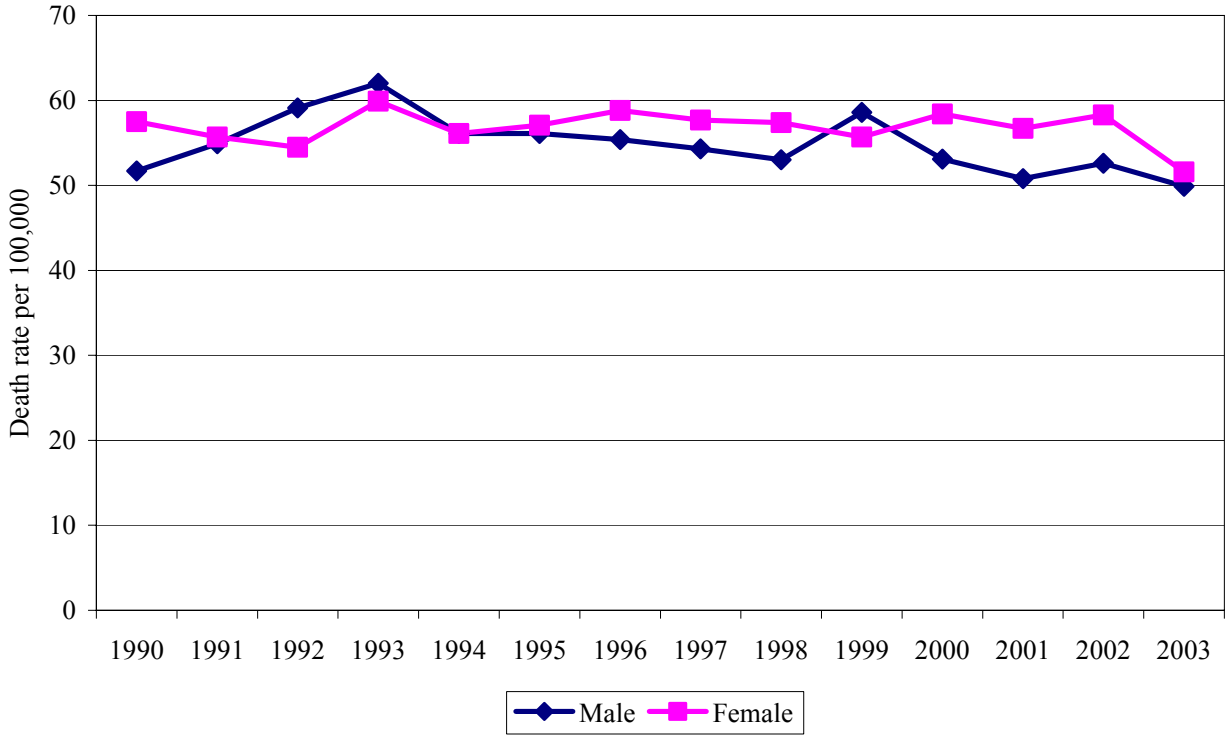
Figure 11: Trends in Stroke by Race, Colorado, 1990 - 2003



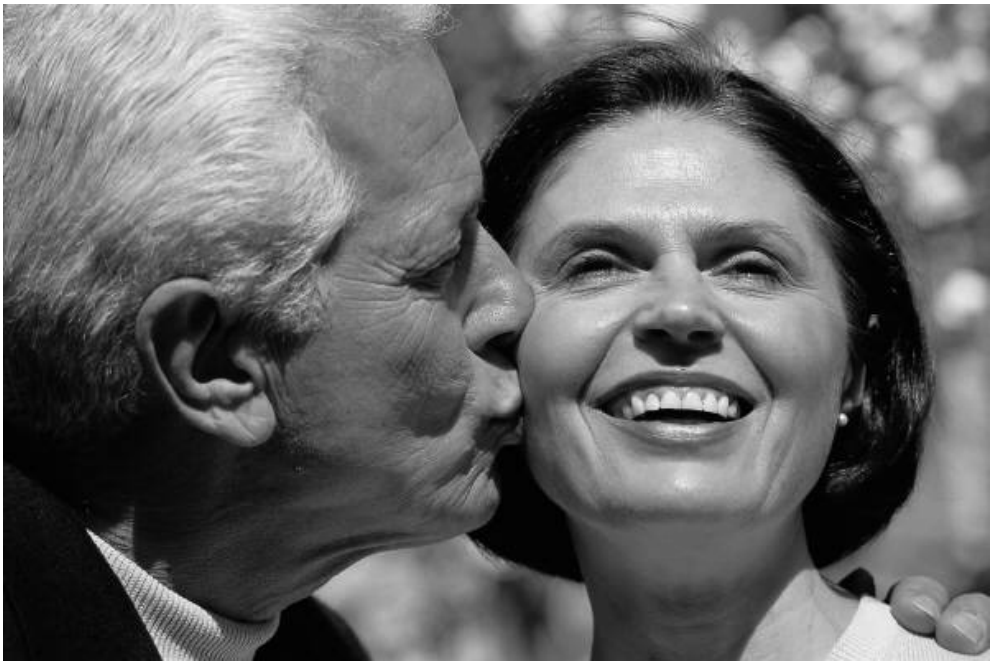
Source: CDPHE, Vital Statistics Section, 2004

The age-adjusted death rates for stroke have remained stable in both men and women during 1990-2003 (Figure 12). In 2003, the rate for males was 49.9 while the rate for females was 51.6. Since women live longer than men on average, the total number of stroke deaths in women (1,116) exceeded that in men (690) during 2003.

Figure 12: Trends in Stroke by Gender, Colorado, 1990-2003

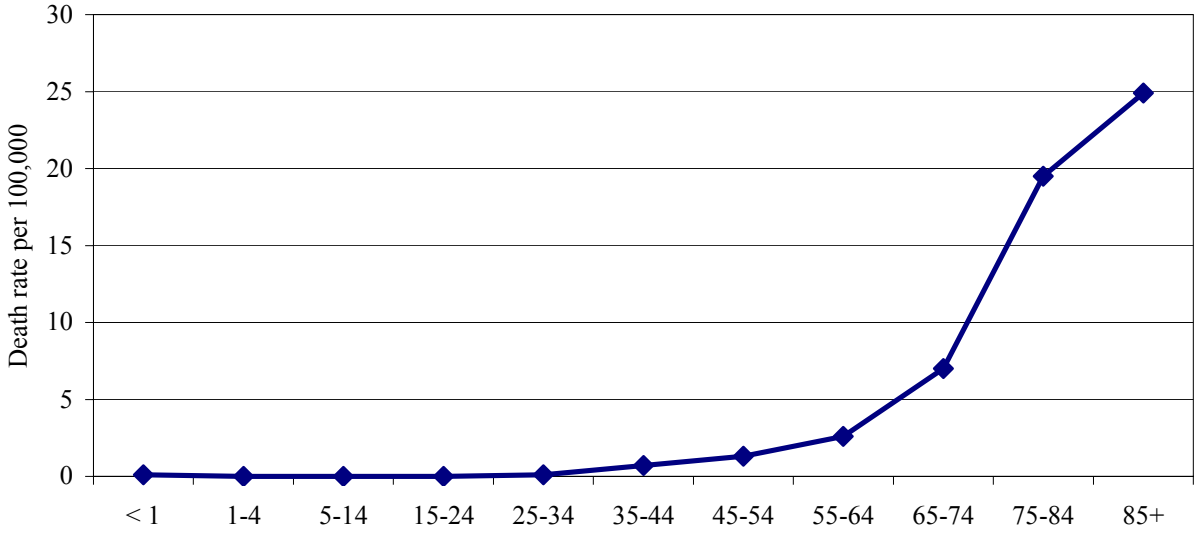


Source: CDPHE, Vital Statistics Section, 2004



The age-adjusted death rates due to stroke by age group are presented in Figure 13. Death rates increase dramatically for those ages 65 to 74 (7.0) and even more dramatic increases occur for those ages 75 to 84 (19.5) and 85 years plus (24.9).

Figure 13: Stroke Death Rates by Age Group, Colorado Residents, 1993-2003 (combined)

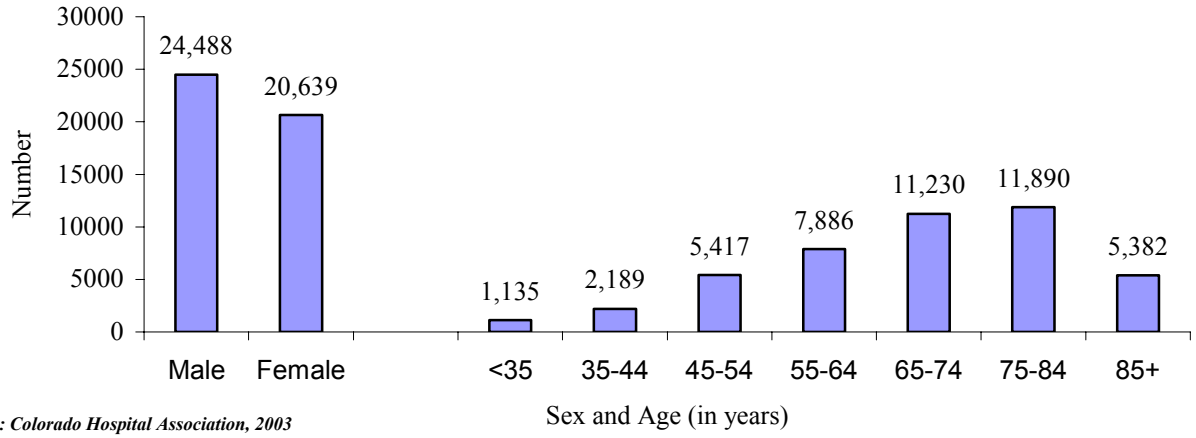


Source: CDPHE, Vital Statistics Section, 2004

Illness from Cardiovascular Disease

Hospitalizations[ii] for cardiovascular disease provide a measure of the morbidity burden of cardiovascular disease. As shown in Figure 14, from 1998-2002, there was an average of more than 24,000 hospitalizations for men and over 20,000 hospitalizations for women each year in Colorado for which cardiovascular disease was the primary diagnosis. Paralleling death rate trends, hospitalizations associated with CVD increased with age, peaking for 75-84 year olds.

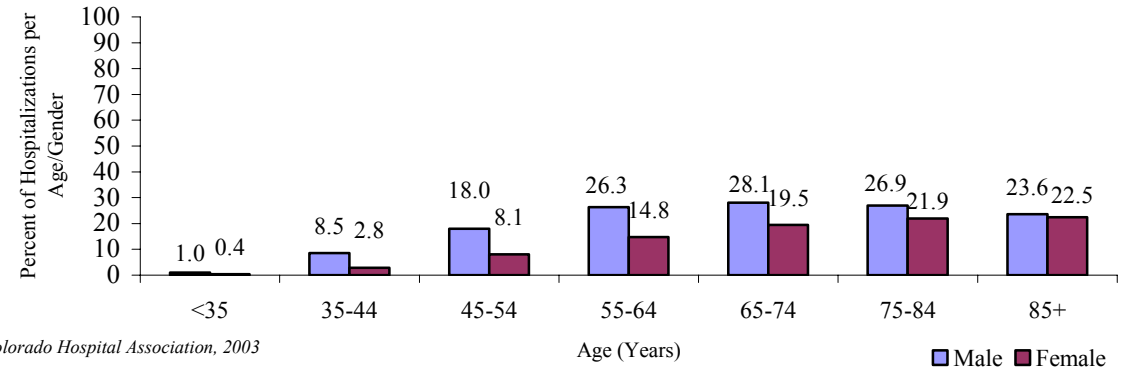
Figure 14: Number of Hospital Discharge Records with Major CVD as Primary Diagnosis by Sex and Age Group: Colorado Residents, Annual Average, 1998-2002



Source: Colorado Hospital Association, 2003

Between 1998 and 2002, cardiovascular disease accounted for nearly 20 percent of all hospitalizations of men ages 45-54, and more than a quarter of all hospitalizations of men ages 55-84 each year in Colorado (Figure 15). Around 20 percent of all hospitalizations for women ages 65 and over were due to cardiovascular disease. While rates for women are considerably lower than the rates for men in the younger age groups, that difference virtually disappears in the oldest group.

