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Diabetes, heart disease and stroke and their associated risk factors lead to more disability and death than any other conditions in Oregon. Combined, these diseases affect one in seven Oregonians, cost $1.5 billion in hospitalizations, and cause more than a quarter of all deaths in Oregon annually.

This report presents data on diabetes, heart disease and stroke prevalence, deaths and hospitalizations. The report also explores common risk factors across these conditions in Oregon. Diabetes, heart disease and stroke share common behavioral risk factors, and disproportionately affect some communities more so than others. Risk factors for diabetes, heart disease and stroke include cigarette smoking, obesity, high blood pressure, lack of physical activity, inadequate consumption of fruits and vegetables, excessive consumption of sodium and consumption of trans fats. People of lower socioeconomic status, African Americans and Native Americans have a higher prevalence of these risk factors compared to all other Oregon communities, and consequently have higher rates of diabetes, heart disease and stroke.

Key findings of this report include:

- In 2011, 15% of adults in Oregon reported having heart disease, stroke or diabetes.
  - There are approximately 278,000 adults with diabetes in Oregon.
  - Approximately 123,000 adults in Oregon have heart disease.
  - Approximately 87,000 adults in Oregon are stroke survivors.
- Shared risk factors for diabetes and heart disease are highly prevalent among adults in Oregon.
  - Sixty-three percent of Oregon adults are either obese, have high blood pressure or high cholesterol, and 8% of Oregon adults have all three of these conditions.
  - In 2011, approximately one in five (20%) of all Oregon adults were current cigarette smokers.
Among adults with heart disease, stroke or diabetes, approximately one in four (25%) are also current cigarette smokers.

- Sixty-two percent of all Oregon adults are considered overweight or obese.
- Among adults with heart disease or stroke, 74% are overweight or obese.
- Among adults with diabetes, 83% are overweight or obese.

Shared risk factors for heart disease, stroke and diabetes disproportionately affect some Oregon communities more than others.

- Oregon adults with less than a high school education are nearly five times more likely to report current cigarette smoking compared to Oregon adults with a college degree.
- The prevalence of obesity among adults with less than a high school education is nearly double that of adults with a college degree.
- Oregon adults with less than a high school education are approximately 23% more likely to have high cholesterol and 24% less likely to have had a cholesterol screening in the past five years compared to Oregon adults with a college degree.
- The prevalence of obesity among non-Latino American Indian and Alaska Native persons is approximately 56% higher than non-Latino white persons.

- The percentage of African American persons who reported high blood pressure is nearly double that of white persons.

Together, diabetes, heart disease and stroke combined lead to more death and disability than any other conditions in Oregon, and are among the most costly health conditions.

- Combined, diabetes, heart disease and stroke account for more than a quarter (28%) of all deaths in Oregon.
- Nearly 48,000 hospitalizations were due to diabetes, heart disease and stroke in 2011, costing nearly $1.5 billion.

The Oregon Heart Disease and Stroke Prevention, and Diabetes Prevention programs focus on developing and implementing comprehensive, community-wide interventions to prevent and control diabetes, heart disease and stroke.

The Health Promotion and Chronic Disease Prevention Section of the Oregon Public Health Division is working with local and state partners to prevent and control diabetes, heart disease and stroke by:

- Increasing availability of healthy foods and beverages in child care facilities, schools, worksites and neighborhoods;
- Increasing places where people can move more safely;
- Increasing the number of environments that are tobacco-free;
- Increasing referrals to self-management programs so that people with chronic disease can live well and take care of themselves;
Improving delivery and use of quality health care services through the physician promotion of the ABCS — A1C checks, Blood pressure control, Cholesterol control, Smoking cessation and reduced Sodium consumption. This comprehensive, community-wide approach makes eating better, moving more, and living tobacco-free easier for all Oregonians wherever they live, work, play and learn.

**VOLUME 1**

**Volume 1** will:
1. Define diabetes;
2. Define heart disease and stroke;
3. Introduce common risk factors that increase an individual’s chance of developing diabetes, heart disease and stroke and proven interventions to help with prevention and management; and
4. Discuss community and health system efforts to help people take care of themselves.

**VOLUME 2**

**Volume 2** will present detailed data tables and graphs showing the prevalence of risk factors for diabetes, heart disease and stroke across select demographics, chronic diseases and risk factors.

**VOLUME 3**

**Volume 3** will present detailed data tables and graphs showing:
1. Diabetes prevalence across select demographics, chronic diseases and risk factors;
2. Diabetes hospitalizations and associated costs; and
3. Diabetes deaths.

**VOLUME 4**

**Volume 4** will present detailed data tables and graphs showing:
1. Heart disease prevalence across select demographics, chronic diseases and risk factors;
2. Heart disease hospitalizations and associated costs; and
3. Heart disease deaths.

**VOLUME 5**

**Volume 5** will present detailed data tables and graphs showing:
1. Stroke prevalence across select demographics, chronic diseases and risk factors;
2. Stroke hospitalizations and associated costs; and
Infographic: Diabetes, Heart Disease and Stroke in Oregon

Combined, these diseases affect and cost $1.5 billion in hospitalizations in 2011. 1 in 7 Oregonians.

78% of Oregon adults have at least one risk factor.

Common risk factors (below) contribute to the development of diabetes and heart disease, and increase the risk of future heart attack and stroke.

Among Oregon adults:
- 1 in 4 is obese.
- 1 in 5 smokes cigarettes.
- 1 in 3 has high cholesterol.
- 1 in 4 has high blood pressure.
- 1 in 5 is physically inactive.

Risk factors for DIABETES, HEART DISEASE and STROKE affect some communities more than others.

Compared to adults with a college degree, adults with less than a high school education are:
- 2x more likely to be obese.
- 2x more likely to smoke cigarettes.

Compared to non-Latino whites, American Indian and Alaska Native adults are:
- 3x more likely to have high blood pressure.
- 2x more likely to smoke cigarettes.

Diabetes, heart disease and stroke cause more than a quarter of all deaths in Oregon annually.

Diabetes, Heart Disease and Stroke in Oregon, 2013 Report
Overview

For the first time, the Oregon Public Health Division is reporting jointly on diabetes, heart disease and stroke. This combined report addresses the connections between these conditions, including ways communities in Oregon can better support people with diabetes, heart disease and stroke in eating well, moving more, living tobacco-free, and having tools to help them take care of themselves.

Diabetes, heart disease and stroke lead to more death and disability than any other conditions in Oregon. In 2011, 15% of adults reported having heart disease, stroke or diabetes. Together, these three diseases are among the most costly health conditions in Oregon. Hospitalizations due to heart disease, stroke and diabetes cost Oregon nearly $1.5 billion in 2011 and caused 28% of all deaths in Oregon.

These diseases are interrelated and complex. Heart disease and stroke are a major complication of diabetes and the leading cause of early death among people with diabetes. People with uncontrolled diabetes have high amounts of glucose (sugar) in the blood, which over time can lead to increased deposits of fatty materials on the inside of the blood vessel walls. These deposits affect blood flow to the heart and brain, increasing the chance of clogging and hardening of the arteries, and consequently increasing the risk for heart disease and stroke. Adults with diabetes are two to four times more likely to have heart disease or suffer a stroke than people without diabetes. Additionally, heart attacks in people with diabetes are more serious and more likely to result in death compared to those without diabetes. Two out of three people with diabetes die of heart disease or stroke.
In addition to those who already have these chronic conditions, many more Oregonians are at risk of developing them. In order to prevent or delay the onset of diabetes, heart disease and stroke, the following underlying risk factors of these diseases need to be addressed:

- Tobacco use;
- Exposure to secondhand smoke;
- Obesity;
- High blood pressure;
- High blood cholesterol;
- Inadequate consumption of fruits and vegetables;
- High sodium consumption;
- Consumption of trans fats;
- Lack of physical activity.
1.1 Diabetes

Diabetes is a chronic metabolic disease in which glucose (sugar) levels in the blood are above normal. High blood sugar occurs when the body does not produce insulin (Type 1 diabetes), or when the body resists and does not properly respond to insulin (Type 2 diabetes). Insulin is a hormone essential to regulation of blood sugar. An estimated 95% of all diabetes cases are classified as Type 2 diabetes, which is largely preventable. If not carefully managed, high blood sugar can cause blindness, skin infections, nerve damage and kidney damage. Today, diabetes is the leading cause of kidney failure, new cases of blindness and non-traumatic lower-leg amputations among adults in the U.S. Diabetes also contributes to high blood pressure and high cholesterol, both of which are primary risk factors for heart disease and stroke.

During the past 20 years, the prevalence of diabetes among adults in Oregon has more than doubled, increasing from 4% in 1990 to more than 8% in 2011 (Figure 1.1). Approximately 278,000 Oregon adults have diabetes, and it is estimated that another 35% of adults (over 1 million more adults) have prediabetes, a condition in which blood sugar levels are higher than normal but not high enough to be considered diabetes. Diabetes is the seventh leading cause of death in Oregon, accounting for 3% of all deaths.

The total cost of diabetes in Oregon is estimated to be nearly $3 billion per year. In 2011, there were 4,274 hospitalizations due to diabetes with an average cost of $21,000 per hospitalization. The American Diabetes Association estimates that nearly $2.2 billion is spent in Oregon from excess medical expenditures associated with diabetes each year, averaging $7,800 per person with diabetes. In addition, costs associated with reduced productivity from diabetes-related death and disability are estimated to be $840 million.

A healthy diet and regular physical activity may prevent or delay the onset of prediabetes and Type 2 diabetes. Once diagnosed, diabetes is usually a lifelong disease. Treatment includes eating better, moving more and taking medication, if prescribed, to manage blood sugar and reduce potentially harmful complications. Diabetes education programs can help people with diabetes learn how to take care of themselves and live better with their disease.
1.2 Heart disease and stroke

Cardiovascular disease is a class of diseases that involve the heart or blood vessels, which includes both heart disease and stroke. Heart disease most often involves the narrowing or blocking of arteries due to the buildup of cholesterol on the walls of the arteries. Blocked arteries can cause a heart attack, which occurs when a section of the heart muscle dies or is damaged due to reduced blood supply.

There are two types of stroke, ischemic and hemorrhagic. An ischemic stroke occurs when blood flow to a part of the brain stops due to an obstruction, such as a fatty deposit or blood clot. If blood flow is stopped for longer than a few seconds, the brain cannot get blood or oxygen and brain cells can die, which can lead to permanent brain damage. Approximately 87% of all stroke cases in the U.S. are ischemic strokes. Hemorrhagic stroke occurs when a weakened blood vessel within the brain ruptures or leaks.

**FIGURE 1.1 DIABETES, HEART DISEASE AND STROKE AMONG ADULTS, OREGON, 2000–2011**


Note: The vertical dashed line denotes a different adjustment method and inclusion of cellular phones in the sample. Starting in 2010, estimates are not comparable to earlier years. Estimates are age-adjusted.
In the past 12 years, the proportion of the adult population with heart disease has decreased by 25%, while the percentage of adults who have had a stroke has remained relatively unchanged (Figure 1.1). In 2011, 4% of Oregon adults had heart disease and 3% were stroke survivors.

During the past 20 years, Oregon has seen significant reductions in the rates of death due to heart disease and stroke. From 1990 to 2011, the heart disease death rate declined by 48%, and the stroke death rate declined by 42%. However, heart disease is still the second leading cause of death in Oregon, while stroke is the fourth leading cause of death. Combined, these two conditions account for 25% of all deaths in Oregon.

Heart disease and stroke are also among the most costly conditions to Oregonians. In 2011, there were 29,839 hospitalizations due to heart disease with an average cost of nearly $39,000 per hospitalization; 7,762 stroke hospitalizations had an average cost of almost $33,000 per hospitalization.

Clinical prevention efforts to reduce heart disease and stroke focus on appropriate aspirin therapy, blood pressure control, cholesterol control and quitting cigarette smoking.
1.3 Reducing risk factors for diabetes, heart disease and stroke through policy

Several health conditions and behaviors can increase the risk for developing diabetes, heart disease and stroke. Age, family history, race and ethnicity are all contributors to the development of diabetes, heart disease and stroke, but these contributing factors cannot be changed or controlled. However, many other risk factors for diabetes, heart disease and stroke are behaviors that people can change, including cigarette smoking and exposure to secondhand smoke, overweight and obesity, high blood pressure, high cholesterol, inadequate fruit and vegetable consumption, and lack of physical activity.

These risk factors affect some communities more so than others. People of lower socio-economic status, African Americans and Native Americans have a higher prevalence of these risk factors compared to other Oregon communities, and subsequently have a higher prevalence of diabetes, heart disease and stroke.

By implementing community-wide prevention strategies that have been proven to work, risk factors can be addressed well before chronic diseases develop. Policy, environmental and system changes have the potential to prevent or reduce heart disease and stroke, increase survival among those who have suffered a heart attack or stroke, and prevent and control diabetes.

The approaches in this report are included in the Health Promotion and Chronic Disease Prevention Section’s strategic plan, and are drawn from best practice recommendations from the Centers for Disease Control and Prevention, as well as reports from Oregon task forces and committees, including the HB 3486 Advisory Committee’s Strategic Plan to Slow the Rate of Diabetes in Oregon and the SB 931 Task Force for a Comprehensive Obesity Prevention Initiative’s Policy Recommendations. In addition, many of these approaches are included in the Oregon Public Health Division Strategic Plan for 2012–2017, which includes strategic priorities around preventing tobacco use, decreasing overweight and obesity, and reducing the burden of heart disease and stroke.

Policy approaches to reduce diabetes, heart disease and stroke risk factors are discussed throughout this report. Strategies are included to increase access to evidence-based chronic disease self-management programs and lifestyle interventions to improve quality of life and reduce health care costs. Additional strategies addressed in this section include those aimed at improving delivery and use of quality community and health care services to prevent disease, detect disease early and manage risk factors.
FIGURE 1.2 HIGH BLOOD PRESSURE, HIGH CHOLESTEROL, OBESITY AND CIGARETTE SMOKING AMONG OREGON ADULTS, 1990–2011

Note: The vertical dashed line denotes a different adjustment method and inclusion of cellular phones in the sample. Starting in 2010, estimates are not comparable to earlier years. Estimates are age-adjusted.
**Cigarette smoking and exposure to secondhand smoke**

Cigarette smoking is a leading cause of heart disease and stroke and worsens the quality of life for people living with diabetes. Cigarette smoking decreases oxygen to the heart, increases blood pressure and heart rate, increases blood clotting and damages cells that line arteries and other blood vessels. Cigarette smoking doubles the risk of heart disease for people with diabetes.

In Oregon, 20% of adults smoke cigarettes. Oregon adults with less than a high school education are nearly five times more likely to report current cigarette smoking compared to Oregon adults with a college degree. One-quarter of those who report having heart disease, stroke or diabetes are current cigarette smokers. In 2011, 7% of Oregon eighth-graders and 12% of 11th-graders smoked cigarettes. Those exposed to secondhand smoke, including nonsmokers, are also at an increased risk of heart disease and stroke. In 2011, 13% of adult Oregonians reported exposure to secondhand smoke while at work.

Fortunately, the prevalence of cigarette smoking among Oregon adults and youth has declined over the last 15 years. From 1996 to 2011, cigarette smoking prevalence declined by 14% among adults (Figure 1.2). From 1996 to 2011, cigarette smoking prevalence declined by 69% among eighth-graders, and nearly 58% among 11th-graders.

In addition, exposure to secondhand smoke at work has declined due to comprehensive smoke-free workplace laws. Exposure to secondhand smoke in the home has also declined as more adults report instituting cigarette smoking bans within their homes. From 1998 to 2011, Oregon adults reporting that there is no cigarette smoking allowed in their home rose 21%, from 75% to 91%.
Policy strategies to reduce tobacco use and secondhand smoke exposure:

Increase the number of environments where Oregonians live, work, learn and play where tobacco use is prohibited. Tobacco-free policies in worksites and public places reduce exposure to secondhand smoke and support those who are trying to quit tobacco, contributing to the prevention of heart disease and stroke and complications related to diabetes.

Increase the price of tobacco products, with a portion dedicated to a comprehensive tobacco control program. Increasing the price of cigarettes has been shown to reduce youth cigarette smoking initiation and cigarette consumption. Raising the price of tobacco reduces demand and decreases the prevalence of tobacco use, thereby reducing associated death and disease. Investing in tobacco control also reduces overall tobacco use. Oregon’s comprehensive Tobacco Prevention and Education Program funds local tobacco control efforts throughout Oregon focused on adults and youth, operates the Oregon Tobacco Quit Line, and conducts statewide education campaigns warning about the dangers of tobacco use and secondhand smoke exposure. Currently Oregon’s Tobacco Prevention and Education Program receives approximately $9 million per year for tobacco use prevention, which is $39.3 million less than the annual funding level recommended by the U.S. Centers for Disease Control and Prevention.14
Obesity

People who are obese are at much higher risk for developing diabetes, heart disease and stroke. Having excess body weight causes the heart to work harder and increases the risk of high blood pressure and high cholesterol.\textsuperscript{15} Sixty-two percent (over 1.8 million) of Oregon adults are considered to be overweight or obese. The prevalence of obesity among adults with less than a high school education is nearly double that of adults with a college degree. The prevalence of obesity among non-Latino American Indian and Alaska Native persons is approximately 56% higher than non-Latino white persons.

While the percentage of Oregon adults who are overweight has remained relatively unchanged during the past 20 years, the percentage of adults who are obese has nearly doubled. Mirroring the rise in diabetes, adult obesity increased from 11% in 1990 to 27% in 2011 (Figure 1.2). Among adults with diabetes, 48% are obese, and 35% of people with heart disease or stroke are obese. Obesity contributes to the deaths of 1,500 Oregonians each year,\textsuperscript{16} making it second only to tobacco as the state’s leading cause of preventable death. Among Oregon youth, approximately 17,500 Oregon eighth- and 11th-graders were overweight or obese in 2011.

Policy strategies to decrease overweight and obesity:

\textbf{Increase the price of sugary drinks to discourage use, with a portion dedicated to a comprehensive obesity prevention and education program.} Although the causes of obesity are complex, there are strong associations between consumption of sugary drinks and weight gain in adults and children.\textsuperscript{17,18,19,20} Consumption of sugary drinks is the largest contributor of calories and added sugars to the American diet.\textsuperscript{21} Raising the price of sugary beverages will reduce consumption.

\textbf{Develop comprehensive obesity prevention and education programs to support efforts addressing diabetes, heart disease and stroke risk factors.} Oregon needs an evidence-based, comprehensive obesity prevention program modeled on the state’s successful comprehensive tobacco prevention program to effectively address the obesity epidemic. A comprehensive statewide obesity prevention and education program would coordinate efforts to establish policies and social norms that promote daily physical activity and healthful eating. A comprehensive program would also help Oregonians make physical activity and healthful eating a part of their everyday lives, which will prevent the development of serious chronic diseases caused by obesity, including diabetes, heart disease and stroke.
High blood pressure

High blood pressure is often referred to as the “silent killer” because many people do not realize they have it. Blood pressure is the force of blood against artery walls as it circulates through the body. Blood pressure normally rises and falls throughout the day, but it can cause health problems if it stays high for extended periods of time. Having high blood pressure increases risk for heart attack and stroke, and can be caused by cigarette smoking, overweight or obesity, and excessive sodium in the diet. Having diabetes also increases the risk of developing high blood pressure. In Oregon, 68% of adults with diabetes and 56% of adults with heart disease or stroke also have high blood pressure, compared with 28% of the general population. The percentage of African American persons who report high blood pressure is nearly double that of white persons. According to the Centers for Disease Control and Prevention, nearly one in three American adults (68 million people) has high blood pressure, and more than half of them do not have it under control. During the last 20 years, high blood pressure in the Oregon adult population increased by 34%, from 21% in 1990 to 28% in 2011 (Figure 1.2).

Policy strategy to address high blood pressure, high cholesterol and low consumption of fruits and vegetables:

Reduce access to sugary beverages and foods high in sodium and trans fats by adopting and implementing nutrition standards for foods and beverages sold in cafeterias, stores and vending machines. Oregon can lower blood pressure and cholesterol levels in the population by reducing trans fats and sodium in the food supply. Overweight and obesity, risk factors for high blood pressure and high cholesterol, can be reduced by limiting access to sugary beverages and foods high in calories and low in nutritional value, and increasing availability of nutritious foods that meet the U.S. Dietary Guidelines. Child care settings, schools, worksites, health systems, and state and local governments can make it easier for individuals to choose healthy food and drink options through nutrition standards and policies that increase convenient access to fruits and vegetables and other healthy foods and drinking water. These policies should also decrease access to unhealthy foods and beverages.
**High cholesterol**

Cholesterol helps the body build new cells, insulate nerves and produce hormones. However, too much cholesterol in the blood can build up on the walls of arteries and block blood flow to vital organs such as the heart and brain, which can lead to heart disease and stroke. High cholesterol is also an indicator for diabetes, as elevated levels of cholesterol are seen in people with insulin resistance. High cholesterol is caused by excess fat — particularly trans fats — in the diet, being overweight or obese, lack of physical activity and cigarette smoking. In Oregon, 64% of adults with diabetes and 67% of adults with heart disease or stroke have high cholesterol, compared with 33% of the general population. Oregon adults with less than a high school education are 23% more likely to have high cholesterol and 24% less likely to have had a cholesterol screening in the past five years compared to Oregon adults with a college degree. During the last 20 years, high cholesterol in the Oregon adult population increased by 26%, from 26% in 1990 to 33% in 2011.

**Inadequate consumption of fruits and vegetables**

Consuming a diet with an adequate amount of fruits and vegetables is associated with lower risks for overweight and obesity, which are risk factors for many chronic diseases including diabetes, heart disease and stroke. The 2010 “Dietary Guidelines for Americans” emphasize three major goals for adults and children: 1) Balance calories with physical activity to manage weight; 2) Eat more of certain foods and nutrients, such as fruits, vegetables, whole grains, fat-free and low-fat dairy products, and seafood; and 3) Eat foods lower in sodium (salt), saturated fats, trans fats, cholesterol, added sugars and refined grains. Following these guidelines can help people achieve and maintain a healthy body weight, which is a key prevention strategy for many chronic diseases and their associated risk factors. However, the percentage of Oregon adults who consume five or more servings of fruits and vegetables per day has remained relatively unchanged for 15 years (Figure 1.2). In 2011, only 22% of adults reported consuming five or more servings of fruits and vegetables each day, while 27% of Oregon eighth-graders and 19% of Oregon 11th-graders reported doing so.
Lack of physical activity

Daily physical activity can provide significant health benefits. Paired with a healthy diet, physical activity can promote weight loss and reduce the risk of overweight and obesity. It can also prevent diabetes, heart disease, and stroke. Even without a dramatic decrease in weight, physical activity can improve blood pressure, blood glucose control, and overall well-being.27 Currently, the Centers for Disease Control and Prevention recommend that adults get at least two and one-half hours a week of moderate-intensity aerobic activity such as brisk walking, or one hour and 15 minutes a week of vigorous-intensity aerobic activity, such as jogging, or a combination of both. In 2011, 20% of adults reported participating in no physical activity outside of work.

In comparison, 33% of adults with heart disease and 32% of adults with diabetes reported participating in no physical activity outside of work. Among Oregon eighth-graders, 56% reported participating in a daily physical education class at school while only 39% of 11th-graders reported doing so.

Policy strategies to address lack of physical activity:

**Increase physical activity through standards for physical activity and screen time.** Physical activity, paired with a healthy diet, can improve blood pressure and blood glucose control, promote weight loss, and reduce the risk of overweight and obesity. Child care, schools, worksites, health systems, and state and local governments can provide physical activity opportunities for employees and students by encouraging active commuting. This can be done by installing bike racks or discounting public transportation; providing physical activity supports in the work environment, such as safe stairwells and onsite wellness centers; and allowing flexibility in schedules to give employees time for physical activity. Reducing or limiting screen time in child care and schools can also increase physical activity.

**Prioritize health in transportation and land use planning initiatives.** This strategy can increase opportunities for physical activity by increasing access to safe biking and walking routes, active transportation, and recreation options.
1.4 Community and health system efforts to help people take care of themselves

In addition to the policy strategies discussed throughout this volume, diabetes, heart disease and stroke can be prevented or better managed through proven lifestyle intervention and chronic disease self-management programs. Quality community and clinical services can assist with the prevention, early detection and management of risk factors and chronic diseases.

Strategies to increase access to chronic disease self-management programs:

- Prevent diabetes, heart disease and stroke and address related risk factors by increasing availability of evidence-based interventions. Lifestyle interventions such as the National Diabetes Prevention Program can prevent or delay onset of Type 2 diabetes among people at high risk. Other evidence-based interventions include the Oregon Tobacco Quit Line, which provides tobacco cessation counseling and increases the chances of quitting successfully, and Walk with Ease, a gentle exercise program that increases walking among participants.

- Support chronic disease self-management by increasing the availability of evidence-based programs. Programs such as Living Well with Chronic Conditions and Tomando Control de su Salud are offered throughout Oregon to provide tools for living a healthy life with chronic health conditions, including diabetes, heart disease, stroke, cancer, arthritis and asthma. Development of a sustainable delivery and funding infrastructure will ensure that an increased number of people with chronic diseases have access to self-management and prevention programs throughout Oregon, leading to improved health outcomes and health care cost savings.

Strategies to improve delivery and use of quality clinical and community services for prevention, early detection and management of risk factors and chronic diseases:

- Conduct screenings according to recommended guidelines for blood pressure, cholesterol and hemoglobin A1C.
- Increase clinical referrals to sustainable, evidence-based prevention and self-management education and support services for people with or at risk for diabetes, heart disease and stroke.
- Assess patients for tobacco use, providing advice to quit, and referring tobacco users to the Oregon Tobacco Quit Line, 1-800-QUIT-NOW (1-800-784-8669), and other evidence-based cessation benefits.
- Deliver health care for people with and at risk for diabetes, heart disease and stroke in accordance with clinical practice guidelines to improve control of shared risk factors for the diseases and their complications.27,28
- Measure performance using standardized metrics to identify practice changes and improve quality.
Conclusions

Diabetes, heart disease and stroke are leading causes of death in Oregon and are among the most costly health conditions in the state. The risk factors for these diseases are increasingly common among adults in Oregon.

By implementing evidence-based prevention strategies, many risk factors can be addressed before chronic diseases develop. Policy, environmental and systems change strategies can prevent or reduce heart disease and stroke, increase survivability for those who have suffered a heart attack or stroke, and prevent, delay and control diabetes.

The Health Promotion and Chronic Disease Prevention Section of the Oregon Public Health Division is working with local and state partners to prevent and control diabetes, heart disease and stroke by:

- Increasing availability of healthy foods and beverages in child care facilities, schools, worksites and neighborhoods;
- Increasing places where people can move more safely;
- Increasing the number of environments that are tobacco-free;
- Increasing referrals to self-management programs so that people with chronic disease can live well and take care of themselves;
- Improving delivery and use of quality health care services through the physician promotion of the ABCS — A1C checks, Blood pressure control, Cholesterol control, Smoking cessation and reduced Sodium consumption.

This comprehensive, community-wide approach makes eating better, moving more and living tobacco-free easier for all Oregonians wherever they live, work, play and learn.
WHAT DOES A HEALTHY COMMUNITY LOOK LIKE?

Where you live, work, play and learn

https://public.health.oregon.gov/DiseasesConditions/ChronicDisease/Pages/pubs.aspx
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This volume summarizes data about common risk factors for diabetes, heart disease and stroke in Oregon. These risk factors include cigarette smoking, obesity, hypertension, high cholesterol, lack of physical activity, inadequate consumption of fruits and vegetables and excessive consumption of sodium. This volume reflects the most recent data available from a variety of sources with data tables and graphs depicting the prevalence of these risk factors in Oregon over time, across select demographics and among those with diabetes, heart disease and stroke.

The intent of this report is to highlight the burden of these common risk factors in Oregon. This report is also intended to assist stakeholders, policymakers and other interested parties in their efforts to reduce the burden of these risk factors for chronic disease and, consequently, reduce the death and disease associated with diabetes, heart disease and stroke. For more information on each dataset, see Appendix A.

What are some common risk factors for diabetes, heart disease and stroke?

- Cigarette smoking;
- Obesity;
- High blood pressure;
- High cholesterol;
- High sodium intake;
- Low consumption of fruits and vegetables;
- Lack of physical activity.
Who has these risk factors?

**Cigarette smoking**
- More than 589,000 adults in Oregon are current cigarette smokers.
- The percentage of Oregon adults who currently smoke cigarettes has decreased 13.5% during the past 15 years, from 23.7% in 1996 to 20.5% in 2011.
- In the past, fewer Oregon adults reported current cigarette smoking compared to the overall U.S. population; however, in recent years as tobacco prevention activities have become more consistent across states, this difference no longer exists.
- Oregon adults with less than a high school education are nearly five times more likely to report current cigarette smoking compared to Oregon adults with a college degree.

**Obesity**
- More than 800,000 adults in Oregon are considered obese.
- The percentage of Oregon adults who are obese more than doubled during the past 20 years, from 11% in 1990 to 27% in 2011.
- In 2009, the percentage of Oregon adults who were obese was lower than the overall adult population in the United States; Oregon adults were 11.2% less likely to be obese than U.S. adults.
- Obesity increased more than 50% for both eighth- and 11th-graders between 2001 and 2009.
- The prevalence of obesity among adults with less than a high school education is nearly double that of adults with a college degree.
- The prevalence of obesity among non-Latino American Indian and Alaska Native persons is 55.6% higher than non-Latino white persons.

**High blood pressure**
- More than 900,000 adults in Oregon have high blood pressure.
- The percentage of Oregon adults with high blood pressure increased 33% during the past 20 years, from 20.7% in 1990 to 27.6% in 2011.
- Fewer Oregon adults (27.6%) report high blood pressure compared with the overall U.S. population (30.2%), which has been consistent over time.
- The percentage of African American persons who report high blood pressure was nearly double that of white persons.

**High cholesterol**
- More than 1.1 million adults in Oregon have high cholesterol.
- The percentage of adults who have high cholesterol increased 27% during the past 20 years, from 25.8% in 1990 to 32.7% in 2011.
Fewer Oregon adults (32.7%) currently report high cholesterol compared to the overall U.S. population (34.2%). However, the prevalence of high cholesterol among adults in Oregon and the United States has been fairly similar over time.

Oregon adults with less than a high school education are 23.3% more likely to have high cholesterol and 23.6% less likely to have had a cholesterol screening in the past five years compared to Oregon adults with a college degree.

**High sodium intake**
- In 2011, an estimated 1.1 million Oregonians were reducing their salt intake, with an equal proportion of males and females.
- In 2011, 16.3% of Oregon adults (an estimated 487,570 people) were advised by their doctors to reduce sodium intake.
- This proportion increases among adults with chronic disease risk factors and chronic conditions: 36.6% of adults with high blood pressure, 21.9% who were obese, 40.4% who had had a stroke, 48.5% who had had a heart attack, 35.8% with heart disease and 44.9% with diabetes were advised by their doctors to reduce sodium intake.

**Lack of physical activity**
- Approximately 600,000 adults in Oregon lack physical activity outside of work.
- Adults with less than a high school education are 70% more likely to report a lack of physical activity compared to adults with a college degree.
- Lack of physical activity among adults with diabetes is approximately 60% higher compared to the general population.

**Low consumption of fruits and vegetables**
- Approximately one-in-three Oregon adults report consuming fruits less than one time daily and nearly one-in-six report consuming vegetables less than one time daily.
- Among Oregon eighth-graders, one-in-three report consuming fruits and vegetables less than one time daily on average.
- Data on the number of Oregon adults who meet CDC’s fruit and vegetable consumption recommendations are unavailable at this time.

**Trans fats consumption**
- In a 2012 survey of adult Oregonians, nearly four-out-of-five respondents believed that consumption of trans fats is harmful to health.
- Only 55% of Oregon adults express concern about their own trans fats consumption.
- Although the majority of Oregon adults are able to correctly identify the most common dietary sources of trans fats, nearly one-in-three are unable to identify foods high in trans fats.
Sugary drink consumption
- In 2011, 13% of Oregon adults reported drinking an average of one or more sugar-sweetened sodas per day.
- Among Oregon eighth-graders, 11% report drinking an average of one or more sugar-sweetened sodas per day.

Risk factors among adults with diabetes and coronary heart disease
Among adults with diabetes:
- 26% are current cigarette smokers;
- 48% are considered obese;
- 68% have high blood pressure;
- 73.2% of those with high blood pressure are taking medication for high blood pressure;
- 64% have high cholesterol;
- 92.7% have had a cholesterol screening in the past five years;
- 33% are physically inactive.

Among adults with heart disease:
- 25% are current cigarette smokers;
- 55% are considered obese;
- 50% have high blood pressure;
- 66.1% of those with high blood pressure are taking medication for high blood pressure;
- 47% have high cholesterol;
- 66.4% have had a cholesterol screening in the past five years;
- 24% are physically inactive.

Risk factors among adults surviving a heart attack and stroke
Among adults surviving a heart attack:
- 22% are current cigarette smokers;
- 33% are considered obese;
- 50% have high blood pressure;
- 89% of those with high blood pressure are taking medication for high blood pressure;
- 72% have high cholesterol;
- 79% have had a cholesterol screening in the past five years;
- 27% are physically inactive.

Among adults surviving a stroke:
- 36% are current cigarette smokers;
- 35% are considered obese;
- 51% have high blood pressure;
- 60% of those with high blood pressure are taking medication for high blood pressure;
- 70% have high cholesterol;
70% have had a cholesterol screening in the past five years;
47% are physically inactive.

Ways to reduce the burden of shared risk factors for diabetes, heart disease and stroke in Oregon

The Oregon Public Health Division is committed to preventing heart disease, stroke and diabetes through a wide range of evidence-based practices. The Health Promotion and Chronic Disease Prevention Section of the Oregon Public Health Division is working with local and state partners to:

- Increase availability of healthy foods and beverages in child care facilities, schools, worksites and neighborhoods;
- Increase places where people can move more safely;
- Increase the number of environments that are tobacco-free;
- Increase referrals to self-management programs so that people with chronic disease can live well and take care of themselves;
- Improve delivery and use of quality health care services through the physician promotion of the ABCS — A1C checks, Blood pressure control, Cholesterol control, and Smoking cessation, and reduced Sodium consumption.

This comprehensive, community-wide approach makes it easier for all Oregonians to eat better, move more and live tobacco-free wherever they live, work, play and learn.
Combined, these diseases affect 1 in 7 Oregonians and cost $1.5 billion in hospitalizations in 2011. 78% of Oregon adults have at least one risk factor.

Common risk factors (below) contribute to the development of diabetes and heart disease, and increase the risk of future heart attack and stroke.

Among Oregon adults:
- 1 in 4 is obese.
- 1 in 5 smokes cigarettes.
- 1 in 3 has high cholesterol.
- 1 in 4 has high blood pressure.
- 1 in 5 is physically inactive.

Risk factors for DIABETES, HEART DISEASE and STROKE affect some communities more than others.

Compared to adults with a college degree, adults with less than a high school education are:
- 2x more likely to be obese.
- 2x more likely to smoke cigarettes.
- 3x more likely to smoke cigarettes.

Compared to non-Latino whites, American Indian and Alaska Native adults are:
- 2x more likely to be obese.
- 2x more likely to smoke cigarettes.

Diabetes, heart disease and stroke cause more than a quarter of all deaths in Oregon annually.

Diabetes, Heart Disease and Stroke in Oregon, 2013 Report
Heart disease and stroke are the leading causes of death in Oregon and the United States, and diabetes is a significant cause of disability. There are several health behaviors that increase a person’s risk for developing these chronic conditions. Focusing on preventing and managing these chronic disease risk factors is a key strategy for reducing the burden of chronic disease in Oregon.

What are the common risk factors for diabetes, heart disease and stroke?

Cigarette smoking

In Oregon, as in the United States, tobacco use is the leading cause of preventable death, which includes death from heart disease and stroke. Damage to the cardiovascular system from tobacco smoke is immediate and occurs even with brief exposure. Breathing tobacco smoke damages the delicate cells that line blood vessels throughout the body, which impairs blood flow to and from the heart. In the short term, heart rate and blood pressure increase. Over time, the walls of blood vessels thicken and narrow, further affecting blood flow. People who smoke have double the risk of heart disease and stroke compared to those who do not smoke. Quitting cigarette smoking reduces the risk for cardiovascular disease and death. The risk for heart attack drops sharply just one year after cigarette smokers quit entirely. Even patients who have already had a heart attack cut their risk of having another one by a third to a half if they quit cigarette smoking. After two to five years the chance of stroke could fall to about the same level as someone who has never smoked. Tobacco use also increases the risk of developing diabetes. Tobacco use can increase blood sugar levels and lead to insulin resistance. And the more you smoke, the greater your risk of diabetes. Heavy cigarette smokers — those who smoke more than 20 cigarettes a day — almost double their risk of developing diabetes, when compared with nonsmokers.
Obesity

Obesity describes a range of weight that is far greater than what is generally considered healthy for a given height. Having excess body weight causes the heart to work harder and increases the risk of high blood pressure and high cholesterol. People who are obese are also at much higher risk for developing diabetes, heart disease and stroke. Currently obesity is the number two preventable cause of death among Oregonians, after tobacco use, and it is expected to become more of a problem as today’s youth carry the burden of obesity into adulthood.

Our social and physical environments are powerful influencers affecting what we eat, how we live and how healthy we are throughout our lifetimes. Today in Oregon, nutritious food and places to play and exercise are out of reach for many people. All Oregonians deserve convenient access to nutritious foods and activities that help them live better. Healthy options should be available to all Oregonians and not dependent on income, educational attainment, race or ethnicity.

High blood pressure

Having high blood pressure raises your risk for heart disease and stroke, which are the leading causes of death and disability in Oregon and nationally. Blood pressure is the force of blood against your artery walls as it circulates through your body. Blood pressure normally rises and falls throughout the day, but it can cause health problems if it stays high for a long time. High blood pressure is caused by a diet high in sodium, being overweight or obese, lack of physical activity that can lead to weight gain, excessive alcohol use and tobacco use. Blood pressure also tends to increase with age and non-Latino African American persons are more likely to have high blood pressure than non-Latino white persons. Although some people can inherit genes that make them more likely to develop high blood pressure, the risk for this chronic disease risk factor can increase even more when heredity is combined with an unhealthy lifestyle.

Diabetes also increases a person’s risk for developing high blood pressure. Diabetes affects the body’s use of a hormone called insulin that tells the body to remove sugar from the blood. With diabetes, the body either doesn’t make enough insulin, can’t use its own insulin as well as it should, or both. This causes sugars to build up in the blood, which increases blood pressure.

High blood pressure is called the “silent killer” because many people don’t realize they have it. High blood pressure often has no warning signs or symptoms. The only way to detect whether or not you have high blood pressure is to have your blood pressure measured by a doctor or health professional — it is quick and painless. Lowering blood pressure by changes in lifestyle — such as quitting cigarette smoking, exercising or taking medication — can lower the risk of heart disease and heart attack.

High cholesterol

Having high cholesterol puts you at risk for heart disease and stroke. Too much cholesterol in the blood can build up on the walls of arteries and block blood flow to vital organs such
as the heart and brain, which can lead to heart disease and stroke. High cholesterol is also an indicator for diabetes, as elevated levels of cholesterol are seen in people with insulin resistance. Approximately one of every six adult Americans has high cholesterol.

High cholesterol tends to affect some more than others. Age and genetic predisposition are important factors that contribute to high cholesterol. Poor nutrition, excessive intake of trans fats, lack of physical activity and cigarette smoking can also trigger high cholesterol or make treating high cholesterol more complicated. There are no symptoms of high cholesterol. Many people have never had their cholesterol checked and are unaware that they are at risk for the associated chronic diseases. Cholesterol levels can be determined with a simple blood test. Preventing high cholesterol or lowering cholesterol levels if already high can be achieved through eating a healthy diet low in trans fats, maintaining a healthy weight, exercising regularly, not cigarette smoking and treating high cholesterol through medication.

**High sodium intake**

Eating a diet high in sodium increases a person’s blood pressure, which results in an increased risk for heart disease and stroke. A modest reduction in salt intake reduces blood pressure and consequently decreases risk of stroke and fatal heart disease in adults. Limiting sodium intake is particularly important for people 51 and older, African American persons, and those who have high blood pressure, chronic kidney disease or diabetes, as these vulnerable populations are all at an increased risk for heart disease and stroke. Approximately nine in 10 persons consume more sodium than recommended by the 2010 Dietary Guidelines for Americans. Reducing population sodium intake to recommended levels is estimated to save 280,000 to 500,000 Americans from dying prematurely of chronic diseases such as heart disease and stroke in a decade, and also save $18 billion in health care costs.

**Lack of physical activity**

Daily physical activity can provide significant health benefits. Paired with a healthy diet, physical activity can promote weight loss and reduce the risk of obesity. Physical activity can also prevent diabetes, heart disease and stroke. Even without a dramatic decrease in weight, physical activity can improve blood pressure, blood glucose control and overall well-being. However, lack of physical activity can have the opposite effect.