Figure 15: Percent of All Hospital Discharge Records that Listed Major CVD as Primary Diagnosis by Sex and Age Group, Colorado Residents, Annual Average 1998-2002

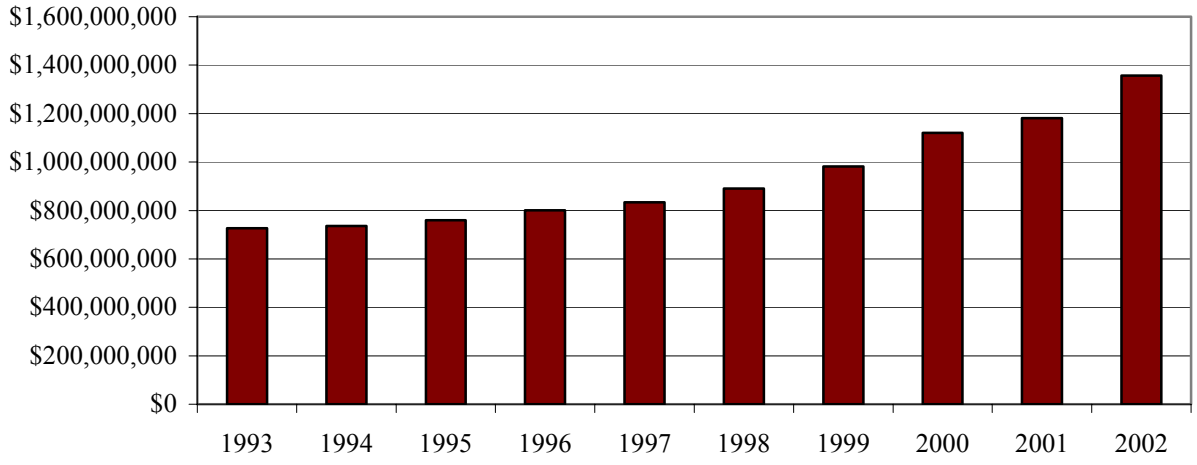


Source: Colorado Hospital Association, 2003

The Cost of Heart Disease and Stroke

The cost of hospitalizations due to cardiovascular disease is very high and is rising. As shown in Figure 16, the total cost for all hospitalizations for which cardiovascular disease was the primary diagnosis was over $700 million in 1993 and rose to more than $1.3 billion in 2002, an 87 percent increase. Adjusted for inflation, these costs demonstrate a true increase in the large economic burden of cardiovascular disease.

Figure 16: Total Cost* for All Hospital Discharges that Listed Major CVD as Primary Diagnosis by Year, Colorado Residents, 1993-2002



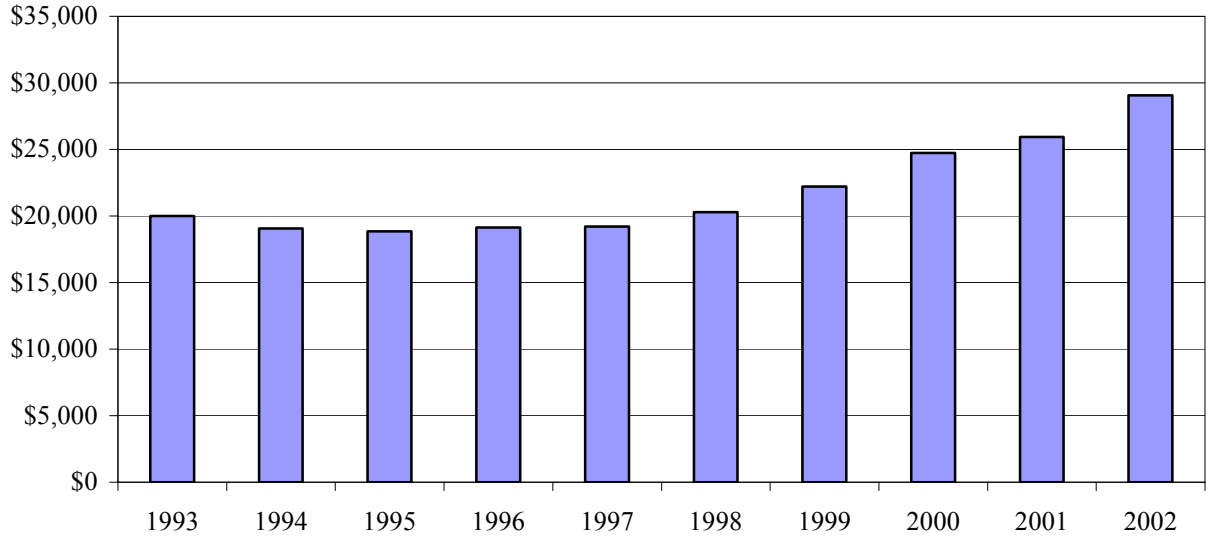
**Adjusted for inflation by converting to 2002 dollars.*
Source: Colorado Hospital Association, 2003

Not included in hospitalization costs are many other costs attributable to cardiovascular disease for which a dollar value is not available. These costs include:

- Hospital care for people with existing cardiovascular disease whose primary diagnosis upon entering the hospital was something other than cardiovascular disease;
- Prehospital expenses and care;
- Emergency department care not resulting in a hospital stay;
- Cardiac rehabilitation;
- Long-term care for those permanently disabled by cardiovascular disease;
- Outpatient treatment and medication for cardiovascular disease;
- Lost productivity; and
- Years of potential life lost.

The rise in the economic burden of cardiovascular disease can be explained by the combination of the increase in the absolute number of cardiovascular disease events and the increase in the cost to hospitalize patients with cardiovascular disease as a primary diagnosis. The cost per hospitalization for cardiovascular disease in Colorado rose from about $20,000 in 1993 to $29,000 in 2002, a 45 percent increase in the cost per case over the past 10 years (Figure 17).

Figure 17: Average Cost* per Hospitalization for All Hospital Discharges that Listed Major CVD as Primary Diagnosis by Year, Colorado Residents, 1993-2002



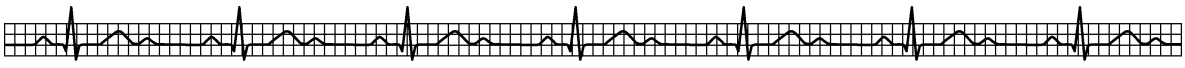
Adjusted for inflation by converting to 2002 dollars.
Source: Colorado Hospital Association, 2003

Modifiable Risk Factors

Risk factors for heart disease and stroke have been well established for many years. Non-modifiable risk factors include advancing age, family history, gender, and genetic determinants. Key modifiable risk factors associated with cardiovascular disease include high blood pressure, high blood cholesterol, smoking, and diabetes. Behaviors that contribute to the development of these risk factors, partly by causing obesity, include physical inactivity and inadequate nutrition.[iii] Screening for high blood pressure and high blood cholesterol is an important step to identify individuals whose risk factors may be undiagnosed and who may benefit from dietary and pharmacological therapy. These interventions, coupled with other lifestyle changes such as stopping smoking, increasing physical activity, and improving nutrition, can be even more effective in lowering the risk of cardiovascular disease (*Healthy People 2010*). The modifiable risk factors are summarized below.

- High Blood Pressure- is a major risk for heart attack and the most important risk factor for stroke.
- Cholesterol- high total cholesterol, LDL cholesterol and triglyceride levels, and low levels of HDL cholesterol increase risk of coronary heart disease and stroke.
- Tobacco Use- increases risk of cardiovascular disease, especially in people who start at an early age and in heavy smokers. Breathing second-hand smoke is an additional risk.
- Diabetes- is a major risk for coronary heart disease and stroke.
- Obesity- is a major risk for coronary heart disease and stroke.
- Physical Inactivity- increases the risk of heart disease and stroke by 50 percent.
- Inadequate Nutrition (or low fruit and vegetable consumption)- by not consuming five servings of fruits and vegetables every day, an opportunity to lower the risk of ischemic stroke by 30 percent is missed.[iv]

Many of the cardiovascular disease risk factors demonstrate disparities within different populations. Interventions addressing specific risk factors can be designed to target different high-risk groups in Colorado. Additionally, it is important to address risk factors early on among children and adolescents so the risks do not persist over time and increase the incidence of cardiovascular disease.



Of the 7 modifiable CVD risk factors in this report, poor diet habits (from not eating enough fruits and vegetables) had the highest prevalence among Coloradans in 2003. Table 2 presents each of the risk factors along with the prevalence of each during 1995 and 2003. Four of the 7 risk factors (inadequate nutrition, high cholesterol, obesity, and diabetes) were worse in 2003 compared to 1995. Three of the risk factors (high blood pressure, current smokers, and physical inactivity) improved during the same time periods.

Table 2: Estimated Prevalence of Modifiable Risk Factors

RISK FACTOR	Percent in 1995	Percent in 2003	Change
Inadequate Nutrition	73.8%	75.8%	worsened
High Cholesterol	27.9%	31.9%	worsened
High Blood Pressure	21.5%	19.8%	improved
Current Smokers	21.8%	18.5%	improved
Physical Inactivity	20.2%	16.8%	improved
Obesity	10.1%	16.0%	worsened
Diabetes	3.5%	4.7%	worsened

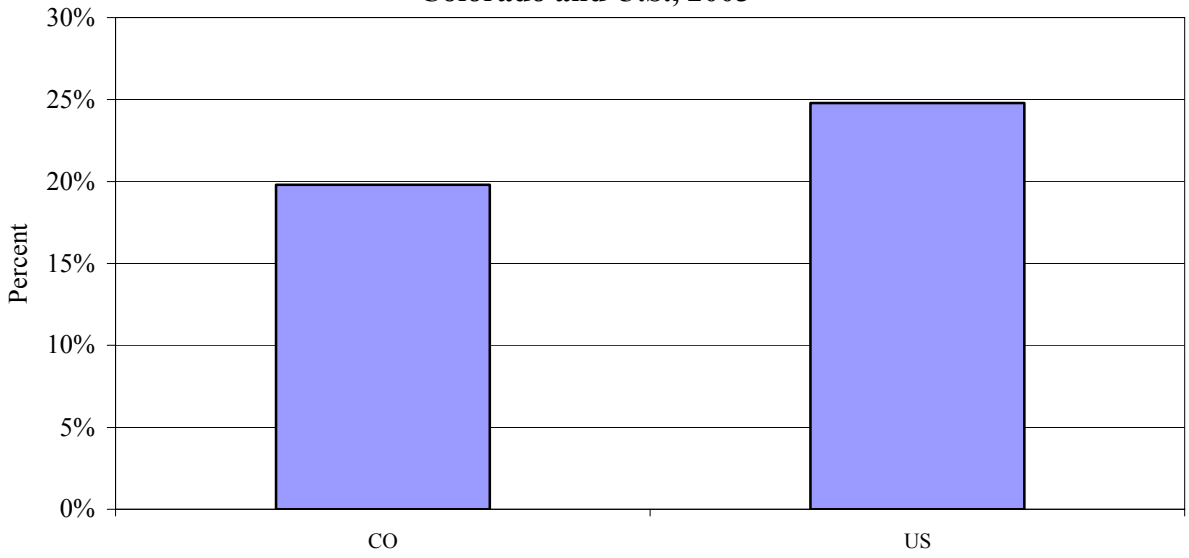
Source: CO BRFSS, 2004

High Blood Pressure

High blood pressure increases the heart's workload, causing the heart to enlarge and weaken over time, thereby increasing the risk of cardiovascular disease. High blood pressure is defined as a measurement greater than 140/90 mm Hg. Furthermore, revised blood pressure guidelines include a new category of persons at risk for high blood pressure by classifying people with a systolic blood pressure of 120-139 and/or a diastolic pressure of 80-89 as "prehypertensive."[v] In Colorado, this means that there are hundreds of thousands of adults who need to be made aware of the importance of blood pressure screening to identify prehypertension and ways to reduce their risk for cardiovascular disease before complications arise.

Coloradans have a lower prevalence of high blood pressure than the U.S. (Figure 18). In 2003, 19.8 percent of Colorado adults aged 18 and older reported that they had been told by a doctor, nurse or other health professional that they have high blood pressure compared to 24.8% in the U.S.

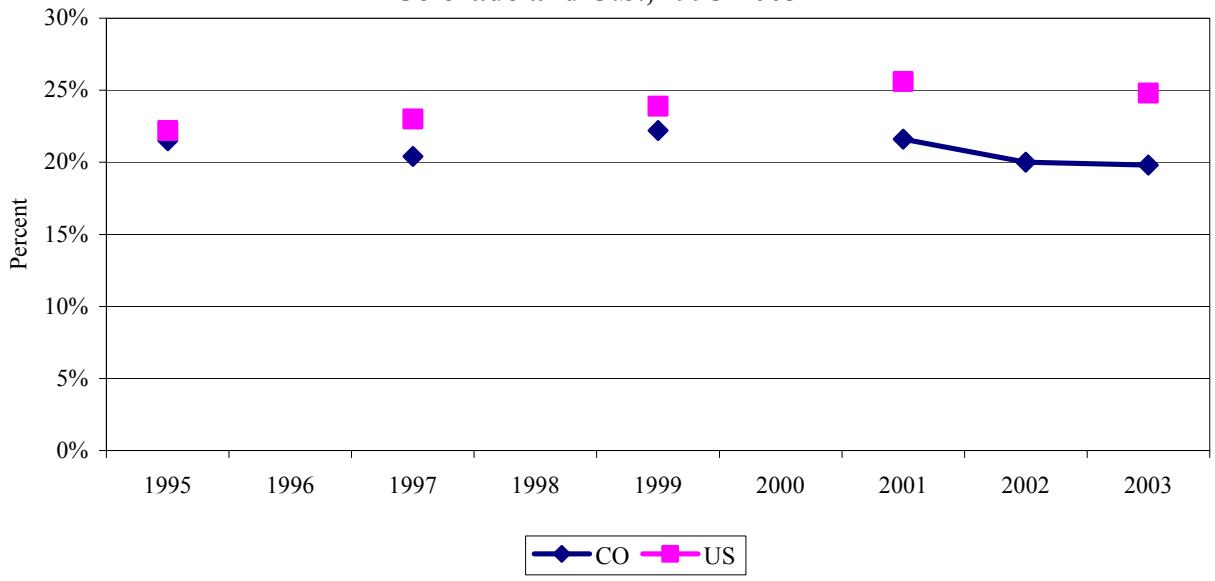
Figure 18: Prevalence of High Blood Pressure, Colorado and U.S., 2003



Sources: CO BRFSS, 2004; CDC BRFSS, 2004

There was a reduction in the prevalence of high blood pressure in Colorado and the U.S. between 2001 and 2003 (Figure 19). The overall trend continues to rise in the U.S. while the overall trend in Colorado has fluctuated.