**Low fruits and vegetables consumption**

Eating fruits and vegetables can help with weight management and lowers the risk of developing chronic diseases like heart disease, stroke and diabetes. Increasing access to high quality and affordable fruits and vegetables is a key step to increasing the population’s consumption of fruits and vegetables. Creating greater access to fresh and affordable fruits and vegetables relies on collaborative work among state leaders, health professionals, food retail owners, farmers, education staff and community members.
Currently, adults in the United States consume fruit approximately 1.1 times per day and vegetables approximately 1.6 times per day. The “Dietary Guidelines for Americans” 2010 recommends that Americans eat more fruits and vegetables as part of a healthy diet. Many states are attempting to increase fruits and vegetables consumption by improving access and establishing policies that make it easier to get fruits and vegetables in communities, schools and child care settings. Twenty-eight states now have a farm to school/preschool policy and 27 states have created state-level food policy councils comprised of private and public partners working together to improve access to healthy food.

Oregonians have been identified as having more access than the majority of other states’ residents to at least one store that offers a wide variety of affordable fruits and vegetables. Oregon is also a leader in the percentage of farmers markets that accept Supplemental Nutrition Assistance Program (SNAP) benefits.

**Trans fats consumption**

Artificial trans fats are not essential for human health. The Dietary Guidelines for Americans 2010 and the Institute of Medicine recommend that individuals keep trans fat consumption as low as possible. There are two main sources of trans fats in the diet. Naturally occurring trans fat is found in small amounts in the fatty parts of meat and dairy products. Artificial trans fat comes from foods that contain partially hydrogenated oil. Often food manufacturers use artificial trans fat in food products because it is inexpensive and it increases the food’s shelf life, stability and texture. Foods that may contain artificial trans fat include fried items, savory snacks (like microwave popcorn), frozen pizzas, baked goods, margarines and spreads, ready-to-use frosting and coffee creamers.

Trans fat intake has significantly decreased in the United States as a result of efforts to increase awareness of its health effects, Nutrition Facts label changes, industry efforts to voluntarily reformulate foods, and some state and local government restriction of its use in restaurants and other food service outlets. However, an average American still consumes 1.3 grams of artificial trans fat each day. Consuming trans fat increases low-density lipoprotein (“bad”) cholesterol and may decrease high-density lipoprotein (“good”) cholesterol. This effect contributes to increased coronary heart disease and death. Further reducing trans fat consumption by avoiding artificial trans fat could prevent 10,000–20,000 heart attacks and 3,000–7,000 coronary heart disease deaths each year in the United States.

The increased risk of heart disease has led several jurisdictions to reduce or eliminate trans fats from use in restaurants and schools. The Food and Drug Administration (FDA) requires trans fat to be listed on food labels. The availability of substitute oils for cooking and food manufacturing permits the banning of trans fat without hardships for restaurant food manufacturers.
Sugary drinks

The rising consumption of sugary drinks, like regular soda or pop or sports drinks, is a significant contributor to the obesity epidemic. Sugary drinks contribute excess calories and sugar to the American diet; a typical 20-ounce soda contains 15 to 18 teaspoons of sugar and upwards of 240 calories. People who drink this “liquid candy” do not feel as full as if they had eaten the same calories from solid food and compensate by eating more.

Sugary drinks are the largest source of added sugars in the diet of U.S. youth. Boys aged 12–19 years consume an average of 22.0 ounces of full-calorie soda drink per day — more than twice their daily intake of fluid milk (9.8 ounces), while girls consume an average of 14.3 ounces of full-calorie soda and 6.3 ounces of fluid milk per day. Youth in particular should drink fewer sugar-sweetened beverages and more water and low-fat or fat-free milk, or limited amounts of 100% fruit juices. Families, schools and other institutions should work to provide healthy beverage choices.

Chronic disease risk factors are a public health priority

The number of Oregonians with common risk factors for diabetes, heart disease and stroke is steadily increasing over time. In 2011, 63% of Oregonians were either obese, had high blood pressure, or had high cholesterol, and 8% of Oregon adults had all three of these conditions. In addition, 20% of Oregon adults smoke cigarettes, and the same number are physically inactive. In order to prevent or delay the onset of diabetes, heart disease and stroke, the underlying risk factors of these diseases must be addressed. Due to the significant burden of chronic diseases in Oregon and nationally, the reduction of these risk factors has been identified as a key component in the Oregon Public Health Division Strategic Plan, 2012–2017, as well as the Healthy People 2020 national health plan.

Oregon Public Health Division Strategic Plan, 2012–2017 outcomes:

- Reduce adult cigarette smoking prevalence to 15% or less.
- Reduce 11th-grade cigarette smoking prevalence to 7.5% or less and eighth-grade cigarette smoking prevalence to 5% or less.
- Adult obesity prevalence will be 30% or less.
- Eleventh-grade obesity prevalence will be 10% or less, and eighth-grade obesity prevalence will be 11% or less.
- Reduce the rate of heart attack hospitalization among Oregon adults aged 74 or younger by 12%.
Healthy People 2020 objectives:\(^{36}\)
- Reduce the proportion of adults with hypertension to 26.9%.
- Reduce the proportion of adults with high total cholesterol levels to 13.5%.
- Increase the proportion of adults who have had their cholesterol checked within the preceding five years to 82.1%.
- Reduce cigarette smoking by adults to 12.0%.
- Reduce use of cigarettes by adolescents to 16.0%.
- Increase the proportion of adults who meet current federal physical activity guidelines for aerobic physical activity and for muscle-strengthening activity to 20.1%.
- Increase the proportion of adolescents who meet current federal physical activity guidelines for aerobic physical activity and for muscle-strengthening activity to 20.2%.
- Reduce the proportion of children and adolescents who are obese to 14.5%.
- Reduce the proportion of adults who are obese to 30.5%.

The Oregon Diabetes, Heart Disease and Stroke Prevention programs are addressing these risk factors by:
- Increasing availability of healthy foods and beverages in child care facilities, schools, worksites and neighborhoods;
- Increasing places where people can move more safely;
- Increasing the number of environments that are tobacco-free;
- Increasing referrals to self-management programs so that people with chronic disease can live well and take care of themselves;
- Improving delivery and use of quality health care services through the physician promotion of the ABCS — A1C checks, Blood pressure control, Cholesterol control, and Smoking cessation, and reduced Sodium consumption.

This comprehensive, community-wide approach makes it easier for all Oregonians wherever they live, work, play and learn to eat better and move more in a tobacco-free environment.
2.1 Who currently smokes?

Cigarette smoking and exposure to secondhand smoke is the number one preventable cause of chronic disease, including heart disease, stroke and diabetes. Early cardiovascular damage occurs among young cigarette smokers, which is concerning because 88% of adult cigarette smokers started smoking before turning 18 years of age.37

- In 2011, it was estimated that more than half-a-million adults, 12% of 11th-grade students and 7% of eighth-grade students in Oregon were current cigarette smokers.
- In the same year, there were 7,337 deaths among Oregon residents attributed to tobacco use. This represented nearly one-quarter (22.4%) of all deaths in Oregon that year.
- Of these tobacco-related deaths, more than one-quarter were from cardiovascular disease.

Cigarette smoking affects some Oregon communities disproportionately. The likelihood of being a current cigarette smoker is higher among Oregon adults with less education and a smaller annual household income. Cigarette smoking is also more likely among those enrolled in the Oregon Health Plan or with no health insurance. In addition, African American and American Indian/Alaska Native persons reported current cigarette smoking more often than other racial and ethnic groups. Oregon adults who identified as gay, lesbian or bisexual were also more likely to report current cigarette smoking compared to the heterosexual adult population.

**FIGURE 2.1.1 TOBACCO-RELATED DEATHS, BY CAUSE, OREGON, 2011**

- **78%** Non-tobacco-related deaths
- **22%** Tobacco-related deaths

Data source: Oregon death certificates
This section will describe the proportion of Oregonians who currently smoke and are at an increased risk for associated chronic diseases. The current cigarette smoking prevalence* will be discussed over time and by select demographics including gender, age, education, income, health insurance status, race and ethnicity, chronic disease risk factors, and chronic conditions.

Historically, fewer Oregon adults report current cigarette smoking compared to the overall U.S. population. However, in recent years as tobacco prevention activities have become more consistent across states, the difference no longer exists (Figure 2.1.2 and Table 2.1.1).

### TABLE 2.1.1 CURRENT CIGARETTE SMOKING AMONG ADULTS, BY YEAR, OREGON AND THE UNITED STATES, 1996–2011

<table>
<thead>
<tr>
<th>YEAR</th>
<th>OREGON</th>
<th>UNITED STATES</th>
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<tbody>
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<tr>
<td>2011</td>
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<td>20.5</td>
</tr>
</tbody>
</table>

**Data source:** Oregon Behavioral Risk Factor Surveillance System; National data from the National Behavioral Risk Factor Surveillance System.

**Note:** National data were not included for 2010 because the method for weighting the data was different from the method used in Oregon. The national estimate excludes territories. Starting in 2010, estimates are not comparable to earlier years. Estimates are age-adjusted.

*For this report, current cigarette smoking prevalence for adults was determined by the percentage of adults who reported smoking at least 100 cigarettes in their lifetime and currently smoke every day or some days. For youth, current cigarette smoking was determined by the percentage of youth who reported smoking a cigarette in the past 30 days.
Since Oregon’s Tobacco Prevention and Education Program was established in 1996, the prevalence of cigarette smoking among the adult population decreased 13.5% by 2011 (Figure 2.1.2 and Table 2.1.1).

The cigarette smoking prevalence among Oregon adults appears to have increased in recent years, but this is due to changes in survey methodology that account for those with cell phones.
This change in methodology includes more survey respondents who are younger in age and are therefore more likely to smoke cigarettes.

In 2011, an estimated 589,272 Oregon adults were current cigarette smokers.

Over time, a higher proportion of males in Oregon reported current cigarette smoking compared to females (Figure 2.1.3).

In 2011, the percentage of adult males reporting current cigarette smoking was higher than females at 22.6% and 18.4%, respectively (Figure 2.1.3).
Over time, the proportion of both eighth- and 11th-grade students in Oregon who reported current cigarette smoking has declined in both Oregon and the United States (Figure 2.1.4).

Historically, the proportion of eighth-grade students who report cigarette smoking has remained relatively consistent with the national trend; however, fewer 11th-grade students in Oregon reported cigarette smoking over time compared to the U.S. population of 11th-graders (Figure 2.1.4).

From 1996 to 2011, the cigarette smoking prevalence among eighth- and 11th-grade students in Oregon decreased by 69.4% and 58.3%, respectively (Figure 2.1.4).

In 2011, an estimated 7% of eighth-grade students and 12% of 11th-grade students were current cigarette smokers in Oregon.
Current cigarette smoking increases from adolescence through young adulthood, when the body is most susceptible to the harms of tobacco smoke, and begins to decline after middle age (Figure 2.1.5).

Current cigarette smoking was highest in the age groups 18 to 24 (young adults) and 25 to 44, with nearly one-quarter of these populations reporting current cigarette smoking (Figure 2.1.5).

**Data source:** Oregon Behavioral Risk Factor Surveillance System and Oregon Healthy Teens Survey

**Note:** Estimates are not age-adjusted. Estimates for eighth- and 11th-grade students were derived from a different data source than adult estimates.
Oregon adults with less than a high school education were nearly five times more likely to report current cigarette smoking compared to Oregon adults with a college degree (Figure 2.1.6).

**FIGURE 2.1.6 CURRENT CIGARETTE SMOKING AMONG ADULTS, BY EDUCATION, OREGON, 2011**

- Less than high school: 37.6%
- High school graduate: 25.7%
- Some college: 20.0%
- College graduate: 7.7%

**Data source:** Oregon Behavioral Risk Factor Surveillance System

**Note:** The horizontal dashed line represents the percentage of the general population in Oregon who reported current cigarette smoking (20.5%). Estimates are age-adjusted.
Oregon adults in households with an annual income of less than $20,000 were more than four times more likely to report current cigarette smoking compared to Oregon adults in households with an annual income of $50,000 or more (Figure 2.1.7).
Oregon Health Plan (OHP) members and those with no health insurance were more than twice as likely to report current cigarette smoking compared to individuals enrolled in private, Medicare or other health insurance plans (Figure 2.1.8).

The higher prevalence of current cigarette smoking observed among the adult population enrolled in OHP may be due to the demographic composition of this vulnerable population. Adult OHP members are low-income and include pregnant women, seniors and people with disabilities. OHP is intended to help ensure that medical care is affordable for those with a low income.38 People with lower incomes are more likely to live in substandard housing and have higher disease morbidity.39

The higher prevalence of cigarette smoking among Oregon adults with no health insurance may be due to unstable employment, lower income and younger age, which increase the likelihood of cigarette smoking.
More African American (33.3%) and American Indian/Alaska Native (35.3%) persons reported current cigarette smoking compared to other racial and ethnic groups (Figure 2.1.9).

Compared to non-Latino white persons, African American and American Indian/Alaska Native persons were 55.6% and 64.9% more likely to report current cigarette smoking, respectively (Figure 2.1.9).

Note: Estimates are age-adjusted.
Gay and bisexual males and lesbian and bisexual females were more likely to report current cigarette smoking than heterosexual men and women (Figure 2.1.10).

Compared to their heterosexual counterparts, bisexual males and females were 62.9% and 65.8% more likely to report current cigarette smoking, respectively (Figure 2.1.10).


**Note:** Estimates are age-adjusted.
Adult Oregonians who were obese, had high blood pressure or were physically inactive report current cigarette smoking more often than the general population of Oregon adults (Figure 2.1.11).

The percentage of Oregon adults who were current cigarette smokers was 20.5% higher among those who had high blood pressure compared to the general population (Figure 2.1.11).

Oregon adults who report no physical activity were 44.4% more likely to report current cigarette smoking than the general population of Oregon adults (Figure 2.1.11).

Data source: Oregon Behavioral Risk Factor Surveillance System

Note: The horizontal dashed line represents the percentage of the general population in Oregon who reported current cigarette smoking (20.5%). Estimates are age-adjusted.
Oregon adults with diabetes had a prevalence of current cigarette smoking that was 25.4% higher than the general population (Figure 2.1.12).

Current cigarette smoking was especially common among Oregon adults who reported having a stroke in their lifetimes. Oregon adults who reported having a stroke were 73% more likely to report current cigarette smoking than the general population (Figure 2.1.12).

Data source: Oregon Behavioral Risk Factor Surveillance System
Note: The horizontal dashed line represents the percentage of the general population in Oregon who reported current cigarette smoking (20.5%). Estimates are age-adjusted.
During 2008–2011, the prevalence of cigarette smoking among Oregon counties ranged from 8.4% to 32.3%.

Benton, Clackamas, Multnomah and Washington counties had significantly lower percentages of adults who smoked cigarettes compared to the rest of the state.

Baker, Coos, Curry, Douglas, Jackson, Josephine, Lincoln and Umatilla counties had significantly higher percentages of adults who smoked cigarettes compared to the rest of the state. See Appendix A for detailed county estimates of current cigarette smoking.

**Data source:** Oregon Behavioral Risk Factor Surveillance System County Combined File.

**Note:** Estimates are age-adjusted. The state cigarette smoking prevalence for 2008–2011 was 16.3%.
Conclusions

Overall, the prevalence of current cigarette smoking among Oregon adults and youth has declined during the past 15 years. However, more than half-a-million Oregon adults, one-in-fifteen eighth-graders and one-in-ten 11th-graders are estimated to currently smoke cigarettes. This puts all ages of the Oregon population at an increased risk for death and disability due to chronic conditions, including heart disease, stroke and diabetes. Inequitable differences in current cigarette smoking were seen across demographic factors, both modifiable and non-modifiable. The likelihood of being a current cigarette smoker was higher among Oregon adults with less education, a smaller annual household income, and those enrolled in the Oregon Health Plan or with no health insurance. In addition, non-Latino African American and non-Latino American Indian/Alaska Native persons reported current cigarette smoking more often than other racial and ethnic groups. Oregon adults who identified as gay, lesbian or bisexual were also more likely to report current cigarette smoking compared to the heterosexual adult population. Those with chronic disease risk factors and comorbid chronic conditions also reported current cigarette smoking more often than the general population. Fortunately, the risk for heart attack drops sharply just one year after cigarette smokers quit entirely. Even patients who have already had a heart attack cut their risk of having another one by a third to a half if they quit smoking cigarettes. After two to five years, the chance of stroke could fall to about the same level as someone who has never smoked.3
2.2 Who is obese?

Obesity is a major risk factor for chronic conditions such as high blood pressure and high cholesterol, and for chronic diseases such as diabetes, heart disease and stroke. To better understand the burden of these chronic conditions and diseases in Oregon, the prevalence of the underlying risk factors (or precursors of disease) needs to be known. It is important to report the prevalence of obesity* among sub-populations of Oregonians (e.g., racial and ethnic minorities) to identify groups of Oregonians who are disproportionately affected by obesity compared to the general population in Oregon. This section will describe the burden of obesity among Oregon adults over time and by select demographics including gender, age, education, income, health insurance status, race and ethnicity, and by other chronic disease risk factors and conditions.

![Figure 2.2.1: Obesity among adults, by year, Oregon and the United States, 1990–2011](image)

**Data source:** Oregon Behavioral Risk Factor Surveillance System

**Note:** The horizontal dashed line denotes a different adjustment method and inclusion of cellular phones in the sample. Starting in 2010, estimates are not comparable to earlier years. BMI calculated based on 2011 CDC definition for all years. Estimates are age-adjusted.

*For this report, adult obesity was determined by the percentage of adults who have a body mass index (BMI) of 30 or above based on self-reported height and weight.
During the past 20 years, the adult obesity prevalence increased 150% in Oregon (Figure 2.2.1 and Table 2.2.1).

In 2009, the percentage of Oregon adults who were obese was lower than the overall adult population in the United States; Oregon adults were 11.2% less likely to be obese than U.S. adults (Figure 2.2.1).

Approximately 800,000 Oregon adults are considered obese, and more than 1.8 million are overweight or obese.

TABLE 2.2.1 OBESITY AMONG ADULTS, BY YEAR, OREGON AND THE UNITED STATES, 1990–2011

<table>
<thead>
<tr>
<th>YEAR</th>
<th>OREGON</th>
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<tbody>
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<tr>
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</tbody>
</table>
The percentage of men and women who are obese has been consistently similar. However, in 2011, 25.7% of men were considered obese compared to 27.5% of women.
Obesity was more prevalent at middle and older ages (45–74) compared to the youngest and oldest age groups (Figure 2.2.3).

Data source: Oregon Behavioral Risk Factor Surveillance System
Note: Estimates are not age-adjusted.
The prevalence of obesity among adults with less than a high school education was nearly double that of adults with a college degree (Figure 2.2.4).

**Data source:** Oregon Behavioral Risk Factor Surveillance System

**Note:** The horizontal dashed line represents the percentage of the general population in Oregon who are obese (26.8%). Estimates are age-adjusted.
Obesity was more prevalent among Oregonians with lower household income levels (Figure 2.2.5).

The prevalence of obesity among adults with a household income of less than $20,000 was 36% higher than those who had a household income of $75,000 or more.

**FIGURE 2.2.5 OBESITY AMONG ADULTS, BY ANNUAL HOUSEHOLD INCOME, OREGON, 2011**

**Data source:** Oregon Behavioral Risk Factor Surveillance System

**Note:** The horizontal dashed line represents the percentage of the general population in Oregon who are obese (26.8%). Estimates are age-adjusted.
The prevalence of obesity among adults currently on the Oregon Health Plan was 35% higher compared to those who had private insurance or Medicare.

**Data source:** Oregon Behavioral Risk Factor Surveillance System

**Note:** The horizontal dashed line represents the percentage of the general population in Oregon who are obese (26.8%). Estimates are age-adjusted.
Many racial and ethnic minority groups in Oregon were disproportionately affected by obesity (Figure 2.2.7). The obesity prevalence among African American, American Indian or Alaska Native, and Latino persons was significantly higher compared to white persons.

Note: Estimates are age-adjusted.
Adults who have high blood pressure, high cholesterol, or are physically inactive had a higher obesity prevalence compared to the general population.

**FIGURE 2.2.8 OBESITY AMONG ADULTS WITH SELECTED HEALTH RISK FACTORS, OREGON, 2011**

Data source: Oregon Behavioral Risk Factor Surveillance System

Note: The horizontal dashed line represents the percentage of the general population in Oregon who are obese (26.8%). Estimates are age-adjusted.

- Current cigarette smoking: 27.6%
- High blood pressure: 42.8%
- High cholesterol: 39.6%
- Physical inactivity: 35.8%
Adults who have diabetes or cardiovascular diseases had a higher obesity prevalence compared to the general population.

The prevalence of obesity among adults with diagnosed diabetes was 78% higher compared to the general population.

The prevalence of obesity among adults with coronary heart disease was more than double that of the general population.

**FIGURE 2.2.9 OBESITY AMONG ADULTS WITH DIABETES AND CARDIOVASCULAR DISEASES, OREGON, 2011**

*Data source:* Oregon Behavioral Risk Factor Surveillance System  
*Note:* The horizontal dashed line represents the percentage of the general population in Oregon who are obese (26.8%). Estimates are age-adjusted.
During 2008–2011, the prevalence of obesity among Oregon counties ranged from 17.2% to 35.3%.

Benton, Deschutes, Jackson, Josephine, Multnomah and Washington counties had significantly lower percentages of adults who were obese compared to the rest of the state.

Coos, Douglas, Linn, Marion, Umatilla and Yamhill counties and North Central Health Division had significantly higher percentages of adults who were obese compared to the rest of the state.

See Appendix A for detailed county estimates of obesity prevalence.
Conclusions
During the past two decades, obesity among Oregon adults has increased 150%. Today, 800,000 Oregon adults are considered obese, and an additional 1 million are overweight. Men and women have a similar prevalence of obesity. Obesity is prevalent among Oregonians of all ages, but less so among the very old. Differences were seen across other demographic factors. Obesity prevalence was higher among Oregon adults with less education, a smaller annual household income, and among those enrolled in the Oregon Health Plan, which is Oregon’s Medicaid program. In addition, African American, American Indian/Alaska Native, and Latino persons had a high prevalence of obesity compared to white persons.
Oregon adults with other chronic disease risk factors and chronic conditions were also more likely to be obese compared to the general population. Most notable, obesity among adults with diagnosed diabetes was 78% higher compared to the general population, and obesity among adults with coronary heart diseases was more than double compared to the general population.
2.3 Who has high blood pressure?

Having high blood pressure increases risk for heart attack and stroke and complicates management of diabetes. High blood pressure can be caused by cigarette smoking, overweight or obesity, and excessive sodium in the diet. In 2011, an estimated 825,579 Oregon adults had high blood pressure*. To understand the burden of heart disease, stroke and diabetes in Oregon, the prevalence of chronic disease risk factors such as high blood pressure needs to be understood. It is important to report the prevalence of high blood pressure among sub-populations of Oregonians (e.g., racial and ethnic minorities) to identify groups of Oregonians who are disproportionately affected by this

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**Data source:** Oregon Behavioral Risk Factor Surveillance System

**Note:** The vertical dashed line denotes a different adjustment method and inclusion of cellular phones in the sample. Starting in 2010, estimates are not comparable to earlier years. Estimates are age-adjusted.

*For this report, high blood pressure prevalence for adults was determined by the percentage of adults who reported "Yes" when asked if they have ever been told by a doctor, nurse or other health professional that they have high blood pressure.
risk factor compared to the general population in Oregon. This section will describe the proportion of Oregonians who report high blood pressure. The high blood pressure prevalence will be discussed over time and by select demographics including gender, age, education, income, health insurance status, race and ethnicity, chronic disease risk factors, and chronic conditions.

- The proportion of adults with high blood pressure has been increasing over the last 15 years in Oregon and nationally (Figure 2.3.1 and Table 2.3.1).
- Fewer Oregon adults reported high blood pressure compared with the overall U.S. population, which has been consistent over time (Figure 2.3.1 and Table 2.3.1).
- From 1995 to 2011, the percentage of Oregonians with high blood pressure increased by 16.5% (Figure 2.3.1 and Table 2.3.1).
- In 2011, an estimated 825,579 Oregon adults had high blood pressure.

### TABLE 2.3.1 ADULTS WITH HIGH BLOOD PRESSURE, BY YEAR, OREGON AND THE UNITED STATES, 1995–2011

<table>
<thead>
<tr>
<th>YEAR</th>
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<tbody>
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Prior to 2002, a similar proportion of males and females in Oregon had high blood pressure. From 2002 to 2011, a higher proportion of males reported high blood pressure than females (Figure 2.3.2).

In 2011, the percentage of adult males reporting high blood pressure was 22.2% higher than females (Figure 2.3.2).

Although there is a disparity in prevalence of high blood pressure among genders, the proportion of adults with high blood pressure who were taking medication for high blood pressure did not differ significantly between males (53.9%) and females (58.5%).

**DATA SOURCE:** Oregon Behavioral Risk Factor Surveillance Systems

**NOTE:** The vertical dashed line denotes a different adjustment method and inclusion of cellular phones in the sample. Starting in 2010, estimates are not comparable to earlier years. Estimates are age-adjusted.
The prevalence of high blood pressure increases greatly with age. More than half of Oregonians aged 65 and older had been diagnosed with high blood pressure, compared to less than 13% of adults aged 18–44 (Figure 2.3.3).
Among Oregon adults with high blood pressure, the proportion taking medication for high blood pressure increased with age (Figure 2.3.4).

Nearly all (91.6%) adults aged 75 years or older reported taking medicine for high blood pressure compared to approximately one-third of adults aged 18 to 44 with high blood pressure (Figure 2.3.4).

Data source: Oregon Behavioral Risk Factor Surveillance System

Note: Estimates are not age-adjusted.
Oregon adults with less than a high school education were 39.3% more likely to report high blood pressure compared to Oregon adults with a college degree (Figure 2.3.5).

The proportion of Oregon adults with high blood pressure taking medication for high blood pressure did not differ significantly by education level; approximately half of those with less than a high school education and half of those with a college degree were taking medication for high blood pressure.

**FIGURE 2.3.5 ADULTS WITH HIGH BLOOD PRESSURE, BY EDUCATION, OREGON, 2011**

Data source: Oregon Behavioral Risk Factor Surveillance System

Note: The horizontal dashed line represents the percentage of the general population with high blood pressure (27.6%). Estimates are age-adjusted.
Oregon adults in households with an annual income of less than $20,000 were 47% more likely to report high blood pressure compared to Oregon adults in households with an annual income of $50,000 or more (Figure 2.3.6).

**Data source:** Oregon Behavioral Risk Factor Surveillance System

**Note:** The horizontal dashed line represents the percentage of the general population with high blood pressure (27.6%). Estimates are age-adjusted.
Oregon Health Plan (OHP) members were 49.8% more likely to report high blood pressure compared to individuals enrolled in private, Medicare or other health insurance plans (Figure 2.3.7).

Oregon adults with no health insurance (26.4%) and those with private, Medicare or other health insurance plans (26.5%) reported a similar prevalence of high blood pressure (Figure 2.3.7). This is likely due to inadequate access to health care; access to care and contact with a health care provider are required to receive a diagnosis of high blood pressure. In addition, those with no health insurance are generally younger and healthier and therefore are less likely to have chronic health conditions.

Adult OHP members were more than twice as likely to smoke as people with any other type of health insurance. Smoking is an important risk factor for high blood pressure. OHP is intended to help ensure that medical care is affordable for those with a low income. People with lower incomes were more likely to live in substandard housing, smoke cigarettes and have higher disease morbidity.
The higher prevalence of high blood pressure observed among the adult population enrolled in OHP may be due to the demographic composition of this vulnerable population. Adult OHP members are low-income and include pregnant women, seniors and people with disabilities.

Adult OHP members were more than twice as likely to smoke cigarettes as people with any other type of health insurance. Cigarette smoking is an important risk factor for high blood pressure. OHP is intended to help ensure that medical care is affordable for those with a low income. People with lower incomes were more likely to live in substandard housing, smoke and have higher disease morbidity.

Oregon adults with high blood pressure and no insurance were approximately 30% less likely to be taking medication for high blood pressure compared to adults enrolled in the Oregon Health Plan or those with private, Medicare or other insurance (Figure 2.3.8).
This is likely due to the high cost of prescription medications that become unavailable to those without insurance coverage.

More African American (51.7%) and American Indian/Alaska Native (35.1%) persons reported high blood pressure compared to other racial and ethnic groups (Figure 2.3.9).

The percentage of African American persons who reported high blood pressure was nearly double that of white persons (Figure 2.3.9).

**Data source:** Oregon Behavioral Risk Factor Surveillance System 2010–2011 Race Oversample

**Note:** Estimates are age-adjusted.
Adults who were obese or very obese, current cigarette smokers, had high cholesterol or were physically inactive reported high blood pressure more often than the general population of Oregon adults (Figure 2.3.10).

The percentage of Oregon adults who had high blood pressure was 77.9% higher among those with high cholesterol compared to the general population (Figure 2.3.10).

Oregon adults who were obese had a high blood pressure prevalence 39.5% higher than the general population; those who were very obese had a high blood pressure prevalence double that of the general population (Figure 2.3.10).

**Data source:** Oregon Behavioral Risk Factor Surveillance System

**Note:** The horizontal dashed line represents the percentage of the general population with high blood pressure (27.6%). Estimates are age-adjusted.
Adult Oregonians with diabetes and those who had a heart attack sometime in their life had a high blood pressure prevalence more than double that of adults in the general population (Figure 2.3.11).

Oregonians who reported either heart disease or a stroke in their lifetimes had a high blood pressure prevalence nearly double that of the general population (Figure 2.3.11).

Data source: Oregon Behavioral Risk Factor Surveillance System
Note: The horizontal dashed line represents the percentage of the general population with high blood pressure (27.6%). Estimates are age-adjusted.
Oregon adults with high blood pressure and a comorbid chronic disease were more likely than the general population with high blood pressure to be taking blood pressure medication (Figure 2.3.12).

Among Oregon adults with high blood pressure, those with a diagnosis of diabetes or heart attack were 31.4% and 58.9% more likely than the general population to be taking medication for high blood pressure, respectively (Figure 2.3.12).

Data source: Oregon Behavioral Risk Factor Surveillance System
Note: The horizontal dashed line represents the percentage of the general population with high blood pressure taking medication for high blood pressure (55.7%). Estimates are age-adjusted.
During 2008–2011, the prevalence of diagnosed high blood pressure among Oregon counties ranged from 14.4% to 38.3%.

Deschutes, Harney, Jefferson and Washington counties had significantly lower percentages of adults with diagnosed high blood pressure compared to the rest of the state.

Douglas County had a significantly higher percentage of adults with diagnosed high blood pressure compared to the rest of the state.

See Appendix A for detailed county estimates for high blood pressure prevalence.
Among Oregon adults with a diagnosis of high blood pressure, a little more than half were advised by their health care professional to change their eating habits and cut down on salt intake; nearly one-in-four were advised to reduce alcohol use, two-in-three were advised to exercise and five-in-six were advised to take blood pressure medication to control high blood pressure (Figure 2.3.14).

Data source: Oregon Behavioral Risk Factor Surveillance System
Note: Estimates are age-adjusted.
Among Oregon adults with a diagnosis of high blood pressure, nearly two-in-three reported changing their eating habits, nearly three-in-four reported cutting down on salt intake, nearly one-in-three report reduced alcohol use, and a little more than half reported engaging in physical activity to reduce their high blood pressure (Figure 2.3.15).

**Data source:** Oregon Behavioral Risk Factor Surveillance System

**Note:** Estimates are age-adjusted.
Conclusions

Overall, the prevalence of high blood pressure among Oregon adults is steadily increasing over time, likely coinciding with the rise in obesity. There are notable differences in prevalence of high blood pressure among males and vulnerable groups of Oregonians including those with less education, a smaller annual household income, and those enrolled in the Oregon Health Plan. In addition, African American persons reported high blood pressure more often than other racial and ethnic groups. Over half of African American persons in Oregon have high blood pressure, which is nearly double the proportion of white persons. Oregon adults with chronic disease risk were also more likely to report high blood pressure than the general population, particularly those with high cholesterol and those who are very obese. Oregonians with diabetes or cardiovascular disease were also more likely to report high blood pressure than the general population and were also more likely to be taking medication for high blood pressure. Fortunately, Oregon adults with high blood pressure are engaging in behaviors that will help to lower their high blood pressure, including changing eating habits, cutting down on salt intake and exercising. The vast majority of those with high blood pressure were advised by their health care provider to take blood pressure medication. Approximately half were not advised to change their eating habits or lower salt intake and 40% were not advised to exercise. These are all key components to the control of high blood pressure.
2.4 Who has high cholesterol?

Having high cholesterol increases risk for heart attack and stroke and is an indicator for diabetes. High cholesterol can be caused by overweight or obesity, and a diet high in artificial trans fats. In 2011, an estimated 1.1 million Oregon adults had high cholesterol. It is important to report the prevalence of high cholesterol* among sub-populations of Oregonians (e.g., racial and ethnic minorities) to identify groups of Oregonians who are disproportionately affected by this risk factor compared to the general population in Oregon. This section will describe the proportion of Oregonians who report high cholesterol. The high cholesterol prevalence will be discussed over time and by select demographics including

*For this report, high cholesterol prevalence for adults was determined by the percentage of adults who reported “Yes” when asked if they have ever been told by a doctor, nurse or other health professional that they have high cholesterol.
gender, age, education, income, health insurance status, race and ethnicity, chronic disease risk factors, and chronic conditions.

- The prevalence of high cholesterol has steadily increased in both Oregon and the United States during the last 15 years (Figure 2.4.1).
- Fewer Oregon adults currently reported high cholesterol compared to the overall U.S. population; however, the prevalence of high cholesterol among adults in Oregon and the United States has been fairly similar over time (Figure 2.4.1 and Table 2.4.1).
- From 1995 to 2011, the prevalence of high cholesterol among Oregon adults increased 23.8% (Figure 2.4.1 and Table 2.4.1).
- In 2011, an estimated 1,151,922 Oregon adults had high cholesterol.

<table>
<thead>
<tr>
<th>YEAR</th>
<th>OREGON</th>
<th>UNITED STATES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>26.4</td>
<td>26.9</td>
</tr>
<tr>
<td>1996</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>1997</td>
<td>29.1</td>
<td>26.7</td>
</tr>
<tr>
<td>1998</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>1999</td>
<td>26.2</td>
<td>27.7</td>
</tr>
<tr>
<td>2000</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>2001</td>
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<td>28.5</td>
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<tr>
<td>2002</td>
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<td>2003</td>
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<tr>
<td>2004</td>
<td>31.6</td>
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<tr>
<td>2005</td>
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<tr>
<td>2006</td>
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<td>N/A</td>
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<tr>
<td>2007</td>
<td>32.9</td>
<td>33.8</td>
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<tr>
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</tr>
<tr>
<td>2011</td>
<td>32.7</td>
<td>34.2</td>
</tr>
</tbody>
</table>
Prior to 1998, a similar proportion of males and females in Oregon had high cholesterol. From 1998 to 2011, a higher proportion of males than females reported high cholesterol (Figure 2.4.2).

In 2011, the percentage of adult males reporting high cholesterol was 15% higher than females (Figure 2.4.2).

Although males had a higher prevalence of high cholesterol, a higher proportion of females (72.5%) reported getting a cholesterol screening in the past five years than males (67.7%).

Data source: Oregon Behavioral Risk Factor Surveillance System
Note: The vertical dashed line denotes a different adjustment method and inclusion of cellular phones in the sample. Starting in 2010, estimates are not comparable to earlier years. Estimates are age-adjusted.
The percentage of adults reporting high cholesterol increased with age (Figure 2.4.3).

Approximately half of Oregon adults aged 55 or older had high cholesterol, and approximately one-in-five of those aged 18 to 44 reported high cholesterol (Figure 2.4.3).

Data source: Oregon Behavioral Risk Factor Surveillance System
Note: Estimates are not age-adjusted.
The proportion of Oregon adults who received a cholesterol screening in the past five years also increased with age; half of adults aged 18 to 44 met cholesterol screening recommendations and nearly all Oregon adults 45-years-old or older received cholesterol screening in the last five years (Figure 2.4.4).

Data source: Oregon Behavioral Risk Factor Surveillance System
Note: Estimates are not age-adjusted.
Oregon adults with less than a high school education were 23.3% more likely to have high cholesterol compared to Oregon adults with a college degree (Figure 2.4.5).

**Data source:** Oregon Behavioral Risk Factor Surveillance System

**Note:** The horizontal dashed line represents the percentage of the general population with high cholesterol (32.7%). Estimates are age-adjusted.
Oregon adults with less than a high school education were 23.6% less likely to have had a cholesterol screening in the past five years compared to Oregon adults with a college degree (Figure 2.4.6).
Oregon adults in households with an annual income of less than $20,000 were 24.3% more likely to report high cholesterol compared to Oregon adults in households with an annual income of $50,000 or more (Figure 2.4.7).

Data source: Oregon Behavioral Risk Factor Surveillance System

Note: The horizontal dashed line represents the percentage of the general population with high cholesterol (32.7%). Estimates are age-adjusted.
Oregon adults in households with an annual income of less than $20,000 were 18.8% less likely to report cholesterol screening compared to Oregon adults in households with an annual income of $50,000 or more (Figure 2.4.8).

**Data source:** Oregon Behavioral Risk Factor Surveillance System

**Note:** The horizontal dashed line represents the percentage of the general population with a cholesterol screening in the past five years (70.1%). Estimates are age-adjusted.
Oregon Health Plan members were 19.3% more likely to report high cholesterol compared to individuals enrolled in private, Medicare or other health insurance plans (Figure 2.4.9).

The higher prevalence of high cholesterol observed among the adult population enrolled in OHP may be due to the demographic composition of this vulnerable population (Figure 2.4.9). Adult OHP members are low-income and include pregnant women, seniors and people with disabilities. Adult OHP members are more than twice as likely to smoke as people with any other type of health insurance. Cigarette smoking is an important risk factor for high cholesterol. OHP is intended to help ensure that medical care is affordable for those with low incomes. People with lower incomes are more likely to smoke cigarettes and have higher disease morbidity.
A similar proportion of OHP members and adults with private insurance reported receiving a cholesterol screening in the past five years (Figure 2.4.10). This is likely due to equal access to health care, which makes it more likely a person will receive recommended preventive health screenings such as cholesterol tests.

Oregon adults with no health insurance were less likely than both members of the Oregon Health Plan and those with private insurance to report high blood pressure or a cholesterol screening in the past five years (figures 2.4.9 and 2.4.10). This is likely due to inadequate access to health care. Access to care and contact with a health care provider are required to receive a cholesterol screening and receive a diagnosis of high cholesterol from a health care provider. In addition, those with no health insurance are generally younger and healthier and therefore are less likely to have chronic health conditions.

**Data source:** Oregon Behavioral Risk Factor Surveillance System

**Note:** The horizontal dashed line represents the percentage of the general population with a cholesterol screening in the past five years (70.1%). Estimates are age-adjusted.
More African American (38.3%) and American Indian/Alaska Native (38.6%) persons reported high cholesterol compared to other racial and ethnic groups (Figure 2.4.11).

The percentage of non-Latino African American persons who reported high cholesterol was 12.6% higher than non-Latino white persons (Figure 2.4.11).


Note: Estimates are age-adjusted.
More non-Latino African American (76.1%) and non-Latino American Indian/Alaska Native (76.6%) persons reported receiving a cholesterol screening in the past five years compared to other racial and ethnic groups (Figure 2.4.12).

The percentage of non-Latino African American persons who reported a cholesterol screening was 9.5% higher than non-Latino white persons (Figure 2.4.12).

Latino persons were less likely to report a cholesterol screening than all other racial and ethnic groups, with a little more than half (59.9%) of this population reporting the recommended screening (2.4.12).

Note: Estimates are age-adjusted.
Adult Oregonians who were obese, had high blood pressure or were physically inactive reported having high cholesterol more often than the general population of Oregon adults (Figure 2.4.13).

The percentage of Oregon adults with high cholesterol was 63.9% higher among those who also had high blood pressure compared to the general population (Figure 2.4.13).

**Data source:** Oregon Behavioral Risk Factor Surveillance System

**Note:** The horizontal dashed line represents the percentage of the general population with high cholesterol (32.7%). Estimates are age-adjusted.
Oregon adults with diabetes had a high cholesterol prevalence nearly double that of adults in the general population (Figure 2.4.14).

Those with heart disease were 42.8% more likely to report high cholesterol compared to the general population of Oregon adults (Figure 2.4.14).

High cholesterol was especially common among those who have had a heart attack or stroke sometimes in their life. Oregon adults who had had a heart attack or stroke were more than twice as likely as the general population to report high cholesterol (Figure 2.1.14).

**Data source:** Oregon Behavioral Risk Factor Surveillance System

**Note:** The horizontal dashed line represents the percentage of the general population with high cholesterol (32.7%). Estimates are age-adjusted.
Although Oregon adults with diabetes and cardiovascular disease were more likely to have high cholesterol, they were also more likely to receive a cholesterol screening than the general population (Figure 2.1.15).