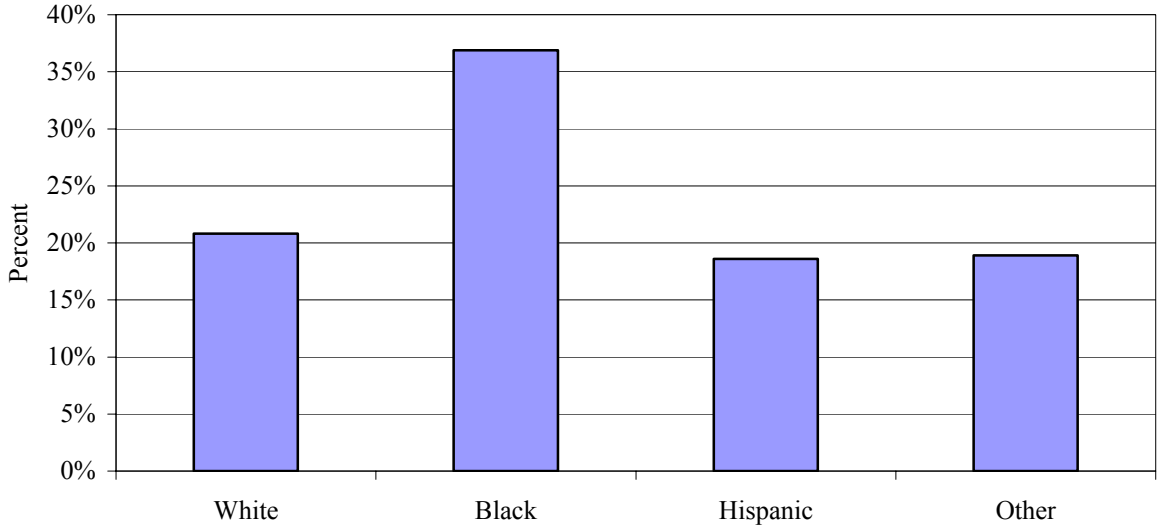
Figure 19: Trends in Prevalence of High Blood Pressure, Colorado and U.S., 1995-2003



Sources: CO BRFSS, 2004; CDC BRFSS, 2004

The prevalence of high blood pressure by race (Figure 20) indicates that Blacks had the highest prevalence (36.9%) of high blood pressure in 2003. Hispanics were less likely than Whites to have been told that they had high blood pressure (18.6 percent versus 20.8 percent, respectively). BRFSS data on health care coverage by race indicate that Hispanics are less likely to have a regular source of health care than Whites. Therefore, they may be unaware of their high blood pressure and this may explain the low prevalence of high blood pressure among Hispanics in Colorado.

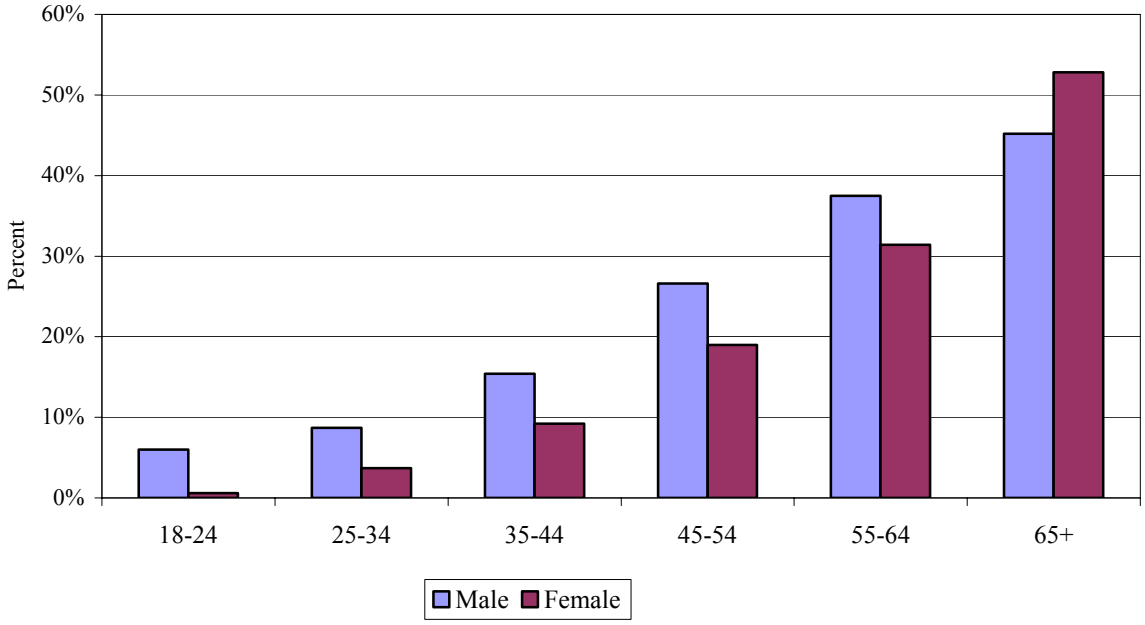
Figure 20: Age-adjusted Prevalence of High Blood Pressure by Race, Colorado, 2003



Source: CO BRFSS, 2004

High blood pressure increased with age for both genders (Figure 21). More males than females had high blood pressure in each age group except for ages 65 and older. Whereas less than 10 percent of those under age 35 had been told that they had high blood pressure, 45.2 percent of males and 52.8 percent of females age 65 and older had received that information.

Figure 21: Prevalence of High Blood Pressure by Gender and Age, Colorado, 2003



Source: CO BRFSS, 2004

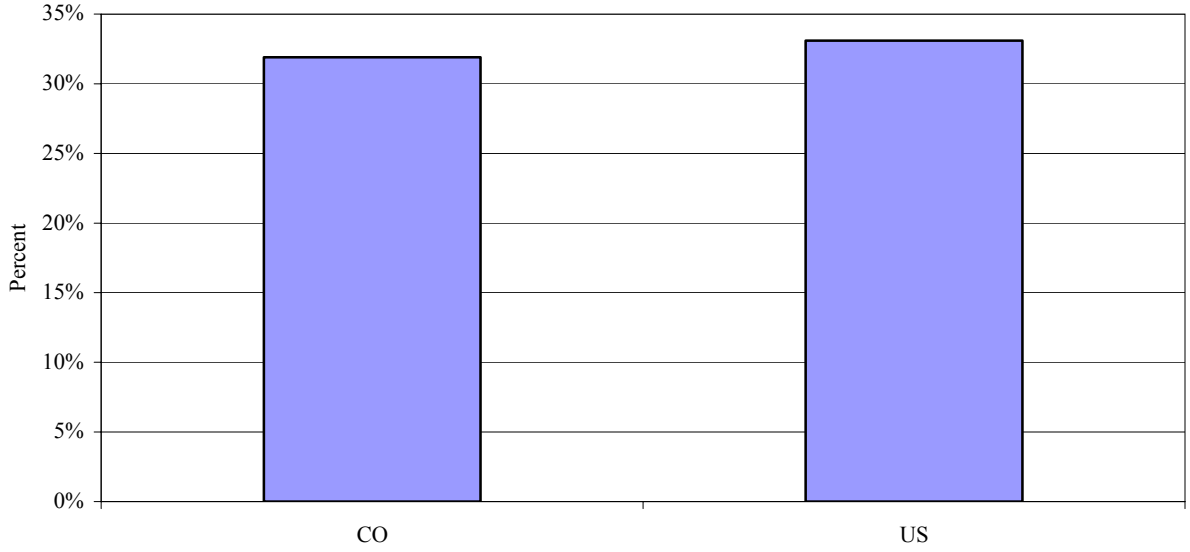
High Cholesterol

A direct link has been demonstrated between high blood cholesterol and cardiovascular disease. Total blood cholesterol is the most common measurement of blood cholesterol. High total blood cholesterol is defined as more than 240 milligrams. Borderline high is between 200 milligrams and 239 milligrams.[vi]

While measuring total blood cholesterol level is crucial for determining risk, it is equally important to determine HDL (high density lipoprotein) or "good" cholesterol level; LDL (low density lipoprotein) cholesterol, sometimes called "bad" cholesterol; and triglyceride level. Physicians use this information to determine the appropriate treatment for patients.[vii] Since the BRFSS does not ask questions regarding HDL, LDL, or triglyceride levels, only total cholesterol prevalence data are reported.

The prevalence of high cholesterol is slightly lower in Colorado compared to the U.S. (Figure 22). In 2003, 31.9 percent of Colorado adults reported that they had been told they had high blood cholesterol at some point in their lives. In the U.S., a slightly higher percentage (33.1%) were told that they had high cholesterol.

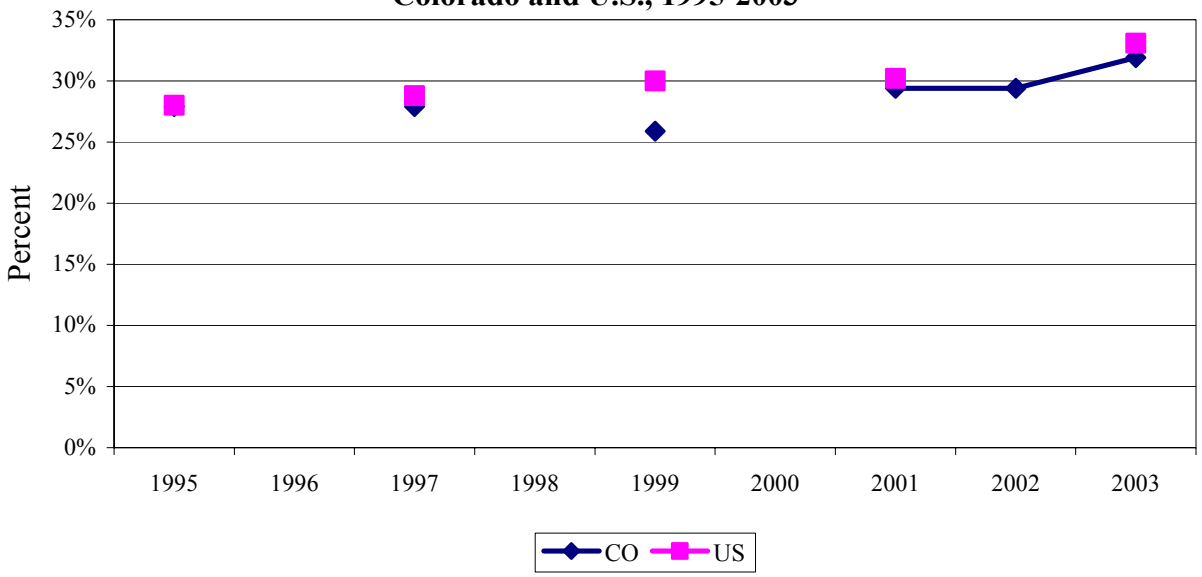
Figure 22: Prevalence of High Cholesterol, Colorado and U.S., 2003



Sources: CO BRFSS, 2004; CDC BRFSS, 2004

In Colorado and for the U.S., the prevalence of high cholesterol has increased from 1995 to 2003 (Figure 23). During this time, prevalence in the U.S. has increased from 28.0 to 33.1 percent, while prevalence in Colorado has increased from 27.9 to 31.9 percent.

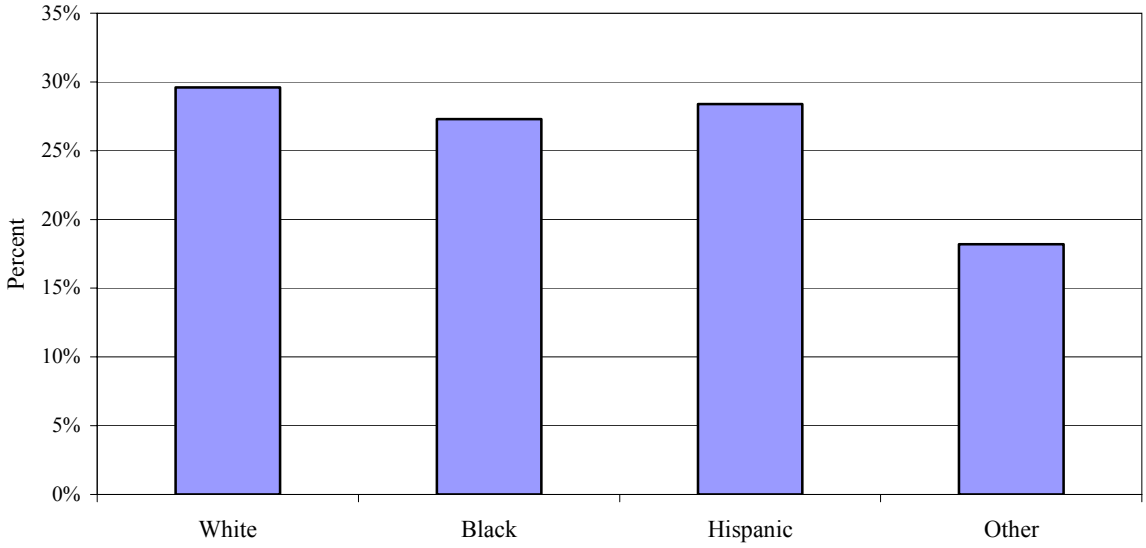
Figure 23: Trend in Prevalence of High Cholesterol, Colorado and U.S., 1995-2003



Sources: CO BRFSS, 2004; CDC BRFSS, 2004

The prevalence of high cholesterol by race (Figure 24) indicates that Whites had the highest percentage of high cholesterol at 29.6 percent, followed by Hispanics at 28.4 percent. The percent for Blacks was 27.3, and the percentage for 'Other' was 18.2. The percentages for Blacks, Hispanics, and Other have a greater margin of error due to a smaller sample size.

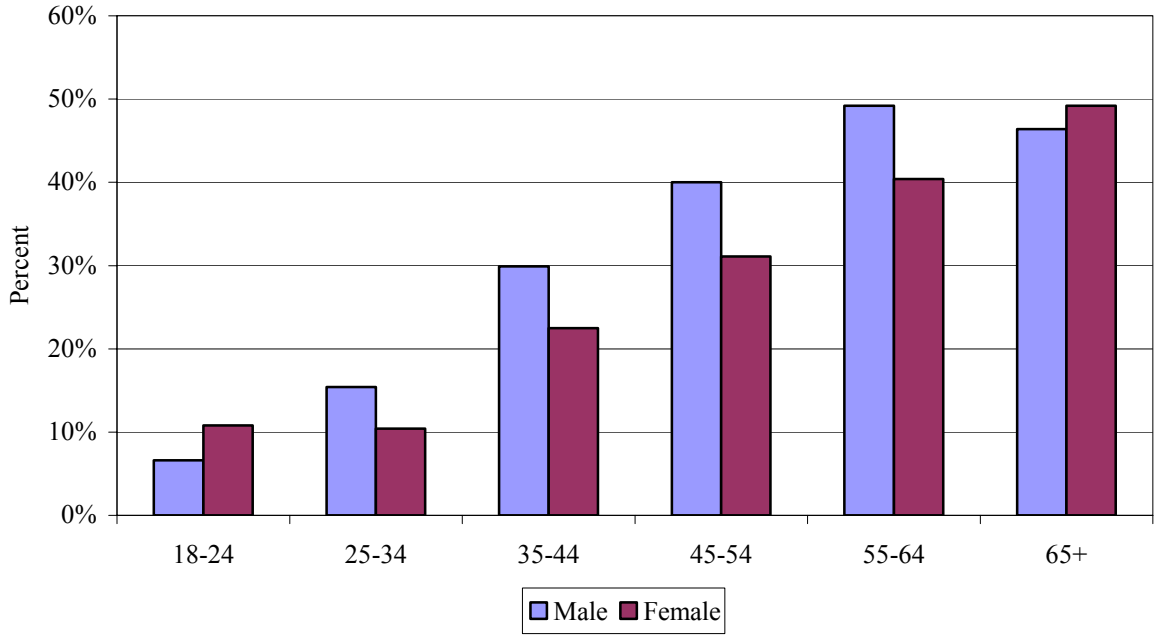
Figure 24: Age-adjusted Prevalence of High Cholesterol by Race, Colorado, 2003



Source: CO BRFSS, 2004

Overall, men were more likely than women to have been told they had high cholesterol. As Figure 25 indicates, the prevalence of high cholesterol increases with age. While less than 16 percent of those under age 35 had been told they had high blood cholesterol, 49.2 percent of males and 40.4 percent of females between the ages of 55 and 64 had high cholesterol. Additionally, of those age 65 and older, 46.4 percent of males and 49.2 percent of females have high cholesterol.

Figure 25: Age-adjusted Prevalence of High Cholesterol by Gender and Age, Colorado, 2003



Source: CO BRFSS, 2004

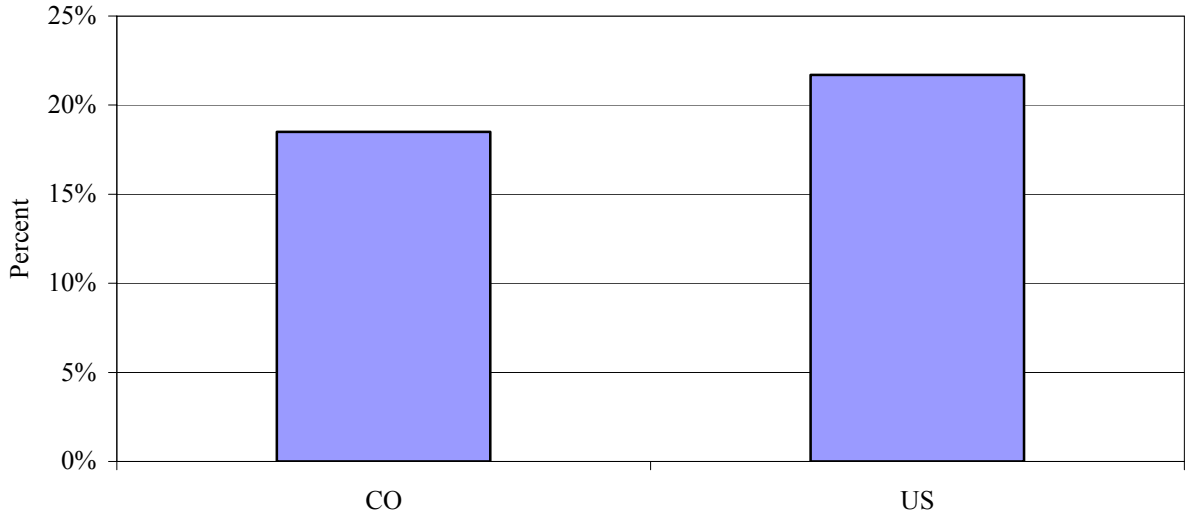
Tobacco use

The U.S. Surgeon General has identified smoking as the most important of the modifiable risk factors for cardiovascular disease.[viii] Toxins in the blood from smoking cigarettes contribute to the development of atherosclerosis, a progressive hardening of the arteries caused by the deposit of fatty plaques and the scarring and thickening of the artery wall. Inflammation of the artery wall and the development of blood clots can obstruct blood flow and cause heart attacks or strokes.[ix] As noted in *Healthy People 2010*, people who quit smoking before age 50 years have half the risk of dying in the next 15 years, compared with people who continue to smoke.

The vast majority (82 percent) of current adult smokers began smoking in their teen years. In 2001, 27 percent of Colorado adolescents reported smoking cigarettes on one or more of the past 30 days.[x] Female teens were slightly more likely to smoke than males, and prevalence of smoking increased with grade level.

The prevalence of current smokers is lower in Colorado than in the U.S. (Figure 26). The percentage of Coloradans adults aged 18 and older who reported being current smokers in 2003 was 18.5 percent. In the U.S. the percentage was 21.7 during the same time period.

Figure 26: Prevalence of Current Smokers, Colorado and U.S., 2003



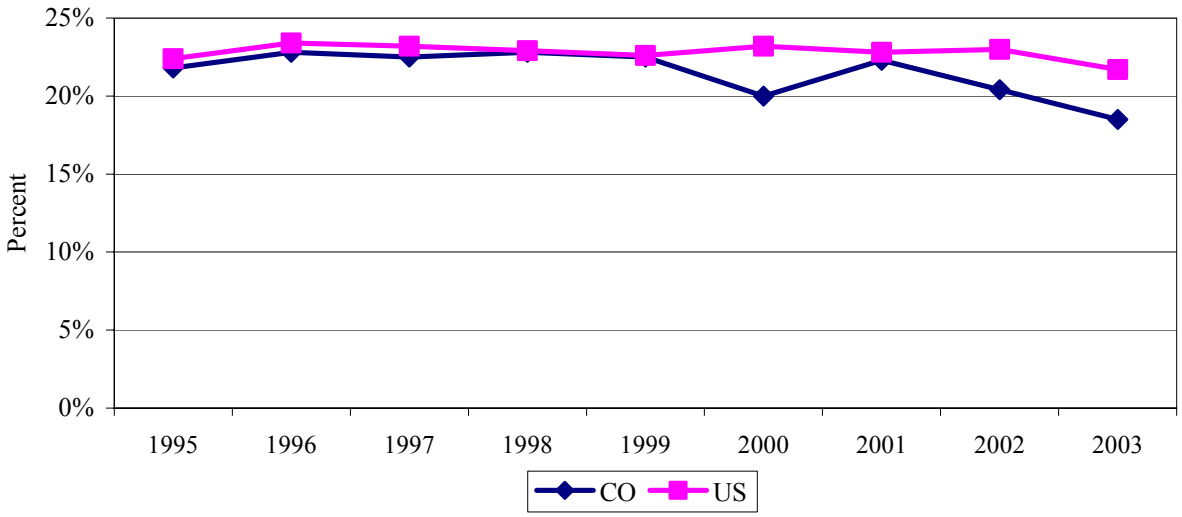
Sources: CO BRFSS, 2004; CDC BRFSS, 2004

Current smoking is decreasing more quickly in Colorado than in the U.S. (Figure 27). From 1995 to 2003, Colorado experienced a decrease of 3.3 percentage points compared to the decrease in the U.S. of 0.7 percentage points.

The decrease in Colorado is due, at least in part, to free counseling services provided by the state through QuitNet (an internet-based service designed to help tobacco users to quit) and Quitline (a toll-free telephone counseling service that connects people who want to quit smoking with trained counselors). QuitNet has had a total of 436,275 visits since its inception in December

2001 through December 2004. During this time, QuitNet has had 15,551 registrants. An evaluation of fiscal year 2004 determined that 51 percent (based on a convenience sample) of users reported being tobacco-free at twelve months after they registered on the site. Quitline has received 22,603 calls since its inception in October 2001 to December 2004. Of these, 15,621 (69 percent) have received guidance and support from counselors as they went through the quitting process. An external evaluation conducted on 20 percent of all Quitline users found that after the individuals' initial call, 28.2 percent of participants of the telephonic tobacco counseling program and 17.8 percent of those who participated in the self-guided cessation program reported being tobacco-free at 6 months.

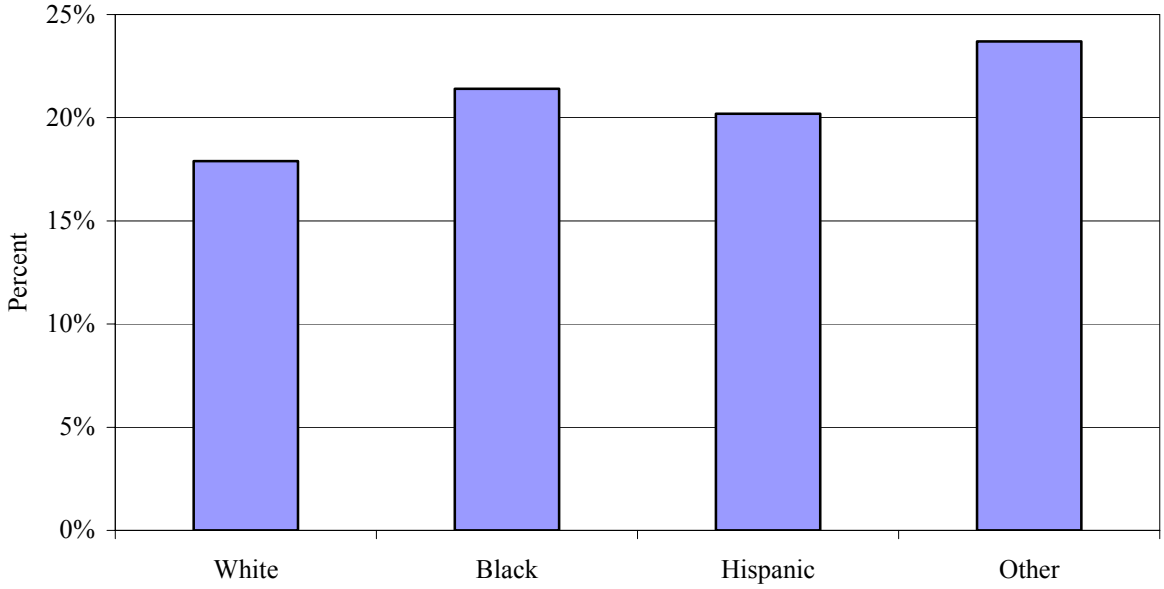
Figure 27: Trend in Prevalence of Current Smokers, Colorado and U.S., 1995-2003



Sources: CO BRFSS, 2004, CDC BRFSS, 2004

The prevalence of current smokers by race (Figure 28) indicates that 'Other' adults 18 and older made up the highest percentage (23.7 percent) of current smokers. Whites made up the lowest percentage (17.9 percent) of current smokers. Among the remaining groups, 21.4 percent of Blacks reported being current smokers and 20.2 percent of Hispanics reported being current smokers.