In particular, nearly all adults with a diagnosis of diabetes (92.7%) received a cholesterol screening in the past five years and were 32.2% more likely to be screened than the general population (Figure 2.1.15).

Oregon adults who have had a heart attack or stroke sometime in their life were 12.6% and 17.0% more likely to have received a cholesterol screening than the general population (Figure 2.1.15).

**FIGURE 2.4.15 CHOLESTEROL SCREENING IN PAST FIVE YEARS AMONG ADULTS WITH DIABETES AND CARDIOVASCULAR DISEASES, OREGON, 2011**

*Data source:* Oregon Behavioral Risk Factor Surveillance System

*Note:* The horizontal dashed line represents the percentage of the general population with a cholesterol screening in the past five years (70.1%). Estimates are age-adjusted.
During 2008–2011, the prevalence of diagnosed high cholesterol among Oregon counties ranged from 12.1% to 68.3%.

Grant and Umatilla counties had significantly higher percentages of adults with diagnosed high cholesterol compared to the rest of the state.

Hood River, Josephine, Multnomah and Washington counties had significantly lower percentages of adults with diagnosed high cholesterol compared to the rest of the state.

See Appendix A for detailed county estimates of the prevalence of high cholesterol.
During 2008–2011, the prevalence of cholesterol screening among Oregon counties ranged from 56.5% to 78.3%.

Douglas, Jefferson and Wallowa counties had significantly lower percentages of adults who have had cholesterol screening in the past five years compared to the rest of the state.

Multnomah and Union counties had significantly higher percentages of adults who have had cholesterol screening in the past five years compared to the rest of the state.

See Appendix A for detailed county estimates of cholesterol screening.

Data source: Oregon Behavioral Risk Factor Surveillance System County Combined File
Note: Estimates are age-adjusted. The state cholesterol screening prevalence for 2008–2011 was 73.1%.
Conclusions

Overall, the prevalence of high cholesterol among Oregon adults is steadily increasing over time, likely coinciding with the rise in obesity. There are notable differences in prevalence of high blood pressure among males and vulnerable groups of Oregonians including those with less education, a smaller annual household income, and those enrolled in the Oregon Health Plan. In addition, African American and American Indian/Alaska Native persons reported high cholesterol more often than other racial and ethnic groups. Fortunately, these groups report receiving cholesterol screening more often than other racial and ethnic groups and are therefore more likely to be aware of high cholesterol, which is essential for making plans to manage the condition. Oregon adults with diabetes or who have had a heart attack and stroke sometime in their life were more likely to report high cholesterol than the general population, but were also more likely to receive a cholesterol screening. Those with heart disease were more likely than the general population to report high cholesterol, but were slightly less likely than the general population to report a cholesterol screening. This indicates a potential need for improved adherence to recommended preventive health screenings among this vulnerable group.
2.5 Who is reducing sodium intake?

Excess consumption of sodium in the diet increases high blood pressure and subsequent risk for cardiovascular disease. In 2011, an estimated 1.1 million Oregonians, with equal proportions of males and females, were reducing their salt intake. To understand the burden of heart disease, stroke and diabetes in Oregon, the prevalence of chronic disease risk factors such as high sodium intake needs to be known. This section will describe the proportion of Oregonians reporting reductions in sodium intake, as well as the proportion who received advice from their health care provider to lower sodium intake.* The proportion of Oregon adults reducing their sodium intake will be discussed by select demographics including age, education, income, health insurance status, chronic disease risk factors and chronic conditions.

- The percentage of adults currently reducing their sodium intake increased with age up to age 74 and then begins to decline (Figure 2.5.1).
- Nearly two-in-three Oregon adults aged 65 to 74 reported reducing sodium intake (Figure 2.5.1).
- Approximately 80% of adults aged 18 to 44 were not currently reducing their sodium intake (Figure 2.5.1).

**FIGURE 2.5.1 ADULTS CURRENTLY REDUCING THEIR SODIUM INTAKE, BY AGE GROUP, OREGON, 2011**

<table>
<thead>
<tr>
<th>Age groups (year)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>18–44</td>
<td>22.8</td>
</tr>
<tr>
<td>45–54</td>
<td>39.2</td>
</tr>
<tr>
<td>55–64</td>
<td>54.9</td>
</tr>
<tr>
<td>65–74</td>
<td>65.0</td>
</tr>
<tr>
<td>75+</td>
<td>53.6</td>
</tr>
</tbody>
</table>

**Data source:** Oregon Behavioral Risk Factor Surveillance System

**Note:** Estimates are not age-adjusted.

*For this report, current sodium reduction among adults was determined by the percentage of adults who reported "Yes" when asked if they are currently reducing their sodium intake.
The proportion of Oregon adults currently reducing their sodium intake did not appear to vary significantly by level of education and was similar at all educational levels to the general population of Oregon adults (Figure 2.5.2).

Those who are high school graduates only or had less than a high school education were more likely to report current reduction of sodium intake than those with some college education or those with a college degree. The reason for this is unknown.

**Data source:** Oregon Behavioral Risk Factor Surveillance System

**Note:** The horizontal dashed line represents the percentage of the general population currently reducing their sodium intake (36.3%). Estimates are age-adjusted.
The proportion of Oregon adults currently reducing their sodium intake did not appear to vary significantly by annual household income and was relatively similar at all income levels to the general population of Oregon adults (Figure 2.5.3).

The proportion of Oregon adults in households with an annual income of $50,000 or more were less likely to report current sodium intake reduction than Oregon adults in households with an annual income of less than $20,000 (Figure 2.5.3). The reason for this is unknown.

**Data source:** Oregon Behavioral Risk Factor Surveillance System

**Note:** The horizontal dashed line represents the percentage of the general population currently reducing their sodium intake (36.3%).

Estimates are age-adjusted.
The proportion of Oregon adults currently reducing their sodium intake did not appear to vary significantly by insurance status and was relatively similar at all levels of insurance status to the general population of Oregon adults (Figure 2.5.4).

- Those enrolled in OHP were 14.8% more likely than those with private, Medicare or other health insurance to currently reduce their sodium intake (Figure 2.5.4). The reason for this is unknown.

**FIGURE 2.5.4 ADULTS CURRENTLY REDUCING THEIR SODIUM INTAKE, BY CURRENT TYPE OF HEALTH INSURANCE, OREGON, 2011**

Data source: Oregon Behavioral Risk Factor Surveillance System

Note: The horizontal dashed line represents the percentage of the general population currently reducing their sodium intake (36.3%). Estimates are age-adjusted.
Oregon adults reporting high blood pressure were 38.6% more likely than the general population to be reducing sodium intake (Figure 2.5.5).

Compared to the general population of Oregon adults, Oregonians who were obese were 44.4% more likely to report a current reduction in sodium intake (Figure 2.5.5).

**Data source:** Oregon Behavioral Risk Factor Surveillance System

**Note:** The horizontal dashed line represents the percentage of the general population currently reducing their sodium intake (36.3%). Estimates are age-adjusted.
Oregon adults with high blood pressure and obesity were more likely than the general population to receive advice from a health care provider to lower sodium intake (Figure 2.5.6).

Oregon adults with high blood pressure were more than twice as likely to receive advice from a health care provider to lower sodium intake as the general population of Oregon adults (Figure 2.5.6).

**Data source:** Oregon Behavioral Risk Factor Surveillance System

**Note:** The horizontal dashed line represents the percentage of the general population in Oregon who had been advised by a doctor to reduce sodium intake (16.3%). Estimates are age-adjusted.
Oregon adults with diabetes were 63.9% more likely to report current reduction of sodium intake than the general population of Oregon adults; those with diabetes were nearly three times as likely to receive advice from a health care provider to lower sodium intake (figures 2.5.7 and 2.5.8).

Oregonians who had had a heart attack in their lifetime were more than twice as likely to report current sodium reduction compared to the general population; those who had had a heart attack sometime in their life were nearly three times as likely to receive advice from a health care provider to lower sodium intake (figures 2.5.7 and 2.5.8).

**Data source:** Oregon Behavioral Risk Factor Surveillance System

**Note:** The horizontal dashed line represents the percentage of the general population currently reducing their sodium intake (36.3%). Estimates are age-adjusted.
Oregon adults who had had a stroke in their lifetime were 31.4% more likely than the general population to report current reduction of sodium intake; those who had had a stroke sometime in their life were more than twice as likely to receive advice from a health care provider to lower sodium intake (figures 2.5.7 and 2.5.8).

**FIGURE 2.5.8 ADULTS WITH DIABETES AND CARDIOVASCULAR DISEASE WHO WERE ADVISED BY A DOCTOR TO LOWER SODIUM INTAKE, OREGON, 2011**

Data source: Oregon Behavioral Risk Factor Surveillance System

Note: The horizontal dashed line represents the percentage of the general population in Oregon who had been advised by a doctor to reduce sodium intake (16.3%). Estimates are age-adjusted.
Conclusions
A little more than one-third of the Oregon adult population is currently reducing sodium intake. Reductions in salt intake were more likely in Oregonians of older ages with only 20% of the 18- to 44-year-old population reducing their sodium intake. Current reductions of sodium intake did not appear to differ significantly by education, income level or insurance status. Encouragingly, Oregon adults who had high blood pressure, obesity, cardiovascular disease and diabetes were more likely to report reductions of sodium intake. In addition, these groups were also more likely to receive advice from a health care provider to lower sodium intake than the general population.
2.6 Who lacks physical activity?

A lack of physical activity is a known risk factor for chronic conditions such as high blood pressure and high cholesterol, and for chronic diseases such as diabetes, heart disease and stroke. To better understand the burden of these chronic conditions and diseases in Oregon, the prevalence of the underlying risk factors (or precursors of disease) needs to be known. It is important to report lack of physical activity among sub-populations of Oregonians (e.g., racial and ethnic minorities) to identify groups of Oregonians who are disproportionately affected compared to the general population in Oregon. This section will describe lack of physical activity* among Oregon adults by select demographics including gender, age, education, income, health insurance status, race and ethnicity, and by other chronic disease risk factors and conditions.

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*For this report, lack of physical activity among adults was determined by the percentage of adults who reported "No" when asked if they participated in any physical activities other than their regular job in the past month.
Overall, 19.5% of Oregonians reported being physically inactive in 2011. Approximately 600,000 adults in Oregon were physically inactive outside of work.

While one-fifth of the adult population reported being physically inactive, Oregon has one of the lowest levels of physical inactivity in the United States.

In Oregon, the percentage of men who reported being physically inactive is slightly higher than women (Figure 2.6.1).

**Data source:** Oregon Behavioral Risk Factor Surveillance System

**Note:** The horizontal dashed line represents the percentage of the general population in Oregon who report no physical activity outside of work in the past 30 days (19.5%). Estimates are age-adjusted.
Adults of middle and older ages were more likely to report a lack of physical activity compared to the youngest age group (Figure 2.6.2).

Data source: Oregon Behavioral Risk Factor Surveillance System
Note: Estimates are age-adjusted.
Lack of physical activity was more common among Oregonians with lower education levels (Figure 2.6.3).

Adults with less than a high school education were 70% more likely to report being physically inactive compared to adults with a college degree.

**Data source:** Oregon Behavioral Risk Factor Surveillance System

**Note:** The horizontal dashed line represents the percentage of the general population in Oregon who report no physical activity outside of work in the past 30 days (19.5%). Estimates are age-adjusted.
Lack of physical activity was more prevalent among Oregonians with lower household income levels (Figure 2.6.4).

Adults who had a household income of $20,000 or less were 68% more likely to report being physically inactive compared to adults who had a household income of $75,000 or more.

**Data source:** Oregon Behavioral Risk Factor Surveillance System

**Note:** The horizontal dashed line represents the percentage of the general population in Oregon who report no physical activity outside of work in the past 30 days (19.5%). Estimates are age-adjusted.
Adults without health insurance and adults currently on the Oregon Health Plan were more likely to report being physically inactive.

Adults who were currently on the Oregon Health Plan were 45% more likely to report being physically inactive compared to the general population.
Compared to white persons, non-Latino adults of racial and ethnic minorities in Oregon were more likely to report a lack of physical activity.

Note: Estimates are age-adjusted.
Adults with other chronic disease risk factors were more likely to report a lack of physical activity compared to adults in the general population. Adults who currently smoke cigarettes were nearly 40% more likely to report lack of physical activity compared to the general population.

**Data source:** Oregon Behavioral Risk Factor Surveillance System

**Note:** The horizontal dashed line represents the percentage of the general population in Oregon who report no physical activity outside of work in the past 30 days (19.5%). Estimates are age-adjusted.
Adults who reported having diabetes, heart disease and stroke were more likely to indicate a lack of physical activity than the general population.

Lack of physical activity among adults with diabetes was approximately 60% higher compared to the general population.

Stroke survivors were much more likely to report a lack of physical activity than the general population of Oregon adults. This is likely due to the physical disability associated with having a stroke. However, more than half reported participating in some form of exercise or physical activity outside of work (Figure 2.6.8).

**FIGURE 2.6.8 LACK OF PHYSICAL ACTIVITY AMONG ADULTS WITH DIABETES AND CARDIOVASCULAR DISEASE, OREGON, 2011**

- **Data source**: Oregon Behavioral Risk Factor Surveillance System
- **Note**: The horizontal dashed line represents the percentage of the general population in Oregon who report no physical activity outside of work in the past 30 days (19.5%). Estimates are age-adjusted.
During 2008–2011, the prevalence of lack of physical activity among Oregon counties ranged from 13.9% to 31.7%.

Clackamas, Jackson and Multnomah counties had significantly lower percentages of adults who lacked physical activity compared to the rest of the state.

Baker, Lincoln and Morrow counties had significantly higher percentages of adults who lacked physical activity compared to the rest of the state.

See Appendix A for detailed county estimates of lack of physical activity.
Conclusions

Approximately one-fifth of the adult population in Oregon reports being physically inactive. Slightly more men report being physically inactive compared to women. As expected, a higher proportion of older Oregonians report being physically inactive compared to the younger adult population. However, many modifiable and non-modifiable differences were seen across other demographic factors. Lack of physical activity was more common among Oregon adults with less education and a smaller annual household income, as well as among those enrolled in the Oregon Health Plan, which is Oregon’s Medicaid program. In addition, a higher proportion of racial and ethnic minority populations reported lack of physical activity compared to non-Latino whites. Oregon adults with chronic disease risk factors and comorbid chronic conditions were also more likely to report a lack of physical activity than the general population. Compared to the general population, adults with diagnosed diabetes were 60% more likely to report being physically inactive, and current cigarette smokers were 40% more likely to report being physically inactive.
Risk factors for heart disease, stroke and diabetes include cigarette smoking and exposure to secondhand smoke, overweight and obesity, high blood pressure, high cholesterol, inadequate consumption of fruits and vegetables and excess consumption of sodium, and lack of physical activity.

Many of these factors can be addressed through lifestyle changes and creation of environments that support Oregonians in eating better, moving more and living tobacco-free. Effectively reducing these risk factors will help reduce the prevalence of diabetes, heart disease and stroke in the future. Oregon is committed to preventing heart disease, stroke and diabetes by addressing the ABCS — A1C checks, blood pressure control, cholesterol control, and smoking cessation, and reduced sodium consumption — through these evidence-based policy strategies:

- Tobacco-free environments and helping cigarette smokers quit;
- Improved access to evidence-based quality care;
- Healthy worksites that encourage healthy eating and offer opportunities for physical activity;
- Environments with limited access to foods high in sodium and trans fats.

The Oregon Tobacco Quit Line provides tobacco cessation counseling and increases the chances of quitting successfully. Walk with Ease, a gentle exercise program that addresses the risk factor of physical inactivity by increasing walking among participants, and Living Well with Chronic Conditions (www.healthoregon.org/takecontrol) and Tomando Control de su Salud, programs that teach people living with chronic conditions the skills to take care of themselves, are offered throughout the state.

Oregon promotes and supports strategies to improve delivery and use of quality clinical services including conducting recommended screenings for blood pressure, cholesterol and blood sugar; increasing clinical referrals to self-management education programs; and delivering health care in accordance with clinical practice guidelines.

Visit the Oregon Heart Disease and Stroke Prevention webpage for more information and heart disease prevention resources: http://public.health.oregon.gov/DiseasesConditions/ChronicDisease/HeartDiseaseStroke/Pages/index.aspx.

Visit the Oregon Diabetes and Prevention Control Program webpage for diabetes prevention resources and more information on strategies to reduce the burden of diabetes in Oregon: www.healthoregon.org/diabetes.
REFERENCES


### APPENDIX A: COUNTY-LEVEL ESTIMATES

#### TABLE A.1. AGE-ADJUSTED AND UNADJUSTED PREVALENCE OF DIABETES, HEART ATTACK AND HEART DISEASE AMONG ADULTS, BY COUNTY, OREGON 2008–2011

<table>
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<th>County</th>
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<th>Heart disease</th>
</tr>
</thead>
<tbody>
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<td>OREGON</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Unadjusted</td>
<td>Age-adjusted</td>
<td>Unadjusted</td>
</tr>
<tr>
<td></td>
<td>–</td>
<td>7.2%</td>
<td>–</td>
</tr>
<tr>
<td>Baker</td>
<td>11.2%</td>
<td>10.0%†</td>
<td>6.1%†</td>
</tr>
<tr>
<td>Benton</td>
<td>6.8%</td>
<td>7.5%</td>
<td>2.5%</td>
</tr>
<tr>
<td>Clackamas</td>
<td>8.1%</td>
<td>7.5%</td>
<td>2.9%</td>
</tr>
<tr>
<td>Clatsop</td>
<td>8.7%</td>
<td>7.5%</td>
<td>6.5%</td>
</tr>
<tr>
<td>Columbia</td>
<td>8.4%</td>
<td>7.5%</td>
<td>2.9%</td>
</tr>
<tr>
<td>Coos</td>
<td>12.4%</td>
<td>10.9%</td>
<td>7.6%</td>
</tr>
<tr>
<td>Crook</td>
<td>10.2%</td>
<td>9.1%</td>
<td>4.7%†</td>
</tr>
<tr>
<td>Curry</td>
<td>9.7%</td>
<td>6.8%</td>
<td>6.5%</td>
</tr>
<tr>
<td>Deschutes</td>
<td>6.6%</td>
<td>5.8%</td>
<td>2.8%</td>
</tr>
<tr>
<td>Douglas</td>
<td>12.8%</td>
<td>11.2%*</td>
<td>6.7%</td>
</tr>
<tr>
<td>Grant</td>
<td>8.3%†</td>
<td>5.8%†</td>
<td>3.5%†</td>
</tr>
<tr>
<td>Harney</td>
<td>9.0%†</td>
<td>7.7%†</td>
<td>–</td>
</tr>
<tr>
<td>Hood River</td>
<td>6.1%†</td>
<td>5.3%†</td>
<td>–</td>
</tr>
<tr>
<td>Jackson</td>
<td>8.6%</td>
<td>7.8%</td>
<td>3.8%</td>
</tr>
<tr>
<td>Jefferson</td>
<td>6.1%†</td>
<td>5.3%†</td>
<td>5.3%†</td>
</tr>
<tr>
<td>Josephine</td>
<td>10.3%</td>
<td>7.6%</td>
<td>6.6%</td>
</tr>
<tr>
<td>Klamath</td>
<td>8.0%</td>
<td>7.0%</td>
<td>6.4%</td>
</tr>
</tbody>
</table>
### TABLE A.1. AGE-ADJUSTED AND UNADJUSTED PREVALENCE OF DIABETES, HEART ATTACK AND HEART DISEASE AMONG ADULTS, BY COUNTY, OREGON 2008–2011, CONTINUED

<table>
<thead>
<tr>
<th>County</th>
<th>Diabetes</th>
<th>Heart attack</th>
<th>Heart disease</th>
<th>Diabetes</th>
<th>Heart attack</th>
<th>Heart disease</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unadjusted</td>
<td>Age-adjusted</td>
<td>Unadjusted</td>
<td>Age-adjusted</td>
<td>Unadjusted</td>
<td>Age-adjusted</td>
</tr>
<tr>
<td>Oregon</td>
<td>–</td>
<td>7.2%</td>
<td>–</td>
<td>9.9%</td>
<td>–</td>
<td>3.5%</td>
</tr>
<tr>
<td>Lake</td>
<td>7.6%†</td>
<td>4.9%†</td>
<td>7.9%†</td>
<td>7.2%†</td>
<td>5.1%†</td>
<td>3.3%†</td>
</tr>
<tr>
<td>Lane</td>
<td>7.4%</td>
<td>6.9%</td>
<td>3.9%</td>
<td>11.7%*</td>
<td>3.6%</td>
<td>3.1%</td>
</tr>
<tr>
<td>Lincoln</td>
<td>10.4%</td>
<td>7.8%</td>
<td>4.1%</td>
<td>9.6%</td>
<td>3.9%</td>
<td>2.7%</td>
</tr>
<tr>
<td>Linn</td>
<td>8.6%</td>
<td>7.3%</td>
<td>4.3%</td>
<td>9.9%</td>
<td>5.4%</td>
<td>4.4%</td>
</tr>
<tr>
<td>Malheur</td>
<td>10.5%</td>
<td>10.3%</td>
<td>3.4%†</td>
<td>9.3%</td>
<td>4.1%†</td>
<td>4.0%†</td>
</tr>
<tr>
<td>Marion</td>
<td>7.8%</td>
<td>7.6%</td>
<td>3.8%</td>
<td>9.2%</td>
<td>4.4%</td>
<td>4.1%</td>
</tr>
<tr>
<td>Morrow</td>
<td>7.3%†</td>
<td>6.6%†</td>
<td>4.1%†</td>
<td>6.6%†</td>
<td>5.8%†</td>
<td>5.6%†</td>
</tr>
<tr>
<td>Multnomah</td>
<td>6.5%</td>
<td>6.6%</td>
<td>2.7%</td>
<td>8.9%</td>
<td>3.7%</td>
<td>3.7%</td>
</tr>
<tr>
<td>Polk</td>
<td>8.3%</td>
<td>7.5%</td>
<td>6.6%</td>
<td>10.6%</td>
<td>6.2%</td>
<td>5.8%</td>
</tr>
<tr>
<td>Tillamook</td>
<td>12.8%</td>
<td>11.2%</td>
<td>5.4%</td>
<td>6.4%*</td>
<td>5.3%</td>
<td>3.3%</td>
</tr>
<tr>
<td>Umatilla</td>
<td>9.6%</td>
<td>9.4%</td>
<td>4.0%</td>
<td>9.1%</td>
<td>2.3%</td>
<td>2.1%*</td>
</tr>
<tr>
<td>Union</td>
<td>9.1%†</td>
<td>8.6%†</td>
<td>3.8%†</td>
<td>13.5%</td>
<td>4.0%†</td>
<td>3.4%†</td>
</tr>
<tr>
<td>Wallowa</td>
<td>7.1%†</td>
<td>5.0%†</td>
<td>4.6%†</td>
<td>6.2%†</td>
<td>6.6%†</td>
<td>4.4%†</td>
</tr>
<tr>
<td>Washington</td>
<td>5.8%</td>
<td>6.0%*</td>
<td>2.5%</td>
<td>9.6%</td>
<td>2.9%</td>
<td>3.1%</td>
</tr>
<tr>
<td>Wheeler</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Yamhill</td>
<td>6.1%</td>
<td>6.0%</td>
<td>4.2%†</td>
<td>9.3%</td>
<td>4.2%</td>
<td>4.0%</td>
</tr>
<tr>
<td>Gilliam/Sherman/Wasco</td>
<td>8.1%</td>
<td>6.6%</td>
<td>6.3%</td>
<td>7.5%†</td>
<td>5.6%</td>
<td>4.9%†</td>
</tr>
</tbody>
</table>

* Statistically significant difference compared with all other counties (p-value <= 0.05)
† This number may be statistically unreliable and should be interpreted with caution.
– This number is suppressed because it is statistically unreliable.

**Data source:** Oregon BRFSS County Combined Dataset 2008–2011

**Note:** Age-adjusted estimates are adjusted to the 2000 Standard Population using three age groups (18–34, 35–54 and 55+).
### Table A.2. Age-Adjusted and Unadjusted Prevalence of Stroke, High Blood Pressure and High Cholesterol Among Adults, by County, Oregon, 2008–2011

<table>
<thead>
<tr>
<th>County</th>
<th>Stroke</th>
<th>High blood pressure</th>
<th>High cholesterol</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unadjusted</td>
<td>Age-adjusted</td>
<td>Unadjusted</td>
</tr>
<tr>
<td>Oregon</td>
<td>–</td>
<td>2.3%</td>
<td>–</td>
</tr>
<tr>
<td>Baker</td>
<td>5.3%†</td>
<td>–</td>
<td>40.4%</td>
</tr>
<tr>
<td>Benton</td>
<td>1.5%</td>
<td>1.6%*</td>
<td>20.9%</td>
</tr>
<tr>
<td>Clackamas</td>
<td>2.5%</td>
<td>2.2%</td>
<td>28.9%</td>
</tr>
<tr>
<td>Clatsop</td>
<td>4.2%</td>
<td>3.1%</td>
<td>35.6%</td>
</tr>
<tr>
<td>Columbia</td>
<td>2.7%†</td>
<td>2.5%†</td>
<td>32.7%</td>
</tr>
<tr>
<td>Coos</td>
<td>6.2%†</td>
<td>5.9%†</td>
<td>32.9%</td>
</tr>
<tr>
<td>Crook</td>
<td>–</td>
<td>–</td>
<td>42.4%</td>
</tr>
<tr>
<td>Curry</td>
<td>2.5%†</td>
<td>1.3%†</td>
<td>35.8%</td>
</tr>
<tr>
<td>Deschutes</td>
<td>1.8%</td>
<td>1.5%*</td>
<td>24.6%</td>
</tr>
<tr>
<td>Douglas</td>
<td>4.3%</td>
<td>3.3%</td>
<td>36.8%</td>
</tr>
<tr>
<td>Grant</td>
<td>–</td>
<td>–</td>
<td>37.3%</td>
</tr>
<tr>
<td>Harney</td>
<td>–</td>
<td>–</td>
<td>21.3%†</td>
</tr>
<tr>
<td>Hood River</td>
<td>–</td>
<td>–</td>
<td>23.2%</td>
</tr>
<tr>
<td>Jackson</td>
<td>2.7%</td>
<td>2.1%</td>
<td>32.0%</td>
</tr>
<tr>
<td>Jefferson</td>
<td>1.8%†</td>
<td>1.4%†</td>
<td>21.9%</td>
</tr>
<tr>
<td>Josephine</td>
<td>3.2%</td>
<td>2.4%</td>
<td>35.5%</td>
</tr>
<tr>
<td>Klamath</td>
<td>3.4%</td>
<td>3.2%</td>
<td>33.7%</td>
</tr>
<tr>
<td>Lake</td>
<td>–</td>
<td>–</td>
<td>32.2%†</td>
</tr>
<tr>
<td>Lane</td>
<td>2.4%</td>
<td>2.1%</td>
<td>28.3%</td>
</tr>
<tr>
<td>County</td>
<td>Stroke Unadjusted</td>
<td>Stroke Age-adjusted</td>
<td>High blood pressure Unadjusted</td>
</tr>
<tr>
<td>-------------</td>
<td>-------------------</td>
<td>---------------------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td>OREGON</td>
<td>–</td>
<td>2.3%</td>
<td>–</td>
</tr>
<tr>
<td>Lincoln</td>
<td>3.7%</td>
<td>2.8%†</td>
<td>39.6%</td>
</tr>
<tr>
<td>Linn</td>
<td>3.9%</td>
<td>3.6%</td>
<td>28.8%</td>
</tr>
<tr>
<td>Malheur</td>
<td>1.6%†</td>
<td>1.4%†</td>
<td>29.3%</td>
</tr>
<tr>
<td>Marion</td>
<td>3.0%</td>
<td>2.8%</td>
<td>27.9%</td>
</tr>
<tr>
<td>Morrow</td>
<td>–</td>
<td>–</td>
<td>29.1%</td>
</tr>
<tr>
<td>Multnomah</td>
<td>1.9%</td>
<td>2.0%*</td>
<td>26.1%</td>
</tr>
<tr>
<td>Polk</td>
<td>1.5%</td>
<td>1.3%*</td>
<td>25.9%</td>
</tr>
<tr>
<td>Tillamook</td>
<td>3.8%†</td>
<td>3.0%†</td>
<td>27.9%</td>
</tr>
<tr>
<td>Umatilla</td>
<td>3.7%</td>
<td>3.4%</td>
<td>32.7%</td>
</tr>
<tr>
<td>Union</td>
<td>2.9%†</td>
<td>2.3%†</td>
<td>31.8%</td>
</tr>
<tr>
<td>Wallowa</td>
<td>5.8%†</td>
<td>–</td>
<td>43.7%</td>
</tr>
<tr>
<td>Washington</td>
<td>2.1%</td>
<td>2.1%</td>
<td>23.5%</td>
</tr>
<tr>
<td>Wheeler</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Yamhill</td>
<td>2.2%</td>
<td>2.0%</td>
<td>27.8%</td>
</tr>
<tr>
<td>Gillian/Sherman/Wasco</td>
<td>2.4%†</td>
<td>1.6%†</td>
<td>37.8%</td>
</tr>
</tbody>
</table>

* Statistically significant difference compared with all other counties (p-value ≤ 0.05)
† This number may be statistically unreliable and should be interpreted with caution.
– This number is suppressed because it is statistically unreliable.

Data source: Oregon BRFSS County Combined Dataset 2008–2011
Note: Age-adjusted estimates are adjusted to the 2000 Standard Population using three age groups (18–34, 35–54 and 55+).
TABLE A.3. AGE-ADJUSTED AND UNADJUSTED PREVALENCE OF OBESITY, CURRENT SMOKER AND LACK OF PHYSICAL ACTIVITY AMONG ADULTS, BY COUNTY, OREGON, 2008–2011

<table>
<thead>
<tr>
<th>County</th>
<th>Obese Unadjusted</th>
<th>Age-adjusted 24.8%</th>
<th>Current cigarette smoker Unadjusted</th>
<th>Age-adjusted 16.3%</th>
<th>Lack of physical activity Unadjusted</th>
<th>Age-adjusted 17.5%</th>
</tr>
</thead>
<tbody>
<tr>
<td>OREGON</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baker</td>
<td>26.6% 26.6%</td>
<td>23.0% 26.4%*</td>
<td>27.7% 31.7%*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Benton</td>
<td>18.1% 18.7%*</td>
<td>10.3% 10.2%*</td>
<td>13.4% 13.9%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clackamas</td>
<td>24.0% 23.9%</td>
<td>14.0% 14.3%*</td>
<td>15.7% 15.4%*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clatsop</td>
<td>30.5% 31.4%</td>
<td>19.6% 20.3%</td>
<td>18.3% 17.5%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Columbia</td>
<td>24.7% 23.7%</td>
<td>18.2% 19.2%</td>
<td>19.2% 18.9%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coos</td>
<td>30.0% 30.0%*</td>
<td>24.8% 28.3%*</td>
<td>21.7% 19.8%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crook</td>
<td>25.5% 25.6%</td>
<td>16.7% 17.4%</td>
<td>19.4% 18.7%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Curry</td>
<td>30.1% 31.5%</td>
<td>24.5% 32.3%*</td>
<td>25.5% 25.1%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deschutes</td>
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<td>13.1% 13.8%</td>
<td>18.1% 18.2%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Douglas</td>
<td>32.5% 33.6%*</td>
<td>23.8% 26.7%*</td>
<td>21.4% 20.9%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grant</td>
<td>23.1% 21.8%</td>
<td>22.8% 26.2%</td>
<td>16.1% 20.1%†</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Harney</td>
<td>22.8% 22.7%</td>
<td>9.0%† 8.4%†</td>
<td>20.7% 18.5%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hood River</td>
<td>19.5% 19.7%</td>
<td>9.2% 9.5%†</td>
<td>16.9% 16.9%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jackson</td>
<td>21.0% 20.7%*</td>
<td>19.7% 21.2%*</td>
<td>15.2% 14.3%*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jefferson</td>
<td>28.5% 28.7%</td>
<td>14.6% 15.4%</td>
<td>21.4% 20.7%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Josephine</td>
<td>21.7% 19.7%*</td>
<td>19.3% 21.3%*</td>
<td>22.1% 21.4%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Klamath</td>
<td>28.4% 29.4%</td>
<td>19.9% 20.6%</td>
<td>21.9% 21.6%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lake</td>
<td>28.4% 27.1%</td>
<td>16.8% 19.2%†</td>
<td>21.0% 19.1%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lane</td>
<td>26.4% 26.5%</td>
<td>17.6% 18.1%</td>
<td>16.8% 16.6%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table A.3. Age-Adjusted and Unadjusted Prevalence of Obesity, Current Smoker, and Lack of Physical Activity Among Adults, by County, Oregon, 2008–2011, Continued

<table>
<thead>
<tr>
<th>County</th>
<th>Obese Unadjusted</th>
<th>Obese Age-adjusted</th>
<th>Current cigarette smoker Unadjusted</th>
<th>Current cigarette smoker Age-adjusted</th>
<th>Lack of physical activity Unadjusted</th>
<th>Lack of physical activity Age-adjusted</th>
</tr>
</thead>
<tbody>
<tr>
<td>OREGON</td>
<td>–</td>
<td>24.8%</td>
<td>–</td>
<td>16.3%</td>
<td>–</td>
<td>17.5%</td>
</tr>
<tr>
<td>Lincoln</td>
<td>27.5%</td>
<td>26.6%</td>
<td>22.8%</td>
<td>27.4%*</td>
<td>21.3%</td>
<td>20.1%</td>
</tr>
<tr>
<td>Linn</td>
<td>30.5%</td>
<td>30.6%*</td>
<td>18.2%</td>
<td>19.0%</td>
<td>24.4%</td>
<td>24.6%*</td>
</tr>
<tr>
<td>Malheur</td>
<td>27.7%</td>
<td>27.9%</td>
<td>22.0%</td>
<td>22.9%</td>
<td>19.2%</td>
<td>18.3%</td>
</tr>
<tr>
<td>Marion</td>
<td>28.0%</td>
<td>28.0%*</td>
<td>14.2%</td>
<td>14.4%</td>
<td>18.1%</td>
<td>18.0%</td>
</tr>
<tr>
<td>Morrow</td>
<td>29.5%</td>
<td>29.7%</td>
<td>14.5%</td>
<td>14.7%</td>
<td>32.0%</td>
<td>31.3%*</td>
</tr>
<tr>
<td>Multnomah</td>
<td>22.4%</td>
<td>22.5%*</td>
<td>14.6%</td>
<td>14.5%*</td>
<td>14.9%</td>
<td>15.0%*</td>
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* Statistically significant difference compared with all other counties (p-value <= 0.05)
† This number may be statistically unreliable and should be interpreted with caution.
– This number is suppressed because it is statistically unreliable.

**Data source:** Oregon BRFSS County Combined Dataset 2008–2011

**Note:** Age-adjusted estimates are adjusted to the 2000 Standard Population using three age groups (18–34, 35–54 and 55+).
APPENDIX B: DATA SOURCES

The data sources used in this report are listed below.
Data sources are described with brief limitations.

**Behavioral Risk Factor Surveillance System (BRFSS)**

Description: The BRFSS is a random-digit dialed telephone survey that is conducted year-round among Oregon adults aged 18 years or older. The BRFSS includes questions on health behavior risk factors such as diet, weight control, tobacco and alcohol use, physical activity, preventive health screenings, and use of health care services. The data are weighted to represent all adults aged 18 years and older. A core set of questions is asked annually, and other topics are surveyed on a rotating basis.

Every few years, Oregon conducts additional BRFSS surveys among under-represented races and ethnicities. The results of these surveys are combined with statewide BRFSS data to provide more stable estimates for chronic diseases and related risk factors among these groups of Oregonians. The most recent race/ethnicity oversamples were conducted in 2010–2011. In addition, BRFSS surveys from 2008–2011 were aggregated to produce more reliable county-level prevalence estimates.

Starting in 2010, Oregon began collecting data from those who use cell phones, causing the method for adjusting (weighting) the data to the demographics of the state to change. This new method is called “raking.” Because of these changes, data prior to 2010 are not directly comparable to the data from 2010 forward. In addition, the national BRFSS also made these changes but did not implement the changes until 2011.

**Limitations:** BRFSS estimates pertain only to the adult population aged 18 years or older living in households. Respondents are identified through telephone-based methods. The survey started collecting data for cell phones in 2009. Cell phone data were incorporated for analysis in Oregon in 2010. According to a recent publication from the National Center for Health Statistics, in 2011 more than 38% of households in Oregon were wireless-only. Finally, results obtained through BRFSS surveys also are limited in that they represent self-reported responses. Not all questions in the BRFSS have been validated.
APPENDIX B
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**Limitations:**
BRFSS estimates pertain only to the adult population aged 18 years or older living in households. Respondents are identified through telephone-based methods. The survey started collecting data for cell phones in 2009. Cell phone data were incorporated for analysis in Oregon in 2010. According to a recent publication from the National Center for Health Statistics, in 2011 more than 38% of households in Oregon were wireless-only. Finally, results obtained through BRFSS surveys also are limited in that they represent self-reported responses. Not all questions in the BRFSS have been validated.

**Hospital Discharge Dataset**

**Description:** The Hospital Discharge Dataset provides information on hospital discharges from all acute care hospitals in Oregon except two Veterans Administration hospitals. The dataset includes admit and discharge dates, diagnosis and procedural codes, financial charges, primary payer, and patient demographic information.

**Limitations:** Prior to 2008, the Hospital Discharge Dataset did not include identifying information that would allow us to ascertain when a single person had multiple hospitalizations; therefore, the calculated rate was the number of hospitalizations per the Oregon population rather than number of different people hospitalized per the Oregon population. In addition, prior to 2008, the dataset did not include information on race or ethnicity. Starting in 2008, the data necessary for investigating repeat hospitalizations for chronic diseases and hospitalizations by race/ethnicity were available and reported.

**Oregon Health Panel Survey (OHPS)**

**Description:** The Oregon Health Panel Survey was conducted in 2012 among non-institutionalized adults aged 18 years or older. Panel members were recruited using random digit dialing sampling based on landline telephone numbers and/or address-based sampling methodologies. A sample of panel members was then drawn at random for the survey. Topics on the survey include knowledge and attitudes toward colorectal screening, trans fats, sugary drinks, and other tobacco products. The data are weighted to represent all adults aged 18 years and older.

**Limitations:** OHPS estimates pertain only to the adult population aged 18 years or older living in households.

**Oregon Healthy Teens (OHT) Survey**

**Description:** Since 2000, the Youth Risk Behavior Survey (developed by the CDC) and the Oregon Public School Drug Use Survey were combined for Oregon into a single annual survey called Oregon Healthy Teens (OHT) Survey. The sample size varies from 1,600 to 32,000 per year, and the final data are weighted to more accurately represent Oregon eighth- and 11th-graders. The survey assesses health topics such as tobacco and alcohol use, HIV knowledge and attitudes, eating behaviors, nutrition and exercise.

**Limitations:** One limitation is that participation by school systems in the OHT is voluntary. However, participation rates have been high thus far. Another limitation is that the OHT questionnaire is not currently available in non-English versions except for a Spanish booklet that can be used as a reference when filling out the English version of the survey. A third limitation is that 3% of surveys were eliminated due to combinations of “dubious” answers and another 5% were eliminated because the student did not fill out grade or gender information.

**Vital records data (full count data)**

**Birth Certificate Statistical File**

The Birth Certificate Statistical File includes all births occurring in Oregon and births occurring out of state to Oregon
residents. This database includes parental demographic information, conditions of the newborn, congenital abnormalities, medical factors of pregnancy, method of delivery, and complications of labor and delivery. It also includes tobacco, alcohol or illicit drug use during pregnancy. Information about maternal diabetes and gestational diabetes is also included.

**Death Certificate Statistical File**

The Death Certificate Statistical File includes all deaths occurring in Oregon and deaths occurring out of state to Oregon residents. Data are obtained from death certificates that are collected from the state registrar. The data are used to examine trends in mortality and causes of death. This database includes cause of death, date and place of death, and decedent demographic information. The mortality data analyzed for this report consists of deaths among Oregon residents.

**Limitations of birth and death files:** The accuracy of the data depends on the accuracy with which the birth attendant, certifying physician or medical examiner describes the circumstances surrounding the birth or the underlying causes of death.

**CDC Wonder database**

The CDC Wonder database provides National Center for Health Statistics (NCHS) national statistical analysis and reporting of deaths from specific diseases.
APPENDIX C: RELIABILITY AND SUPPRESSION GUIDELINES

In this report, some numbers include a warning that they are potentially unreliable or they are unreliable and suppressed (not shown). In general, reliability refers to the stability of a number being reported.