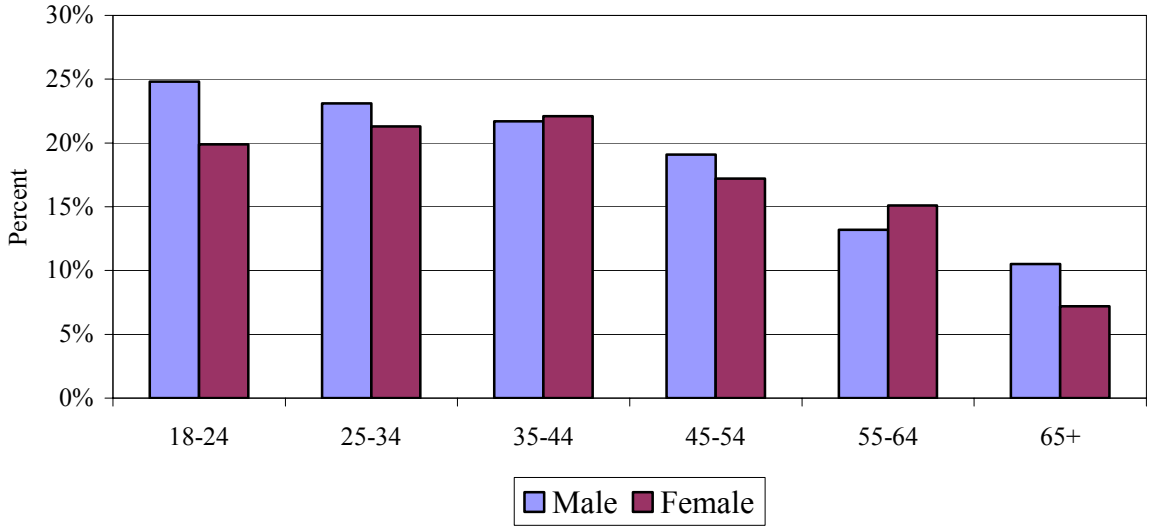
Figure 28: Age-adjusted Prevalence of Current Smokers by Race, Colorado, 2003



Source: CO BRFSS, 2004

Females reported being current smokers less than males, except for age groups 35-44 and 55-64 (Figure 29). The percentage of current smokers decreased with age, decreasing dramatically among those age 45 years and older. Nearly 25 percent of males and 20 percent of females ages 18 through 24 reported being current smokers.

Figure 29: Age-adjusted Prevalence of Current Smokers by Gender and Age, Colorado, 2003



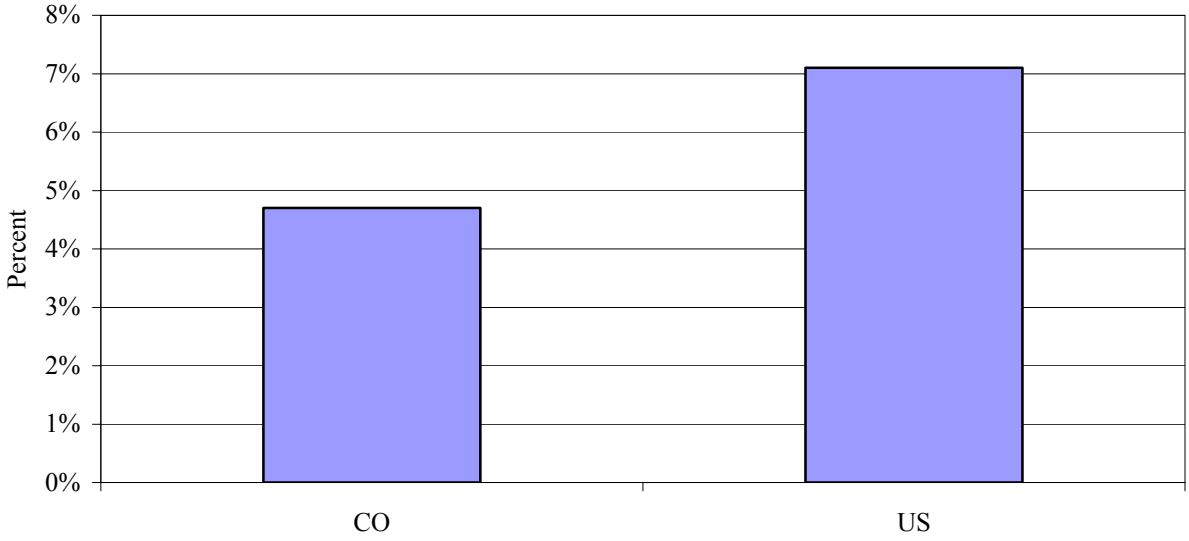
Source: CO BRFSS, 2004

Diabetes

Adults who have diabetes are two to four times more likely to have heart disease or suffer a stroke than adults who do not have diabetes. People with type 2 diabetes have higher rates of hypertension, dyslipidemia,[xi] and obesity, which are major reasons that account for their elevated cardiovascular disease mortality risk.[xii] While mortality due to heart disease has declined for the general population, the heart disease mortality rate has increased 23 percent in women with diabetes over the past 30 years.[xiii] Type 2 diabetes can frequently be prevented through behavior modifications associated with obesity, such as physical activity and nutrition.

Data from the 2003 BRFSS indicate that 4.7 percent of adult Coloradans have been diagnosed with diabetes (Figure 30). By comparison, 7.1 percent of U.S. adults have been diagnosed with diabetes.

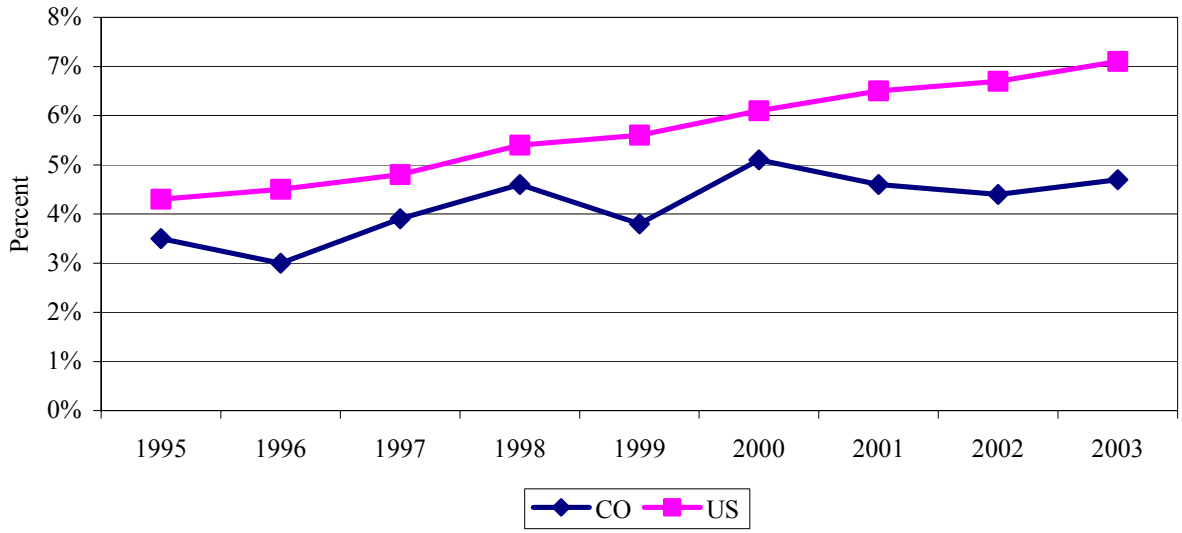
Figure 30: Prevalence of Diabetes, Colorado and U.S., 2003



Sources: CO BRFSS, 2004; CDC BRFSS, 2004

The trend in prevalence of diabetes has been increasing in Colorado and in the U.S. (Figure 31). In 1995, 3.5 percent of Coloradans were diagnosed with diabetes while 4.7 percent were diagnosed in 2003.

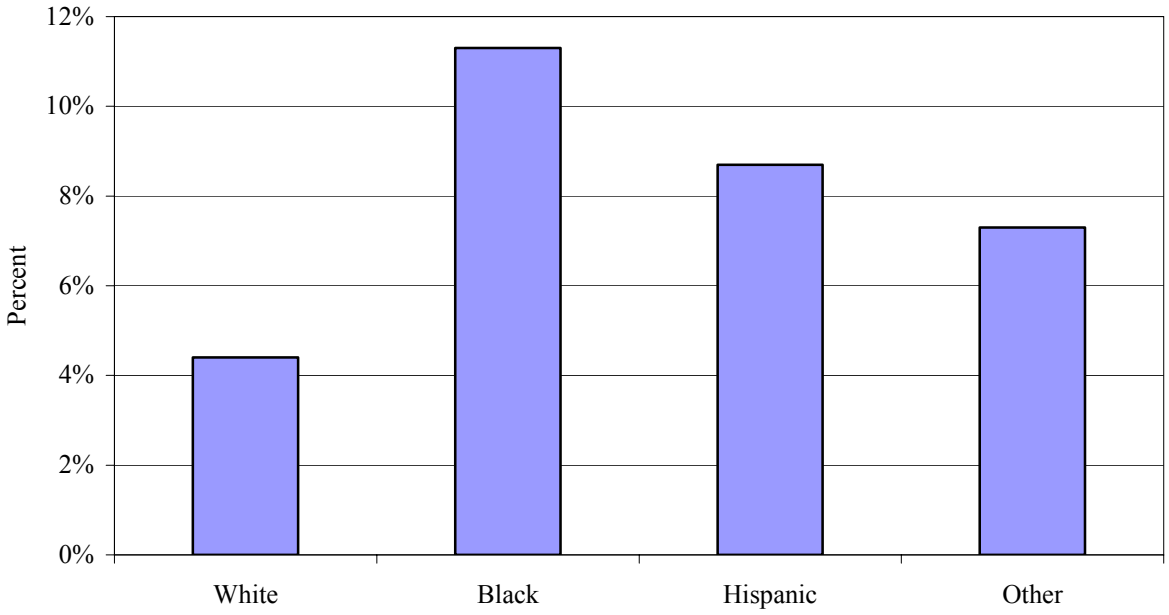
Figure 31: Trend in Prevalence of Diabetes, Colorado and U.S., 1995-2003



Sources: CO BRFSS, 2004; CDC BRFSS, 2004

The prevalence of diabetes by race (Figure 32) indicates that Black and Hispanic adults age 18 and older made up the highest percentages of people diagnosed with diabetes, 11.3 percent and 8.7 percent, respectively. The percent for Whites was 4.4 and the percentage for 'Other' was 7.3.

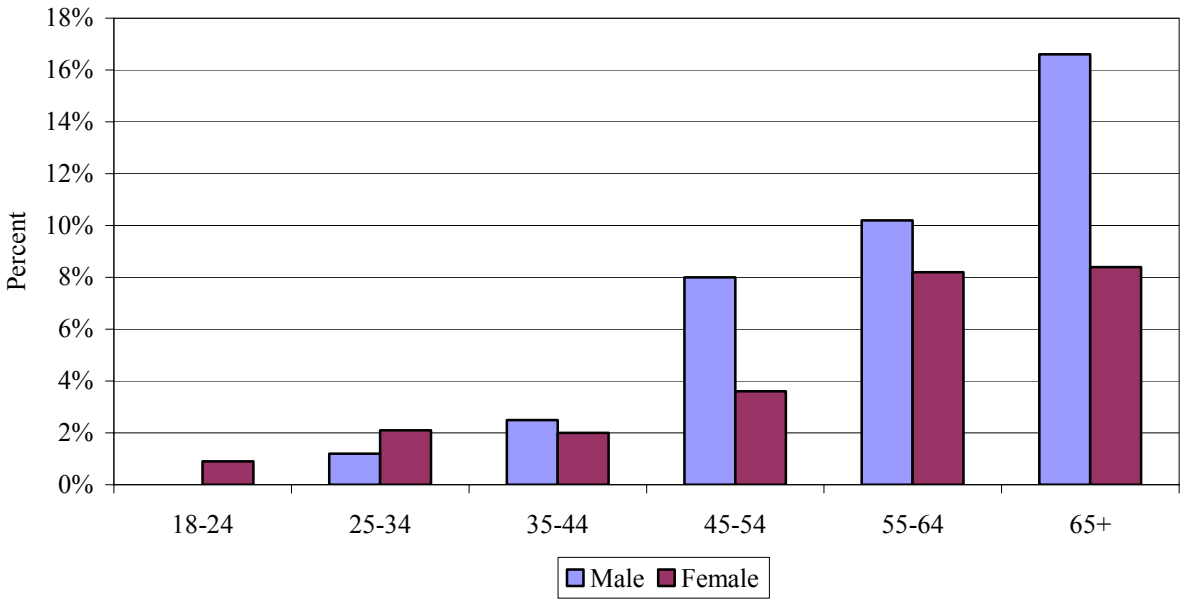
Figure 32: Age-adjusted Prevalence of Diabetes by Race, Colorado, 2003



Source: CO BRFSS, 2004

The prevalence of diabetes was greater for males than for females during 2003 (Figure 33). Among adults between ages 18 and 34, the percentage of females with diabetes is higher than males. However, males have a higher percentage of diabetes in all other age groups. The most dramatic difference is for adults 65 years and older. Females had a percentage of 8.4 while males had a percentage of 16.6.