The guidelines used to gauge reliability differ depending on the type of data used. Some data sources include all events under study (such as births, deaths or hospitalizations). These will be referred to as “full count.” Other data sources are from surveys of randomly selected individuals, adjusted to represent the full population. These will be referred to as “survey.” The text below briefly describes the methods used to determine if the information in this report includes a warning for reliability or is suppressed.

**Full count**
Determine the number of events (n).
- n ≥ 12: Report the estimate.
- n ≥ 5 and n < 12: Report the estimate and include a warning regarding reliability.
- n < 5: Do not report the estimate and state that it is suppressed.

**Survey**
Determine the total number of persons surveyed (x) for a particular question and calculate the standard error (SE) for the reported number. Use the SE to calculate a statistic called the relative standard error (RSE). RSE is a measure of the variability of an estimate compared with the estimate itself.
1. Determine if the estimate is being calculated on a full population (i.e., everyone) or a subpopulation (i.e., a smaller group of all people surveyed who share a common trait such as race, county or medical condition).

2. If the full population, determine if the denominator is >= 50. If yes, proceed; if not, suppress.

3. If a subpopulation, determine if the denominator is >= 20. If yes, proceed; if not, suppress.

4. Apply the following logic to each RSE:
   - RSE < 30%: Report the estimate.
   - RSE >= 30% and RSE < 50%: Report the estimate and include a warning regarding reliability.
   - RSE >= 50%: Do not report the estimate and state that it is suppressed.
1. Determine if the estimate is being calculated on a full population (i.e., everyone) or a subpopulation (i.e., a smaller group of all people surveyed who share a common trait such as race, county or medical condition).

2. If the full population, determine if the denominator is $\geq 50$. If yes, proceed; if not, suppress.

3. If a subpopulation, determine if the denominator is $\geq 20$. If yes, proceed; if not, suppress.

4. Apply the following logic to each RSE:
   - RSE < 30%: Report the estimate.
   - RSE $\geq 30$% and RSE < 50%: Report the estimate and include a warning regarding reliability.
   - RSE $\geq 50$%: Do not report the estimate and state that it is suppressed.
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This chapter summarizes data about diabetes in Oregon. It includes the most recent data available from a variety of sources. This chapter includes detailed data tables and graphs depicting diabetes prevalence, deaths and hospitalizations over time and across select demographics, chronic diseases and risk factors. The intent of this report is to highlight the burden of diabetes in Oregon and to assist stakeholders, policymakers and other interested parties in their efforts to reduce this burden. For more information on each dataset used in this chapter, see Appendix B.

**What is diabetes?**

- Diabetes is a chronic metabolic disease in which glucose (sugar) levels in the blood are above normal.
- High blood sugar occurs when the body does not produce enough insulin (Type 1 diabetes), or when the body resists and does not properly respond to insulin (Type 2 diabetes).
- Prediabetes occurs when blood glucose levels are higher than normal but not yet in the range of diabetes.
- Gestational diabetes is a form of diabetes that occurs during pregnancy.
- If not carefully managed, high blood sugar can cause blindness, skin infections, nerve damage and kidney damage.
- Diabetes also adversely affects the cardiovascular system, which can lead to high blood pressure and high cholesterol; both are primary risk factors for heart disease and stroke.
Who has diabetes?

- In Oregon, an estimated 9.3% of adults have diabetes (or 8.3% age-adjusted). This translates to approximately 278,000 adults with diabetes in Oregon.
- Oregon has a lower burden of diabetes compared to the United States overall; however, since 1990, diabetes in Oregon has increased 118%.
- In Oregon, diabetes is more common among men compared to women (8.9% vs. 7.9%).
- Older Oregonians are more likely to report diagnosed diabetes compared to younger Oregonians. More than one-fifth of Oregonians aged 65–74 years are diagnosed with diabetes, compared to less than 3% among those aged 18–44 years.
- Diabetes is more common among Oregonians with lower education levels. The prevalence of diabetes among those with less than a high school education is more than double that of Oregonians with a college degree (12% vs. 5%).

- The prevalence of diabetes among adults with an annual household income of less than $20,000 is nearly three times that of those who have a household income of $75,000 or more (14% vs. 5%).
- The percentage of adults with diabetes who are covered by the Oregon Health Plan is more than double that of adults with other types of insurance (17% vs. 8%).
- Many racial and ethnic groups in Oregon are disproportionately affected by diabetes: 23% of non-Latino African Americans, 15% of Latinos, and 14% of non-Latino American Indian/Alaska Natives have been diagnosed with diabetes compared to 7% of non-Latino whites and Asians.
- Of adults with coronary heart disease in Oregon, 48% also have diabetes.

Risk factors for diabetes

- **Obesity**: More than one-quarter of adults in Oregon are obese. Among adults with diabetes, 48% are obese.
- **High blood pressure and high cholesterol**: 28% of adults in Oregon have high blood pressure and 32% have high cholesterol. Among adults with diabetes, the prevalence doubles at 68% and 64%, respectively.
- **Lack of physical activity**: One-third of adults with diabetes in Oregon are physically inactive, compared to 20% of adults overall.
- **Cigarette smoking**: 26% percent of adults with diabetes in Oregon are current smokers, compared to 20% of adults overall.
Prediabetes: It is estimated that nearly one million Oregon adults have prediabetes.

Gestational diabetes: 8% of all births in Oregon in 2011 were to mothers who were diagnosed with gestational diabetes.

Diabetes mortality
- Diabetes was the seventh leading cause of death in Oregon in 2011. Since 1990, the diabetes death rate in Oregon has increased 44%.
- In the last decade, the diabetes death rate in Oregon has consistently been higher compared to the United States overall.
- In Oregon, diabetes is listed as the primary cause of death on 1,114 death certificates (3.4% of all deaths) and as a secondary (contributing) cause of death on 2,732 death certificates (11.7% of all deaths). In total, diabetes is listed as a cause of death on more than 15% of all deaths.
- The diabetes death rate is 50% higher for men than for women.
- The diabetes death rate is higher among non-Latino African Americans, non-Latino American Indian/Alaska Natives and Latinos compared to non-Latino whites.
- Among deaths where diabetes was listed as the primary cause, 61% had heart disease, heart attack or stroke listed as a contributing cause of death.

Diabetes hospitalizations
- In 2011, 4,274 hospitalizations in Oregon were primarily attributed to diabetes.
- Between 1997 and 2011, the diabetes hospitalization rate increased 19%.
- Among hospitalizations primarily attributed to complications of diabetes, 40% were due to ketoacidosis (low insulin combined with high blood sugar levels), 15% were due to neurological issues, and 6% were due to peripheral circulatory issues.
- For nearly a quarter (24.9%) of diabetes hospitalizations, heart disease, heart attack or stroke was listed as a secondary diagnosis.

Cost of diabetes
- According to the American Diabetes Association, excess medical expenditures associated with diabetes totals nearly $2.2 billion each year; that is an average of $7,800 per person with diabetes. In addition, costs associated with reduced productivity from diabetes are estimated at $840 million. The estimated total cost of diabetes in Oregon is nearly $3 billion per year.
- In 2011, the average cost of a hospitalization primarily due to diabetes was $21,367, with the total cost of all diabetes hospitalizations in Oregon reaching more than $91 million.
Prevention and management of diabetes

- Those who have prediabetes or gestational diabetes are more likely to develop diabetes in the future. A healthy diet and regular physical activity may prevent or delay the onset of prediabetes and Type 2 diabetes.
- 63% of adults aged 45 years and above in Oregon reported having a blood sugar test within the past three years.
- Adults with diabetes in Oregon have met Healthy People 2020 goals for annual foot and eye exams, two or more A1C checks within the past year, and for receiving formal diabetes education. However, the number of adults with diabetes who self-monitor their blood glucose at least once daily is below the target goal.

Ways to reduce the burden of diabetes in Oregon

The Oregon Public Health Division is committed to preventing diabetes and reducing the risk of diabetes complications through a wide range of evidence-based practices. The Health Promotion and Chronic Disease Prevention Section of the Oregon Public Health Division is working with local and state partners to:

- Increase availability of healthy foods and beverages in child care facilities, schools, worksites and neighborhoods;
- Increase places where people can move more safely;
- Increase the number of environments that are tobacco-free;
- Increase referrals to self-management and prevention programs such as the National Diabetes Prevention Program so that people with diabetes or prediabetes can live well and take care of themselves;
- Improve delivery and use of quality health care services including promotion of the ABCS — A1C checks, Blood pressure control, Cholesterol control, and Smoking cessation.

This comprehensive, community-wide approach makes it easier for all Oregonians to eat better, move more, and live tobacco-free wherever they live, work, play and learn.
Diabetes in Oregon

Approximately 278,000 adults in Oregon have diabetes, and an estimated 1 million have prediabetes.

Diabetes affects some communities more than others.

According to the American Diabetes Association, diabetes costs Oregonians nearly $3 billion each year due to health care costs and reduced productivity.

People with diabetes are 2 to 4 times more likely to have heart disease or a stroke.

Certain risk factors can worsen diabetes and diabetes-related complications, and contribute to the development of other chronic diseases like heart disease and stroke.

Among Oregon adults with diabetes:

- 1 in 2 is obese.
- 1 in 4 smokes cigarettes.
- 2 in 3 have high blood pressure.
- 2 in 3 have high cholesterol.
- 1 in 3 is physically inactive.

1 in 2 is obese.
1 in 4 smokes cigarettes.
2 in 3 have high blood pressure.
2 in 3 have high cholesterol.
1 in 3 is physically inactive.

Compared to adults with a college degree, adults with less than a high school education are:

- 2x more likely to have diabetes.

Compared to non-Latino whites, African American, American Indian, Alaska Native and Latino people are:

- 2 to 3x more likely to have diabetes.

Diabetes, Heart Disease and Stroke in Oregon, 2013 Report
What is diabetes?

Diabetes is a chronic metabolic disease in which glucose (sugar) levels in the blood are above normal. High blood sugar occurs when the body does not produce enough insulin (Type 1 diabetes), or when the body resists and does not properly respond to insulin (Type 2 diabetes).

Prediabetes occurs when blood glucose levels are higher than normal but not yet in the range of diabetes, and gestational diabetes is a form of diabetes that occurs during pregnancy. Those who have prediabetes or gestational diabetes are at a higher risk of developing Type 2 diabetes, but the progression to diabetes may be prevented or delayed with regular physical activity and a healthy diet. Once diagnosed, diabetes is usually a lifelong disease with treatment consisting of a combination of medication, diet modifications and physical activity to manage blood sugar and reduce potentially harmful complications.

If not carefully managed, diabetes can cause blindness, skin infections, nerve damage and kidney damage. Today, diabetes is the leading cause of adult blindness and non-traumatic lower-leg amputations.\(^1\) Diabetes contributes to high blood pressure and high cholesterol, both of which are primary risk factors for heart disease and stroke.

Several health conditions and behaviors can increase the risk for developing diabetes or prediabetes. Age, family history, race and ethnicity are contributors to the development of diabetes that cannot be modified or controlled. However, many other risk factors for diabetes and complications of diabetes are modifiable, including overweight and obesity, high blood pressure, abnormal cholesterol, low fruit and vegetable consumption, lack of physical activity and cigarette smoking.\(^1,2\)

For this report, diabetes prevalence was determined by the percentage of adults who responded “Yes” when asked if they have ever been told by a doctor, nurse or other health professional that they have diabetes. This does not distinguish between Type 1 or Type 2 diabetes, and does not include those who currently have prediabetes, gestational diabetes or borderline diabetes.
Risk factors for diabetes and prediabetes

Non-modifiable:
- Age;
- Family history;
- Race and ethnicity;
- Gestational diabetes during previous pregnancy;
- Having given birth to a baby weighing more than 9 pounds.

Modifiable:
- Overweight and obesity;
- Lack of physical activity;
- Cigarette smoking;
- High blood pressure;
- Abnormal cholesterol.

Diabetes is a public health priority

During the past 20 years, the prevalence of diabetes among adults in Oregon has more than doubled, increasing from 4% in 1990 to more than 8% in 2011. There are approximately 278,000 adults with diagnosed diabetes in Oregon, and it is estimated that 35% of adults have pre-diabetes. Diabetes is the seventh leading cause of death in Oregon, accounting for 3% of all deaths. In 2011, there were 4,274 hospitalizations due to diabetes with an average cost of $21,000 per hospitalization. According to the American Diabetes Association, excess medical expenditures associated with diabetes total nearly $2.2 billion each year; that is an average of $7,800 per person with diabetes. In addition, costs associated with reduced productivity from diabetes are estimated at $840 million. The estimated total cost of diabetes in Oregon is nearly $3 billion per year.3

Due to the significant morbidity and mortality associated with this disease, the 2007 Oregon Legislature passed House Bill 3486, which declared an emergency related to diabetes and obesity and led to the development in 2009 of a strategic plan to slow the rate of diabetes caused by obesity and other environmental factors.4

Oregon Diabetes Program priorities

- Creating healthy communities that support people in eating better, moving more and living tobacco-free where they live, work, play and learn.
- Helping prevent diabetes in those at risk for the disease by increasing access to lifestyle change programs, and helping people with diabetes live better by increasing access to chronic disease self-management programs.
- Improving delivery and use of quality clinical services to prevent diabetes, detect it early and manage risk factors.
- Eliminating health disparities among population groups.
- Providing facts and figures about diabetes in Oregon.
3.1 Who has diabetes?

To understand the burden of diabetes in Oregon, the prevalence of the disease needs to be known. Prevalence is the percentage of people with diabetes in a particular population, at a given time. It is important to report the prevalence of diabetes among sub-populations of Oregonians (e.g., racial and ethnic minorities) to identify groups of Oregonians who are disproportionately affected by diabetes compared to the general population in Oregon. This section will describe the burden of diabetes among Oregon adults over time and by select demographics including gender, age, education, income, health insurance status, race and ethnicity, chronic disease risk factors, and chronic conditions.

FIGURE 3.1.1 ADULTS WITH DIAGNOSED DIABETES, BY YEAR, OREGON AND THE UNITED STATES, 1995–2011


Note: National data were not included for 2010 because the method for weighting the data was different from the method used in Oregon. The national estimate excludes territories. The vertical dashed line denotes a different adjustment method and inclusion of cellular phones in the sample. Starting in 2010, estimates are not comparable to earlier years. Estimates are age-adjusted.
During the past two decades, the age-adjusted diabetes prevalence among Oregon adults more than doubled, increasing from 4.0% in 1995 to 8.3% in 2011 (Table 3.1.1 and Figure 3.1.1).

Oregon’s diabetes prevalence is lower compared to the United States.

Approximately 278,000 Oregon adults had diabetes in 2011.

### TABLE 3.1.1 ADULTS WITH DIAGNOSED DIABETES, BY YEAR, OREGON AND THE UNITED STATES, 1995–2011

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*Note:* National data were not included for 2010 because the method for weighting the data was different from the method used in Oregon. The national estimate excludes territories. Starting in 2010, estimates are not comparable to earlier years. Estimates are age-adjusted.
Since 2000, the prevalence of diabetes has been higher for males compared to females (Figure 3.1.2). In 2011, the percentage of adult males with diagnosed diabetes was 8.9%, compared to 7.9% among females.

**Data source:** Oregon Behavioral Risk Factor Surveillance System: National data from the National Behavioral Risk Factor Surveillance System. Estimates are age-adjusted.
Diabetes was more prevalent among people in older age groups. Older Oregonians were much more likely to report diagnosed diabetes compared to younger Oregonians (Figure 3.1.3).

Approximately one-fifth of Oregon adults aged 65 years and over reported having diagnosed diabetes, compared to less than 3% of adults aged 18–44 years (Figure 3.1.3).

Data source: Oregon Behavioral Risk Factor Surveillance System

Note: Estimates are not age-adjusted.
Diabetes was more common among Oregonians with lower education levels (Figure 3.1.4).

The prevalence of diabetes among adults with less than high school education was more than double that of Oregonians with a college degree (Figure 3.1.4).

**FIGURE 3.1.4 ADULTS WITH DIAGNOSED DIABETES, BY EDUCATION, OREGON, 2011**

Data source: Oregon Behavioral Risk Factor Surveillance System

Note: The horizontal line represents the percentage of Oregon’s general population with diabetes (8.3%). Estimates are age-adjusted.
Diabetes was more prevalent among Oregonians with lower annual household income levels (Figure 3.1.5).

The prevalence of diabetes among adults with an annual household income of less than $20,000 was nearly three times that of those with an annual household income of $75,000 or more (Figure 3.1.5).
The prevalence of diabetes among adults currently insured by the Oregon Health Plan was more than double that of those who had other types of health insurance (Figure 3.1.6).

Those with no health insurance may have a lower prevalence of diagnosed diabetes due to inadequate access to health care. Access to care and contact with a health care provider are required to receive a diabetes diagnosis.

In addition, those with no health insurance are generally younger and healthier and therefore are less likely to have chronic health conditions.

Data source: Oregon Behavioral Risk Factor Surveillance System
Note: The horizontal line represents the percentage of Oregon’s general population with diabetes (8.3%). Estimates are age-adjusted.
Many racial and ethnic minority groups in Oregon were disproportionately affected by diabetes (Figure 3.1.7).

Among non-Latino African-Americans, nearly 23% were diagnosed with diabetes, compared with 15% of Latinos, 14% of American Indian/Alaska Natives, and 7% of whites and Asians (Figure 3.1.7).

National data reflect similar disparities in diabetes prevalence by racial and ethnic groups.\textsuperscript{5}
The prevalence of diabetes increases with body weight, and approximately doubles with each increasing category of body mass index.*

The prevalence of diagnosed diabetes among Oregon adults who are very obese (BMI of 40.0 and above) was extremely high at 27%.

Adults who are obese were nearly four times more likely than adults of a healthy weight to report having diagnosed diabetes, and adults who are very obese were eight times more likely to report having diagnosed diabetes.

*To determine adult overweight and obesity ranges, self-reported weight and height are used to calculate body mass index (BMI) because, for most people, it correlates with the amount of body fat a person has, although it is not a direct measure of body fat. An adult who has a BMI between 25 and 29.9 is considered overweight, 30 to 39.9 is considered obese, and 40.0 and above is considered very obese.
The diabetes prevalence among adults who are current smokers was higher compared to the general population (Figure 3.1.9).

Adults with high blood pressure and high cholesterol were more than twice as likely to report having diagnosed diabetes compared to the general population (Figure 3.1.9).

Of adults who reported a lack of physical activity* in the past month, 14.6% had been diagnosed with diabetes (Figure 3.1.9).

*For this report, lack of physical activity was determined by the percentage of adults who responded “No” when asked if they participated in any physical activity (other than what is done during one’s regular job) or exercises, such as running, calisthenics, golf, gardening or walking during the past month.

Data source: Oregon Behavioral Risk Factor Surveillance System

Note: The horizontal line represents the percentage of Oregon’s general population with diabetes (8.3%). Estimates are age-adjusted.
Diabetes is more prevalent among adults who also have cardiovascular diseases (Figure 3.1.10).

More than one-quarter of adults who had ever had a heart attack or stroke also had diagnosed diabetes, and almost one-half of adults who had coronary heart disease also had diagnosed diabetes.

Data source: Oregon Behavioral Risk Factor Surveillance System
Note: The horizontal line represents the percentage of Oregon’s general population with diabetes (8.3%). Estimates are age-adjusted.
During 2008–2011, the prevalence of diagnosed diabetes among Oregon counties ranged from 5.3% to 11.2%.

Washington County had a significantly lower percentage of adults with diagnosed diabetes (6.0%) compared to the rest of the state.

Douglas County had a significantly higher percentage of adults with diagnosed diabetes (11.2%) compared to the rest of the state.

See Appendix A for detailed county estimates.
Conclusions
During the past two decades, the percentage of Oregon adults with diagnosed diabetes has more than doubled. Men tend to have a higher prevalence of diagnosed diabetes compared to women. As expected, a higher proportion of older Oregonians reported having diagnosed diabetes compared to the younger adult population. However, many differences were seen across other demographic factors, both modifiable and non-modifiable. The prevalence of diagnosed diabetes was higher among Oregon adults with less education, a smaller annual household income, and among those enrolled in the Oregon Health Plan, which is Oregon’s Medicaid program. In addition, non-Latino African Americans, non-Latino American Indians/Alaska Natives, and Latinos were more likely to report having diagnosed diabetes compared to non-Latino whites. Oregon adults with chronic disease risk factors and other chronic conditions were also more likely to report having diagnosed diabetes than the general population. Most notable, adults who are obese are nearly four times more likely than adults of a healthy weight to report having diagnosed diabetes, and adults who are very obese are eight times more likely to report having diagnosed diabetes.
3.2 Risk factors among adults with diagnosed diabetes

Several health conditions and behaviors can increase the risk for developing diabetes. Age, family history, race and ethnicity contribute to developing diabetes, heart disease and stroke that cannot be modified or controlled. However, many other risk factors for diabetes are modifiable, including cigarette smoking, overweight and obesity, high blood pressure, high cholesterol, and lack of physical activity.\(^1\)\(^2\) These risk factors increase one’s risk for developing diabetes and can contribute to developing other chronic diseases, cause difficulties in self-management, and increase the risk of complications for those who have the disease. This section will describe the burden of risk factors and behaviors and other chronic conditions among Oregon adults who have been diagnosed with diabetes.

- Adults with diagnosed diabetes were less likely to be of a healthy weight and more likely to be obese compared to adults without diabetes (Figure 3.2.1).
- Adults with diagnosed diabetes were four times more likely to report being very obese (BMI of 40.0 and above) compared to adults without diabetes (Figure 3.2.1).

**FIGURE 3.2.1 BODY WEIGHT STATUS AMONG ADULTS WITH AND WITHOUT DIAGNOSED DIABETES, OREGON, 2011**

![Bar Chart](chart.png)

*Data source:* Oregon Behavioral Risk Factor Surveillance System  
*Note:* Estimates are age-adjusted.
The percentage of adults with diagnosed diabetes who also had high blood pressure or high cholesterol was more than double that of adults without diabetes (Figure 3.2.2).

The cigarette smoking rate among adults with diagnosed diabetes was approximately 30% higher compared to adults without diabetes (Figure 3.2.2).

Adults with diabetes were more likely to report doing no physical activity outside of work in the past month (Figure 3.2.2).
The prevalence of heart disease or heart attack among adults with diagnosed diabetes was almost four times higher than adults without diabetes, and the prevalence of stroke was nearly three-and-one-half times higher (Figure 3.2.3).
Conclusions

Overall, Oregon adults who have diagnosed diabetes also report chronic disease risk factors and other chronic conditions at a higher rate than those who do not have diagnosed diabetes. A higher proportion of adults with diagnosed diabetes were obese, smoked cigarettes, had high blood pressure, had high cholesterol and were not physically active compared to adults without diagnosed diabetes. Most notably, adults with diagnosed diabetes were 62% more likely to report being obese and almost three times as likely to report high blood pressure or high cholesterol compared to adults without diagnosed diabetes. High blood pressure and high cholesterol, along with cigarette smoking and lack of physical activity, are key contributors to the development of cardiovascular diseases and diabetes-related complications.
3.3 Diabetes self-management

Having diabetes means that blood glucose (blood sugar) levels are too high. If blood glucose stays too high for a long time, serious health problems may result. People with diabetes can lower their chances of having a heart attack, a stroke or other complications of diabetes by managing their diabetes ABCS – A1C (a measure of the average blood glucose level over the past three months), Blood pressure control, Cholesterol control, and Smoking cessation.67

Health care providers can help people with diabetes understand what their ABC numbers should be and what they can do to reach their targets.* General recommendations for staying healthy with diabetes include:

- Eat well.
- Be physically active.
- Maintain a healthy weight.
- Stop cigarette smoking.
- Keep track of blood sugar levels.
- Learn to cope with stress.
- Check feet every day for cuts, blisters, red spots and swelling.
- Take medicines for diabetes and other health problems as prescribed.

- Get routine health care including an annual flu shot and recommended tests (including A1C, blood pressure, cholesterol and a dilated eye exam).

Diabetes self-management education (DSME) programs can help people with diabetes gain the knowledge and skills needed to modify their behaviors and successfully self-manage the disease and its related conditions. The American Diabetes Association (ADA) and the American Association of Diabetes Educators (AADE) accredit, or recognize, diabetes education programs that meet National Standards for Diabetes Self-Management Education. In Oregon, DSME is available through organizations whose programs have been ADA-recognized, AADE-accredited, or licensed to offer the Stanford Diabetes Self-Management Program. In addition, people with diabetes may benefit from the Oregon Tobacco Quit Line and other self-management programs offered in Oregon such as Living Well with Chronic Conditions and Tomando Control de su Salud.

Self-management practices are crucial in keeping one’s diabetes under control. Regular blood sugar monitoring, doctor visits, screenings for other diabetes-related complications, and educational classes are some examples of proper diabetes management (Figure 3.3.1).

- Of Oregon adults with diabetes (Type 1 or Type 2), 28.6% currently used insulin (not pictured).
- The majority checked their blood sugar and their feet for sores or irritations at least once per day.
- Nearly three-fourths of adults had their A1C levels checked by a health professional at least twice within the past year.
- Approximately two-thirds of adults with diabetes had an eye exam within the past year and had taken a class on managing their diabetes.

Data source: Oregon Behavioral Risk Factor Surveillance System
Adults with diabetes in Oregon have met Healthy People 2020 goals for annual foot and eye exams, two or more A1C checks within the past year, and for receiving formal diabetes education. However, the number of adults with diabetes who self-monitor their blood glucose at least once daily is below the target goal.

Just over half of adults with diagnosed diabetes had an annual influenza (flu) shot within the past year (Figure 3.3.2).

Most adults with diagnosed diabetes had their cholesterol checked within the past year.

Most adults with diagnosed diabetes were currently trying to lose weight or maintain their current weight.

Conclusions

Encouragingly, many Oregon adults who have diagnosed diabetes are taking steps to manage their condition. A majority of adults with diagnosed diabetes meet recommendations for cholesterol screening and getting their A1C levels checked by a health professional. In addition, the majority of adults with diagnosed diabetes were trying to lose or maintain weight. However, there is room for improvement as approximately one-third of adults with diagnosed diabetes had never taken a class on how to manage their diabetes.
3.4 Diabetes hospitalizations

If diabetes is not properly managed or controlled, severe complications, such as infections, nerve damage and kidney damage, can develop and lead to hospitalization. In 2011, about one in six hospitalizations in Oregon were related to patients with diabetes. Research shows that patients with diabetes tend to have longer and more costly hospital stays, and are more likely to be admitted through the emergency department compared to patients without diabetes. Among hospitalizations primarily caused by diabetes, approximately 40% were due to ketoacidosis (low insulin combined with high blood sugar levels), which is a serious condition that can result from uncontrolled or improperly managed diabetes. This section will describe diabetes-related hospitalizations in Oregon, complications involved and their associated costs.

FIGURE 3.4.1 DIABETES HOSPITALIZATION RATE, OREGON, 1997–2011

Data source: Oregon Hospital Discharge Dataset
Note: Estimates are age-adjusted.
Between 1997 and 2011, the diabetes hospitalization rate increased 19% (Figure 3.4.1 and Table 3.4.1).

In 2011, men had a higher rate of hospitalization primarily caused by diabetes compared to women.

In 2011, diabetes was listed as the primary cause of hospitalization on 4,274 records, and as a contributing cause on 48,778 records. In total, diabetes was listed as any cause on 15.2% of all hospitalizations in 2011.

The average cost of a hospitalization primarily caused by diabetes was more than $21,000, with the total cost of all hospitalizations primarily caused by diabetes reaching more than $91 million in 2011.

### Table 3.4.1 Diabetes Hospitalization Rate, Oregon, 1997–2011

<table>
<thead>
<tr>
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<tr>
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<td>107.1</td>
</tr>
</tbody>
</table>

**Note:** Estimates are age-adjusted.
Among hospitalizations with diabetes listed as a contributing cause, almost one-quarter had cardiovascular diseases listed as the primary cause of hospitalization (Figure 3.4.2).

Similarly, among hospitalizations primarily caused by diabetes, nearly a quarter had heart disease, heart attack or stroke listed as a contributing cause of hospitalization (not pictured).

**FIGURE 3.4.2 HOSPITALIZATIONS DUE TO CARDIOVASCULAR DISEASES AMONG PATIENTS WITH DIABETES, OREGON, 2011**

- Heart disease: 17.1%
- Heart attack: 3.4%
- Stroke: 3.6%

Data source: Oregon Hospital Discharge Dataset
Ketoacidosis (low insulin combined with high blood sugar levels) was the most common related complication among hospitalizations that were primarily caused by diabetes (39.9% of all primary diabetes hospitalizations).

Hyperosmolarity (dehydration due to high blood sugar levels), along with neurological, circulatory and renal manifestations were also common complications.

**Data source:** Oregon Hospital Discharge Dataset

**Note:** Complications reflect primary diabetes ICD-9 diagnosis codes (250.0–250.9)
Conclusions
The rate of diabetes hospitalizations in Oregon has increased over time. In 2011, men had a higher rate of diabetes hospitalizations compared to women. Many patients with diabetes who were hospitalized were primarily admitted to the hospital for cardiovascular conditions. Among hospitalizations primarily due to diabetes, ketoacidosis was reported as the most common diabetes-related complication.
3.5 Diabetes mortality

Diabetes is the seventh leading cause of death in Oregon. However, since many diabetes deaths tend to be primarily attributed to diabetes-related complications (such as heart disease) rather than diabetes itself, examining diabetes as the primary cause of death underestimates the impact of the disease on mortality. Overall, the risk of death among people with diabetes is about double that of people without diabetes (of a similar age).¹ This section will describe diabetes mortality in Oregon as a primary and contributing cause of death.

- Since 1990, the diabetes death rate in Oregon increased 44% (Figure 3.5.1 and Table 3.5.1).
- In the last decade, the diabetes death rate in Oregon has consistently been higher compared to the United States (Figure 3.5.1 and Table 3.5.1).

**FIGURE 3.5.1 DIABETES DEATH RATES, OREGON AND THE UNITED STATES, 1990–2011**

Data source: Oregon Vital Records and CDC WONDER online database (data not yet available for 2011).

Notes: Estimates are age-adjusted. Death rates reflect diabetes as the primary cause of death.
In 2011, the diabetes death rate in Oregon was 24.8 per 100,000 deaths.

<table>
<thead>
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</table>
The diabetes death rate was 50% higher for men than for women in 2011 (Figure 3.5.2).

Diabetes was the seventh leading cause of death in Oregon in 2011.

A total of 1,114 deaths were primarily due to diabetes, accounting for 3.4% of all deaths among Oregon residents.

Diabetes was additionally listed as a contributing cause of death on 2,732 death certificates. In total, diabetes was reported on 3,846 death certificates in Oregon in 2011, accounting for 12% of all deaths among Oregon residents.

Data source: Oregon Vital Records
Notes: Estimates are age-adjusted. Death rates reflect diabetes as the primary cause of death.
In 2011, the diabetes death rate was higher among non-Latino African-Americans, non-Latino American Indians/Alaska Natives, and Latinos compared to non-Latino whites (Figure 3.5.3).

**Conclusions**

Diabetes was the primary cause of death for more than 3% of all deaths in Oregon in 2011, and was a contributing factor to an additional 8%. In total, diabetes was the primary or contributing cause of death for approximately 12% (3,486) of all deaths in Oregon in 2011. The diabetes death rate is higher among men compared to women, and it is also higher among racial and ethnic minority groups compared to non-Latino whites. Of deaths where diabetes was the primary cause, more than 60% listed cardiovascular diseases as a contributing cause. Of deaths where cardiovascular diseases were the primary cause, 13% listed diabetes as a contributing cause.
3.6 Costs of diabetes

Diabetes creates a significant economic burden at the national, state and community level. The American Diabetes Association (ADA) estimates that annual expenditures related to diabetes have reached $245 billion in the United States, including $176 billion in direct medical costs and $69 billion in indirect costs (absenteeism, reduced productivity, unemployment due to disability, etc.). This is an increase of 41% over the previous estimate ($174 billion) from 2007. The ADA also estimates that 23% of total health care costs in the United States can be attributed to diabetes.

In Oregon, nearly $2.2 billion in excess medical expenditures are associated with diabetes each year, averaging $7,800 per person with diabetes. In addition, costs associated with reduced productivity from diabetes are estimated at $840 million. The total cost of diabetes in Oregon is estimated at nearly $3 billion per year. Many of the medical expenditures related to diabetes can be attributed to hospitalizations due to complications. The average cost of a hospitalization primarily caused by diabetes was more than $21,000 in 2011, with the total cost of all hospitalizations primarily caused by diabetes reaching more than $91 million.

Diabetes continues to be a major contributor to increased health care costs. Without significant changes in public and private health system strategies, the costs associated with diabetes can be expected to at least double during the next 25 years.

Reducing diabetes costs

Maintaining a healthy diet and getting regular physical activity may prevent or delay the onset of Type 2 diabetes and reduce the risk of complications for people with diabetes. Some of the behavioral and environmental factors associated with diabetes include cigarette smoking and exposure to secondhand smoke, overweight and obesity, high blood pressure, high cholesterol, and lack of physical activity. Many of these factors can be addressed by creating environments that support Oregonians in eating better, moving more and living tobacco-free.

Oregon also promotes and supports strategies to improve delivery and use of quality clinical services to prevent diabetes and diabetes-related complications. These strategies include conducting recommended screenings for blood pressure, cholesterol, and blood sugar; increasing clinical referrals to self-management education programs; and delivering health care in accordance with clinical practice guidelines.
FIGURE 3.6.1 DIRECT MEDICAL COSTS DUE TO DIABETES, UNITED STATES, 2012

Data source: American Diabetes Association
3.7 Prediabetes

Prediabetes is a condition in which blood sugar levels are higher than normal but not high enough to be considered diabetes. People with prediabetes have a higher risk of developing Type 2 diabetes, heart disease and stroke. The Centers for Disease Control and Prevention (CDC) estimates that 35% of U.S. adults aged 20 years or older have prediabetes. Applying the national prediabetes estimated rate to the Oregon population yields an estimate of nearly one million adults in Oregon who have prediabetes, and most likely do not know they have it. It is recommended that screening for Type 2 diabetes with a blood glucose test be considered for those who are at higher risk, including adults at any age who are overweight and have additional diabetes risk factors. Testing for adults without other diabetes risk factors is recommended starting at age 45 years. If test results are normal, testing is recommended every three years, with more frequent testing depending on risk status and if results indicate prediabetes. For children and adolescents under 18 years of age, testing to detect Type 2 diabetes and prediabetes should be considered for those who are overweight and have two or more additional risk factors for diabetes (family history, racial or ethnic minority, lack of physical activity, high blood pressure or high cholesterol). People with prediabetes who adopt a healthier lifestyle and lose weight by eating better and moving more can prevent or delay Type 2 diabetes. The National Diabetes Prevention Program is a one-year, community-based lifestyle change program proven to prevent Type 2 diabetes in adults at risk for developing diabetes. Participants work with a lifestyle coach in a group setting that includes 16 core sessions (usually one per week) and eight post-core sessions (one per month). The Oregon Health Authority Public Health Division is working with partner organizations to expand the reach of the National Diabetes Prevention Program in Oregon. In Oregon, approximately two-thirds of adults aged 45 years or older reported having a blood sugar test within the past three years.

- Of those adults aged 45 years or above who reported having a blood sugar test in the last three years, 9% reported having been diagnosed with prediabetes.
- This is likely an underestimate of the prediabetes prevalence in Oregon, since 37% of adults reported they have not had a blood sugar test within the past three years. Many adults who have had a blood sugar test within the past three years could also be unknown.
FIGURE 3.7.1 ADULTS AGED 45 YEARS AND OLDER WHO HAVE HAD A BLOOD SUGAR TEST WITHIN THE PAST THREE YEARS, OREGON, 2011

Data source: Oregon Behavioral Risk Factor Surveillance System
Notes: Estimates are age-adjusted.
3.8 Gestational diabetes

Gestational diabetes is a type of diabetes that occurs during pregnancy. In most cases, gestational diabetes goes away after pregnancy. However, 5% to 10% of women with gestational diabetes are found to have diabetes immediately after pregnancy, and women who have had gestational diabetes have a 35% to 60% chance of developing diabetes in the next 10–20 years.1

When blood sugar is frequently high during pregnancy, it can result in increased health risks for pregnant women, including preeclampsia, preterm birth and C-section.10 It can also cause the baby of a woman with gestational diabetes to grow very large (nine pounds or more). Large babies increase the risk of complications during birth and of the baby being overweight or developing diabetes later in life.10 Eating well, staying active and keeping blood sugar under control can prevent complications from gestational diabetes as well as prevent or delay getting Type 2 diabetes following pregnancy.

This section will describe the burden of gestational diabetes among Oregon mothers over time and by race and ethnicity.

- The prevalence of gestational diabetes among Oregon mothers more than doubled from 1995 to 2011, increasing from 3.4% to 8.2% (Figure 3.8.1 and Table 3.8.1).

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**FIGURE 3.8.1 PERCENTAGE OF BIRTHS TO MOTHERS WITH GESTATIONAL DIABETES, OREGON, 1995–2011**

Data source: Oregon Vital Records
Notes: Data refer to births to mothers aged 10–49 years. Estimates are age-adjusted.
### TABLE 3.8.1 PERCENTAGE OF BIRTHS TO MOTHERS WITH GESTATIONAL DIABETES, OREGON, 1995–2011

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<thead>
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</table>

**Data source:** Oregon Vital Records  
**Notes:** Data refer to births to mothers aged 10–49. Estimates are age-adjusted.
Oregon mothers who were members of racial and ethnic minority groups were disproportionately affected by gestational diabetes (Figure 3.8.2).

Nearly 13% of Latina mothers were diagnosed with gestational diabetes during their pregnancies, compared with 11.7% of non-Latina Native Hawaiians/Pacific Islanders, 10.5% of non-Latino Asians, 6.9% of non-Latino American Indians/Alaska Natives, and 6% of non-Latina whites, and non-Latina African-American women (Figure 3.8.2).

Conclusions

The prevalence of gestational diabetes among Oregon mothers more than doubled during the past 15 years, increasing more than 140% between 1995 and 2011. Mothers who are members of racial and ethnic minority groups are disproportionately affected by gestational diabetes, especially non-Latino Asians, non-Latino Native Hawaiians or Pacific Islanders, and Latina women.
Maintaining a healthy diet and getting regular physical activity may prevent or delay the onset of Type 2 diabetes and reduce the risk of complications for people with diabetes. Some of the behavioral and environmental factors associated with diabetes include cigarette smoking and exposure to secondhand smoke, overweight and obesity, high blood pressure, high cholesterol, inadequate consumption of fruits and vegetables, and lack of physical activity. Many of these factors can be addressed through lifestyle changes and environments that support Oregonians in eating better, moving more and living tobacco-free. Effectively reducing these risk factors will help reduce the prevalence of diabetes in the future.

There are many resources available in Oregon to support individuals, families and employers in preventing and controlling diabetes. The National Diabetes Prevention Program is a one-year, community-based lifestyle change program that has been proven to prevent Type 2 diabetes in adults at risk for developing diabetes. For people with diabetes, Oregon’s chronic disease self-management program (Living Well with Chronic Conditions and Tomando Control de su Salud) provide tools for living a healthy life with chronic health conditions such as diabetes. Diabetes self-management programs help people with diabetes gain the knowledge and skills needed to modify their behavior and successfully self-manage the disease and its related conditions. The Oregon Tobacco Quit Line provides free tobacco cessation coaching to help people live tobacco-free. Visit www.healthoregon.org/takecontrol for more information on programs to help people manage their condition and live healthier lives.

Oregon also promotes and supports strategies to improve delivery and use of quality clinical services to prevent diabetes and diabetes-related complications. These strategies include conducting recommended screenings for blood pressure, cholesterol, and blood sugar; increasing clinical referrals to self-management education programs; and delivering health care in accordance with clinical practice guidelines.

Visit the Oregon Diabetes and Prevention Control Program webpage for diabetes prevention resources and more information on strategies to reduce the burden of diabetes in Oregon: www.healthoregon.org/diabetes.


### APPENDIX A: COUNTY-LEVEL ESTIMATES

<table>
<thead>
<tr>
<th>Diabetes</th>
<th>Heart attack</th>
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<th>County</th>
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<tr>
<td></td>
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<td>Age-adjusted</td>
<td>Unadjusted</td>
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<tr>
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<td>7.2%</td>
<td>–</td>
</tr>
<tr>
<td><strong>County</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baker</td>
<td>11.2%</td>
<td>10.0%†</td>
<td>6.1%†</td>
</tr>
<tr>
<td>Benton</td>
<td>6.8%</td>
<td>7.5%</td>
<td>2.5%</td>
</tr>
<tr>
<td>Clackamas</td>
<td>8.1%</td>
<td>7.5%</td>
<td>2.9%</td>
</tr>
<tr>
<td>Clatsop</td>
<td>8.7%</td>
<td>7.5%</td>
<td>6.5%</td>
</tr>
<tr>
<td>Columbia</td>
<td>8.4%</td>
<td>7.5%</td>
<td>2.9%</td>
</tr>
<tr>
<td>Coos</td>
<td>12.4%</td>
<td>10.9%</td>
<td>7.6%</td>
</tr>
<tr>
<td>Crook</td>
<td>10.2%</td>
<td>9.1%</td>
<td>4.7%†</td>
</tr>
<tr>
<td>Curry</td>
<td>9.7%</td>
<td>6.8%</td>
<td>6.5%</td>
</tr>
<tr>
<td>Deschutes</td>
<td>6.6%</td>
<td>5.8%</td>
<td>2.8%</td>
</tr>
<tr>
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<td>12.8%</td>
<td>11.2%*</td>
<td>6.7%</td>
</tr>
<tr>
<td>Grant</td>
<td>8.3%†</td>
<td>5.8%†</td>
<td>3.5%†</td>
</tr>
<tr>
<td>Harney</td>
<td>9.0%†</td>
<td>7.7%†</td>
<td>–</td>
</tr>
<tr>
<td>Hood River</td>
<td>6.1%†</td>
<td>5.3%†</td>
<td>–</td>
</tr>
<tr>
<td>Jackson</td>
<td>8.6%</td>
<td>7.8%</td>
<td>3.8%</td>
</tr>
<tr>
<td>Jefferson</td>
<td>6.1%†</td>
<td>5.3%†</td>
<td>5.3%†</td>
</tr>
<tr>
<td>Josephine</td>
<td>10.3%</td>
<td>7.6%</td>
<td>6.6%</td>
</tr>
<tr>
<td>Klamath</td>
<td>8.0%</td>
<td>7.0%</td>
<td>6.4%</td>
</tr>
</tbody>
</table>
### TABLE A.1. AGE-ADJUSTED AND UNADJUSTED PREVALENCE OF DIABETES, HEART ATTACK AND HEART DISEASE AMONG ADULTS, BY COUNTY, OREGON 2008–2011, CONTINUED

<table>
<thead>
<tr>
<th>County</th>
<th>Diabetes Unadjusted</th>
<th>Diabetes Age-adjusted</th>
<th>Heart attack Unadjusted</th>
<th>Heart attack Age-adjusted</th>
<th>Heart disease Unadjusted</th>
<th>Heart disease Age-adjusted</th>
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</thead>
<tbody>
<tr>
<td>OREGON</td>
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<td>7.2%</td>
<td>–</td>
<td>9.9%</td>
<td>–</td>
<td>3.5%</td>
</tr>
<tr>
<td>Lake</td>
<td>7.6%†</td>
<td>4.9%†</td>
<td>7.9%†</td>
<td>7.2%†</td>
<td>5.1%†</td>
<td>3.3%†</td>
</tr>
<tr>
<td>Lane</td>
<td>7.4%</td>
<td>6.9%</td>
<td>3.9%</td>
<td>11.7%*</td>
<td>3.6%</td>
<td>3.1%</td>
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<tr>
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<td>10.4%</td>
<td>7.8%</td>
<td>4.1%</td>
<td>9.6%</td>
<td>3.9%</td>
<td>2.7%</td>
</tr>
<tr>
<td>Linn</td>
<td>8.6%</td>
<td>7.3%</td>
<td>4.3%</td>
<td>9.9%</td>
<td>5.4%</td>
<td>4.4%</td>
</tr>
<tr>
<td>Malheur</td>
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<td>10.3%</td>
<td>3.4%†</td>
<td>9.3%</td>
<td>4.1%†</td>
<td>4.0%†</td>
</tr>
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<td>7.6%</td>
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<td>4.1%</td>
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<tr>
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<td>5.6%†</td>
</tr>
<tr>
<td>Multnomah</td>
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<td>3.7%</td>
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<tr>
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<td>6.2%</td>
<td>5.8%</td>
</tr>
<tr>
<td>Tillamook</td>
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<td>5.3%</td>
<td>3.3%</td>
</tr>
<tr>
<td>Umatilla</td>
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<tr>
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<td>13.5%</td>
<td>4.0%†</td>
<td>3.4%†</td>
</tr>
<tr>
<td>Wallowa</td>
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<td>5.0%†</td>
<td>4.6%†</td>
<td>6.2%†</td>
<td>6.6%†</td>
<td>4.4%†</td>
</tr>
<tr>
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<td>9.6%</td>
<td>2.9%</td>
<td>3.1%</td>
</tr>
<tr>
<td>Wheeler</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Yamhill</td>
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<td>4.0%</td>
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<tr>
<td>Gilliam/Sherman/Wasco</td>
<td>8.1%</td>
<td>6.6%</td>
<td>6.3%</td>
<td>7.5%†</td>
<td>5.6%</td>
<td>4.9%†</td>
</tr>
</tbody>
</table>

* Statistically significant difference compared with all other counties (p-value ≤ 0.05)
† This number may be statistically unreliable and should be interpreted with caution.
– This number is suppressed because it is statistically unreliable.

Data source: Oregon BRFSS County Combined Dataset 2008–2011

Note: Age-adjusted estimates are adjusted to the 2000 Standard Population using three age groups (18–34, 35–54 and 55+).
## TABLE A.2. AGE-ADJUSTED AND UNADJUSTED PREVALENCE OF STROKE, HIGH BLOOD PRESSURE AND HIGH CHOLESTEROL AMONG ADULTS, BY COUNTY, OREGON, 2008–2011

<table>
<thead>
<tr>
<th>County</th>
<th>Stroke Unadjusted</th>
<th>Stroke Age-adjusted</th>
<th>High blood pressure Unadjusted</th>
<th>High blood pressure Age-adjusted</th>
<th>High cholesterol Unadjusted</th>
<th>High cholesterol Age-adjusted</th>
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</thead>
<tbody>
<tr>
<td>OREGON</td>
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<td>2.3%</td>
<td>–</td>
<td>26.6%</td>
<td>–</td>
<td>32.2%</td>
</tr>
<tr>
<td>Baker</td>
<td>5.3%†</td>
<td>–</td>
<td>40.4%</td>
<td>32.8%</td>
<td>56.4%</td>
<td>51.7%</td>
</tr>
<tr>
<td>Benton</td>
<td>1.5%</td>
<td>1.6%*</td>
<td>20.9%</td>
<td>21.5%</td>
<td>29.1%</td>
<td>27.8%</td>
</tr>
<tr>
<td>Clackamas</td>
<td>2.5%</td>
<td>2.2%</td>
<td>28.9%</td>
<td>27.0%</td>
<td>37.1%</td>
<td>33.1%</td>
</tr>
<tr>
<td>Clatsop</td>
<td>4.2%</td>
<td>3.1%</td>
<td>35.6%</td>
<td>31.2%</td>
<td>41.3%</td>
<td>28.4%</td>
</tr>
<tr>
<td>Columbia</td>
<td>2.7%†</td>
<td>2.5%†</td>
<td>32.7%</td>
<td>29.4%</td>
<td>40.7%</td>
<td>29.8%</td>
</tr>
<tr>
<td>Coos</td>
<td>6.2%†</td>
<td>5.9%†</td>
<td>32.9%</td>
<td>26.1%</td>
<td>39.8%</td>
<td>35.2%</td>
</tr>
<tr>
<td>Crook</td>
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<td>–</td>
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<td>38.3%</td>
<td>48.3%</td>
<td>42.9%</td>
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<td>1.3%†</td>
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<td>22.7%</td>
<td>44.9%</td>
<td>29.3%</td>
</tr>
<tr>
<td>Deschutes</td>
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<td>1.5%*</td>
<td>24.6%</td>
<td>21.2%*</td>
<td>38.0%</td>
<td>37.8%</td>
</tr>
<tr>
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<td>3.3%</td>
<td>36.8%</td>
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<td>43.5%</td>
<td>38.4%</td>
</tr>
<tr>
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<td>–</td>
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<td>54.2%</td>
<td>68.3%*</td>
</tr>
<tr>
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<td>–</td>
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<td>14.4%*</td>
<td>39.1%</td>
<td>37.8%†</td>
</tr>
<tr>
<td>Hood River</td>
<td>–</td>
<td>–</td>
<td>23.2%</td>
<td>20.6%</td>
<td>16.2%</td>
<td>12.1%*</td>
</tr>
<tr>
<td>Jackson</td>
<td>2.7%</td>
<td>2.1%</td>
<td>32.0%</td>
<td>29.0%</td>
<td>41.6%</td>
<td>34.0%</td>
</tr>
<tr>
<td>Jefferson</td>
<td>1.8%†</td>
<td>1.4%†</td>
<td>21.9%</td>
<td>17.6%*</td>
<td>38.6%</td>
<td>24.0%</td>
</tr>
<tr>
<td>Josephine</td>
<td>3.2%</td>
<td>2.4%</td>
<td>35.5%</td>
<td>29.7%</td>
<td>38.2%</td>
<td>26%*</td>
</tr>
<tr>
<td>Klamath</td>
<td>3.4%</td>
<td>3.2%</td>
<td>33.7%</td>
<td>30.6%</td>
<td>44.0%</td>
<td>39.7%</td>
</tr>
<tr>
<td>Lake</td>
<td>–</td>
<td>–</td>
<td>32.2%†</td>
<td>22.1%</td>
<td>58.8%</td>
<td>51.0%</td>
</tr>
<tr>
<td>Lane</td>
<td>2.4%</td>
<td>2.1%</td>
<td>28.3%</td>
<td>26.8%</td>
<td>39.1%</td>
<td>33.7%</td>
</tr>
</tbody>
</table>
TABLE A.2. AGE-ADJUSTED AND UNADJUSTED PREVALENCE OF STROKE, HIGH BLOOD PRESSURE AND HIGH CHOLESTEROL AMONG ADULTS, BY COUNTY, OREGON, 2008–2011, CONTINUED

<table>
<thead>
<tr>
<th>County</th>
<th>Stroke</th>
<th>High blood pressure</th>
<th>High cholesterol</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unadjusted</td>
<td>Age-adjusted</td>
<td>Unadjusted</td>
</tr>
<tr>
<td>OREGON</td>
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<td>2.3%</td>
<td>–</td>
</tr>
<tr>
<td>Lincoln</td>
<td>3.7%</td>
<td>2.8%†</td>
<td>39.6%</td>
</tr>
<tr>
<td>Linn</td>
<td>3.9%</td>
<td>3.6%</td>
<td>28.8%</td>
</tr>
<tr>
<td>Malheur</td>
<td>1.6%†</td>
<td>1.4%†</td>
<td>29.3%</td>
</tr>
<tr>
<td>Marion</td>
<td>3.0%</td>
<td>2.8%</td>
<td>27.9%</td>
</tr>
<tr>
<td>Morrow</td>
<td>–</td>
<td>–</td>
<td>29.1%</td>
</tr>
<tr>
<td>Multnomah</td>
<td>1.9%</td>
<td>2.0%*</td>
<td>26.1%</td>
</tr>
<tr>
<td>Polk</td>
<td>1.5%</td>
<td>1.3%*</td>
<td>25.9%</td>
</tr>
<tr>
<td>Tillamook</td>
<td>3.8%†</td>
<td>3.0%†</td>
<td>27.9%</td>
</tr>
<tr>
<td>Umatilla</td>
<td>3.7%</td>
<td>3.4%</td>
<td>32.7%</td>
</tr>
<tr>
<td>Union</td>
<td>2.9%†</td>
<td>2.3%†</td>
<td>31.8%</td>
</tr>
<tr>
<td>Wallowa</td>
<td>5.8%†</td>
<td>–</td>
<td>43.7%</td>
</tr>
<tr>
<td>Washington</td>
<td>2.1%</td>
<td>2.1%</td>
<td>23.5%</td>
</tr>
<tr>
<td>Wheeler</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Yamhill</td>
<td>2.2%</td>
<td>2.0%</td>
<td>27.8%</td>
</tr>
<tr>
<td>Gilliam/Sherman/Wasco</td>
<td>2.4%†</td>
<td>1.6%†</td>
<td>37.8%</td>
</tr>
</tbody>
</table>

* Statistically significant difference compared with all other counties (p-value ≤ 0.05)
† This number may be statistically unreliable and should be interpreted with caution.
– This number is suppressed because it is statistically unreliable.

Data source: Oregon BRFSS County Combined Dataset 2008–2011
Note: Age-adjusted estimates are adjusted to the 2000 Standard Population using three age groups (18–34, 35–54 and 55+).
<table>
<thead>
<tr>
<th>County</th>
<th>Obese Unadjusted (%)</th>
<th>Obese Age-adjusted (%)</th>
<th>Current Cigarette Smoker Unadjusted (%)</th>
<th>Current Cigarette Smoker Age-adjusted (%)</th>
<th>Lack of Physical Activity Unadjusted (%)</th>
<th>Lack of Physical Activity Age-adjusted (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>OREGON</td>
<td>–</td>
<td>24.8%</td>
<td>–</td>
<td>16.3%</td>
<td>–</td>
<td>17.5%</td>
</tr>
<tr>
<td>Baker</td>
<td>26.6%</td>
<td>26.6%</td>
<td>23.0%</td>
<td>26.4%*</td>
<td>27.7%</td>
<td>31.7%*</td>
</tr>
<tr>
<td>Benton</td>
<td>18.1%</td>
<td>18.7%*</td>
<td>10.3%</td>
<td>10.2%*</td>
<td>13.4%</td>
<td>13.9%</td>
</tr>
<tr>
<td>Clackamas</td>
<td>24.0%</td>
<td>23.9%</td>
<td>14.0%</td>
<td>14.3%*</td>
<td>15.7%</td>
<td>15.4%*</td>
</tr>
<tr>
<td>Clatsop</td>
<td>30.5%</td>
<td>31.4%</td>
<td>19.6%</td>
<td>20.3%</td>
<td>18.3%</td>
<td>17.5%</td>
</tr>
<tr>
<td>Columbia</td>
<td>24.7%</td>
<td>23.7%</td>
<td>18.2%</td>
<td>19.2%</td>
<td>19.2%</td>
<td>18.9%</td>
</tr>
<tr>
<td>Coos</td>
<td>30.0%</td>
<td>30.0%*</td>
<td>24.8%</td>
<td>28.3%*</td>
<td>21.7%</td>
<td>19.8%</td>
</tr>
<tr>
<td>Crook</td>
<td>25.5%</td>
<td>25.6%</td>
<td>16.7%</td>
<td>17.4%</td>
<td>19.4%</td>
<td>18.7%</td>
</tr>
<tr>
<td>Curry</td>
<td>30.1%</td>
<td>31.5%</td>
<td>24.5%</td>
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<td>25.5%</td>
<td>25.1%</td>
</tr>
<tr>
<td>Deschutes</td>
<td>17.4%</td>
<td>17.2%*</td>
<td>13.1%</td>
<td>13.8%</td>
<td>18.1%</td>
<td>18.2%</td>
</tr>
<tr>
<td>Douglas</td>
<td>32.5%</td>
<td>33.6%*</td>
<td>23.8%</td>
<td>26.7%*</td>
<td>21.4%</td>
<td>20.9%</td>
</tr>
<tr>
<td>Grant</td>
<td>23.1%</td>
<td>21.8%</td>
<td>22.8%</td>
<td>26.2%</td>
<td>16.1%†</td>
<td>20.1%†</td>
</tr>
<tr>
<td>Harney</td>
<td>22.8%</td>
<td>22.7%</td>
<td>9.0%†</td>
<td>8.4%†</td>
<td>20.7%</td>
<td>18.5%</td>
</tr>
<tr>
<td>Hood River</td>
<td>19.5%</td>
<td>19.7%</td>
<td>9.2%‡</td>
<td>9.5%†</td>
<td>16.9%</td>
<td>16.9%</td>
</tr>
<tr>
<td>Jackson</td>
<td>21.0%</td>
<td>20.7%*</td>
<td>19.7%</td>
<td>21.2%*</td>
<td>15.2%</td>
<td>14.3%*</td>
</tr>
<tr>
<td>Jefferson</td>
<td>28.5%</td>
<td>28.7%</td>
<td>14.6%</td>
<td>15.4%</td>
<td>21.4%</td>
<td>20.7%</td>
</tr>
<tr>
<td>Josephine</td>
<td>21.7%</td>
<td>19.7%*</td>
<td>19.3%</td>
<td>21.3%*</td>
<td>22.1%</td>
<td>21.4%</td>
</tr>
<tr>
<td>Klamath</td>
<td>28.4%</td>
<td>29.4%</td>
<td>19.9%</td>
<td>20.6%</td>
<td>21.9%</td>
<td>21.6%</td>
</tr>
<tr>
<td>Lake</td>
<td>28.4%</td>
<td>27.1%</td>
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<td>19.2%‡</td>
<td>21.0%</td>
<td>19.1%</td>
</tr>
<tr>
<td>Lane</td>
<td>26.4%</td>
<td>26.5%</td>
<td>17.6%</td>
<td>18.1%</td>
<td>16.8%</td>
<td>16.6%</td>
</tr>
</tbody>
</table>
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<table>
<thead>
<tr>
<th>County</th>
<th>Obese Unadjusted</th>
<th>Obese Age-adjusted</th>
<th>Current cigarette smoker Unadjusted</th>
<th>Current cigarette smoker Age-adjusted</th>
<th>Lack of physical activity Unadjusted</th>
<th>Lack of physical activity Age-adjusted</th>
</tr>
</thead>
<tbody>
<tr>
<td>OREGON</td>
<td>–</td>
<td>24.8%</td>
<td>–</td>
<td>16.3%</td>
<td>–</td>
<td>17.5%</td>
</tr>
<tr>
<td><strong>Lincoln</strong></td>
<td>27.5%</td>
<td>26.6%</td>
<td>22.8%</td>
<td>27.4%*</td>
<td>21.3%</td>
<td>20.1%</td>
</tr>
<tr>
<td><strong>Linn</strong></td>
<td>30.5%</td>
<td>30.6%*</td>
<td>18.2%</td>
<td>19.0%</td>
<td>24.4%</td>
<td>24.6%*</td>
</tr>
<tr>
<td><strong>Malheur</strong></td>
<td>27.7%</td>
<td>27.9%</td>
<td>22.0%</td>
<td>22.9%</td>
<td>19.2%</td>
<td>18.3%</td>
</tr>
<tr>
<td><strong>Marion</strong></td>
<td>28.0%</td>
<td>28.0%*</td>
<td>14.2%</td>
<td>14.4%</td>
<td>18.1%</td>
<td>18.0%</td>
</tr>
<tr>
<td><strong>Morrow</strong></td>
<td>29.5%</td>
<td>29.7%</td>
<td>14.5%</td>
<td>14.7%</td>
<td>32.0%</td>
<td>31.3%*</td>
</tr>
<tr>
<td><strong>Multnomah</strong></td>
<td>22.4%</td>
<td>22.5%*</td>
<td>14.6%</td>
<td>14.5%*</td>
<td>14.9%</td>
<td>15.0%*</td>
</tr>
<tr>
<td><strong>Polk</strong></td>
<td>27.4%</td>
<td>27.2%</td>
<td>13.2%</td>
<td>14.2%</td>
<td>16.8%</td>
<td>16.4%</td>
</tr>
<tr>
<td><strong>Tillamook</strong></td>
<td>29.1%</td>
<td>27.9%</td>
<td>19.8%</td>
<td>23.0%</td>
<td>17.9%</td>
<td>15.3%</td>
</tr>
<tr>
<td><strong>Umatilla</strong></td>
<td>34.4%</td>
<td>34.8%*</td>
<td>20.6%</td>
<td>21.0%*</td>
<td>26.2%</td>
<td>26.2%*</td>
</tr>
<tr>
<td><strong>Union</strong></td>
<td>27.4%</td>
<td>28.1%</td>
<td>10.8%</td>
<td>11.6%</td>
<td>16.0%</td>
<td>16.3%</td>
</tr>
<tr>
<td><strong>Wallowa</strong></td>
<td>18.3%</td>
<td>18.1%</td>
<td>14.9%†</td>
<td>16.9%†</td>
<td>32.6%</td>
<td>35.1%†</td>
</tr>
<tr>
<td><strong>Washington</strong></td>
<td>21.9%</td>
<td>21.9%*</td>
<td>12.7%</td>
<td>12.6%*</td>
<td>16.7%</td>
<td>16.7%</td>
</tr>
<tr>
<td><strong>Wheeler</strong></td>
<td>22.6%†</td>
<td>–</td>
<td>12.1%†</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td><strong>Yamhill</strong></td>
<td>34.8%</td>
<td>35.0%*</td>
<td>18.4%</td>
<td>18.5%</td>
<td>28.4%</td>
<td>28.2%*</td>
</tr>
<tr>
<td><strong>Gilliam/Sherman/ Wasco</strong></td>
<td>35.2%</td>
<td>35.3%*</td>
<td>13.7%</td>
<td>14.4%</td>
<td>19.6%</td>
<td>18.1%</td>
</tr>
</tbody>
</table>

* Statistically significant difference compared with all other counties (p-value ≤ 0.05)
† This number may be statistically unreliable and should be interpreted with caution.
– This number is suppressed because it is statistically unreliable.

**Data source:** Oregon BRFSS County Combined Dataset 2008–2011

**Note:** Age-adjusted estimates are adjusted to the 2000 Standard Population using three age groups (18–34, 35–54 and 55+).
APPENDIX B: DATA SOURCES

The data sources used in this report are listed below. Data sources are described with brief limitations.

**Behavioral Risk Factor Surveillance System (BRFSS)**

Description: The BRFSS is a random-digit dialed telephone survey that is conducted year-round among Oregon adults aged 18 years or older. The BRFSS includes questions on health behavior risk factors such as diet, weight control, tobacco and alcohol use, physical activity, preventive health screenings, and use of health care services. The data are weighted to represent all adults aged 18 years and older. A core set of questions is asked annually, and other topics are surveyed on a rotating basis.

Every few years, Oregon conducts additional BRFSS surveys among under-represented races and ethnicities. The results of these surveys are combined with statewide BRFSS data to provide more stable estimates for chronic diseases and related risk factors among these groups of Oregonians. The most recent race/ethnicity oversamples were conducted in 2010–2011. In addition, BRFSS surveys from 2008–2011 were aggregated to produce more reliable county-level prevalence estimates.

Starting in 2010, Oregon began collecting data from those who use cell phones, causing the method for adjusting (weighting) the data to the demographics of the state to change. This new method is called “raking.” Because of these changes, data prior to 2010 are not directly comparable to the data from 2010 forward. In addition, the national BRFSS also made these changes but did not implement the changes until 2011.

**Limitations:** BRFSS estimates pertain only to the adult population aged 18 years or older living in households. Respondents are identified through telephone-based methods. The survey started collecting data for cell phones in 2009. Cell phone data were incorporated for analysis in Oregon in 2010. According to a recent publication from the National Center for Health Statistics, in 2011 more than 38% of households in Oregon were wireless-only. Finally, results obtained through BRFSS surveys also are limited in that they represent self-reported responses. Not all questions in the BRFSS have been validated.
Hospital Discharge Dataset

Description: The Hospital Discharge Dataset provides information on hospital discharges from all acute care hospitals in Oregon except two Veterans Administration hospitals. The dataset includes admit and discharge dates, diagnosis and procedural codes, financial charges, primary payer, and patient demographic information.

Limitations: Prior to 2008, the Hospital Discharge Dataset did not include identifying information that would allow us to ascertain when a single person had multiple hospitalizations; therefore, the calculated rate was the number of hospitalizations per the Oregon population rather than number of different people hospitalized per the Oregon population. In addition, prior to 2008, the dataset did not include information on race or ethnicity. Starting in 2008, the data necessary for investigating repeat hospitalizations for chronic diseases and hospitalizations by race/ethnicity were available and reported.

Oregon Health Panel Survey (OHPS)

Description: The Oregon Health Panel Survey was conducted in 2012 among non-institutionalized adults aged 18 years or older. Panel members were recruited using random digit dialing sampling based on landline telephone numbers and/or address-based sampling methodologies. A sample of panel members was then drawn at random for the survey. Topics on the survey include knowledge and attitudes toward colorectal screening, trans fats, sugary drinks, and other tobacco products. The data are weighted to represent all adults aged 18 years and older.

Limitations: OHPS estimates pertain only to the adult population aged 18 years or older living in households.

Oregon Healthy Teens (OHT) Survey

Description: Since 2000, the Youth Risk Behavior Survey (developed by the CDC) and the Oregon Public School Drug Use Survey were combined for Oregon into a single annual survey called Oregon Healthy Teens (OHT) Survey. The sample size varies from 1,600 to 32,000 per year, and the final data are weighted to more accurately represent Oregon eighth- and 11th-graders. The survey assesses health topics such as tobacco and alcohol use, HIV knowledge and attitudes, eating behaviors, nutrition and exercise.

Limitations: One limitation is that participation by school systems in the OHT is voluntary. However, participation rates have been high thus far. Another limitation is that the OHT questionnaire is not currently available in non-English versions except for a Spanish booklet that can be used as a reference when filling out the English version of the survey. A third limitation is that 3% of surveys were eliminated due to combinations of “dubious” answers and another 5% were eliminated because the student did not fill out grade or gender information.

Vital records data (full count data)

Birth Certificate Statistical File

The Birth Certificate Statistical File includes all births occurring in Oregon and births occurring out of state to Oregon.
residents. This database includes parental demographic information, conditions of the newborn, congenital abnormalities, medical factors of pregnancy, method of delivery, and complications of labor and delivery. It also includes tobacco, alcohol or illicit drug use during pregnancy. Information about maternal diabetes and gestational diabetes is also included.

**Death Certificate Statistical File**

The Death Certificate Statistical File includes all deaths occurring in Oregon and deaths occurring out of state to Oregon residents. Data are obtained from death certificates that are collected from the state registrar. The data are used to examine trends in mortality and causes of death. This database includes cause of death, date and place of death, and decedent demographic information. The mortality data analyzed for this report consists of deaths among Oregon residents.

**Limitations of birth and death files:** The accuracy of the data depends on the accuracy with which the birth attendant, certifying physician or medical examiner describes the circumstances surrounding the birth or the underlying causes of death.

**CDC Wonder database**

The CDC Wonder database provides National Center for Health Statistics (NCHS) national statistical analysis and reporting of deaths from specific diseases.
In this report, some numbers include a warning that they are potentially unreliable or they are unreliable and suppressed (not shown). In general, reliability refers to the stability of a number being reported.

The guidelines used to gauge reliability differ depending on the type of data used. Some data sources include all events under study (such as births, deaths or hospitalizations). These will be referred to as “full count.” Other data sources are from surveys of randomly selected individuals, adjusted to represent the full population. These will be referred to as “survey.” The text below briefly describes the methods used to determine if the information in this report includes a warning for reliability or is suppressed.

**Full count**

Determine the number of events (n).

- $n \geq 12$: Report the estimate.
- $n \geq 5$ and $n < 12$: Report the estimate and include a warning regarding reliability.
- $n < 5$: Do not report the estimate and state that it is suppressed.

**Survey**

Determine the total number of persons surveyed (x) for a particular question and calculate the standard error (SE) for the reported number. Use the SE to calculate a statistic called the relative standard error (RSE). RSE is a measure of the variability of an estimate compared with the estimate itself.
1. Determine if the estimate is being calculated on a full population (i.e., everyone) or a subpopulation (i.e., a smaller group of all people surveyed who share a common trait such as race, county or medical condition).

2. If the full population, determine if the denominator is \( \geq 50 \). If yes, proceed; if not, suppress.

3. If a subpopulation, determine if the denominator is \( \geq 20 \). If yes, proceed; if not, suppress.

4. Apply the following logic to each RSE:
   - RSE < 30%: Report the estimate.
   - RSE \( \geq 30\% \) and RSE < 50%: Report the estimate and include a warning regarding reliability.
   - RSE \( \geq 50\% \): Do not report the estimate and state that it is suppressed.
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This chapter summarizes the findings of Oregon’s heart disease and heart attack data system and includes the most up-to-date data on prevalence,* deaths and hospitalizations over time and across select demographics, chronic diseases and risk factors. The intent of this chapter is to highlight the burden of heart disease and heart attack in Oregon and to assist stakeholders, policymakers and other interested parties in efforts to reduce this burden. For more information on each dataset used in this chapter, see Appendix B.

**What are heart disease and heart attack?**

- Heart disease falls under a class of diseases that involve the heart or blood vessels called cardiovascular disease.\(^1\)
- The term “heart disease” includes several types of heart conditions, the most common of which is “coronary heart disease.”\(^1\)
- Coronary heart disease occurs when a substance called plaque (cholesterol deposits) builds up inside the arteries and restricts blood flow to the heart, which can cause angina (chest pain) or a heart attack.\(^2\)
- A heart attack, also called a myocardial infarction, occurs when a section of the heart muscle dies or is damaged due to reduced blood supply.\(^3\)
- Anyone can develop heart disease and eventual heart attack, but both conditions can be prevented or managed by eating a healthy diet, maintaining a healthy weight, being active, not smoking cigarettes, limiting alcohol use, and managing chronic health conditions such as diabetes, high blood pressure and high cholesterol.\(^4\)
- People who experience a heart attack need emergency care such as cardiopulmonary resuscitation (CPR) or electrical shock (defibrillation); the more time that passes without treatment to restore blood flow, the greater the damage to the heart.\(^3\)

*There is an important limitation of the heart attack prevalence estimates. In general, “prevalence” of heart attack refers to the percentage of people reporting a heart attack at a given time. This prevalence estimate is based on responses from adult Oregonians who had a heart attack, but did not die from the heart attack and are healthy enough to respond to a series of survey questions about their health and health practices. This prevalence does not capture heart attacks that resulted in death or significant disability, so it is likely an underestimate of the true heart attack prevalence in Oregon. This caveat does not apply to the numbers of heart attack deaths and hospitalizations presented in the chapter as these are based on death certificates and reports from Oregon hospitals rather than survey data.
Who has heart disease and heart attack?

- In Oregon, an estimated 3.5% of adults reported a diagnosis of heart disease and 3.7% reported having had a heart attack in their lifetime.
- This translates to approximately 122,000 adult Oregonians with heart disease and 128,000 who had ever had a heart attack.
- Since 2005, the burden of heart disease and heart attack in Oregon remained relatively unchanged at approximately 3.5%.
- Although the percentage of Oregon adults reporting heart disease and heart attack decreased among both males and females over time, males saw greater decreases compared to females.
- Historically, Oregon has had a lower burden of heart disease and heart attack than the United States overall.

In 2011:

- More Oregon adult males reported heart disease (4.2%) and heart attack (4.7%) compared to females (2.9% and 2.8%, respectively).
- Oregonians aged 75 years or older were more likely to report heart disease (15.2%) and heart attack (15.0%) compared to younger Oregonians aged 18–44 years (0.3% and 0.6%, respectively).
- Oregon adults with less than a high school education were nearly twice as likely to report heart disease and nearly four times as likely to report having had a heart attack compared to Oregon adults with a college degree.
- Oregon adults in households with an annual income of less than $20,000 were nearly three times more likely to report heart disease and nearly four times more likely to report having had a heart attack compared to Oregon adults in households with an annual income of $50,000 or more.
- Members of Oregon’s Medicaid program, Oregon Health Plan (OHP), were nearly two times more likely to report heart disease compared to individuals enrolled in private, Medicare or other health insurance, and nearly three times more likely than individuals with no health insurance.
- OHP members were two times more likely to report having had a heart attack compared to individuals with no health insurance and those enrolled in private, Medicare or other health insurance.
- Compared to non-Latino white persons, a higher percentage of non-Latino African American and non-Latino American Indian/Alaska Native persons reported heart disease and having had a heart attack compared to non-Latino white persons.
- Adult Oregonians who were obese or very obese, current cigarette smokers, or had high blood pressure or high cholesterol reported heart disease and heart attack more often than the general population of Oregon adults.
- Oregon adults with diabetes reported a heart disease and heart attack prevalence triple that of adults in the general population.
Adults who had ever had a heart attack were 11 times more likely to report heart disease and adults with heart disease were 16 times more likely to report having had a heart attack than the general population of Oregonians.

**Risk factors for heart disease and heart attack**

- Oregon adults reporting heart disease and heart attack were more likely to be obese, not engage in physical activity, have high blood pressure and high cholesterol, and have a co-occurring diagnosis of diabetes.

**Heart disease in Oregon:**

- **Obesity and lack of physical activity:** Oregon adults reporting heart disease were twice as likely to be obese and not engage in physical activity compared to those without a diagnosis of heart disease.
- **High blood pressure and high cholesterol:** Adults with heart disease were nearly three times as likely to report high blood pressure and twice as likely to report high cholesterol as those without heart disease.
- **Diabetes and stroke:** Oregon adults with heart disease were six times more likely to have diabetes, 17 times more likely to have had a stroke and 33 times more likely to have had a heart attack compared to those who did not have heart disease.

**Heart attack in Oregon:**

- **High blood pressure and high cholesterol:** Adults who had ever had a heart attack were more than twice as likely to report high blood pressure and high cholesterol as those who had not had a heart attack.
- **Diabetes and stroke:** Oregon adults who had ever had a heart attack were more than three times as likely to have diabetes and more than 21 times as likely to have heart disease as those who had not had a heart attack.

**Heart disease and heart attack hospitalizations in Oregon**

- In 2011, 29,839 hospitalizations in Oregon were primarily attributed to heart disease with heart attack comprising 5,988 (20%) of these hospitalizations; heart disease accounted for 8.5% of all hospitalizations.
- An additional 92,501 individuals were hospitalized with heart disease as a non-primary diagnosis or contributing cause of hospitalization.
- The average length of stay for a person hospitalized with a primary diagnosis of heart disease in Oregon was 4.0 days and for heart attack was 3.8 days for heart attack.
- From 1997 to 2011, the heart disease and heart attack hospitalization rates decreased by 30.7% and 33.6%, respectively.
- In 2011, more than one-quarter of hospitalizations with a primary diagnosis of heart disease or heart attack had diabetes listed as a contributing cause.
From 1997 to 2011, diabetes as a contributing cause of hospitalization increased 19% among hospitalizations due to heart disease and 22.7% among hospitalizations due to heart attack.

In 2011, nearly two-in-three (68%) heart attack hospitalizations resulted in a discharge to home or self-care.

**Cost of heart disease and heart attack in Oregon**

- In 2011, the average cost of a hospitalization due to heart disease in Oregon was more than $38,000, with total medical costs exceeding $1.1 billion.
- Males accounted for 61% of the total cost of heart disease hospitalizations; $701.4 million and $440.1 million were spent on heart disease hospitalizations for males and females, respectively.

**Heart disease and heart attack mortality in Oregon**

- In 2011, heart disease was the primary cause of death for 6,215 Oregonians, accounting for 19% of all deaths among Oregon residents.
- In the past, heart disease and heart attack death rates have been higher among men than women; however, the difference in heart disease and heart attack death rates between the two genders has decreased over time, particularly for heart attack deaths.
- In 2011, 3,360 male and 2,855 female Oregonians died from heart disease, which equates to a heart disease death rate of 178.2 deaths and 103.2 deaths per 100,000 population for males and females, respectively.
- In 2011, 626 male and 452 female Oregonians died from heart attack, which translates to a heart attack death rate of 32.2 deaths and 17.0 deaths per 100,000 population for males and females, respectively.
- In 2011, 626 male and 452 female Oregonians died from heart attack, which translates to a heart attack death rate of 32.2 deaths and 17.0 deaths per 100,000 population for males and females, respectively.
- In the past, heart disease and heart attack death rates have declined across all age groups; heart attack death rates have seen a larger relative decline than heart disease death rates across all age groups.
- Heart disease and heart attack death rates are higher in older age groups, particularly in those age 75 years old or older; heart disease and heart attack death rates appear to be higher among men than women in all age groups.
- From 1991 to 2009, death rates from heart disease and heart attack decreased for all racial and ethnic groups.
Over time, the disparity in heart disease and heart attack death rates among racial and ethnic groups has lessened; however, non-Latino African American persons have had consistently higher death rates from both heart disease and heart attack compared to all other racial and ethnic groups.

**Ways to reduce the burden of heart disease and heart attack in Oregon**

The Oregon Public Health Division is committed to preventing heart disease and heart attack through a wide range of evidence-based practices. The Health Promotion and Chronic Disease Prevention Section of the Oregon Public Health Division is working with local and state partners to:

- Increase availability of healthy foods and beverages in child care facilities, schools, worksites and neighborhoods;
- Increase places where people can move about more safely;
- Increase the number of environments that are tobacco-free;
- Increase referrals to self-management programs so that people with chronic disease can live well and take care of themselves;
- Improve delivery and use of quality health care services through the physician promotion of the ABCS — appropriate **Aspirin** therapy, **Blood pressure** control, **Cholesterol** control, **Smoking** cessation and reduced **Sodium** consumption.

This comprehensive, community-wide approach makes it easier for all Oregonians to eat better, move more, and live tobacco-free wherever they live, work, play and learn.
Approximately 122,000 adults in Oregon have heart disease, which is the second leading cause of death in Oregon.

Heart disease costs Oregonians more than $1 billion in hospitalizations.

Certain risk factors can worsen existing heart disease and ultimately lead to heart attack and stroke.

Among Oregon adults with heart disease:
- 1 in 2 has diabetes.
- 1 in 2 is obese.
- 1 in 7 smokes cigarettes.
- 2 in 3 have high cholesterol.
- 3 in 4 have high blood pressure.
- 1 in 3 is physically inactive.

Heart disease affects some communities more than others.

Compared to non-Latino whites, African American, American Indian and Alaska Native people are:
- 2x more likely to have heart disease.
- 2x more likely to have a heart attack in their lifetime.

Diabetes, Heart Disease and Stroke in Oregon, 2013 Report
What are heart disease and heart attack?

Heart disease falls under a class of diseases that involves the heart or blood vessels called cardiovascular disease. The term “heart disease” refers to several types of heart conditions. The most common type of heart condition in the United States is coronary heart disease. Coronary heart disease occurs when a substance called plaque builds up inside the arteries that supply blood to the heart. Plaque is made up of cholesterol deposits, which can accumulate in the arteries. Over time, plaque can harden or rupture. Hardening plaque causes the arteries to narrow, which reduces or blocks the flow of oxygen-rich blood to the heart. If a plaque ruptures, a blood clot can form and a large blood clot can mostly or completely block blood flow through the artery. If the flow of blood to the heart is reduced or blocked, angina or a heart attack can occur. Angina is chest pain or discomfort and is the most common symptom of coronary heart disease. A heart attack, also called a myocardial infarction, occurs when a section of the heart muscle dies or is damaged due to reduced blood supply.

Anyone can develop coronary heart disease that could lead to a heart attack, but both conditions can be prevented or managed by practicing certain healthy behaviors and managing existing chronic medical conditions. Not smoking cigarettes and limiting exposure to secondhand smoke, limiting alcohol use, increasing physical activity, and eating a diet high in fruits and vegetables and low in salt and artificial trans fats can help prevent coronary heart disease and subsequent heart attack. Coronary heart disease can also be prevented or managed by controlling or managing existing medical conditions such as high blood pressure, high cholesterol, diabetes and overweight and obesity. In addition, those with a family history of heart disease are more susceptible to having coronary heart disease and an eventual heart attack. The risk for heart disease can increase even more when heredity is combined with unhealthy behaviors, such as cigarette smoking and not getting enough physical activity. Those with a family history of heart disease should be aware of their increased risk for heart attack and adopt healthy behaviors and manage pre-existing chronic conditions.
Risk factors for heart disease and heart attack

Behaviors
- Tobacco use;
- Lack of physical activity;
- Diet high in salt or trans fats;
- Excessive alcohol use.

Chronic conditions
- High blood pressure;
- High cholesterol;
- Diabetes;
- Overweight and obesity.

Other
- Family history;
- Older age;
- Male gender;
- African American, Latino or American Indian/Alaska Native race and ethnicity.

People who experience a heart attack need emergency care, such as cardiopulmonary resuscitation (CPR) or electrical shock (defibrillation). The more time that passes without treatment to restore blood flow, the greater the damage to the heart. Therefore, the chances of surviving a heart attack are greater when emergency treatment begins quickly. If signs or symptoms of a heart attack are present, 9-1-1 should be called immediately. In 1999, almost half of cardiac deaths in the United States occurred before emergency services and hospital treatment could be administered.

Common heart attack signs and symptoms
- Pain or discomfort in the jaw, neck or back;
- Feeling weak, light-headed or faint;
- Chest pain or discomfort;
- Pain or discomfort in arms or shoulders;
- Shortness of breath.

Every year, about 785,000 Americans have an initial heart attack and another 470,000 have a recurrent heart attack. It is important for heart attack survivors to control chronic conditions that may cause another heart attack, including high blood pressure, high cholesterol and diabetes through healthy lifestyle behaviors such as not cigarette smoking and engaging in physical activity.

Heart disease is a public health priority

During the past 20 years, heart disease prevalence, hospitalizations and mortality have consistently declined in both Oregon and nationally. Still, heart disease is the second leading cause of death in Oregon and the first leading cause of death in the United States overall. In 2011, an estimated 122,640 Oregon adults reported having heart disease, and there were 29,839 hospitalizations due to heart disease with a total cost of more than $1.1 billion. Due to the significant morbidity and mortality associated with this disease, heart
disease prevention has been identified as a key component in the Oregon Public Health Division Strategic Plan 2012–2017, as well as the Healthy People 2020 national health plan. The Oregon Heart Disease and Stroke Prevention Program is also a supporter of the U.S. Department of Health and Human Services Million Hearts® campaign, which began in 2012 and aims to prevent one million heart attacks and strokes by 2017.