Figure 33: Age-adjusted Prevalence of Diabetes by Gender and Age, Colorado, 2003



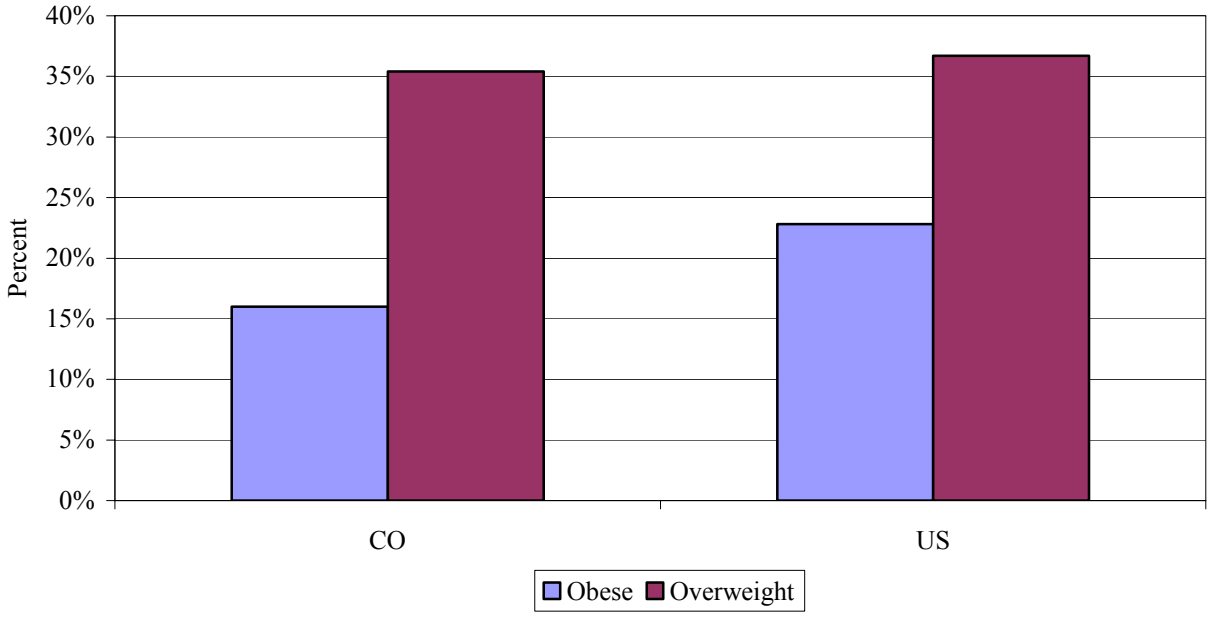
Source: CO BRFSS, 2004

Overweight/Obesity

The incidence of heart disease (heart attack, congestive heart failure, sudden cardiac death, angina or chest pain, and abnormal heart rhythm) is increased in persons who are overweight or obese (BMI > 25). High blood pressure is twice as common in adults who are obese than in those who are at a healthy weight. Obesity is associated with elevated triglycerides (blood fat) and decreased HDL cholesterol ("good cholesterol").[xiv]

In 2003, 16 percent of Colorado adults were obese compared to 22.8 percent in the U.S. (Figure 34). The prevalence of overweight Coloradans was 35.4 percent and 36.7 percent in the U.S.

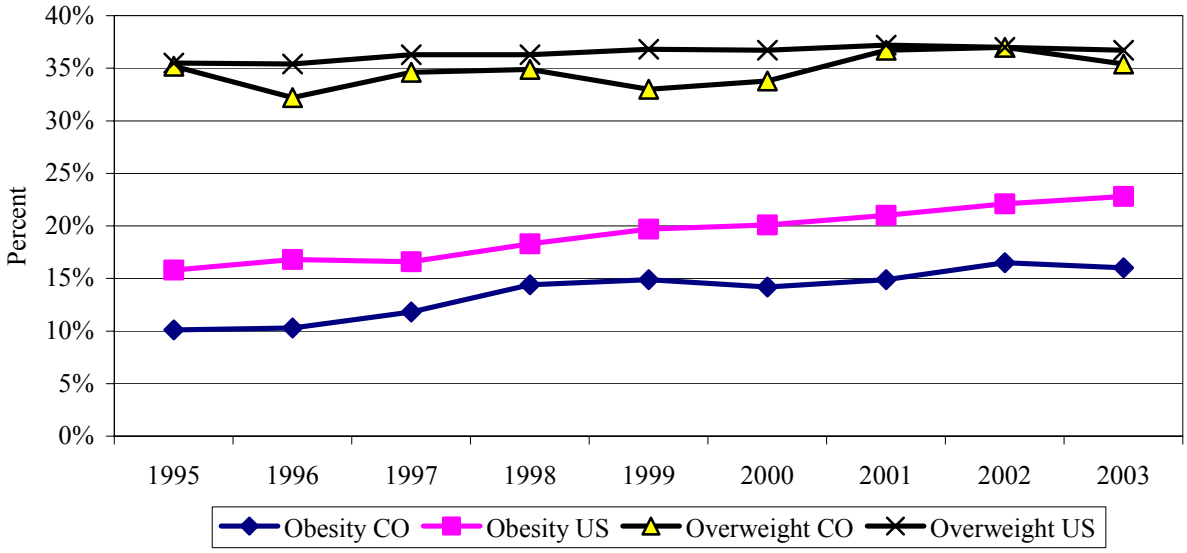
Figure 34: Prevalence of Obesity/Overweight, Colorado and U.S., 2003



Sources: CO BRFSS, 2004; CDC BRFSS, 2004

Colorado's obesity rate has increased from 10.1 percent in 1995 to 16 percent in 2003 (Figure 35). During the same time period, the rate of obesity in the U.S. increased from 15.8 percent to 22.8 percent. The prevalence of overweight Coloradans has fluctuated but has shown a slight increase between 1995 and 2003 from 35.2 percent to 35.4 percent. In the U.S., the trend in overweight increased from 35.5 percent to 36.7 percent.

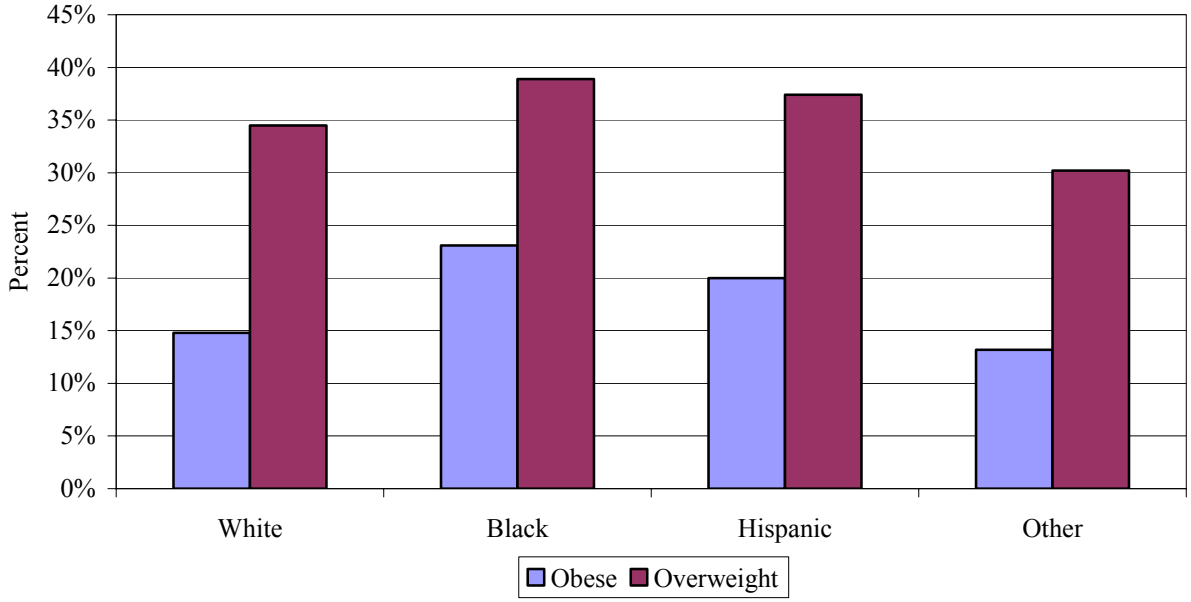
Figure 35: Trends in Prevalence of Obesity/Overweight, Colorado and U.S., 1995-2003



Sources: CO BRFSS, 2004; CDC BRFSS, 2004

The prevalence of obesity/overweight by race (Figure 36) indicate that Blacks and Hispanics in Colorado are more likely to be obese than Whites or 'Other' racial/ethnic groups. Twenty-three percent of Blacks were obese, while 20.0 percent of Hispanics, 13.2 percent of 'Other', and 14.8 percent of Whites were obese. Nearly 39 percent of Blacks were overweight, 37.4 percent of Hispanics, 34.5 percent of Whites, and 30.2 percent of 'Other' were overweight.

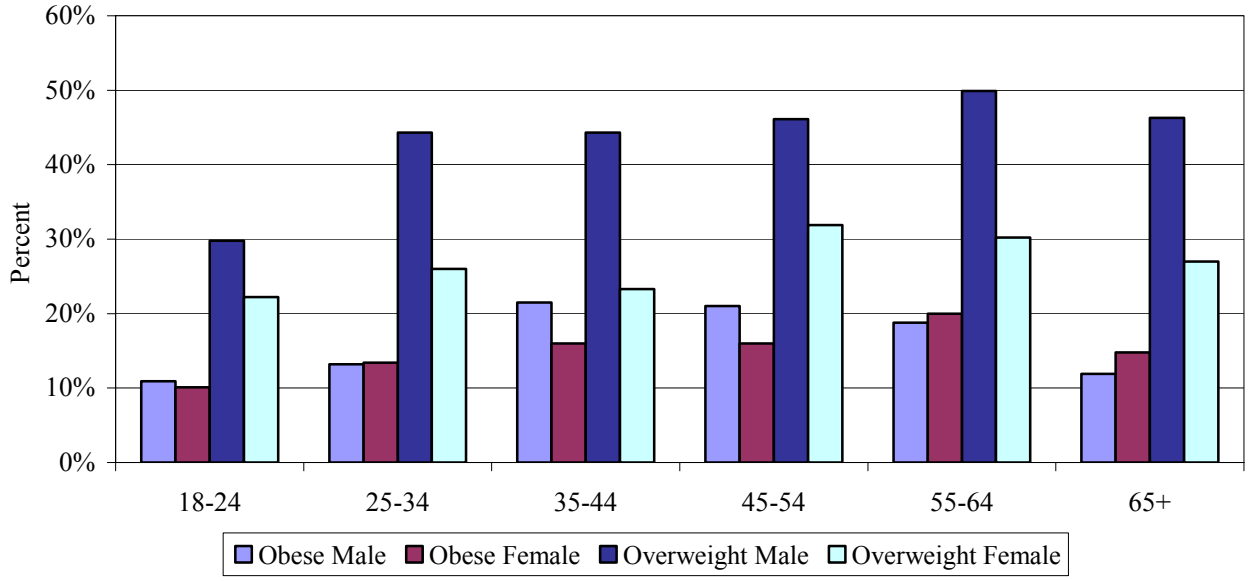
Figure 36: Age-adjusted Prevalence of Obesity/Overweight by Race, Colorado, 2003



Source: CO BRFSS, 2004

As Figure 37 indicates, the prevalence of obesity is highest (21.5 percent) for males ages 35 to 44. For females, the highest prevalence of obesity (20.0 percent) was for those ages 55 to 64. In every age group, the percentages of men who are overweight are dramatically higher than for women. Nearly 50 percent of males ages 55 to 64 were overweight.