**Heart Disease and Stroke Prevention Program priorities**

- Controlling high blood pressure and cholesterol;
- Recognizing the signs and symptoms of heart attack and stroke and taking appropriate actions;
- Improving emergency response;
- Eliminating health disparities between population groups;
- Providing facts and figures about heart disease and stroke in Oregon.

**Million Hearts® aims to prevent heart disease and stroke by:**

- Improving access to effective care;
- Improving the quality of care for the ABCS — appropriate *Aspirin therapy, Blood pressure control, Cholesterol control, Smoking cessation and reduced Sodium consumption*;
- Focusing clinical attention on the prevention of heart attack and stroke;
- Activating the public to lead heart-healthy lifestyles;
- Improving the prescription adherence to appropriate medications for the ABCS.

The Oregon Heart Disease and Stroke Prevention Program also developed *Oregon’s Statewide Plan for Heart Disease and Stroke Prevention and Care*. The statewide plan was completed by Oregon’s Coordinating Council for Heart Disease and Stroke in order to create a vision for the prevention, early detection, treatment and self-management of these diseases and their related risk factors.
4.1 Who has heart disease and has had a heart attack?

To understand the burden of heart disease* and heart attack in Oregon, the prevalence of the diseases needs to be known. Prevalence is the percentage of people with heart disease or heart attack in a particular population, at a given time. It is important to report the prevalence of these diseases among sub-populations of Oregonians (e.g., racial and ethnic minorities) to identify groups that are disproportionately affected.

**FIGURE 4.1.1 ADULTS WITH HEART DISEASE, BY YEAR, OREGON VS. UNITED STATES, 2005–2011**


Note: National data were not included for 2010 because the method for weighting the data was different from the method used in Oregon. The national estimate excludes territories. The vertical dashed line denotes a different adjustment method and inclusion of cellular phones in the sample. Starting in 2010, estimates are not comparable to earlier years. Estimates are age-adjusted.

*Throughout sections 4.1–4.3, the term heart disease specifically refers to Oregon adults who reported a diagnosis of coronary heart disease or angina.

+ For this report, heart disease prevalence was determined by the percentage of adults who responded “Yes” when asked if they have ever been told by a doctor, nurse or other health professional that they had angina or coronary heart disease. Heart attack prevalence was determined by the percentage of adults who responded “Yes” when asked if they have ever been told by a doctor, nurse or other health professional that they had a heart attack also called a myocardial infarction. This prevalence estimate is based on responses from adult Oregonians who had a heart attack, but did not die from the heart attack and are healthy enough to respond to a series of survey questions about their health and health practices. This prevalence does not capture heart attacks that resulted in death or significant disability, so it is likely an underestimate of the true heart attack prevalence in Oregon. This caveat does not apply to the numbers of heart attack deaths and hospitalizations presented in the chapter as these are based on death certificates and reports from Oregon hospitals rather than survey data.
affected by heart disease and heart attack compared to the general population in Oregon. This section will describe the burden of heart disease and heart attack among Oregon adults over time and by select demographic characteristics including gender, age, education, income, health insurance status, race and ethnicity, chronic disease risk factors, and chronic conditions.

- Fewer Oregon adults reported having a diagnosis of heart disease compared with the overall U.S. population (Figure 4.1.1). This has been consistent over time, but the reason for the difference is unknown.

- Since 2005, the percentage of Oregonians who have been diagnosed with heart disease has remained steady at around 3.5% (Figure 4.1.1 and Table 4.1.1).

- During this same period, the proportion of Oregonians reporting having had a heart attack has also remained steady at around 3.5% (Table 4.1.2 and Figure 4.1.2).

- In 2011, more than 122,000 Oregon adults were estimated to have heart disease.

**TABLE 4.1.1 ADULTS WITH HEART DISEASE, BY YEAR, OREGON VS. UNITED STATES, 2005–2011**

<table>
<thead>
<tr>
<th>YEAR</th>
<th>OREGON HEART DISEASE</th>
<th>UNITED STATES HEART DISEASE</th>
</tr>
</thead>
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<tr>
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<td>3.7</td>
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</tr>
<tr>
<td>2011</td>
<td>3.5</td>
<td>4.0</td>
</tr>
</tbody>
</table>

**TABLE 4.1.2 ADULTS WHO HAD EVER HAD A HEART ATTACK, BY YEAR, OREGON VS. UNITED STATES, 2005–2011**

<table>
<thead>
<tr>
<th>YEAR</th>
<th>OREGON HEART DISEASE</th>
<th>UNITED STATES HEART DISEASE</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>3.5</td>
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<tr>
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</tr>
<tr>
<td>2011</td>
<td>3.7</td>
<td>4.0</td>
</tr>
</tbody>
</table>

**Data sources:** Oregon Behavioral Risk Factor Surveillance System: National data from the National Behavioral Risk Factor Surveillance System.

**Note:** National data were not included for 2010 because the method for weighting the data was different from the method used in Oregon. The national estimate excludes territories. Starting in 2010, estimates are not comparable to earlier years. Estimates are age-adjusted.
In 2011, more than 128,000 Oregonians were estimated to have had a heart attack in their lifetime.

Fewer Oregon adults reported having had a heart attack compared with the overall U.S. population (Figure 4.1.2). This has been consistent over time, but the reason for the difference is unknown.

**Data source:** Oregon Behavioral Risk Factor Surveillance System: National data from the National Behavioral Risk Factor Surveillance System.

**Note:** National data were not included for 2010 as the method for weighting the data was different from the method used in Oregon. The national estimate excludes territories. The vertical dashed line denotes a different adjustment method and inclusion of cellular phones in the sample. Starting in 2010, estimates are not comparable to earlier years. Estimates are age-adjusted.
Over time, a higher proportion of males than females reported having heart disease (Figure 4.1.3).

Although the percentage of Oregon adults reporting heart disease and heart attack decreased among both males and females over time, males saw greater decreases compared to females.

Prevalence of heart disease decreased by 34% among males and 9% among females (Figure 4.1.3).

In 2011, an estimated 4.2% of males and 2.9% of females had heart disease (Figure 4.1.3).

Data source: Oregon Behavioral Risk Factor Surveillance System.
Notes: The vertical dashed line denotes a different adjustment method and inclusion of cellular phones in the sample. Starting in 2010, estimates are not comparable to earlier years. Estimates are age-adjusted.
In 2011, an estimated 4.7% of males and 2.8% of females reported having had a heart attack in their lifetime (Figure 4.1.4).

Over time, a higher proportion of males than females reported having had a heart attack (Figure 4.1.4).

Prevalence of heart attack decreased 24% among males and 20% among females (Figure 4.1.4).

Although the percentage of Oregon adults reporting having had a heart attack decreased among both males and females over time, males saw greater decreases compared to females.

Data source: Oregon Behavioral Risk Factor Surveillance System.
Notes: The vertical dashed line denotes a different adjustment method and inclusion of cellular phones in the sample. Starting in 2010, estimates are not comparable to earlier years. Estimates are age-adjusted.
The percentage of adults reporting heart disease was higher in older age groups (Figure 4.1.5).

Nearly one-in-six Oregonians aged 75 years or older reported heart disease compared to less than 1 percent of adults aged 18–44 years (Figure 4.1.5).

**FIGURE 4.1.5 ADULTS WITH HEART DISEASE, BY AGE GROUP, OREGON, 2011**

**Data source:** Oregon Behavioral Risk Factor Surveillance System

**Note:** Estimates are not age-adjusted.

*Estimate may be unreliable; interpret with caution.
The percentage of adults who have ever had a heart attack was higher in older age groups (Figure 4.1.6).

Nearly one-in-six Oregonians aged 75 years or older reported ever having had a heart attack compared to less than 1 percent of adults aged 18–44 years (Figure 4.1.6).

Data source: Oregon Behavioral Risk Factor Surveillance System.

Notes: Estimates are not age-adjusted.

*Estimate may be unreliable; interpret with caution.
Oregon adults with less than a high school education were nearly two times more likely to report heart disease compared to Oregon adults with a college degree (Figure 4.1.7).

Data source: Oregon Behavioral Risk Factor Surveillance System.
Notes: The horizontal dashed line represents the percentage of the general population in Oregon who reported heart disease (3.5%). Estimates are age-adjusted.
Oregon adults with less than a high school education were nearly four times more likely to report having had a heart attack compared to Oregon adults with a college degree (Figure 4.1.8).
Oregon adults in households with an annual income of less than $20,000 were nearly three times more likely to report heart disease compared to Oregon adults in households with an annual income of $50,000 or more (Figure 4.1.9).

**Data source:** Oregon Behavioral Risk Factor Surveillance System

**Note:** The horizontal dashed line represents the percentage of the general population in Oregon who reported heart disease (3.5%). Estimates are age-adjusted.
Oregon adults in households with an annual income of less than $20,000 were nearly four times more likely to report having had a heart attack compared to Oregon adults in households with an annual income of $50,000 or more (Figure 4.1.10).

Data source: Oregon Behavioral Risk Factor Surveillance System

Note: The horizontal dashed line represents the percentage of the general population in Oregon who reported a heart attack (3.7%). Estimates are age-adjusted.
Oregon Health Plan (OHP) members were nearly two times more likely to report heart disease compared to individuals enrolled in private, Medicare or other health insurance, and nearly three times more likely than individuals with no health insurance (Figure 4.1.11).

**Data source:** Oregon Behavioral Risk Factor Surveillance System

**Note:** The horizontal dashed line represents the percentage of the general population in Oregon who reported heart disease (3.5%). Estimates are age-adjusted.
OHP members were two times more likely to report having had a heart attack compared to individuals with no health insurance and those enrolled in private, Medicare or other health insurance (Figure 4.1.12).

Those with no health insurance may have a lower prevalence of heart disease and heart attack due to inadequate access to health care. Access to care and contact with a health care provider are required to receive a diagnosis of heart disease or heart attack. In addition, those with no health insurance are generally younger and healthier and therefore are less likely to have chronic health conditions.

The higher prevalence of heart disease and heart attack observed among the adult population enrolled in OHP may be due to the demographic composition of this vulnerable population. Adult OHP members are low-income and include pregnant women, seniors and people with disabilities and are more than twice as likely to smoke as people with any other type of health insurance. Smoking cigarettes is an important risk factor for heart disease and subsequent heart attack. OHP is intended to help ensure that medical care is affordable for those with a low income. People with lower incomes are more likely to live in substandard housing, smoke and have higher disease morbidity.
More non-Latino African American (5.7%) and non-Latino American Indian/Alaska Native (4.1%) persons reported heart disease and having had a heart attack compared to non-Latino white persons (Figure 4.1.13).

The percentage of non-Latino African American persons reporting a diagnosis of heart disease was 58% higher than non-Latino white persons (Figure 4.1.13).


Note: Estimates are age-adjusted. The heart disease prevalence estimate for Latino ethnicity has been suppressed because it is statistically unreliable.

*This number may be statistically unreliable and should be interpreted with caution.
No Latino African American persons were more than twice as likely to report having had a heart attack as non-Latino white persons (Figure 4.1.14).

A similar proportion of Latino and non-Latino white persons reported having had a heart attack (Figure 4.1.14).

Note: Estimates are age-adjusted.
*This number may be statistically unreliable and should be interpreted with caution.
Oregon adults who were very obese were more than twice as likely as the general adult population to report heart disease and 59% more likely to report having had a heart attack (Figure 4.1.15).

The prevalence of heart disease was 54% higher among Oregon adults with high blood pressure and 37% higher among those with high cholesterol compared to the general population (Figure 4.1.15).

Adult Oregonians who were obese or very obese, * current cigarette smokers, or had high blood pressure or high cholesterol reported heart disease more often than the general population (Figure 4.1.15).

*To determine adult overweight and obesity ranges, self-reported weight and height are used to calculate Body Mass Index (BMI), since for most people it correlates with the amount of body fat a person has, although it is not a direct measure of body fat. An adult who has a BMI between 25 and 29.9 is considered overweight, 30 to 39.9 is considered obese, and 40.0 and above is considered very obese.
Adult Oregonians who were obese or very obese, current cigarette smokers, or had high blood pressure or high cholesterol reported having had a heart attack more often than the general population (Figure 4.1.16).

The prevalence of heart attack was 59% higher among Oregon adults with high blood pressure and 57% higher in those with high cholesterol compared to the general population of Oregon adults (Figure 4.1.16).

Although it appears that Oregon adults who smoke reported a similar prevalence of heart disease as the general population, those who smoke were 49% more likely to report having had a heart attack (figures 4.1.15 and 4.1.16).
Oregon adults with diabetes had a heart disease prevalence triple that of adults in the general population (Figure 4.1.17).

Oregon adults who had ever had a stroke were five times more likely to have heart disease (Figure 4.1.17).

Heart disease is especially common among those who have had a heart attack in their lifetime because heart disease is a precursor to heart attack and the two conditions are components of the same disease process. Adults who have had a heart attack were 11 times more likely to report heart disease and adults with heart disease were 16 times more likely to report having had a heart attack than the general population of Oregonians (figures 4.1.17 and 4.1.18).
Oregon adults with diabetes had a heart attack prevalence triple that of adults in the general population (Figure 4.1.18).

Oregon adults who had ever had a stroke were seven times more likely to report having had a heart attack (Figure 4.1.18).

Data source: Oregon Behavioral Risk Factor Surveillance System
Note: The horizontal dashed line represents the percentage of the general population who reported a heart attack (3.7%). Estimates are age-adjusted.
During 2008–2011, the prevalence of heart disease among Oregon counties ranged from 2.0% to 7.3%.

Benton, Clackamas and Umatilla counties had significantly lower percentages of adults with diagnosed heart disease compared to the rest of the state.

See Appendix A for detailed county estimates of heart disease prevalence.
During 2008–2011, the prevalence of diagnosed heart attack among Oregon counties ranged from 1.9% to 6.9%.

Clackamas, Deschutes, Multnomah and Washington counties had significantly lower percentages of adults with diagnosed heart attack compared to the rest of the state.

Douglas, Klamath and Polk counties had significantly higher percentages of adults with diagnosed heart attack compared to the rest of the state.

See Appendix A for detailed county estimates of heart attack prevalence.
Conclusions
The percentage of Oregon adults who have heart disease and have had a heart attack has remained relatively consistent over time, and is historically lower than adults in the rest of the United States. Many groups of Oregonians are disproportionately affected by heart disease and heart attack, including males, African American persons, those with less education and a smaller annual household income, and those enrolled in the Oregon Health Plan. Oregon adults with chronic disease risk factors and other chronic conditions were also more likely to report having heart disease and having had a heart attack than the general population. Oregon adults who were very obese were two times more likely than the general adult population to report heart disease, and the prevalence of a heart attack was 59% higher among Oregon adults with high blood pressure.
4.2 Risk factors among the heart disease and heart attack population

Many Oregon adults who reported a diagnosis of heart disease or having had a heart attack are affected by risk factors such as high blood pressure, high cholesterol, obesity and cigarette smoking that can lead to the development of additional chronic disease and increase the chance for another heart attack. Understanding the disproportionate burden of chronic disease risk factors and other chronic diseases among the heart disease and heart attack population will inform the prevention and treatment of these conditions. This section will describe the burden of chronic disease risk factors and other chronic conditions among Oregon adults who have reported heart disease or having had a heart attack.
As shown, of adults without heart disease, 26.3% were obese; of adults with heart disease, 55% were obese.

- Oregon adults reporting heart disease were twice as likely to be obese and not engage in physical activity compared to those without a diagnosis of heart disease (Figure 4.2.1).
- Nearly three-in-four Oregon adults with a diagnosis of heart disease also reported high blood pressure; adults with heart disease were nearly three times more likely to report high blood pressure than those without heart disease (Figure 4.2.1).
- Approximately two-in-three Oregon adults with heart disease also reported high cholesterol; adults with heart disease were more than twice as likely to report high cholesterol as adults without heart disease (Figure 4.2.1).

Data source: Oregon Behavioral Risk Factor Surveillance System
Note: Estimates are age-adjusted.
As shown, of adults who had not had a heart attack, 26.2% were obese; of adults who had ever had a heart attack, 33% were obese.

- A little more than half of Oregon adults who had had a heart attack in their lifetime reported high blood pressure; adults who had ever had a heart attack were more than twice as likely to report high blood pressure as those without a history of heart attack (Figure 4.2.2).

- Nearly three-in-four adult Oregonians who had ever had a heart attack also reported having high cholesterol; adults who had ever had a heart attack reported high cholesterol more than twice as much as adults who have never had a heart attack (Figure 4.2.2).
As shown, of adults without heart disease, 7.6% also had diabetes; of adults with heart disease, 48.2% also had diabetes.

- Of Oregon adults with heart disease, nearly half reported being diagnosed with diabetes, one-in-three had ever had a stroke and three-in-five had ever had a heart attack (Figure 4.2.3).

- Oregon adults with heart disease were six times more likely to have diabetes, 17 times more likely to have had a stroke and 33 times more likely to have had a heart attack compared to those who did not have heart disease (Figure 4.2.3).
Of Oregon adults who had ever had a heart attack, more than one-in-four had been diagnosed with diabetes, nearly one-in-five had ever had a stroke and more than one-in-three had been diagnosed with heart disease (Figure 4.2.4).

Oregon adults who had ever had a heart attack were more than three times as likely to have diabetes and more than 21 times as likely to have heart disease as those who had not had a heart attack (Figure 4.2.4).

**FIGURE 4.2.4 SELECTED CHRONIC DISEASES AMONG ADULTS WHO HAD EVER HAD A HEART ATTACK, OREGON, 2011**

![Bar chart showing the percentage of adults with diabetes, stroke, and heart disease among those with and without a heart attack.](chart_image)

**Data source:** Oregon Behavioral Risk Factor Surveillance System

**Note:** Estimates are age-adjusted. *This number may be statistically unreliable and should be interpreted with caution.
Conclusions

Overall, Oregon adults who reported heart disease and having had a heart attack also reported chronic disease risk factors and co-morbid chronic conditions at a higher rate than those who do not have heart disease and heart attack. Adults with heart disease and heart attack were more likely to be obese, have high blood pressure and high cholesterol and be physically inactive than those without heart disease or those who had ever had a heart attack. Adults with heart disease are three times as likely to have high blood pressure and twice as likely to have high cholesterol as those without heart disease. High blood pressure and high cholesterol, along with smoking cigarettes and lack of physical activity, are key contributors to having a first heart attack and increase the likelihood of having another heart attack if not properly controlled. Oregon adults with heart disease were six times more likely to have diabetes, 17 times more likely to have a stroke and 33 times more likely to have a heart attack compared to those who did not have heart disease.
4.3 Prevention and management of heart disease and heart attack

Heart disease and heart attack can be prevented and managed by living a healthy lifestyle and managing other chronic diseases. A healthy lifestyle includes eating a diet high in fruits and vegetables and low in salt and trans fats, being active, maintaining a healthy weight and not cigarette smoking. Individuals with high cholesterol, high blood pressure or diabetes can lower risk for heart disease and heart attack by having cholesterol checked, monitoring blood pressure, managing diabetes, and taking prescribed medicine for control of these conditions.

Management of diabetes includes taking insulin or other medications to manage blood glucose levels and regularly receiving blood glucose (A1C) tests to monitor blood glucose levels. Many heart attack survivors may also require cardiac rehabilitation to reduce the risk of another heart attack or related conditions such as stroke and kidney disease. Cardiac rehabilitation is a program that helps heart attack survivors make lifestyle changes to improve heart health and quality of life through eating a heart-healthy diet high in fresh fruits and vegetables and low in artificial trans fats and sodium, increasing physical activity, stopping cigarette smoking, and managing stress.

Oregon is committed to preventing heart disease and heart attack by addressing the “ABCS” — appropriate Aspirin therapy, Blood pressure control, Cholesterol control, Smoking cessation and reduced Sodium consumption. This section will describe the proportion of Oregon adults with heart disease and heart attack who practice behaviors that help manage current heart disease and prevent future heart attack.

- Three-in-four Oregon adults with heart disease take aspirin daily or every other day and nearly all (96.5%) had a cholesterol screening in the past five years (Figure 4.3.1).
- Less than half of adults who had ever had a heart attack reported aspirin use daily or every other day, but the majority reported a cholesterol screening in the past five years (78.9%) (Figure 4.3.1).
- A little more than half (54.3%) of adults with heart disease reported currently reducing their sodium intake, while more than three-in-four adults who had ever had a heart attack were reducing their sodium intake (Figure 4.3.1).
The vast majority of Oregon adults with heart disease (96.1%) and heart attack (88.5%) who also had a diagnosis of high blood pressure were taking medication for their high blood pressure (Figure 4.3.1).

Among adults with heart disease and heart attack who were current cigarette smokers, 55.8% and 49.9% had made a quit attempt in the past year (Figure 4.3.1). A similar proportion of current cigarette smokers without heart disease or heart attack reported a quit attempt in the previous year (51.9%).
The vast majority of adults who have heart disease (94.1%) or had ever had a heart attack (84.6%) were trying to lose or maintain weight (Figure 4.3.2). This was higher than the general population of Oregon adults without heart disease or heart attack (80.4%).

Among adults who had ever had a heart attack, 50.4% received outpatient rehabilitation following the heart attack (Figure 4.3.2).

Among adults with heart disease and a diagnosis of diabetes, nearly three-in-four had taken a class in diabetes management and had their A1C checked two or more times by a health professional within the past year (Figure 4.3.2).

Of adults who had ever had a heart attack and also diabetes, 72.7% had taken a class in diabetes management and 67.7% had their A1C checked two or more times by a health professional within the past year (Figure 4.3.2).
Conclusions

Encouragingly, many Oregon adults who reported heart disease or having had a heart attack are taking steps to prevent an initial or recurring heart attack. The vast majority of both adults with heart disease and those with a heart attack met recommendations for cholesterol screening, were taking doctor-prescribed medication for high blood pressure and had taken a class in diabetes self-management if they had diabetes. In addition, Oregon adults with heart disease and heart attack were more likely than those without these chronic conditions to work on weight management. Interestingly, those who had a heart attack were much more likely to be reducing their sodium intake compared to those who reported heart disease; this may indicate increased vigilance regarding high blood pressure control among those who have experienced an acute cardiac event. In contrast, the majority of adults with heart disease were taking daily aspirin, while less than half of those with heart attack were taking aspirin therapy. The reason for this is unknown. A similar proportion of Oregon adults with heart disease and heart attack made quit attempts compared to Oregon adults without heart disease and heart attack. Cigarette smoking increases the likelihood of a future heart attack, so smoking cessation is especially important for this group of Oregon adults with heart disease and previous heart attack. These results point to a continued need to improve sodium reduction among adults with heart disease, aspirin therapy among heart attack survivors who can safely take aspirin and cigarette smoking cessation among both groups to prevent future heart attacks.
4.4 Heart disease and heart attack hospitalizations

Chest pain is among the top five reasons for emergency department (ED) visits in the United States in those aged 15–64 years and heart disease is among the top three reasons for ED visits in those aged 65 years or older. Like ED visits, hospitalizations for heart disease and heart attack are important measures to track chronic and acute cardiac events. Nationally, there were more than 3.7 million hospital discharges for heart disease and 595,000 for heart attack specifically in 2010. This equates to heart disease and heart attack hospitalization rates of 121 per 100,000 U.S. residents and 19.3 per 100,000 U.S. residents, respectively. The average length of stay for a person hospitalized with a primary diagnosis of heart disease was 4.6 days and 5.4 days for heart attack. Among Oregon residents in 2011, 29,839 were hospitalized with a primary diagnosis of heart disease with heart attack comprising approximately 5,988 (20%) of those hospitalizations. Another 92,501 individuals were hospitalized with heart disease as a non-primary diagnosis or contributing cause. Heart disease accounted for 8.5% of all hospitalizations in Oregon in 2011. The average stay for a person hospitalized with a primary heart disease diagnosis in Oregon was 4.0 days and 3.8 days for heart attack. This section describes heart disease- and heart attack-related hospitalizations in Oregon.

Figure 4.4.1 Heart Disease Hospitalization Rate, by Year, Oregon, 1997–2011

Data source: Oregon Hospital Discharge Database
over time and by select patient characteristics including gender, age and co-morbid stroke or diabetes.

- The overall rate of heart disease and heart attack hospitalizations in Oregon decreased since 1997, with year-to-year variation in the numbers (tables 4.4.1 and 4.4.2, figures 4.4.1 and 4.4.2).

- From 1997 to 2011, the heart disease and heart attack hospitalization rates decreased by 30.7% and 33.6%, respectively (tables 4.4.1 and 4.4.2, figures 4.4.1 and 4.4.2).

**TABLE 4.4.1 HEART DISEASE HOSPITALIZATION RATE, BY YEAR, OREGON, 1997–2011**

<table>
<thead>
<tr>
<th>YEAR</th>
<th>HEART DISEASE HOSPITALIZATION RATE</th>
</tr>
</thead>
<tbody>
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<tr>
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<td>2009</td>
<td>744.3</td>
</tr>
<tr>
<td>2010</td>
<td>746.2</td>
</tr>
<tr>
<td>2011</td>
<td>702.9</td>
</tr>
</tbody>
</table>

**TABLE 4.4.2 HEART ATTACK HOSPITALIZATION RATE, BY YEAR, OREGON, 1997–2011**

<table>
<thead>
<tr>
<th>YEAR</th>
<th>HEART ATTACK HOSPITALIZATION RATE</th>
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</thead>
<tbody>
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<tr>
<td>2010</td>
<td>146.1</td>
</tr>
<tr>
<td>2011</td>
<td>141.5</td>
</tr>
</tbody>
</table>

Data source: Oregon Hospital Discharge Database
Note: ICD-9 codes 390–398, 402, 404, 410–429

Data source: Oregon Hospital Discharge Database
Note: ICD-9 code 410
FIGURE 4.4.2 HEART ATTACK HOSPITALIZATION RATE, BY YEAR, OREGON, 1997–2011

Data source: Oregon Hospital Discharge Database

Note: ICD-9 code 410
The percentage of both heart disease and heart attack hospital discharges among males and females varied substantially by age group.

In 2011, in all age groups before the age of 85, men accounted for a higher proportion of heart disease and heart attack hospital discharges, whereas women comprised the majority of hospital discharges in the 85 years or older age group for both heart disease (61.1%) and heart attack (56.7%) (figures 4.4.3 and 4.4.4). This is likely due to the longer life expectancy of females compared to males. This trend was also observed in Oregon hospital discharges due to stroke (see Volume 5: Stroke in Oregon 2013).
FIGURE 4.4.4 PERCENTAGE OF TOTAL HOSPITALIZATIONS WITH A PRIMARY DIAGNOSIS OF HEART ATTACK, BY AGE GROUP AND GENDER, OREGON, 2011

Data source: Oregon Hospital Discharge Database
Note: ICD-9 code 410
In 2011, 66% of heart disease hospitalizations occurred among people aged 65 years or older (Figure 4.4.5).

The average age of a person hospitalized for heart disease in 2011 was 70.2 years.

Although the average age of a person hospitalized for heart disease has stayed constant over time in Oregon, the average age for those hospitalized with heart attack has increased by two years since 1997. This could indicate improvements in self-management of heart disease.

Although most heart disease and heart attack hospitalizations occur in older Oregonians over the age of 65 years, those under 65 are still susceptible to these conditions and account for approximately one-in-three heart disease and heart attack hospitalizations (figures 4.4.5 and 4.4.6).
In 2011, 61% of heart attack hospitalizations occurred among people aged 65 years or older (Figure 4.4.6).

The average age of a person hospitalized for a heart attack in 2011 was 69.2 years.
In 2011, more than one-quarter of hospitalizations with a primary diagnosis of heart disease or heart attack had diabetes listed as a contributing cause (Figure 4.4.7).

From 1997 to 2011, a contributing cause of diabetes increased 19% among hospitalizations due to heart disease and 22.7% among hospitalizations due to heart attack (Figure 4.4.7).

**FIGURE 4.4.7 PERCENTAGE OF TOTAL HOSPITALIZATIONS WITH A PRIMARY DIAGNOSIS OF HEART DISEASE OR HEART ATTACK AND A NON-PRIMARY DIAGNOSIS OF DIABETES OVER TIME, OREGON, 1997–2011**

Data source: Oregon Hospital Discharge Database

Note: ICD-9 codes 390–398, 402, 404, 410–429 for heart disease and 410 for heart attack
In 2011, nearly two-in-three (68%) heart attack hospitalizations resulted in a discharge to home or self-care (Figure 4.4.8).

**FIGURE 4.4.8 DISCHARGE STATUS OF HOSPITALIZATIONS WITH A PRIMARY DIAGNOSIS OF HEART ATTACK, OREGON, 2011**

- **Home or self-care**: 68%
- **Transferred to another short-term hospital**: 7%
- **Transferred to skilled nursing facility**: 7%
- **Transferred to home health care service**: 7%
- **Transferred to rehab facility or hospital unit**: 0.4%
- **Other (includes those who died)**: 11%

**Data source:** Oregon Hospital Discharge Database

**Note:** ICD-9 code 410

- In 2011, nearly two-in-three (68%) heart attack hospitalizations resulted in a discharge to home or self-care (Figure 4.4.8).
Conclusions
The rates of heart disease and heart attack hospitalizations in both Oregon and the nation have steadily decreased over time. The majority of heart disease and heart attack hospitalizations occur among people aged 65 years or older, but those under the age of 65 are susceptible to these two conditions and accounted for about one-in-three heart disease and heart attack hospitalizations in 2011. Although men account for a higher proportion of heart disease and heart attack hospitalizations overall, women comprise the majority of these hospitalizations in those aged 85 years or older, which is likely due to the longer life expectancy of females compared to males.
4.5 Heart disease and heart attack mortality

Heart disease and heart attack can be prevented or managed by eating a healthy diet, maintaining a healthy weight, being physically active, not smoking cigarettes, and preventing or managing high blood pressure, high cholesterol and diabetes. Unfortunately, heart disease is the second leading cause of death in Oregon and the leading cause of death nationally. In 2009, heart disease accounted for one of every four deaths in the United States, killing more than 385,000 Americans.

In 2011, heart disease was the primary cause of death for 6,215 Oregonians, accounting for 19% of all deaths among Oregon residents. This section will describe deaths from heart disease and heart attack among the Oregon population.

- From 1990 to 2010, both heart disease and heart attack death rates in Oregon were consistently lower than national rates. In recent years, the difference between Oregon and the United States has lessened (figures 4.5.1 and 4.5.2, tables 4.5.1 and 4.5.2).

Figure 4.5.1: Number of Heart Disease Deaths per 100,000 People, by Year, Oregon vs. United States, 1990–2010

Data source: Centers for Disease Control and Prevention (CDC) WONDER data system
Note: Estimates are age-adjusted. Death rates reflect heart disease as the primary cause of death.
Since 1990, the rate of death due to heart disease in Oregon decreased 48.4% (Figure 4.5.1 and Table 4.5.1). The larger relative decrease in heart attack death rates compared to heart disease death rates may reflect improved clinical care and emergency medical services. From 1990 to 2010, the national rate of death due to heart disease decreased 43.5% (Figure 4.5.1 and Table 4.5.1).

### TABLE 4.5.1 NUMBER OF HEART DISEASE DEATHS PER 100,000 PEOPLE, BY YEAR, OREGON VS. UNITED STATES, 1990–2010

<table>
<thead>
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<tr>
<td>2010</td>
<td>137.9</td>
<td>179.1</td>
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Data source: Centers for Disease Control and Prevention (CDC) Wonder data system  
Note: Estimates are age-adjusted. Death rates reflect heart disease as the primary cause of death.
From 1990 to 2010, the national rate of death due to heart attack decreased 65.3(154,475)(121,264) (Figure 4.5.2 and Table 4.5.2).
<table>
<thead>
<tr>
<th>YEAR</th>
<th>OREGON HEART ATTACK DEATH RATE</th>
<th>U.S. HEART ATTACK DEATH RATE</th>
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</tr>
<tr>
<td>2010</td>
<td>24.9</td>
<td>36.5</td>
</tr>
</tbody>
</table>

Data source: Centers for Disease Control and Prevention (CDC) Wonder data system

Note: Estimates are age-adjusted. Death rates reflect heart attack as the primary cause of death.

Since 1990, the rate of death due to heart attack in Oregon decreased 68.6% (Figure 4.5.2 and Table 4.5.2).
Over time, heart disease and heart attack death rates were higher among men than women (figures 4.5.3 and 4.5.4).

However, the difference in heart disease and heart attack death rates between the two genders decreased over time, particularly for heart attack deaths (figures 4.5.3 and 4.5.4).

In 2011, 3,360 male and 2,855 female Oregonians died from heart disease. This is a heart disease death rate of 178.2 per 100,000 population for males and 103.2 per 100,000 population for females.
In 2011, 626 male and 452 female Oregonians died from heart attack. This is a heart attack death rate of 32.2 per 100,000 population for males and 17.0 per 100,000 population for females.
From 1990 to 2011, there was a 33.7% decrease in the heart disease death rate among those aged less than 65 years, a 61.0% decrease in those 65–74 years old, a 52.3% decrease in those 75–84 years old and a 36.2% decrease in those 85 years old or older (Figure 4.5.5).

Over time, heart disease and heart attack death rates declined across all age groups in Oregon (figures 4.5.5 and 4.5.6).

Heart attack death rates saw a larger relative decline than heart disease death rates across all age groups (figures 4.5.5 and 4.5.6).
From 1990 to 2011, there was a 55.2% decrease in the heart attack death rate among those aged less than 65 years, a 70.8% decrease in those 65–74 years old, a 72.6% decrease in those 75–84 years old and a 60.9% decrease in those 85 years old or older (Figure 4.5.6).
Heart disease and heart attack death rates were higher in older age groups, and were markedly higher in those aged 75 years old or older (figures 4.5.7 and 4.5.8).

Heart disease and heart attack death rates were higher among men than women in all age groups (figures 4.5.7 and 4.5.8).
FIGURE 4.5.8 NUMBER OF HEART ATTACK DEATHS PER 100,000 PEOPLE, BY AGE GROUP AND GENDER, OREGON, 2011

Data source: Oregon Death Certificates
Note: Death rates reflect heart attack as the primary cause of death.
Over time, death rates from heart disease and heart attack decreased for all racial and ethnic groups (figures 4.5.9 and 4.5.10).
Although the disparity in heart disease and heart attack death rates among racial and ethnic groups lessened over time, non-Latino African American persons had consistently higher death rates from both heart disease and heart attack compared to all other racial and ethnic groups (figures 4.5.9 and 4.5.10).
A higher percentage of the non-Latino African American population in Oregon reported high blood pressure, obesity, diabetes and cigarette smoking than other racial and ethnic groups, which may contribute to this disparity.

From 2008–2010, non-Latino African American persons had the highest average death rates from heart disease and heart attack at 147.3 deaths per 100,000 people and 29.3 deaths per 100,000 people, respectively (figures 4.5.11 and 4.5.12).

**Data source:** Oregon Death Certificates  
**Notes:** Calculated death rate for each year is the average of adjacent three years due to small numbers, e.g., death rate in 1991 is the average of 1990–1992. Death rates reflect heart disease as the primary cause of death.
Latino people had the lowest average death rates from heart disease and heart attack at 61.3 deaths per 100,000 people and 11.2 deaths per 100,000 people, respectively (figures 4.5.11 and 4.5.12).

The African American population had an additional 86 heart disease deaths per 100,000 people and 18.1 heart attack deaths per 100,000 people compared to the Latino population (figures 4.5.11 and 4.5.12).

Data source: Oregon Death Certificates

Notes: Calculated death rate for each year is the average of adjacent three years due to small numbers, e.g., death rate in 1991 is the average of 1990–1992. Death rates reflect heart attack as the primary cause of death.
Conclusions
Overall, deaths from heart disease and heart attack have been decreasing over time both in Oregon and nationally. Decreases in heart disease and heart attack death were seen among both males and females, and across all age groups and racial and ethnic groups. It is important to note that although all racial and ethnic groups saw decreases in heart attack and heart disease death rates, non-Latino African American persons still experienced a disproportionately high burden of heart disease and heart attack death compared to all other racial and ethnic groups, and this trend has held constant over the last two decades.
4.6 Heart disease and heart attack costs

Heart disease is the second leading cause of death in Oregon and heart attack is a leading cause of serious long-term disability in Oregon and nationally. Every year, approximately 715,000 people in the United States have a heart attack, and about 125,000 of these heart attacks result in death.20 Chest pain is among the top five reasons for emergency department (ED) visits in the United States in those age 15–64 years and heart disease is among the top three reasons for ED visits in those aged 65 years or older.17 The cost is high for hospitalization, death and disability associated with heart disease and heart attack. The costs for coronary heart disease alone are $109 billion every year, which includes the cost of health care services, medication and lost productivity.21 In Oregon, the average cost of a hospitalization due to heart disease in 2011 was more than $38,000, with total medical costs exceeding $1.1 billion. The costs associated with heart disease and heart attack hospitalizations have steadily increased since 1997. In addition to these direct costs, families who experience heart disease and eventual heart attack not only suffer high medical bills, but also indirect costs such as lost wages and a decreased standard of living due to serious illness and disability.

In 2011, males accounted for 61% of the total cost of heart disease hospitalizations and females accounted for 39% of the total costs; $701.4 million and $440.1 million were spent on heart disease hospitalizations for males and females, respectively (figures 4.6.1 and 4.6.2).

Data source: Oregon Hospital Discharge Dataset
This distribution of total costs across genders was similar for heart attack, but differed from total costs of stroke hospitalizations in Oregon, where males and females accounted for roughly 50\% of total costs (see Volume 5: The Burden of Stroke in Oregon 2013).

Nationally, $99.2 billion was spent on direct economic costs associated with heart disease.\textsuperscript{22}

\begin{figure}[h]
    \centering
    \includegraphics[width=\textwidth]{figure462.png}
    \caption{Total Costs of Hospitalizations with a Primary Diagnosis of Heart Attack, by Gender, Oregon, 2011}
    \textbf{Data source:} Oregon Hospital Discharge Dataset
\end{figure}
Of the direct costs due to heart disease, more than half (57%) were attributable to hospital inpatient stays, which equates to more than $46 billion (Figure 4.6.3).

Nearly one-quarter (22%) of direct heart disease costs were attributable to hospital outpatient or office-based provider visits, 9% to prescribed medicines, 7% to home health and 6% to emergency room visits (Figure 4.6.3).²²
According to national data from 2010, 44% of heart attack medical expenses were paid by Medicare, 34% by private insurance, 7% by Medicaid, 5% out of pocket and 10% from some other source (Figure 4.6.4).
Conclusions

Lowering the cost of health care is one component of the Oregon Health Authority Triple Aim framework for optimizing health systems performance, which also includes improving the patient experience of care and improving the health of populations.\textsuperscript{24} With current heart disease prevention and treatment trends, the direct medical costs associated with heart disease care are projected to increase by 198\% during the next 20 years, from $35.7 billion in 2010 to $106.4 billion in 2030.\textsuperscript{25} In addition, the indirect costs associated with lost productivity due to heart disease are projected to increase by 53\%, from $73.2 billion in 2010 to $112.3 billion in 2030.\textsuperscript{25} However, these projections do not need to become a reality; heart disease and heart attack are largely preventable.

Heart disease and heart attack prevention include living tobacco-free, moving more, eating a diet high in fresh fruits and vegetables and low in sodium and artificial trans fats, maintaining a healthy weight and managing high blood pressure and high cholesterol. Communities can support individuals in the prevention and management of heart disease and heart attack by establishing tobacco-free environments, increasing access to fresh fruits and vegetables, increasing opportunities for physical activity and reducing sodium and trans fats in the food supply.
Heart disease and heart attack can be prevented or managed by living tobacco-free and limiting exposure to secondhand smoke, limiting alcohol use, increasing physical activity, and eating a diet high in fruits and vegetables and low in salt and artificial trans fats. These conditions can also be prevented by controlling existing medical conditions such as high blood pressure, high cholesterol, diabetes, and overweight and obesity. People who have been identified as being more susceptible to having a heart attack — including those with a family history of heart disease, older adults, men and African American persons — should be aware that their predisposition to heart disease in combination with an unhealthy lifestyle further increases the risk for heart disease and heart attack.

Our social and physical environments are powerful influencers, affecting what we eat, how we live and how healthy we are throughout our lifetime. Today in Oregon, nutritious food and places to play and exercise are out of reach for many people. All Oregonians deserve convenient access to nutritious foods and activities that help them live better. Healthy options should be available to all Oregonians and not dependent on income, educational attainment, race or ethnicity. Oregon is committed to the Million Hearts® initiative, preventing heart disease and stroke by addressing the ABCS — appropriate Aspirin therapy, Blood pressure control, Cholesterol control, Smoking cessation and reduced Sodium consumption — through these evidence-based policy strategies:

- Tobacco-free environments and helping cigarette smokers quit;
- Improved access to evidence-based quality care;
Healthy worksites that encourage healthy eating and offer opportunities for physical activity;

Environments with limited access to foods high in sodium and trans fats.