Figure 37: Age-adjusted Prevalence of Obesity/Overweight by Gender and Age, Colorado, 2003



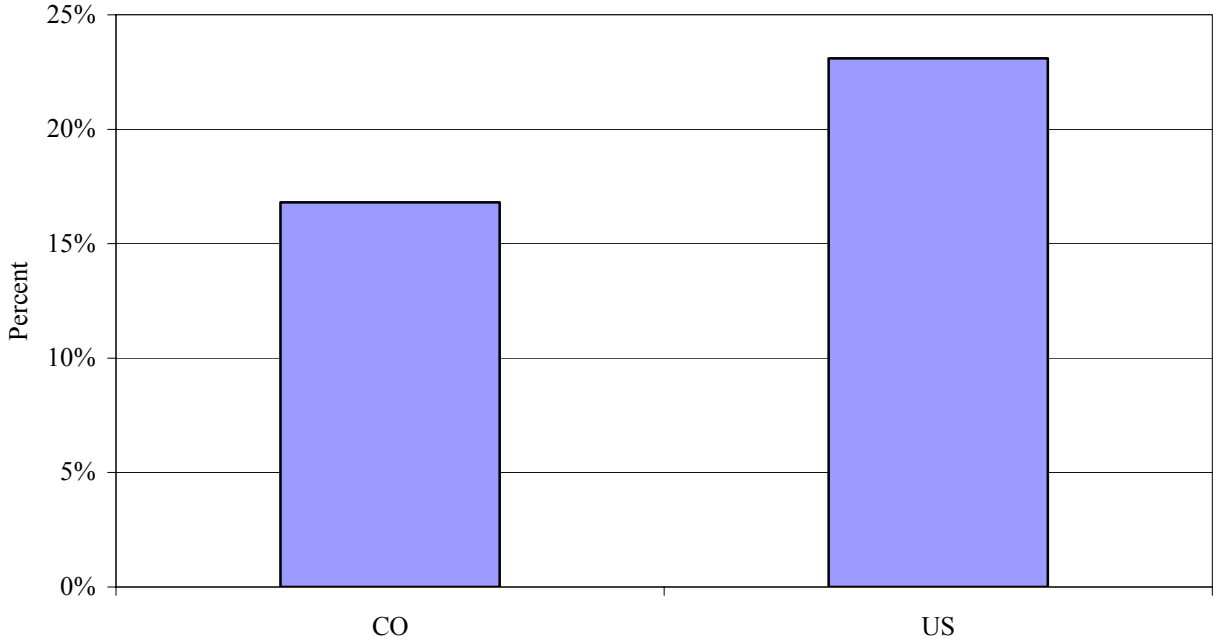
Source: CO BRFSS, 2004

Physical Inactivity

Physical activity plays an important role in preventing the development of obesity and cardiovascular disease. Federal physical activity recommendations are to participate in at least 30 minutes of moderate physical activity most days of the week.[xv] Examples of physical activities include running, calisthenics, golf, gardening, or walking for exercise. Following these recommendations can help to maintain a healthy weight, decrease blood pressure, and increase levels of "good" cholesterol (high-density lipoprotein, or HDL).

Since physical activity is not a risk factor, the opposite term "physical inactivity" is used instead. The prevalence of physical inactivity (Figure 38) is higher in the U.S. than it is for Coloradans. In 2003, 23.1 percent of adults aged 18 and older were physically inactive in the U.S compared to16.8 percent in Colorado.

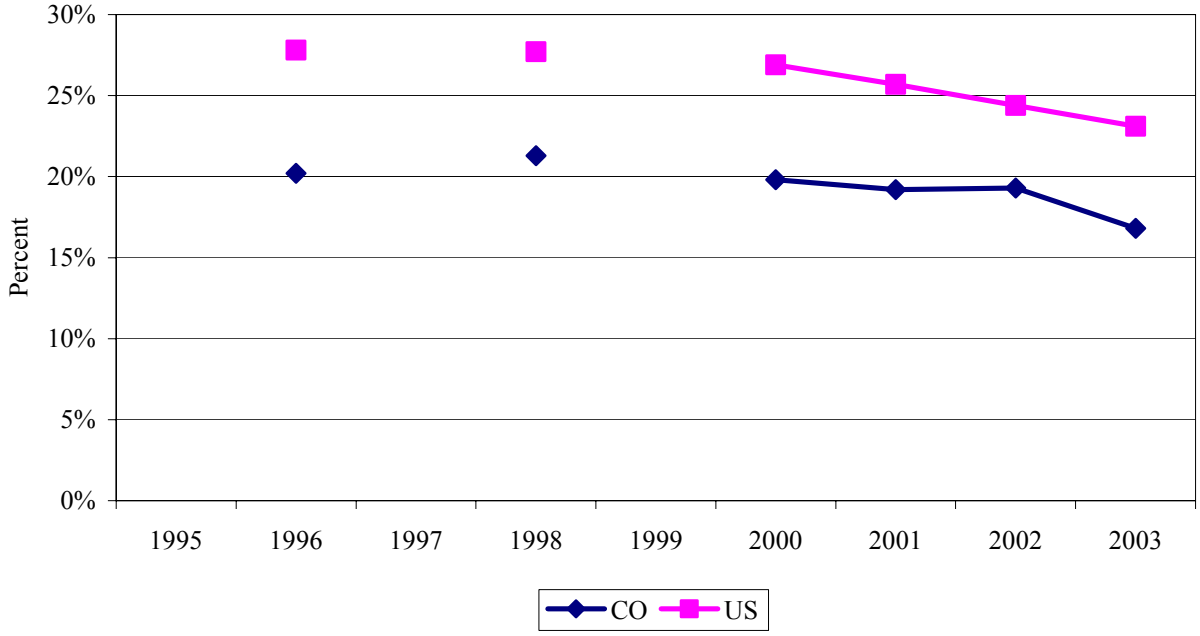
Figure 38: Prevalence of Physical Inactivity, Colorado and U.S., 2003



Sources: CO BRFSS, 2004; CDC BRFSS, 2004

Physical activity is increasing in Colorado and in the U.S. (Figure 39). From 1996 to 2003, Colorado experienced a decrease in physical inactivity of 3.6 percentage points while the decrease in the U.S. was 4.7 percentage points.

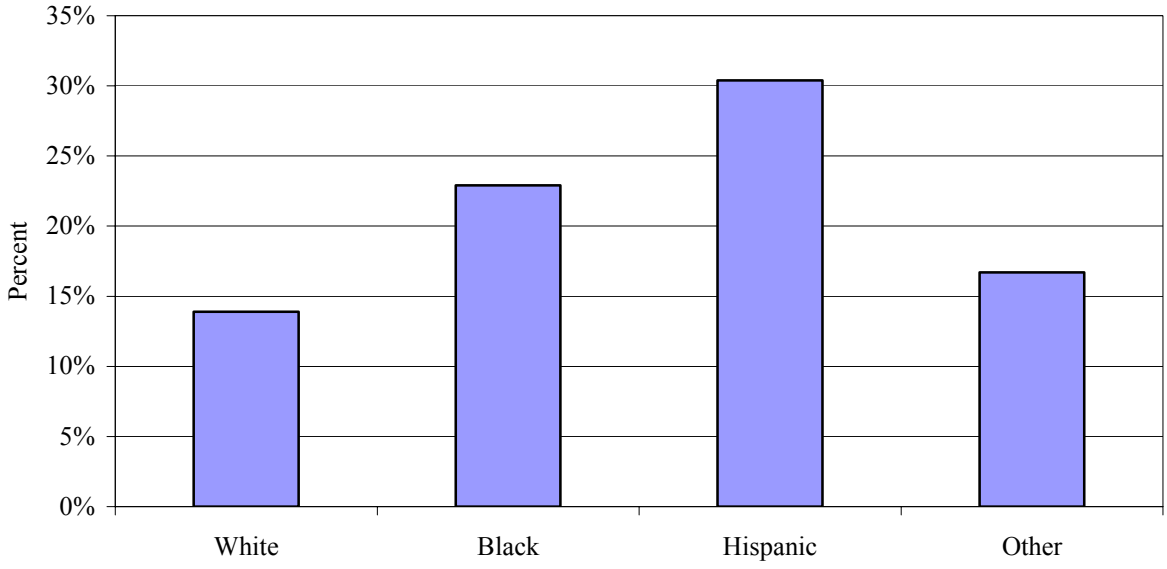
Figure 39: Trend in Prevalence of Physical Inactivity, Colorado and U.S., 1995-2003



Sources: CO BRFSS, 2004; CDC BRFSS, 2004

Physical inactivity varied by race/ethnicity (Figure 40). Whereas only 13.9 percent of White adults reported physical inactivity, 22.9 percent of Blacks did and 30.4 percent of Hispanics did.

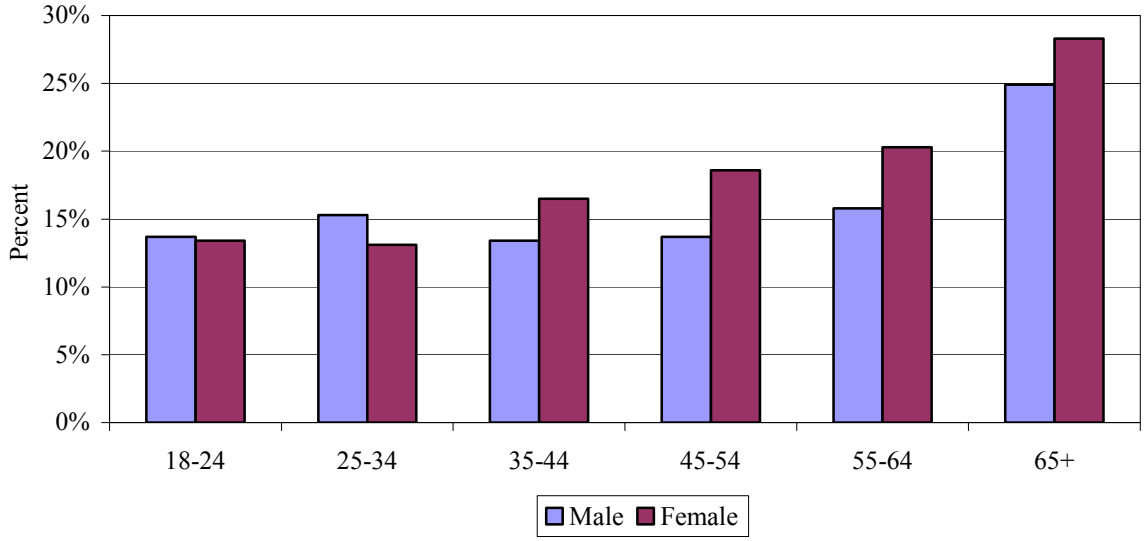
Figure 40: Prevalence of Physical Inactivity by Race, Colorado, 2003



Source: CO BRFSS, 2004

More females than males reported being physically inactive (Figure 41). The percentage of physical inactivity increases by age with a notable increase for those ages 65 and older.

Figure 41: Prevalence of Physical Inactivity by Gender and Age, Colorado, 2003



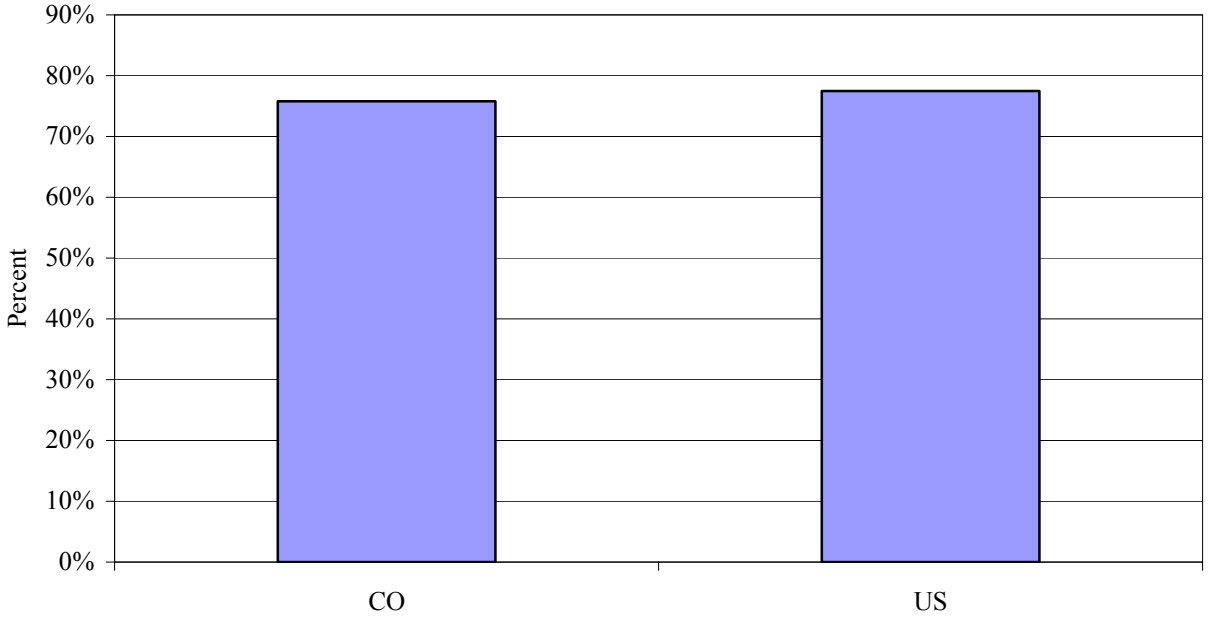
Source: CO BRFSS, 2004

Inadequate Nutrition

A diet low in saturated fat and high in fruits, vegetables, and whole grains can help to decrease high blood pressure, or prevent its occurrence. The majority of individuals in the U.S. do not consume recommended amounts of fruits and vegetables.

In 2003, 75.8 percent of Colorado adults consumed less than five servings of fruits and vegetables a day (Figure 42). In the U.S. this percentage was 77.5.