Some programs currently offered by the Oregon Health Authority that help individuals with heart disease and heart attack prevention behaviors include the Oregon Tobacco Quit Line (https://public.health.oregon.gov/PreventionWellness/TobaccoPrevention/GetHelp Quitting/Pages/oregonquitline.aspx), Walk with Ease (www.arthritis.org/resources/community-programs/walk-with-ease/) and Living Well with Chronic Conditions (http://public.health.oregon.gov/diseasesconditions/chronicdisease/livingwell/Pages/Index.aspx) programs. The Oregon Tobacco Quit Line provides free tobacco cessation coaching to help people live tobacco-free. Walk with Ease, a gentle exercise program that addresses the risk factor of physical inactivity by increasing walking among participants, and Living Well with Chronic Conditions and Tomando Control de su Salud, programs that teach people living with chronic conditions the skills to take care of themselves, are offered throughout the state.

Oregon also promotes and supports strategies to improve delivery and use of quality clinical services to prevent heart disease and heart attack and manage risk factors. These include increased blood pressure screenings and increased clinical referrals to evidence-based prevention and self-management education and support services.

Visit the Oregon Heart Disease and Stroke Prevention webpage for more information and heart disease prevention resources: http://public.health.oregon.gov/DiseasesConditions/ChronicDisease/HeartDiseaseStroke/Pages/index.aspx.
REFERENCES


### Table A.1. Age-Adjusted and Unadjusted Prevalence of Diabetes, Heart Attack and Heart Disease Among Adults, by County, Oregon 2008–2011

<table>
<thead>
<tr>
<th>County</th>
<th>Diabetes</th>
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<th>Heart disease</th>
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<td>7.5%</td>
<td>2.5%</td>
</tr>
<tr>
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<td>7.5%</td>
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</tr>
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## TABLE A.1. AGE-ADJUSTED AND UNADJUSTED PREVALENCE OF DIABETES, HEART ATTACK AND HEART DISEASE AMONG ADULTS, BY COUNTY, OREGON 2008–2011, CONTINUED

<table>
<thead>
<tr>
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<th>Diabetes Unadjusted</th>
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<th>Heart attack Unadjusted</th>
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<td>3.3%*</td>
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* Statistically significant difference compared with all other counties (p-value < = 0.05)
† This number may be statistically unreliable and should be interpreted with caution.
– This number is suppressed because it is statistically unreliable.

**Data source:** Oregon BRFSS County Combined Dataset 2008–2011

**Note:** Age-adjusted estimates are adjusted to the 2000 Standard Population using three age groups (18–34, 35–54 and 55+).
TABLE A.2. AGE-ADJUSTED AND UNADJUSTED PREVALENCE OF STROKE, HIGH BLOOD PRESSURE AND HIGH CHOLESTEROL AMONG ADULTS, BY COUNTY, OREGON, 2008–2011

<table>
<thead>
<tr>
<th>County</th>
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<th>High cholesterol</th>
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<tr>
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<td>20.9%</td>
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<tr>
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<td>2.5%</td>
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<td>Jackson</td>
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<td>21.9%</td>
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<tr>
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TABLE A.2. AGE-ADJUSTED AND UNADJUSTED PREVALENCE OF STROKE, HIGH BLOOD PRESSURE AND HIGH CHOLESTEROL AMONG ADULTS, BY COUNTY, OREGON, 2008–2011, CONTINUED

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<th>County</th>
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<th>High blood pressure Age-adjusted</th>
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<td>29.8%</td>
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<td>44.6%</td>
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<td>2.1%</td>
<td>23.5%</td>
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<td>32.2%</td>
<td>28.6%*</td>
</tr>
<tr>
<td>Wheeler</td>
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<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Yamhill</td>
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<td>2.0%</td>
<td>27.8%</td>
<td>26.9%</td>
<td>35.3%</td>
<td>32.7%</td>
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<tr>
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<td>34.1%</td>
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* Statistically significant difference compared with all other counties (p-value ≤ 0.05)
† This number may be statistically unreliable and should be interpreted with caution.
– This number is suppressed because it is statistically unreliable.

Data source: Oregon BRFSS County Combined Dataset 2008–2011
Note: Age-adjusted estimates are adjusted to the 2000 Standard Population using three age groups (18–34, 35–54 and 55+).
# TABLE A.2. AGE-ADJUSTED AND UNADJUSTED PREVALENCE OF STROKE, HIGH BLOOD PRESSURE AND HIGH CHOLESTEROL AMONG ADULTS, BY COUNTY, OREGON, 2008–2011

<table>
<thead>
<tr>
<th>County</th>
<th>Stroke</th>
<th>High blood pressure</th>
<th>High cholesterol</th>
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<td>Unadjusted</td>
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<td>OREGON</td>
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<td>–</td>
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<td>Baker</td>
<td>26.6%</td>
<td>26.6%</td>
<td>23.0%</td>
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<tr>
<td>Clackamas</td>
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<td>14.0%</td>
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<td>19.6%</td>
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<tr>
<td>Columbia</td>
<td>24.7%</td>
<td>23.7%</td>
<td>18.2%</td>
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<tr>
<td>Coos</td>
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<td>24.5%</td>
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<tr>
<td>Deschutes</td>
<td>17.4%</td>
<td>17.2%*</td>
<td>13.1%</td>
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<tr>
<td>Douglas</td>
<td>32.5%</td>
<td>33.6%*</td>
<td>23.8%</td>
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<tr>
<td>Grant</td>
<td>23.1%</td>
<td>21.8%</td>
<td>22.8%</td>
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<tr>
<td>Harney</td>
<td>22.8%</td>
<td>22.7%</td>
<td>9.0%†</td>
</tr>
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<td>Hood River</td>
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<td>9.2%</td>
</tr>
<tr>
<td>Jackson</td>
<td>21.0%</td>
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<td>19.7%</td>
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<td>28.5%</td>
<td>28.7%</td>
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<td>19.3%</td>
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Note: Unadjusted estimates are adjusted to the 2000 Standard Population using three age groups (18–34, 35–54 and 55+).
### TABLE A.3. AGE-ADJUSTED AND UNADJUSTED PREVALENCE OF OBESITY, CURRENT SMOKER AND LACK OF PHYSICAL ACTIVITY AMONG ADULTS, BY COUNTY, OREGON, 2008–2011, CONTINUED

<table>
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<th>County</th>
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<th>Current cigarette smoker Unadjusted</th>
<th>Age-adjusted</th>
<th>Lack of physical activity Unadjusted</th>
<th>Age-adjusted</th>
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<td>26.6%</td>
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* Statistically significant difference compared with all other counties (p-value <= 0.05)
† This number may be statistically unreliable and should be interpreted with caution.
– This number is suppressed because it is statistically unreliable.

**Data source:** Oregon BRFSS County Combined Dataset 2008–2011

**Note:** Age-adjusted estimates are adjusted to the 2000 Standard Population using three age groups (18–34, 35–54 and 55+).
### TABLE A.3. AGE-ADJUSTED AND UNADJUSTED PREVALENCE OF OBESITY, CURRENT SMOKER AND LACK OF PHYSICAL ACTIVITY AMONG ADULTS, BY COUNTY, OREGON, 2008–2011, CONTINUED

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**Behavioral Risk Factor Surveillance System (BRFSS)**

Description: The BRFSS is a random-digit dialed telephone survey that is conducted year-round among Oregon adults aged 18 years or older. The BRFSS includes questions on health behavior risk factors such as diet, weight control, tobacco and alcohol use, physical activity, preventive health screenings, and use of health care services. The data are weighted to represent all adults aged 18 years and older. A core set of questions is asked annually, and other topics are surveyed on a rotating basis.

Every few years, Oregon conducts additional BRFSS surveys among under-represented races and ethnicities. The results of these surveys are combined with statewide BRFSS data to provide more stable estimates for chronic diseases and related risk factors among these groups of Oregonians. The most recent race/ethnicity oversamples were conducted in 2010–2011. In addition, BRFSS surveys from 2008–2011 were aggregated to produce more reliable county-level prevalence estimates.

Starting in 2010, Oregon began collecting data from those who use cell phones, causing the method for adjusting (weighting) the data to the demographics of the state to change. This new method is called “raking.” Because of these changes, data prior to 2010 are not directly comparable to the data from 2010 forward. In addition, the national BRFSS also made these changes but did not implement the changes until 2011.

**Limitations:** BRFSS estimates pertain only to the adult population aged 18 years or older living in households. Respondents are identified through telephone-based methods. The survey started collecting data for cell phones in 2009. Cell phone data were incorporated for analysis in Oregon in 2010. According to a recent publication from the National Center for Health Statistics, in 2011 more than 38% of households in Oregon were wireless-only. Finally, results obtained through BRFSS surveys also are limited in that they represent self-reported responses. Not all questions in the BRFSS have been validated.
Hospital Discharge Dataset

Description: The Hospital Discharge Dataset provides information on hospital discharges from all acute care hospitals in Oregon except two Veterans Administration hospitals. The dataset includes admit and discharge dates, diagnosis and procedural codes, financial charges, primary payer, and patient demographic information.

Limitations: Prior to 2008, the Hospital Discharge Dataset did not include identifying information that would allow us to ascertain when a single person had multiple hospitalizations; therefore, the calculated rate was the number of hospitalizations per the Oregon population rather than number of different people hospitalized per the Oregon population. In addition, prior to 2008, the dataset did not include information on race or ethnicity. Starting in 2008, the data necessary for investigating repeat hospitalizations for chronic diseases and hospitalizations by race/ethnicity were available and reported.

Oregon Health Panel Survey (OHPS)

Description: The Oregon Health Panel Survey was conducted in 2012 among non-institutionalized adults aged 18 years or older. Panel members were recruited using random digit dialing sampling based on landline telephone numbers and/or address-based sampling methodologies. A sample of panel members was then drawn at random for the survey. Topics on the survey include knowledge and attitudes toward colorectal screening, trans fats, sugary drinks, and other tobacco products. The data are weighted to represent all adults aged 18 years and older.

Limitations: OHPS estimates pertain only to the adult population aged 18 years or older living in households.

Oregon Healthy Teens (OHT) Survey

Description: Since 2000, the Youth Risk Behavior Survey (developed by the CDC) and the Oregon Public School Drug Use Survey were combined for Oregon into a single annual survey called Oregon Healthy Teens (OHT) Survey. The sample size varies from 1,600 to 32,000 per year, and the final data are weighted to more accurately represent Oregon eighth- and 11th-graders. The survey assesses health topics such as tobacco and alcohol use, HIV knowledge and attitudes, eating behaviors, nutrition and exercise.

Limitations: One limitation is that participation by school systems in the OHT is voluntary. However, participation rates have been high thus far. Another limitation is that the OHT questionnaire is not currently available in non-English versions except for a Spanish booklet that can be used as a reference when filling out the English version of the survey. A third limitation is that 3% of surveys were eliminated due to combinations of “dubious” answers and another 5% were eliminated because the student did not fill out grade or gender information.

Vital records data (full count data)

Birth Certificate Statistical File

The Birth Certificate Statistical File includes all births occurring in Oregon and births occurring out of state to Oregon.
residents. This database includes parental demographic information, conditions of the newborn, congenital abnormalities, medical factors of pregnancy, method of delivery, and complications of labor and delivery. It also includes tobacco, alcohol or illicit drug use during pregnancy. Information about maternal diabetes and gestational diabetes is also included.

**Death Certificate Statistical File**

The Death Certificate Statistical File includes all deaths occurring in Oregon and deaths occurring out of state to Oregon residents. Data are obtained from death certificates that are collected from the state registrar. The data are used to examine trends in mortality and causes of death. This database includes cause of death, date and place of death, and decedent demographic information. The mortality data analyzed for this report consists of deaths among Oregon residents.

**Limitations of birth and death files:** The accuracy of the data depends on the accuracy with which the birth attendant, certifying physician or medical examiner describes the circumstances surrounding the birth or the underlying causes of death.

**CDC Wonder database**

The CDC Wonder database provides National Center for Health Statistics (NCHS) national statistical analysis and reporting of deaths from specific diseases.
In this report, some numbers include a warning that they are potentially unreliable or they are unreliable and suppressed (not shown). In general, reliability refers to the stability of a number being reported.

The guidelines used to gauge reliability differ depending on the type of data used. Some data sources include all events under study (such as births, deaths or hospitalizations). These will be referred to as “full count.” Other data sources are from surveys of randomly selected individuals, adjusted to represent the full population. These will be referred to as “survey.” The text below briefly describes the methods used to determine if the information in this report includes a warning for reliability or is suppressed.

**Full count**
Determine the number of events (n).
- \( n \geq 12 \): Report the estimate.
- \( n \geq 5 \) and \( n < 12 \): Report the estimate and include a warning regarding reliability.
- \( n < 5 \): Do not report the estimate and state that it is suppressed.

**Survey**
Determine the total number of persons surveyed (x) for a particular question and calculate the standard error (SE) for the reported number. Use the SE to calculate a statistic called the relative standard error (RSE). RSE is a measure of the variability of an estimate compared with the estimate itself.
1. Determine if the estimate is being calculated on a full population (i.e., everyone) or a subpopulation (i.e., a smaller group of all people surveyed who share a common trait such as race, county or medical condition).

2. If the full population, determine if the denominator is $\geq 50$. If yes, proceed; if not, suppress.

3. If a subpopulation, determine if the denominator is $\geq 20$. If yes, proceed; if not, suppress.

4. Apply the following logic to each RSE:
   - RSE $< 30\%$: Report the estimate.
   - RSE $\geq 30\%$ and RSE $< 50\%$: Report the estimate and include a warning regarding reliability.
   - RSE $\geq 50\%$: Do not report the estimate and state that it is suppressed.
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This chapter summarizes the findings of Oregon’s stroke data system and includes the most up-to-date data on stroke prevalence,* death and hospitalizations over time and across select demographics, chronic diseases and risk factors. The intent of this chapter is to highlight the burden of stroke in Oregon and to assist stakeholders, policymakers and other interested parties in efforts to reduce this burden. For more information on each dataset used in this chapter, see Appendix B.

**What is stroke?**

- Stroke falls under a class of diseases, called cardiovascular disease, that involves the heart or blood vessels.
- There are two types of stroke: hemorrhagic and ischemic.
- An ischemic stroke occurs when blood flow to a part of the brain stops due to an obstruction, such as a fatty deposit or blood clot. If blood flow is stopped for longer than a few seconds, the brain cannot get blood or oxygen and brain cells can die, which can lead to permanent brain damage.
- Approximately 87% of all stroke cases in the United States are ischemic strokes.1
- Hemorrhagic stroke occurs when a weakened blood vessel within the brain ruptures or leaks.
- Anyone can have a stroke, but the risk of stroke can be reduced by eating a healthy diet, maintaining a healthy weight, being active, not smoking, limiting alcohol use, and managing chronic health conditions such as diabetes, high blood pressure and high cholesterol.
- If signs or symptoms of a stroke are present, call 9-1-1 immediately. The chance of stroke survival and recovery is higher if emergency treatment is received right away.

---

*There is an important limitation of the stroke prevalence estimates. In general, “prevalence” of stroke refers to the percentage of people reporting having had a stroke at a given time. This prevalence estimate is based on responses from adult Oregonians who had a stroke, but did not die from the stroke and are healthy enough to respond to a series of survey questions about their health and health practices. This estimate does not capture strokes that resulted in death or significant disability, so it is likely an underestimate of the true stroke prevalence in Oregon. This caveat does not apply to the numbers of stroke deaths and hospitalizations presented in the chapter because these are based on death certificates and reports from Oregon hospitals rather than survey data.
Who has stroke?

- In Oregon, an estimated 2.5% of adults reported having a history of stroke. This translates to approximately 86,000 Oregon adults who had ever had a stroke.
- Oregon has a smaller proportion of the population who have ever had a stroke than the United States overall. Since 2005, the percentage of people with a history of stroke in Oregon has remained relatively unchanged.
- More adult males (2.7%) reported having a history of stroke than adult females (2.5%) in 2011; however, there does not appear to be a consistent difference in stroke prevalence between adult males and females in Oregon over time.
- Oregonians aged 75 years or older (10.8%) were more likely to report ever having a stroke than younger Oregonians aged 18–44 years (0.4%).
- Oregon adults with less than a high school education (3.9%) were three times more likely to report ever having a stroke than Oregon adults with a college degree (1.3%).
- Oregon adults with an annual household income of less than $20,000 (4.6%) were nearly four times more likely to report ever having a stroke than Oregon adults in households with an annual income of $50,000 or more (1.2%).
- Oregon adults enrolled in the Oregon Health Plan (6.3%) were nearly three times more likely to report having a stroke than individuals with no insurance (2.0%) or those enrolled in private, Medicare or other health insurance plans (2.2%).
- A higher percentage of non-Latino African American (4.8%) and non-Latino American Indian/Alaska Native (4.2%) persons reported having a history of stroke compared to non-Latino white (2.5%) and non-Latino Asian/Pacific Islander (3.5%) persons.

Risk factors for stroke

- **High blood pressure and high cholesterol:** Among the general population of Oregon adults, 28% reported high blood pressure and 32% high cholesterol. Among adults who reported a history of stroke, the proportion with high blood pressure nearly doubled at 51%, and the proportion with high cholesterol more than doubled at 70%.
- **Obesity:** More than one-quarter of adults in Oregon are obese. Among adults who report having a stroke, 35% are obese.
Cigarette smokers: Approximately one-in-three adults who reported a history of stroke were current cigarette smokers, compared to 20% of adults overall.

Lack of physical activity: Nearly half of adults who reported a history of stroke got inadequate physical activity, compared to 20% of adults overall.

Stroke hospitalizations
- In 2011, 7,762 hospitalizations in Oregon were primarily attributed to stroke.
- Between 1997 and 2011, the stroke hospitalization rate decreased by 18.2%.
- Among those hospitalized for stroke, one-quarter had diabetes listed as a secondary diagnosis.

Cost of stroke
- In 2011, the average cost of a hospitalization primarily due to stroke was $32,723, with the total cost of all hospitalizations reaching almost $254 million.

Stroke mortality
- In 2011, stroke was the fourth leading cause of death in Oregon.
- From 1990 to 2010, stroke death rates in Oregon were consistently higher than national rates. However, in recent years the difference between Oregon and the United States has narrowed.

Since 1990, the stroke death rate in Oregon has decreased by 44%, from 72.1 deaths per 100,000 population to 40.1 deaths per 100,000 population.

In 2011, 1,906 deaths were primarily due to having a stroke, accounting for 6% of all deaths among Oregon residents.

Stroke death rates are higher among older age groups, with a markedly higher rate in those aged 75 years and older.

Stroke death rates are similar for men and women; declines in the stroke death rate have been observed in both men and women during the last decade.

African Americans have consistently had a higher death rate from stroke compared with all other racial and ethnic groups. Over time, the disparity in the stroke death rate among racial and ethnic groups has lessened. However, African Americans still have a higher stroke death rate than other racial and ethnic groups.

Meeting Healthy People 2020 goals
- Healthy People provides science-based, 10-year national objectives for improving the health of all Americans.
- One of the Healthy People goals to achieve by the year 2020 is the reduction of deaths due to stroke.
- The death rate due to stroke in Oregon is steadily decreasing; however, the stroke death rate will need to be reduced by an additional 16% over the remaining years to achieve the Healthy People 2020 goal of 33.8 stroke deaths per 100,000 population.
Ways to reduce the burden of stroke in Oregon

Oregon is committed to preventing stroke through a wide range of evidence-based practices. The Health Promotion and Chronic Disease Prevention Section of the Oregon Public Health Division is working with local and state partners to:

- Increase availability of healthy foods and beverages in child care facilities, schools, worksites and neighborhoods;
- Increase places where people can move more safely;
- Increase the number of environments that are tobacco-free;
- Increase referrals to self-management programs so that people with chronic disease can live well and take care of themselves;
- Improve delivery and use of quality health care services through the physician promotion of the ABCS — appropriate Aspirin therapy, Blood pressure control, Cholesterol control, Smoking cessation and reduced Sodium consumption.

This comprehensive, community-wide approach makes it easier for all Oregonians to eat better, move more and live tobacco-free wherever they live, work, play and learn.
What is stroke?

Stroke falls under a class of diseases, called cardiovascular disease, that involves the heart or blood vessels. There are two types of stroke: hemorrhagic and ischemic. An ischemic stroke occurs when blood flow to a part of the brain stops due to an obstruction, such as a fatty deposit. If blood flow is stopped for longer than a few seconds, the brain cannot get blood or oxygen and brain cells can die, which can lead to permanent brain damage. Approximately 87% of all stroke cases in the United States are ischemic strokes. Hemorrhagic stroke occurs when a weakened blood vessel within the brain ruptures or leaks. Approximately 77% of strokes every year are first or new strokes, while approximately one-in-four are recurrent strokes.

Anyone can have a stroke, but the risk of stroke can be reduced by practicing specific healthy behaviors and managing existing chronic medical conditions. Not smoking and limiting exposure to secondhand cigarette smoke, limiting alcohol use, increasing physical activity, and eating a diet high in fruits and vegetables and low in salt and artificial trans fats can help prevent a stroke from occurring. Stroke can also be prevented by controlling existing medical conditions such as high blood pressure, high cholesterol, heart disease, diabetes, and overweight and obesity. Healthy behaviors help control these pre-existing medical conditions. In addition, those with a family history of stroke, older adults, men, and African American, Latino, and American Indian/Alaska Native persons have all been identified as being more susceptible to having a stroke.
Stroke risk factors

Behaviors:
- Tobacco use;
- Alcohol use;
- Lack of physical activity;
- Diet high in salt or trans fats.

Chronic conditions:
- High blood pressure;
- High cholesterol;
- Heart disease;
- Diabetes;
- Overweight and obesity;
- Previous stroke.

Heredity:
- Family history;
- Older age;
- Male gender;
- African American, Latino or American Indian/Alaska Native race and ethnicity.

Common stroke signs and symptoms
- Sudden numbness or weakness of the face, arm or leg;
- Sudden confusion or trouble speaking or understanding others;
- Sudden trouble seeing in one or both eyes;
- Sudden dizziness, trouble walking, or loss of balance or coordination;
- Sudden severe headache with no known cause.

If signs or symptoms of a stroke are present, call 9-1-1 immediately. The chance of stroke survival and recovery is higher if emergency treatment is received right away. People who have ever had a stroke are at high risk for another one. At least one in every eight stroke survivors has another stroke within five years. It is important for stroke survivors to control chronic conditions that may cause another stroke — including high blood pressure, high cholesterol and diabetes — through healthy lifestyle behaviors such as not smoking and engaging in physical activity.
Stroke is a public health priority

During the past 20 years, stroke prevalence, hospitalizations and mortality have consistently declined in both Oregon and nationally. However, stroke is still the fourth leading cause of death in Oregon and the third leading cause of death in the United States overall. In 2011, an estimated 86,000 Oregon adults reported having a stroke, and there were 7,762 hospitalizations due to stroke with a total cost of nearly $254 million. Due to the significant morbidity and mortality associated with this disease, stroke prevention has been identified as a key component in the Oregon Public Health Division Strategic Plan 2012–2017, as well as the Healthy People 2020 national health plan. The Oregon Heart Disease and Stroke Prevention Program also supports the U.S. Department of Health and Human Services Million Hearts® campaign, which began in 2012 and aims to prevent one million heart attacks and strokes by 2017.

Heart Disease and Stroke Prevention Program priorities

- Controlling high blood pressure and cholesterol;
- Recognizing the signs and symptoms of heart attack and stroke and taking appropriate actions;
- Improving emergency response;
- Eliminating health disparities between population groups;
- Providing facts and figures about heart disease and stroke in Oregon.

Million Hearts® aims to prevent heart disease and stroke by:

- Improving access to effective care;
- Improving the quality of care for the ABCS — appropriate Aspirin therapy, Blood pressure control, Cholesterol control, Smoking cessation and reduced Sodium consumption;
- Focusing clinical attention on the prevention of heart attack and stroke;
- Activating the public to lead heart-healthy lifestyles;
- Improving prescription adherence to appropriate medications for the ABCS.

The Oregon Heart Disease and Stroke Prevention Program also developed Oregon’s Statewide Plan for Heart Disease and Stroke Prevention and Care. The statewide plan was completed by Oregon’s Coordinating Council for Heart Disease and Stroke in order to create a vision for the prevention, early detection, treatment and self-management of these diseases and their related risk factors. In addition to the statewide plan, the 2013 Oregon legislative session saw the passage of Senate Bill 375, which created a stroke care subcommittee charged with developing guidelines related to stroke care in Oregon, and directed the Oregon Health Authority to establish and implement a plan for improving the quality of stroke care in Oregon.
Approximately 86,000 adults in Oregon have had a stroke in their lifetime. Stroke is the fourth leading cause of death in Oregon.

Certain risk factors can complicate recovery from a stroke and can increase the chance of having another stroke.

- 1 in 3 smokes cigarettes.
- 1 in 3 is obese.
- 1 in 3 smokes cigarettes.
- 2 in 3 have high cholesterol.
- 1 in 2 has high blood pressure.
- 1 in 2 is physically inactive.

STROKE affects some communities more than others.

Compared to adults with a college degree, adults with less than a high school education are:

- 3x more likely to have a stroke.

Compared to non-Latino whites, African American people are:

- 2x more likely to have a stroke in their lifetime.

Stroke costs Oregonians $254 million in hospitalizations and, combined with heart disease, causes nearly 1 in 4 deaths.
5.1 Who has stroke?

To understand the burden of stroke in Oregon, the prevalence* of the disease needs to be known. Prevalence is the percentage of people with stroke in a particular population, at a given time. It is important to report the prevalence of stroke among subpopulations of Oregonians (e.g., racial and ethnic minorities) to identify groups of Oregonians who are disproportionately affected by stroke compared to the general population in Oregon. This section will describe the burden of stroke among Oregon adults over time and by select demographics including gender, age, education, income, health insurance status, race and ethnicity, chronic disease risk factors, and chronic conditions.

*For this report, stroke prevalence was determined by the percentage of adults who responded “Yes” when asked if they have ever been told by a doctor, nurse or other health professional that they had a stroke.

**FIGURE 5.1.1 ADULTS WHO HAD EVER HAD A STROKE, BY YEAR, OREGON VS. UNITED STATES, 2005–2011**

Data sources: Oregon Behavioral Risk Factor Surveillance System; national data from the National Behavioral Risk Factor Surveillance System.

Notes: National data were not included for 2010 as the method for weighting the data was different from the method used in Oregon. The national estimate excludes territories. The vertical dashed line denotes a different adjustment method and inclusion of cellular phones in the sample. Starting in 2010, estimates are not comparable to earlier years. Estimates are age-adjusted.
Fewer Oregon adults reported ever having a stroke compared with the overall U.S. population (Figure 5.1.1 and Table 5.1.1). This has been fairly consistent over time, but the reason for this difference is unknown.

In general, since 2005, the percentage of Oregonians who had a history of stroke remained steady at around 2.5% (Table 5.1.1 and Figure 5.1.1). This was true even though the method for adjusting the data changed starting in 2010, and is not comparable to prior years.

In 2011, nearly 86,000 Oregon adults were estimated to have a history of stroke.

TABLE 5.1.1 ADULTS WHO HAD EVER HAD A STROKE, BY YEAR, OREGON AND UNITED STATES, 2005–2011

<table>
<thead>
<tr>
<th>YEAR</th>
<th>OREGON</th>
<th>UNITED STATES</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>2.5</td>
<td>2.6</td>
</tr>
<tr>
<td>2006</td>
<td>2.3</td>
<td>2.6</td>
</tr>
<tr>
<td>2007</td>
<td>2.1</td>
<td>2.6</td>
</tr>
<tr>
<td>2008</td>
<td>2.2</td>
<td>2.6</td>
</tr>
<tr>
<td>2009</td>
<td>3.0</td>
<td>2.4</td>
</tr>
<tr>
<td>2010</td>
<td>2.3</td>
<td>N/A</td>
</tr>
<tr>
<td>2011</td>
<td>2.5</td>
<td>2.7</td>
</tr>
</tbody>
</table>

Data sources: Oregon Behavioral Risk Factor Surveillance System; national data from the National Behavioral Risk Factor Surveillance System.
Notes: National data were not included for 2010 as the method for weighting the data was different from the method used in Oregon. The national estimate excludes territories. Starting in 2010, estimates are not comparable to earlier years. Estimates are age-adjusted.
Over time, there does not appear to be a consistent difference between adult males and females in having a history of stroke (Figure 5.1.2).

Nationally, the proportion of adult males with a history of stroke has been consistently higher compared to adult females.\(^5\)

In 2011, the percentage of adult males reporting ever having a stroke was higher compared to adult females at 2.7% and 2.3%, respectively (Figure 5.1.2).

However, a recent systematic review of gender differences in stroke showed that while stroke is more common among men, women become more severely ill after having a stroke.\(^6\)
The percentage of adults reporting ever having a stroke was higher in older age groups (Figure 5.1.3).

Approximately one-in-ten Oregonians aged 75 years or older reported ever having a stroke, compared to less than 1% of adults aged 18–44 years (Figure 5.1.3).

Data sources: Oregon Behavioral Risk Factor Surveillance System.
Notes: Estimates are not age-adjusted.
*This number may be statistically unreliable and should be interpreted with caution.
Oregon adults with less than a high school education were three times more likely to report ever having a stroke compared to Oregon adults with a college degree (Figure 5.1.4).

This reflects similar national data from 2010, where adults with less than a high school education were nearly three times as likely to report stroke compared to those with a college degree. This was true even though the method for adjusting the national data in 2010 was different than the method used to adjust Oregon-specific data in 2011.
FIGURE 5.1.5 ADULTS WHO HAD EVER HAD A STROKE, BY ANNUAL HOUSEHOLD INCOME, OREGON, 2011

Data sources: Oregon Behavioral Risk Factor Surveillance System.
Notes: The horizontal line represents the percentage of the general population in Oregon that reported ever having a stroke (2.5%). Estimates are age-adjusted.

- Oregon adults in households with an annual income of less than $20,000 were nearly four times more likely to report ever having a stroke compared to Oregon adults in households with an annual income of $50,000 or more (Figure 5.1.5).
Oregon Health Plan (OHP) members were nearly three times more likely to report ever having a stroke compared to individuals with no health insurance or those enrolled in private, Medicare or other health insurance plans (Figure 5.1.6).

Those with no health insurance may have a lower prevalence of stroke due to inadequate access to health care. Access to care and contact with a health care provider are required to receive a diagnosis of stroke. In addition, those with no health insurance are generally younger and healthier and therefore are less likely to have chronic health conditions.

The higher prevalence of stroke observed among the adult population enrolled in OHP may be due to the demographic composition of this vulnerable population. Adult OHP members are low-income and include pregnant women, seniors and people with disabilities. Adult OHP members are more than twice as likely to smoke cigarettes as people with any other type of health insurance. Smoking is an important risk factor for stroke. OHP is intended to help ensure that medical care is affordable for those with a low income. People with lower incomes are more likely to live in substandard housing, smoke cigarettes and have higher disease morbidity.
A higher percentage of non-Latino African American (4.8%) and non-Latino American Indian/Alaska Native (4.2%) persons reported ever having a stroke compared to other racial and ethnic groups (Figure 5.1.7).

Non-Latino African Americans (3.9%) and non-Latino American Indians/Alaska Natives (5.9%) also had the highest prevalence of stroke nationally.¹

The percentage of non-Latino African American persons who reported having a stroke was nearly double that of non-Latino white persons (Figure 5.1.7).

Non-Latino African American persons’ risk of having a first stroke was also nearly double that of non-Latino white persons at the national level.¹

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Notes: Estimates are age-adjusted. The stroke prevalence estimate for Latino ethnicity has been suppressed because it is statistically unreliable.

*This number may be statistically unreliable and should be interpreted with caution.
Adult Oregonians who were either current cigarette smokers or who had high blood pressure or high cholesterol reported ever having a stroke more often than the general population of Oregon adults (Figure 5.1.8).

Although Oregonians who were overweight or obese had similar prevalence of stroke compared to the general population, those who were very obese* reported having a stroke more often than the general Oregon adult population (Figure 5.1.8).

The percentage of Oregon adults who had a stroke was 40% higher among cigarette smokers compared to the general population (Figure 5.1.8).

Oregon adults with high blood pressure were nearly twice as likely as the general adult population to report ever having a stroke (Figure 5.1.8).

The percentage of Oregon adults who had ever had a stroke was 52% higher among those with high cholesterol compared to the general population (Figure 5.1.8).

*To determine adult overweight and obesity ranges, self-reported weight and height are used to calculate body mass index (BMI). For most people, BMI correlates with the amount of body fat a person has, although it is not a direct measure of body fat. An adult who has a BMI between 25 and 29.9 is considered overweight, 30 to 39.9 is considered obese, and 40.0 and above is considered very obese.
Oregon adults with diabetes reported a history of stroke at nearly three times the rate of adults in the general population (Figure 5.1.9).

History of stroke was especially common among Oregonians who reported ever having a heart attack or having heart disease. Oregon adults who have ever had a heart attack reported having a history of stroke more than seven times as often as the general population of adults (Figure 5.1.9).

The percentage of Oregonians with heart disease who also reported a history of stroke was more than 13 times greater than the percentage of the general adult population who reported a history of stroke (Figure 5.1.9).

**FIGURE 5.1.9 ADULTS WHO HAD EVER HAD A STROKE, BY SELECTED CHRONIC DISEASES, OREGON, 2011**

- **Data source:** Oregon Behavioral Risk Factor Surveillance System
- **Note:** The horizontal line represents the percentage of Oregon’s general population who reported a stroke (2.5%). Estimates are age-adjusted.
During 2008–2011, the prevalence of diagnosed stroke among Oregon counties ranged from 1.3% to 5.9%.

Benton, Deschutes, Multnomah and Polk counties had significantly lower percentages of adults with a history of stroke compared to the rest of the state.

See Appendix A for detailed county estimates of stroke prevalence.
Conclusions
The percentage of Oregon adults with a history of stroke has remained relatively consistent over time. Although there does not appear to be a difference in having a history of stroke by gender, many other vulnerable groups of Oregonians are disproportionately affected by stroke. These groups include older Oregonians, those with less education and a smaller annual household income, those enrolled in OHP, African American persons, and American Indian and Alaska Native persons. Oregon adults with chronic disease risk factors and other chronic conditions were also more likely to report having a history of stroke than the general population. Most notably, adults with high blood pressure were twice as likely as the general population to report having a history of stroke and adults with angina or coronary heart disease were 13 times more likely to report a history of stroke.
Many Oregon adults who report ever having a stroke are affected by risk factors such as high blood pressure, high cholesterol, obesity and cigarette smoking that can lead to the development of additional chronic diseases and increase the chance for another stroke. Understanding the disproportionate burden of chronic disease risk factors and other chronic diseases among the stroke population will inform the prevention and treatment of stroke. This section will describe the burden of chronic disease risk factors and behaviors and other chronic conditions among Oregon adults who have reported having a stroke.

Oregon adults who had had a stroke were 32% more likely to be obese, 75% more likely to smoke, and more than twice as likely to get no physical activity outside of work compared to those who had not had a stroke (Figure 5.2.1).

A little more than half of adults who had ever had a stroke also reported a diagnosis of high blood pressure; adults who had ever had a stroke were nearly twice as likely to report high blood pressure compared to adults who had not had a stroke (Figure 5.2.1).

More than two out of three adults who had ever had a stroke also reported high cholesterol; adults who had had a stroke were more than twice as likely to report high cholesterol compared to adults who had not had a stroke (Figure 5.2.1).

**FIGURE 5.2.1 SELECTED CHRONIC DISEASE RISK FACTORS AMONG ADULTS WHO HAD EVER HAD A STROKE, OREGON, 2011**

<table>
<thead>
<tr>
<th></th>
<th>Without stroke</th>
<th>With stroke</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obese (BMI 30+)</td>
<td>26.5</td>
<td>35.1</td>
</tr>
<tr>
<td>Current cigarette smoker</td>
<td>20.3</td>
<td>35.5</td>
</tr>
<tr>
<td>High blood pressure</td>
<td>26.8</td>
<td>51.0</td>
</tr>
<tr>
<td>High cholesterol</td>
<td>32.3</td>
<td>69.5</td>
</tr>
<tr>
<td>Physical inactivity</td>
<td>19.0</td>
<td>46.5</td>
</tr>
</tbody>
</table>

Data source: Oregon Behavioral Risk Factor Surveillance System

Note: Estimates are age-adjusted.
More than one-quarter of Oregon adults who had ever had a stroke had also been diagnosed with diabetes; adults who had ever had a stroke were more than three times as likely to also have diabetes compared to adults who had not had a stroke (Figure 5.2.2).

Nearly one-in-five adults who had ever had a stroke had also been diagnosed with heart disease; adults who had ever had a stroke were more than six times more likely to have heart disease compared to adults who had not had a stroke (Figure 5.2.2).

More than one-quarter of adults who had ever had a stroke also reported having had a heart attack; adults who had ever had a stroke were eight times more likely to report having had a heart attack compared to adults who had not had a stroke (Figure 5.2.2).

**FIGURE 5.2.2 SELECTED CHRONIC DISEASES AMONG ADULTS WHO HAD EVER HAD A STROKE, OREGON, 2011**

<table>
<thead>
<tr>
<th>Disease</th>
<th>Without stroke</th>
<th>With stroke</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes</td>
<td>8.0</td>
<td>26.0</td>
</tr>
<tr>
<td>Heart disease</td>
<td>3.1</td>
<td>19.4</td>
</tr>
<tr>
<td>Heart attack</td>
<td>3.2</td>
<td>25.9</td>
</tr>
</tbody>
</table>

**Data source:** Oregon Behavioral Risk Factor Surveillance System

**Note:** Estimates are age-adjusted.
Conclusions

Overall, Oregon adults who reported having had a stroke also reported chronic disease risk factors and other chronic conditions at a higher rate than those who had not had a stroke. A higher proportion of adults who had ever had a stroke was obese, smoked cigarettes, had high blood pressure and high cholesterol and a lack of physical activity compared to adults who had not had a stroke. Most notably, adults who had ever had a stroke were approximately two times more likely to report high cholesterol and high blood pressure than adults who had not had a stroke. High blood pressure and high cholesterol, along with smoking and lack of physical activity, are key contributors to having a first stroke and increase the likelihood of having another stroke if not properly controlled.
5.3 Prevention and management of stroke

Stroke can be prevented and managed by living a healthy lifestyle and managing other chronic diseases. A healthy lifestyle includes eating a diet high in fruits and vegetables and low in salt and trans fats, being active, maintaining a healthy weight, and not smoking cigarettes. Individuals with high cholesterol, high blood pressure, diabetes or heart disease can lower risk for stroke or prevent another stroke from occurring by having their cholesterol checked, monitoring blood pressure, managing diabetes and taking medicine prescribed by a health care provider. Many stroke survivors may also require rehabilitation that often involves physical therapy to help relearn skills such as eating and bathing, which may have been lost because of the stroke. Oregon is committed to preventing stroke by addressing the ABCS of stroke prevention — appropriate Aspirin therapy, Blood pressure control, Cholesterol control, Smoking cessation and reduced Sodium consumption. This section will describe the proportion of Oregon adults who had ever had a stroke who practice behaviors that help prevent future strokes.

- More than four out of five Oregon adults who had ever had a stroke had had a cholesterol screening in the past five years (82%) and nearly two-in-three took aspirin daily or every other day (Figure 5.3.1).
- A little less than half (47.7%) of adults who had ever had a stroke were currently reducing their sodium intake.

**FIGURE 5.3.1 SELECTED STROKE PREVENTION AND MANAGEMENT BEHAVIORS AMONG ADULTS WHO HAD EVER HAD A STROKE, OREGON, 2011**

![Bar Chart](image)

Data source: Oregon Behavioral Risk Factor Surveillance System
Note: Estimates are age-adjusted.
intake (Figure 5.3.1); this percentage increased to 59.7% if the stroke survivor had also been diagnosed with high blood pressure.

- Among adults who had ever had a stroke and a diagnosis of high blood pressure, 59.6% were taking medication for high blood pressure (Figure 5.3.1); however, this does not imply that high blood pressure was under control.

- Among adults who had ever had a stroke who were current cigarette smokers, 54.4% had attempted to quit smoking within the past year (Figure 5.3.1).

- Three-in-four Oregon adults who had ever had a stroke were trying to lose or maintain weight.

- A little more than half (52.7%) received outpatient rehabilitation following the stroke (Figure 5.3.2).