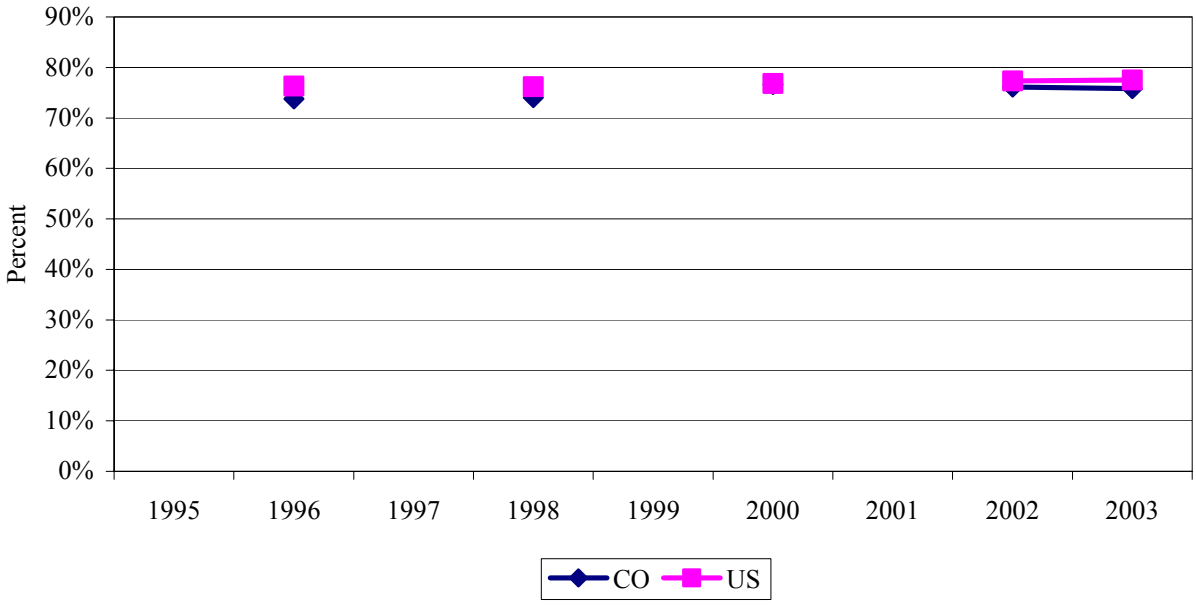
Figure 42: Prevalence of Inadequate Nutrition, Colorado and U.S., 2003



Sources: CO BRFSS, 2004; CDC BRFSS, 2004

In Colorado and in the U.S., the prevalence of inadequate nutrition has increased from 1996 to 2003 (Figure 43). The prevalence in the U.S. increased from 76.3 to 77.5 percent, while in Colorado, it has increased from 73.8 to 75.8 percent.

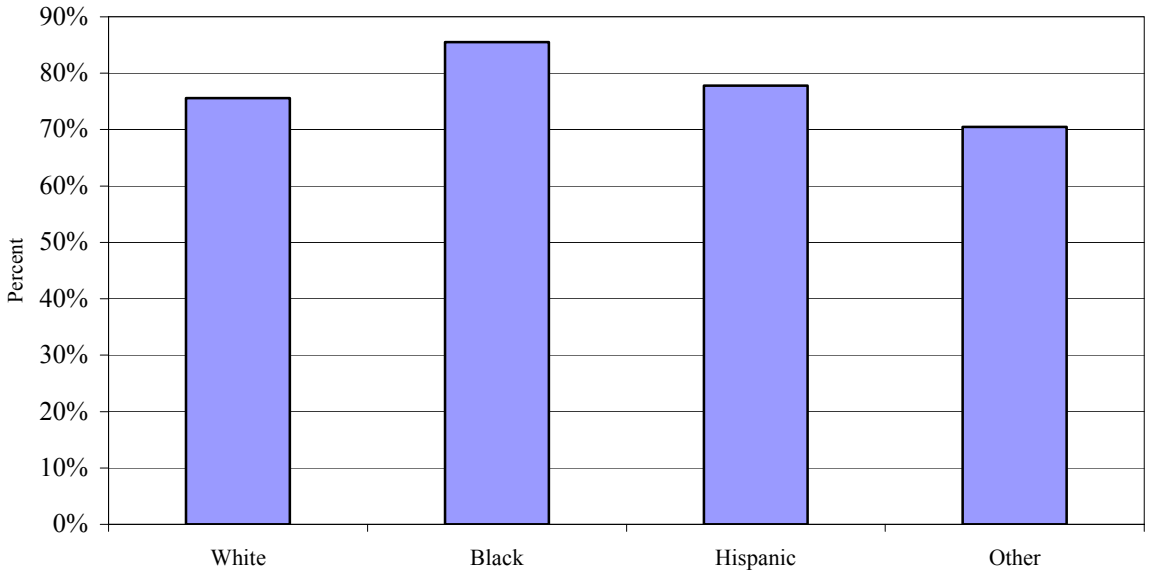
Figure 43: Trend in Prevalence of Inadequate Nutrition, Colorado and U.S., 1995-2003



Sources: CO BRFSS, 2004; CDC BRFSS, 2004

'Other' adults age 18 and older made up the lowest percentage that reported inadequate nutrition at 70.5 percent (Figure 44). Among the remaining groups, 75.6 percent of Whites reported consuming less than 5 servings of fruits and vegetables per day, 85.5 percent of Blacks, and 77.8 percent of Hispanics reported inadequate nutrition.

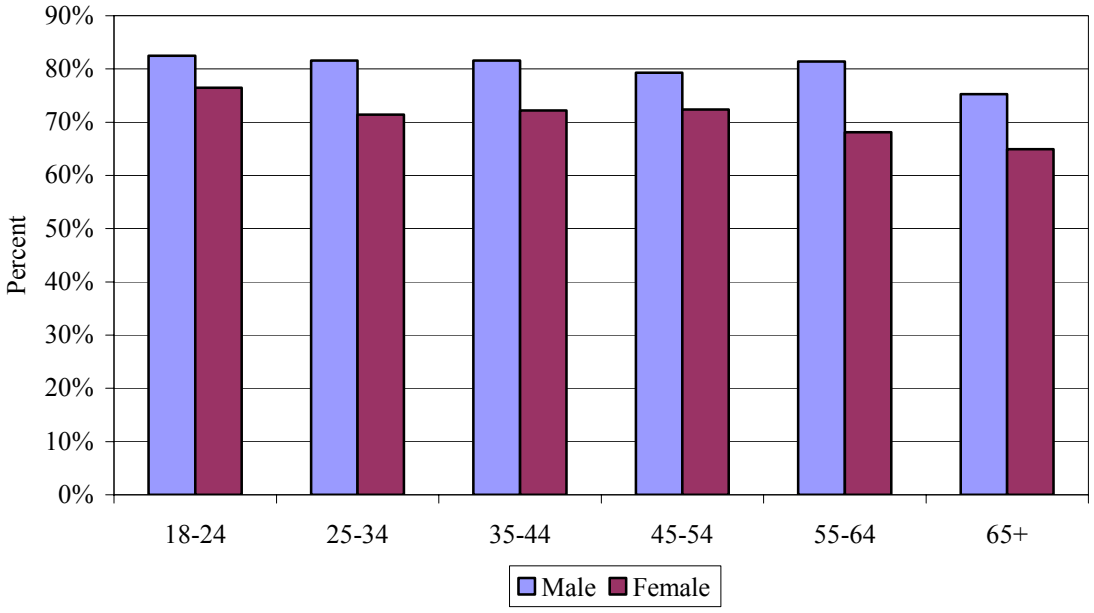
Figure 44: Prevalence of Inadequate Nutrition by Race, Colorado, 2003



Source: CO BRFSS, 2004

Males in every age group were much more likely than females to consume less than five servings of fruits and vegetables per day (Figure 45). For females, inadequate nutrition decreased with age. For males, inadequate nutrition does not decrease except for those ages 65 and older.

Figure 45: Prevalence of Inadequate Nutrition by Gender and Age, Colorado, 2003



Source: CO BRFSS, 2004

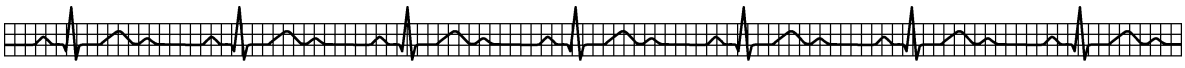
Discussion and Conclusions

The Healthy People 2010 target for coronary heart disease is to reduce deaths to less than 166 per 100,000 people. In 2003, the death rate in Colorado was 118.6, surpassing the target by 28.5 percent. Although the target was reached, programmatic efforts to maintain and further decrease the death rate for coronary heart disease will be important in Colorado, as it remains our number one public health problem.

The Healthy People 2010 target for stroke is to reduce deaths to less than 48 per 100,000 people. In 2003, the death rate in Colorado was 51.3. By 2010, the stroke death rate needs to decrease by 6.9 percent. A recommendation is to focus programmatic efforts on health disparities since the biggest decrease (28.7 percent) is needed among Blacks while an 8.7 percent decrease is necessary for Whites to reach the 2010 target. Furthermore, a 7.5 percent decrease is needed for females while a 3.8 percent decrease is needed for males.

Primary prevention is one major strategy to reduce the development of cardiovascular disease and stroke, specifically through lifestyle interventions that promote heart-healthy behaviors. High cholesterol is one of the major risk factors that can be modified. To prevent or lower cholesterol, lifestyle changes include eating a diet low in saturated fat and cholesterol, increasing physical activity, and reducing excess weight. The Healthy People 2010 target is to reduce the proportion of adults with high cholesterol to 17 percent. This presents a major challenge as 31.9 percent of Colorado adults had high cholesterol during 2003 and the data from 1995 to 2003 indicate an increasing trend. A decrease of 46.7 percent from the 2003 percentage needs to occur to reach the target.

High blood pressure is another major risk factor for heart disease and stroke. The Healthy People 2010 target is to reduce the proportion of adults with high blood pressure to 16 percent. In 2003, this percentage was 19.8 among Coloradans. A 19.2 percent decrease from the 2003 percentage is necessary to reach the target.



In summary, the Healthy People 2010 targets are compared to 2003 prevalence in Table 3.

Table 3: Targets for Healthy People 2010 Compared to Colorado BRFSS Data for 2003

RISK FACTOR	Healthy People 2010 Target	Prevalence of Modifiable Risk Factor in 2003 Colorado	% Change Needed to Achieve HP 2010 Target
Inadequate Nutrition	Increase to at least 50% the proportion of adults and adolescents who consume at least three daily servings of vegetables	75.8% *24.2% have adequate nutrition	106.6% increase needed
High Cholesterol	Reduce to 17% the proportion of adults with high total cholesterol	31.9%	46.7% decrease needed
High Blood Pressure	Reduce to 16% the proportion of people with high blood pressure	19.8%	19.2% decrease needed
Current Smokers	Reduce to 12% the proportion of adults who smoke cigarettes	18.5%	35.1% decrease needed
Physical Inactivity	Reduce to at least 20% the proportion of adults who engage in no leisure-time physical activity	16.8%	2010 HP target met
Overweight/Obesity	Increase to at least 60% the prevalence of healthy weight	37.0% (Overweight) 16.5% (Obese) *46.5% are at healthy weight	29.0% increase needed
Diabetes	Reduce the rate of diagnosed diabetes to 25 cases per 1,000 population (Or reduced to 2.5%)	4.7%	46.8% decrease needed

*Percentage was subtracted from 100 to produce a percentage that is in-line with the HP 2010 target.

Sources: CO BRFSS, 2004; Healthy People 2010

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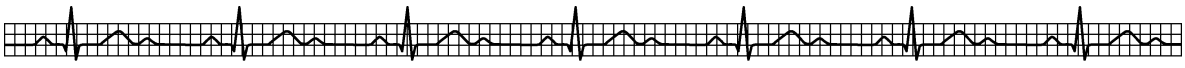

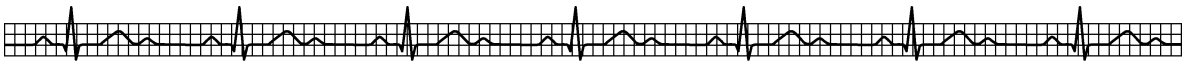

References and Footnotes

[i] This figure includes the number of deaths due to heart disease, stroke, atherosclerosis, essential hypertension and hypertensive renal disease, and other diseases of the circulatory system.
[ii] Hospitalizations include anyone admitted to the hospital. This number includes those who died after being admitted, but does not include those who were dead on arrival or who died in the emergency department. It also does not include people treated in and released from the emergency department.
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[x] Colorado Youth Risk Behavior Survey; 2001.
[xi] An abnormal excess of fat or lipids in the blood.
[xii] Roman SH, Harris MI. *Management of Diabetes Mellitus from a Public Health Perspective*. Endocrinol Metab Clin North Am 1997; 26:443-74.
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[xv] U.S. Department of Health and Human Services. *The Surgeon General's Call to Action to Prevent and Decrease Overweight and Obesity.* U.S. Department of Health and Human Services, Public Health Service, Office of the Surgeon General; 2001.