- Among adults who had ever had a stroke and a diagnosis of diabetes, 56.8% had taken a class on diabetes management and 51.8% had had their A1C checked two or more times by a health professional within the past year (Figure 5.3.2). These are both recommended diabetes management practices.
Conclusions

Encouragingly, many Oregon adults who reported having had a stroke are taking steps to prevent a future stroke. A majority of stroke survivors met recommendations for cholesterol screening including taking doctor-prescribed medication for high blood pressure, taking an aspirin daily or every other day, and making attempts to quit smoking if they were current cigarette smokers. In addition, the majority of adults who had ever had a stroke were trying to lose or maintain weight and had taken a class in diabetes self-management if they also had diabetes. However, there is room for improvement. Less than half of adults who had ever had a stroke were trying to reduce their sodium intake, which can lower high blood pressure, and 46% of adults who had ever had a stroke who smoke cigarettes did not make an attempt to quit smoking.
5.4 Stroke hospitalizations

Stroke is a leading cause of disability and among the top five reasons for emergency department (ED) visits in the United States.\textsuperscript{10} Like ED visits, hospitalizations for stroke are an important measure to track acute stroke events. Nationally, there were more than one million hospital discharges for stroke in 2010, which is a stroke hospitalization rate of 33.0 per 10,000 U.S. residents.\textsuperscript{11} The average length of stay for a person hospitalized with stroke was 6.1 days.\textsuperscript{11} Among Oregon residents, 7,762 were hospitalized with a primary diagnosis of stroke in 2011, and another 10,555 individuals were hospitalized with stroke as a non-primary diagnosis or contributing cause. Stroke accounted for 2% of all hospitalizations in Oregon in 2011. The average length of stay for a person hospitalized with stroke was 4.2 days. This section will describe stroke-related hospitalizations in Oregon over time and by select patient characteristics including gender, age and comorbid heart disease or diabetes.

- The overall rate of stroke hospitalizations in Oregon decreased since 1997, with year-to-year variation in the numbers (Figure 5.4.1 and Table 5.4.1).

\begin{figure}
\centering
\includegraphics[width=\textwidth]{figure5.4.1.png}
\caption{Number of stroke hospital discharges per 100,000 people, by year, Oregon, 1997–2011}
\label{fig:5.4.1}
\end{figure}

\textbf{Data source:} Oregon Hospital Discharge Database

From 1997 to 2011, the stroke hospitalization rate decreased by 18.2%.

Nationally, the stroke hospitalization rate decreased by 8.9% from 1999 to 2009.\textsuperscript{12}

### Table 5.4.1 Number of Stroke Hospital Discharges per 100,000 People, by Year, Oregon, 1997–2011

<table>
<thead>
<tr>
<th>YEAR</th>
<th>Stroke Hospitalization Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997</td>
<td>222.9</td>
</tr>
<tr>
<td>1998</td>
<td>226.7</td>
</tr>
<tr>
<td>1999</td>
<td>216.9</td>
</tr>
<tr>
<td>2000</td>
<td>212.3</td>
</tr>
<tr>
<td>2001</td>
<td>210.2</td>
</tr>
<tr>
<td>2002</td>
<td>217.0</td>
</tr>
<tr>
<td>2003</td>
<td>203.8</td>
</tr>
<tr>
<td>2004</td>
<td>197.6</td>
</tr>
<tr>
<td>2005</td>
<td>191.6</td>
</tr>
<tr>
<td>2006</td>
<td>200.7</td>
</tr>
<tr>
<td>2007</td>
<td>192.1</td>
</tr>
<tr>
<td>2008</td>
<td>185.5</td>
</tr>
<tr>
<td>2009</td>
<td>179.0</td>
</tr>
<tr>
<td>2010</td>
<td>181.0</td>
</tr>
<tr>
<td>2011</td>
<td>182.3</td>
</tr>
</tbody>
</table>

*Data source: Oregon Hospital Discharge Database*

*Note: ICD-9 codes 430–434 and 436–438.*
The distribution of stroke hospital discharges between men and women varies substantially by age group.

In 2011, in all age groups before the age of 75 years, men accounted for a higher proportion of stroke hospital discharges, whereas women comprised the majority of hospital discharges in the 75–84 year age group (52.5%) and in the 85 years or older age group (66%) (Figure 5.4.2).

This pattern has also been observed in national hospital discharge data where women constituted 66.2% of stroke hospital discharges in the 85 years or older age group in 2010. This has been attributed to the longer lifespan of women compared to men.13

**FIGURE 5.4.2 PERCENTAGE OF TOTAL STROKE HOSPITAL DISCHARGES WITHIN AGE GROUPS, BY GENDER, OREGON, 2011**

*Data source:* Oregon Hospital Discharge Database

From 1997 to 2011, the proportion of hospitalizations with a primary diagnosis of stroke decreased 10% (Figure 5.4.3).

Over time, the average age of hospital inpatients with a primary diagnosis of stroke has remained constant; the average age in 1997 was 73 years, 72 years in 2004 and 72 years in 2011.

The proportion of total stroke hospitalizations comprised of those less than 65 years old increased by 37% from 1997 to 2011 (Figure 5.4.3).
In 2011, 70% of stroke hospitalizations occurred among people aged 65 years or older (Figure 5.4.4).

The average age of a person hospitalized for stroke in 2011 was 72 years; this average age has been consistent over time.

Although the majority of stroke hospitalizations occurred in older Oregonians over the age of 65, those under 65 years of age were still susceptible to stroke, accounting for nearly one-in-three stroke hospitalizations (Figure 5.4.4).

This is similar to national hospital data from 2009, when 34% of people hospitalized for stroke were under the age of 65.12
Among those hospitalized with a primary diagnosis of stroke, one-quarter also had a secondary diagnosis of diabetes and half had a secondary diagnosis of coronary heart disease. These are both conditions that increase the risk of having a stroke (Figure 5.4.5).

From 1997 to 2011, the proportion of hospitalizations due to stroke with a contributing cause of diabetes or heart disease increased by 12% and 21%, respectively (Figure 5.4.5).

- In addition to stroke hospitalization disparities across age and gender, national data on stroke hospitalizations have identified disparities among racial and ethnic groups.
- According to 2008 national data on stroke hospitalizations among Medicare beneficiaries, African American persons had a stroke hospitalization rate that was 27% higher than the general population, 30% higher than white persons, and 36% higher than Latino persons.¹³

**FIGURE 5.4.5 PRIMARY STROKE HOSPITALIZATIONS WITH SECONDARY DIAGNOSIS OF HEART DISEASE OR DIABETES OVER TIME, OREGON, 1997–2011**

Data source: Oregon Hospital Discharge Database
In 2011, nearly half of stroke hospitalizations resulted in a discharge to home or self-care; one-in-five stroke hospitalizations resulted in transfer to a skilled nursing facility; and approximately 8% of those hospitalized for a stroke were discharged to a rehabilitation facility or hospital unit (Figure 5.4.6).
Conclusions

The rate of stroke hospitalizations in both Oregon and the nation has steadily decreased over time. The majority of stroke hospitalizations occur among people aged 65 years or older, but those under the age of 65 years are susceptible to stroke and accounted for 30% of stroke hospitalizations in 2011. Although men account for a higher proportion of stroke hospitalizations overall, women comprise the majority of stroke hospitalizations in older age groups, particularly in the 85 years or older age group.
5.5 Stroke mortality

Stroke can be prevented by eating a healthy diet, maintaining a healthy weight, being physically active, not smoking, and preventing or managing high blood pressure, high cholesterol and diabetes. Unfortunately, stroke is the fourth leading cause of death in Oregon and nationally. In 2009, stroke accounted for one of every 19 deaths in the United States, killing almost 130,000 Americans. In 2011, stroke was the primary cause of death for 1,906 Oregonians, accounting for 6% of all deaths among Oregon residents. This section will describe deaths from stroke among the Oregon population.

- From 1990 to 2010, stroke death rates in Oregon were consistently higher than national rates. However, in recent years the difference between Oregon and the United States has lessened (Figure 5.5.1 and Table 5.5.1).

**FIGURE 5.5.1 NUMBER OF STROKE DEATHS PER 100,000 PEOPLE, BY YEAR, OREGON VS. UNITED STATES AND HEALTHY PEOPLE 2020 TARGET, 1990–2010**

![Graph showing stroke death rates per 100,000 people by year for Oregon, the United States, and the Healthy People 2020 target.](image)

**Data source:** Centers for Disease Control and Prevention (CDC) WONDER data system

**Note:** Estimates are age-adjusted. Death rates reflect stroke as the primary cause of death.
Since 1990, the death rate due to stroke in Oregon and nationally has decreased 44.4% and 43%, respectively.

To achieve the Healthy People 2020 goal of 33.8 stroke deaths per 100,000 people, the stroke death rate in Oregon must be reduced by 16% (Figure 5.5.1).

<table>
<thead>
<tr>
<th>YEAR</th>
<th>STROKE DEATH RATES — OREGON</th>
<th>STROKE DEATH RATES — UNITED STATES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>72.1</td>
<td>68.6</td>
</tr>
<tr>
<td>1991</td>
<td>71.5</td>
<td>66.1</td>
</tr>
<tr>
<td>1992</td>
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<td>64.6</td>
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<td>1993</td>
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<td>65.8</td>
</tr>
<tr>
<td>1994</td>
<td>79.7</td>
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<tr>
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<td>1997</td>
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<td>54.6</td>
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<td>51.2</td>
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<td>44.1</td>
<td>42.1</td>
</tr>
<tr>
<td>2009</td>
<td>43.5</td>
<td>39.6</td>
</tr>
<tr>
<td>2010</td>
<td>40.1</td>
<td>39.1</td>
</tr>
</tbody>
</table>

Data source: Centers for Disease Control and Prevention (CDC) WONDER data system

Note: Estimates are age-adjusted. Death rates reflect stroke as the primary cause of death.
FIGURE 5.5.2 NUMBER OF STROKE DEATHS PER 100,000 PEOPLE, BY GENDER AND YEAR, OREGON, 1990–2011

Over time, stroke death rates between males and females in Oregon have remained relatively similar (Figure 5.5.2).

Declines in stroke death rates have been observed in both genders during the last decade (Figure 5.5.2).

Nationally, there has been a greater decline in stroke death rates in men than women.13

In 2011, 775 male and 1,131 female Oregonians died from stroke. This is a stroke death rate of 41.8 per 100,000 population for males and 41.5 per 100,000 population for females.

Data source: Oregon death certificates
Note: Death rates reflect stroke as the primary cause of death.
Over time, stroke death rates have declined across all age groups, except those under the age of 65 (Figure 5.5.3).

From 1990 to 2011, there was a 40.1% decrease in the stroke death rate among those aged 65–74 years, a 45.5% decrease in those aged 75–84 years and a 43.6% decrease in those aged 85 years or older (Figure 5.5.3).
Stroke death rates were higher in older age groups, and particularly in those aged 75 years old or older (Figure 5.5.4).

Stroke death rates were higher among men than women in most age groups with the exception of those aged 85 years old and older, where women had a higher stroke death rate (Figure 5.5.4). This is likely due to the longer life expectancy of females compared to males.

**FIGURE 5.5.4 NUMBER OF STROKE DEATHS PER 100,000 PEOPLE, BY AGE GROUP AND GENDER, OREGON, 2011**

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Death rate per 100,000 population</th>
</tr>
</thead>
<tbody>
<tr>
<td>35–44</td>
<td>Male: 4.1, Female: 4.6, Total: 4.8</td>
</tr>
<tr>
<td>45–54</td>
<td>Male: 11.6, Female: 9.6, Total: 10.6</td>
</tr>
<tr>
<td>55–64</td>
<td>Male: 31.7, Female: 18.9, Total: 25.2</td>
</tr>
<tr>
<td>65–74</td>
<td>Male: 63.4, Female: 79.7, Total: 97.3</td>
</tr>
<tr>
<td>75–84</td>
<td>Male: 285.8, Female: 313.7, Total: 350.3</td>
</tr>
<tr>
<td>85+</td>
<td>Male: 963.3, Female: 1,094, Total: 1,165.7</td>
</tr>
</tbody>
</table>

**Data source:** Oregon death certificates

**Note:** Death rates reflect stroke as the primary cause of death.
From 1991 to 2009, death rates from stroke decreased for all racial and ethnic groups (Figure 5.5.5).

Over time, the disparity in the stroke death rate among racial and ethnic groups has lessened; however, non-Latino African American persons had consistently higher death rates from stroke compared with all other racial and ethnic groups (Figure 5.5.5).

A higher percentage of the non-Latino African American population in Oregon reported high blood pressure, obesity, diabetes and cigarette smoking than other racial and ethnic groups, which may contribute to this disparity.

Nationally, African American persons are more likely to die following a stroke than are white persons.¹
African American persons had the highest death rate from stroke at 56.0 stroke deaths per 100,000 people.

The African American population had an additional 18.2 stroke deaths per 100,000 people compared to the Latino population, who had the lowest stroke death rate of all racial and ethnic groups in Oregon (Figure 5.5.6).

There also appears to be a disparity in age at stroke death across racial and ethnic groups (data not shown). Nationally, death certificate data show that the average age at stroke death was younger for African American, American Indian/Alaska Native and Asian/Pacific Islander persons compared to white persons. The average age at stroke death was also younger for Latino persons than non-Latino persons.¹³
The stroke death rate among Oregon counties ranged from 17.4 per 100,000 people in Sherman County to 57.0 per 100,000 people in Jefferson County.

**FIGURE 5.5.7 NUMBER OF STROKE DEATHS PER 100,000 PEOPLE, BY COUNTY, OREGON, 2005–2010**

*Data source:* Oregon Vital Records

*Note:* Stroke death rate for each county is the annual average of 6 years (2005–2010).
Conclusions
Overall, death from stroke is decreasing over time both in Oregon and nationally. However, further decreases in stroke death are needed to achieve the population health goals outlined in the Healthy People 2020 objectives. Decreases in stroke death are seen among both males and females, all age groups over 64 years old, and all racial and ethnic groups. It is important to note that although all racial and ethnic groups have seen decreases in stroke death rates, non-Latino African American persons still experience a disproportionately high burden of stroke death compared to all other racial and ethnic groups, and this trend has held constant during the last two decades.
5.6 Stroke costs

Stroke is the fourth leading cause of death and a leading cause of serious long-term disability in Oregon and nationally.\textsuperscript{1,14} Every year, more than 795,000 people in the United States have a stroke, and 130,000 of these strokes result in death.\textsuperscript{1,14} Stroke is also among the top five reasons for visits to the emergency department and a leading contributor to hospitalizations.\textsuperscript{9} Stroke is an expensive chronic condition due to the associated hospitalizations, deaths and disabilities. The nation spends $38.6 billion annually on stroke, including the cost of health care services, medications and lost productivity.\textsuperscript{15} The average cost of ischemic stroke per person in the United States (87\% of strokes are ischemic) is estimated at approximately $140,000, which includes inpatient care, rehabilitation and follow-up care.\textsuperscript{1} In Oregon, the average cost of a hospitalization due to stroke in 2011 was nearly $33,000, with total medical costs exceeding $250 million. The costs associated with stroke hospitalizations have steadily increased since 1997. In addition to these direct costs, families who experience stroke not only have to deal with medical bills, but also indirect costs such as lost wages and a decreased standard of living due to serious illness and disability.

\begin{figure}
\centering
\includegraphics[width=\textwidth]{figure5.6.1.png}
\caption{Total costs of hospitalizations with a primary diagnosis of stroke, by gender, Oregon, 2011}
\end{figure}

- In 2011, males and females each accounted for 50\% of the total cost of stroke hospitalizations; $126.7 million and $127.3 million were spent on stroke hospitalizations among females and males, respectively (Figure 5.6.1).
- This differs from hospitalization with a primary diagnosis of heart disease or heart attack where males accounted for more than 60\% of total costs.
Nationally, $22.8 billion were spent on direct economic costs associated with stroke.\textsuperscript{16}

Of the direct costs due to stroke, nearly half (47\%) were attributable to hospital inpatient stays, which equates to expenditures of more than $10.7 billion (Figure 5.6.2).

More than one-quarter (26\%) of direct stroke costs were attributable to home health, 19\% to hospital outpatient or office-based provider visits, 4.5\% to prescribed medicines and 2.5\% to emergency room visits (Figure 5.6.2).\textsuperscript{16}

\textbf{FIGURE 5.6.2 DISTRIBUTION OF DIRECT ECONOMIC COSTS OF STROKE, BY TYPE OF SERVICE, UNITED STATES, 2009}

\textbf{Data source:} National Heart, Lung and Blood Institute, disease statistics
According to national data from 2010, 53% of stroke medical expenses were paid by Medicare, 21% by private insurance, 13% by Medicaid, 3% out of pocket and 9% from some other source (Figure 5.6.3).17
Conclusions

Lowering the cost of health care is one of the goals of the Triple Aim framework for optimizing health systems’ performance. If nothing changes in stroke prevention and treatment trends, the direct medical costs associated with stroke care are projected to increase by 238% over the next 20 years, from $28.3 billion in 2010 to $95.6 billion in 2030. In addition, the indirect costs associated with lost productivity due to stroke are projected to increase by 73%, from $25.6 billion in 2010 to $44.4 billion in 2030. However, these projections need not become a reality because stroke is largely preventable.

Stroke prevention includes not smoking, eating a diet high in fresh fruits and vegetables and low in sodium and artificial trans fats, getting regular physical activity and managing high blood pressure, high cholesterol and obesity. Our social and physical environments are powerful influencers affecting what we eat, how we live and how healthy we end up. Today in Oregon, nutritious food and places to play and exercise are out of reach for many people. All Oregonians deserve convenient access to foods and activities that help them live better, regardless of their income, education, race or ethnicity. Healthy options should be expected, not something to search out. Communities can support individuals in the prevention and management of stroke by establishing tobacco-free environments, increasing access to fresh fruits and vegetables, increasing opportunities for physical activity and reducing sodium and trans fats in the food supply.
Stroke can be prevented by living tobacco-free and limiting exposure to secondhand cigarette smoke, limiting alcohol use, increasing physical activity, and eating a diet high in fruits and vegetables and low in salt and artificial trans fats. Stroke can also be prevented by controlling existing medical conditions such as high blood pressure, high cholesterol, diabetes, and overweight and obesity. In addition, those with a family history of stroke, older adults and men as well as African American, Latino and American Indian/Alaska Native persons have all been identified as being more susceptible to having a stroke. These vulnerable populations should be aware that their predisposition to stroke in combination with an unhealthy lifestyle further increases the risk for having a stroke.

Oregon is committed to the Million Hearts® initiative, preventing heart disease and stroke by addressing the ABCS — appropriate Aspirin therapy, Blood pressure control, Cholesterol control, Smoking cessation and reduced Sodium consumption — through these evidence-based policy strategies:

- Tobacco-free environments and helping cigarette smokers quit;
- Improved access to evidence-based quality care;
- Healthy worksites that encourage healthy eating and offer opportunities for physical activity;
- Environments with limited access to foods high in sodium and trans fats.
Some programs currently offered by the Oregon Health Authority that help individuals with heart disease and heart attack prevention behaviors include the Oregon Tobacco Quit Line (https://public.health.oregon.gov/PreventionWellness/TobaccoPrevention/GetHelpQuitting/Pages/oregonquitline.aspx), Walk with Ease (www.arthritis.org/resources/community-programs/walk-with-ease/) and Living Well with Chronic Conditions (http://public.health.oregon.gov/diseasesconditions/chronicdisease/livingwell/Pages/Index.aspx). The Oregon Tobacco Quit Line provides tobacco cessation counseling and increases the chances of quitting successfully. Walk with Ease, a gentle exercise program that addresses the risk factor of physical inactivity by increasing walking among participants, and Living Well with Chronic Conditions and Tomando Control de su Salud — programs that teach people living with chronic conditions the skills to take care of themselves — are offered throughout the state.

Oregon also promotes and supports strategies to improve delivery and use of quality clinical services to prevent stroke and manage risk factors such as increasing blood pressure screenings and clinical referrals to evidence-based prevention and self-management education and support services.

Visit the Oregon Heart Disease and Stroke Prevention webpage for more information and heart disease prevention resources: http://public.health.oregon.gov/DiseasesConditions/ChronicDisease/HeartDiseaseStroke/Pages/index.aspx.
REFERENCES


**APPENDIX A: COUNTY-LEVEL ESTIMATES**

**TABLE A.1. AGE-ADJUSTED AND UNADJUSTED PREVALENCE OF DIABETES, HEART ATTACK AND HEART DISEASE AMONG ADULTS, BY COUNTY, OREGON 2008–2011**

<table>
<thead>
<tr>
<th>County</th>
<th>Diabetes Unadjusted</th>
<th>Diabetes Age-adjusted</th>
<th>Heart attack Unadjusted</th>
<th>Heart attack Age-adjusted</th>
<th>Heart disease Unadjusted</th>
<th>Heart disease Age-adjusted</th>
</tr>
</thead>
<tbody>
<tr>
<td>OREGON</td>
<td>–</td>
<td>7.2%</td>
<td>–</td>
<td>9.9%</td>
<td>–</td>
<td>3.5%</td>
</tr>
<tr>
<td>Baker</td>
<td>11.2%</td>
<td>10.0%†</td>
<td>6.1%†</td>
<td>7.5%</td>
<td>6.0%†</td>
<td>6.4%†</td>
</tr>
<tr>
<td>Benton</td>
<td>6.8%</td>
<td>7.5%</td>
<td>2.5%</td>
<td>10.8%</td>
<td>2.5%</td>
<td>2.5%*</td>
</tr>
<tr>
<td>Clackamas</td>
<td>8.1%</td>
<td>7.5%</td>
<td>2.9%</td>
<td>9.5%</td>
<td>2.9%</td>
<td>2.6%*</td>
</tr>
<tr>
<td>Clatsop</td>
<td>8.7%</td>
<td>7.5%</td>
<td>6.5%</td>
<td>5.9%*</td>
<td>4.9%</td>
<td>3.8%</td>
</tr>
<tr>
<td>Columbia</td>
<td>8.4%</td>
<td>7.5%</td>
<td>2.9%</td>
<td>11.3%</td>
<td>3.5%</td>
<td>3.0%</td>
</tr>
<tr>
<td>Coos</td>
<td>12.4%</td>
<td>10.9%</td>
<td>7.6%</td>
<td>18.1%*</td>
<td>8.5%</td>
<td>7.3%†</td>
</tr>
<tr>
<td>Crook</td>
<td>10.2%</td>
<td>9.1%</td>
<td>4.7%†</td>
<td>6.8%†</td>
<td>2.8%†</td>
<td>2.0%†</td>
</tr>
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<td>7.5%</td>
<td>4.9%</td>
</tr>
<tr>
<td>Deschutes</td>
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<td>9.2%</td>
<td>3.5%</td>
<td>2.9%</td>
</tr>
<tr>
<td>Douglas</td>
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<td>11.2%*</td>
<td>6.7%</td>
<td>14.2%*</td>
<td>4.4%</td>
<td>3.2%</td>
</tr>
<tr>
<td>Grant</td>
<td>8.3%†</td>
<td>5.8%†</td>
<td>3.5%†</td>
<td>12.1%†</td>
<td>4.7%†</td>
<td>2.6%†</td>
</tr>
<tr>
<td>Harney</td>
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<td>–</td>
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<td>–</td>
</tr>
<tr>
<td>Hood River</td>
<td>6.1%†</td>
<td>5.3%†</td>
<td>–</td>
<td>2.2%†</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
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<td>8.6%</td>
<td>7.8%</td>
<td>3.8%</td>
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</tr>
<tr>
<td>Jefferson</td>
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<td>5.3%†</td>
<td>5.3%†</td>
<td>9.2%†</td>
<td>2.6%†</td>
<td>2.0%†</td>
</tr>
<tr>
<td>Josephine</td>
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<td>6.6%</td>
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</tr>
<tr>
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<td>7.0%</td>
<td>6.4%</td>
<td>14.1%</td>
<td>4.0%</td>
<td>3.3%</td>
</tr>
</tbody>
</table>
### TABLE A.1. AGE-ADJUSTED AND UNADJUSTED PREVALENCE OF DIABETES, HEART ATTACK AND HEART DISEASE AMONG ADULTS, BY COUNTY, OREGON 2008–2011, CONTINUED

<table>
<thead>
<tr>
<th>County</th>
<th>Diabetes</th>
<th>Heart attack</th>
<th>Heart disease</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unadjusted</td>
<td>Age-adjusted</td>
<td>Unadjusted</td>
</tr>
<tr>
<td>OREGON</td>
<td>–</td>
<td>7.2%</td>
<td>–</td>
</tr>
<tr>
<td>Lake</td>
<td>7.6%†</td>
<td>4.9%†</td>
<td>7.9%†</td>
</tr>
<tr>
<td>Lane</td>
<td>7.4%</td>
<td>6.9%</td>
<td>3.9%</td>
</tr>
<tr>
<td>Lincoln</td>
<td>10.4%</td>
<td>7.8%</td>
<td>4.1%</td>
</tr>
<tr>
<td>Linn</td>
<td>8.6%</td>
<td>7.3%</td>
<td>4.3%</td>
</tr>
<tr>
<td>Malheur</td>
<td>10.5%</td>
<td>10.3%</td>
<td>3.4%†</td>
</tr>
<tr>
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<td>7.8%</td>
<td>7.6%</td>
<td>3.8%</td>
</tr>
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<td>Morrow</td>
<td>7.3%†</td>
<td>6.6%†</td>
<td>4.1%†</td>
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<td>6.6%</td>
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</tr>
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<td>7.5%</td>
<td>6.6%</td>
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<td>12.8%</td>
<td>11.2%</td>
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</tr>
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<td>9.6%</td>
<td>9.4%</td>
<td>4.0%</td>
</tr>
<tr>
<td>Union</td>
<td>9.1%†</td>
<td>8.6%†</td>
<td>3.8%†</td>
</tr>
<tr>
<td>Wallowa</td>
<td>7.1%†</td>
<td>5.0%†</td>
<td>4.6%†</td>
</tr>
<tr>
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<td>5.8%</td>
<td>6.0%*</td>
<td>2.5%</td>
</tr>
<tr>
<td>Wheeler</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Yamhill</td>
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<td>6.0%</td>
<td>4.2%†</td>
</tr>
<tr>
<td>Gilliam/Sherman/Wasco</td>
<td>8.1%</td>
<td>6.6%</td>
<td>6.3%</td>
</tr>
</tbody>
</table>

* Statistically significant difference compared with all other counties (p-value \( \leq 0.05 \))
† This number may be statistically unreliable and should be interpreted with caution.
– This number is suppressed because it is statistically unreliable.

**Data source:** Oregon BRFSS County Combined Dataset 2008–2011

**Note:** Age-adjusted estimates are adjusted to the 2000 Standard Population using three age groups (18–34, 35–54 and 55+).
### TABLE A.2. AGE-ADJUSTED AND UNADJUSTED PREVALENCE OF STROKE, HIGH BLOOD PRESSURE AND HIGH CHOLESTEROL AMONG ADULTS, BY COUNTY, OREGON, 2008–2011

<table>
<thead>
<tr>
<th>County</th>
<th>Stroke</th>
<th>High blood pressure</th>
<th>High cholesterol</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unadjusted</td>
<td>Age-adjusted</td>
<td>Unadjusted</td>
</tr>
<tr>
<td>OREGON</td>
<td>—</td>
<td>2.3%</td>
<td>—</td>
</tr>
<tr>
<td>Baker</td>
<td>5.3%†</td>
<td>—</td>
<td>40.4%</td>
</tr>
<tr>
<td>Benton</td>
<td>1.5%</td>
<td>1.6%*</td>
<td>20.9%</td>
</tr>
<tr>
<td>Clackamas</td>
<td>2.5%</td>
<td>2.2%</td>
<td>28.9%</td>
</tr>
<tr>
<td>Clatsop</td>
<td>4.2%</td>
<td>3.1%</td>
<td>35.6%</td>
</tr>
<tr>
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<td>2.7%†</td>
<td>2.5%†</td>
<td>32.7%</td>
</tr>
<tr>
<td>Coos</td>
<td>6.2%†</td>
<td>5.9%†</td>
<td>32.9%</td>
</tr>
<tr>
<td>Crook</td>
<td>—</td>
<td>—</td>
<td>42.4%</td>
</tr>
<tr>
<td>Curry</td>
<td>2.5%†</td>
<td>1.3%†</td>
<td>35.8%</td>
</tr>
<tr>
<td>Deschutes</td>
<td>1.8%</td>
<td>1.5%*</td>
<td>24.6%</td>
</tr>
<tr>
<td>Douglas</td>
<td>4.3%</td>
<td>3.3%</td>
<td>36.8%</td>
</tr>
<tr>
<td>Grant</td>
<td>—</td>
<td>—</td>
<td>37.3%</td>
</tr>
<tr>
<td>Harney</td>
<td>—</td>
<td>—</td>
<td>21.3%†</td>
</tr>
<tr>
<td>Hood River</td>
<td>—</td>
<td>—</td>
<td>23.2%†</td>
</tr>
<tr>
<td>Jackson</td>
<td>2.7%</td>
<td>2.1%</td>
<td>32.0%</td>
</tr>
<tr>
<td>Jefferson</td>
<td>1.8%†</td>
<td>1.4%†</td>
<td>21.9%</td>
</tr>
<tr>
<td>Josephine</td>
<td>3.2%</td>
<td>2.4%</td>
<td>35.5%</td>
</tr>
<tr>
<td>Klamath</td>
<td>3.4%</td>
<td>3.2%</td>
<td>33.7%</td>
</tr>
<tr>
<td>Lake</td>
<td>—</td>
<td>—</td>
<td>32.2%†</td>
</tr>
<tr>
<td>Lane</td>
<td>2.4%</td>
<td>2.1%</td>
<td>28.3%</td>
</tr>
</tbody>
</table>
### Table A.2. Age-Adjusted and Unadjusted Prevalence of Stroke, High Blood Pressure and High Cholesterol Among Adults, by County, Oregon, 2008–2011, Continued

<table>
<thead>
<tr>
<th>County</th>
<th>Stroke Unadjusted</th>
<th>Stroke Age-adjusted</th>
<th>High blood pressure Unadjusted</th>
<th>High blood pressure Age-adjusted</th>
<th>High cholesterol Unadjusted</th>
<th>High cholesterol Age-adjusted</th>
</tr>
</thead>
<tbody>
<tr>
<td>OREGON</td>
<td>–</td>
<td>2.3%</td>
<td>–</td>
<td>26.6%</td>
<td>–</td>
<td>32.2%</td>
</tr>
<tr>
<td>Lincoln</td>
<td>3.7%</td>
<td>2.8%†</td>
<td>39.6%</td>
<td>35.1%</td>
<td>45.4%</td>
<td>34.8%</td>
</tr>
<tr>
<td>Linn</td>
<td>3.9%</td>
<td>3.6%</td>
<td>28.8%</td>
<td>26.3%</td>
<td>33.8%</td>
<td>28.4%</td>
</tr>
<tr>
<td>Malheur</td>
<td>1.6%†</td>
<td>1.4%†</td>
<td>29.3%</td>
<td>26.0%</td>
<td>30.3%</td>
<td>21.7%*</td>
</tr>
<tr>
<td>Marion</td>
<td>3.0%</td>
<td>2.8%</td>
<td>27.9%</td>
<td>27.2%</td>
<td>33.6%</td>
<td>29.8%</td>
</tr>
<tr>
<td>Morrow</td>
<td>–</td>
<td>–</td>
<td>29.1%</td>
<td>22.9%</td>
<td>41.6%</td>
<td>27.5%</td>
</tr>
<tr>
<td>Multnomah</td>
<td>1.9%</td>
<td>2.0%*</td>
<td>26.1%</td>
<td>26.1%</td>
<td>35.1%</td>
<td>32.4%</td>
</tr>
<tr>
<td>Polk</td>
<td>1.5%</td>
<td>1.3%*</td>
<td>25.9%</td>
<td>24.4%</td>
<td>36.4%</td>
<td>30.5%</td>
</tr>
<tr>
<td>Tillamook</td>
<td>3.8%†</td>
<td>3.0%†</td>
<td>27.9%</td>
<td>20.4%</td>
<td>47.0%</td>
<td>44.9%</td>
</tr>
<tr>
<td>Umatilla</td>
<td>3.7%</td>
<td>3.4%</td>
<td>32.7%</td>
<td>32.1%</td>
<td>47.6%</td>
<td>42.6%*</td>
</tr>
<tr>
<td>Union</td>
<td>2.9%†</td>
<td>2.3%†</td>
<td>31.8%</td>
<td>28.8%</td>
<td>41.3%</td>
<td>40.0%</td>
</tr>
<tr>
<td>Wallowa</td>
<td>5.8%†</td>
<td>–</td>
<td>43.7%</td>
<td>28.7%</td>
<td>44.6%</td>
<td>35.2%</td>
</tr>
<tr>
<td>Washington</td>
<td>2.1%</td>
<td>2.1%</td>
<td>23.5%</td>
<td>24.2%*</td>
<td>32.2%</td>
<td>28.6%*</td>
</tr>
<tr>
<td>Wheeler</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Yamhill</td>
<td>2.2%</td>
<td>2.0%</td>
<td>27.8%</td>
<td>26.9%</td>
<td>35.3%</td>
<td>32.7%</td>
</tr>
<tr>
<td>Gilliam/Sherman/Wasco</td>
<td>2.4%†</td>
<td>1.6%†</td>
<td>37.8%</td>
<td>34.1%</td>
<td>35.6%</td>
<td>27.3%</td>
</tr>
</tbody>
</table>

* Statistically significant difference compared with all other counties (p-value <= 0.05)
† This number may be statistically unreliable and should be interpreted with caution.
– This number is suppressed because it is statistically unreliable.

**Data source:** Oregon BRFSS County Combined Dataset 2008–2011

**Note:** Age-adjusted estimates are adjusted to the 2000 Standard Population using three age groups (18–34, 35–54 and 55+).
TABLE A.2. AGE-ADJUSTED AND UNADJUSTED PREVALENCE OF STROKE, HIGH BLOOD PRESSURE AND HIGH CHOLESTEROL AMONG ADULTS, BY COUNTY, OREGON, 2008–2011

<table>
<thead>
<tr>
<th>County</th>
<th>Stroke</th>
<th>High blood pressure</th>
<th>High cholesterol</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unadjusted</td>
<td>Age-adjusted</td>
<td>Unadjusted</td>
</tr>
<tr>
<td>OREGON</td>
<td>2.3%</td>
<td>26.6%</td>
<td>32.2%</td>
</tr>
<tr>
<td>Lincoln</td>
<td>3.7%</td>
<td>2.8%†</td>
<td>39.6%</td>
</tr>
<tr>
<td>Linn</td>
<td>3.9%</td>
<td>3.6%</td>
<td>28.8%</td>
</tr>
<tr>
<td>Malheur</td>
<td>1.6%†</td>
<td>1.4%†</td>
<td>29.3%</td>
</tr>
<tr>
<td>Marion</td>
<td>3.0%</td>
<td>2.8%</td>
<td>27.9%</td>
</tr>
<tr>
<td>Morrow</td>
<td>–</td>
<td>–</td>
<td>29.1%</td>
</tr>
<tr>
<td>Multnomah</td>
<td>1.9%</td>
<td>2.0%*</td>
<td>26.1%</td>
</tr>
<tr>
<td>Polk</td>
<td>1.5%</td>
<td>1.3%*</td>
<td>25.9%</td>
</tr>
<tr>
<td>Tillamook</td>
<td>3.8%†</td>
<td>3.0%†</td>
<td>27.9%</td>
</tr>
<tr>
<td>Umatilla</td>
<td>3.7%</td>
<td>3.4%</td>
<td>32.7%</td>
</tr>
<tr>
<td>Union</td>
<td>2.9%†</td>
<td>2.3%†</td>
<td>31.8%</td>
</tr>
<tr>
<td>Wallowa</td>
<td>5.8%†</td>
<td>–</td>
<td>43.7%</td>
</tr>
<tr>
<td>Washington</td>
<td>2.1%</td>
<td>2.1%</td>
<td>23.5%</td>
</tr>
<tr>
<td>Wheeler</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Yamhill</td>
<td>2.2%</td>
<td>2.0%</td>
<td>27.8%</td>
</tr>
<tr>
<td>Gilliam/Sherman/Wasco</td>
<td>2.4%†</td>
<td>1.6%†</td>
<td>37.8%</td>
</tr>
</tbody>
</table>

TABLE A.3. AGE-ADJUSTED AND UNADJUSTED PREVALENCE OF OBESITY, CURRENT SMOKER AND LACK OF PHYSICAL ACTIVITY AMONG ADULTS, BY COUNTY, OREGON, 2008–2011

<table>
<thead>
<tr>
<th>County</th>
<th>Obese</th>
<th>Current cigarette smoker</th>
<th>Lack of physical activity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unadjusted</td>
<td>Age-adjusted</td>
<td>Unadjusted</td>
</tr>
<tr>
<td>OREGON</td>
<td>–</td>
<td>24.8%</td>
<td>–</td>
</tr>
<tr>
<td>Baker</td>
<td>26.6%</td>
<td>26.6%</td>
<td>23.0%</td>
</tr>
<tr>
<td>Benton</td>
<td>18.1%</td>
<td>18.7%*</td>
<td>10.3%</td>
</tr>
<tr>
<td>Clackamas</td>
<td>24.0%</td>
<td>23.9%</td>
<td>14.0%</td>
</tr>
<tr>
<td>Clatsop</td>
<td>30.5%</td>
<td>31.4%</td>
<td>19.6%</td>
</tr>
<tr>
<td>Columbia</td>
<td>24.7%</td>
<td>23.7%</td>
<td>18.2%</td>
</tr>
<tr>
<td>Coos</td>
<td>30.0%</td>
<td>30.0%*</td>
<td>24.8%</td>
</tr>
<tr>
<td>Crook</td>
<td>25.5%</td>
<td>25.6%</td>
<td>16.7%</td>
</tr>
<tr>
<td>Curry</td>
<td>30.1%</td>
<td>31.5%</td>
<td>24.5%</td>
</tr>
<tr>
<td>Deschutes</td>
<td>17.4%</td>
<td>17.2%*</td>
<td>13.1%</td>
</tr>
<tr>
<td>Douglas</td>
<td>32.5%</td>
<td>33.6%*</td>
<td>23.8%</td>
</tr>
<tr>
<td>Grant</td>
<td>23.1%</td>
<td>21.8%</td>
<td>22.8%</td>
</tr>
<tr>
<td>Harney</td>
<td>22.8%</td>
<td>22.7%</td>
<td>9.0%†</td>
</tr>
<tr>
<td>Hood River</td>
<td>19.5%</td>
<td>19.7%</td>
<td>9.2%</td>
</tr>
<tr>
<td>Jackson</td>
<td>21.0%</td>
<td>20.7%*</td>
<td>19.7%</td>
</tr>
<tr>
<td>Jefferson</td>
<td>28.5%</td>
<td>28.7%</td>
<td>14.6%</td>
</tr>
<tr>
<td>Josephine</td>
<td>21.7%</td>
<td>19.7%*</td>
<td>19.3%</td>
</tr>
<tr>
<td>Klamath</td>
<td>28.4%</td>
<td>29.4%</td>
<td>19.9%</td>
</tr>
<tr>
<td>Lake</td>
<td>28.4%</td>
<td>27.1%</td>
<td>16.8%</td>
</tr>
<tr>
<td>Lane</td>
<td>26.4%</td>
<td>26.5%</td>
<td>17.6%</td>
</tr>
</tbody>
</table>
### TABLE A.3. AGE-ADJUSTED AND UNADJUSTED PREVALENCE OF OBESITY, CURRENT SMOKER AND LACK OF PHYSICAL ACTIVITY AMONG ADULTS, BY COUNTY, OREGON, 2008–2011, CONTINUED

<table>
<thead>
<tr>
<th>County</th>
<th>Obese Unadjusted</th>
<th>Obese Age-adjusted</th>
<th>Current cigarette smoker Unadjusted</th>
<th>Current cigarette smoker Age-adjusted</th>
<th>Lack of physical activity Unadjusted</th>
<th>Lack of physical activity Age-adjusted</th>
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<tbody>
<tr>
<td>OREGON</td>
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<td>24.8%</td>
<td>–</td>
<td>16.3%</td>
<td>–</td>
<td>17.5%</td>
</tr>
<tr>
<td>Lincoln</td>
<td>27.5%</td>
<td>26.6%</td>
<td>22.8%</td>
<td>27.4%*</td>
<td>21.3%</td>
<td>20.1%</td>
</tr>
<tr>
<td>Linn</td>
<td>30.5%</td>
<td>30.6%*</td>
<td>18.2%</td>
<td>19.0%</td>
<td>24.4%</td>
<td>24.6%*</td>
</tr>
<tr>
<td>Malheur</td>
<td>27.7%</td>
<td>27.9%</td>
<td>22.0%</td>
<td>22.9%</td>
<td>19.2%</td>
<td>18.3%</td>
</tr>
<tr>
<td>Marion</td>
<td>28.0%</td>
<td>28.0%*</td>
<td>14.2%</td>
<td>14.4%</td>
<td>18.1%</td>
<td>18.0%</td>
</tr>
<tr>
<td>Morrow</td>
<td>29.5%</td>
<td>29.7%</td>
<td>14.5%</td>
<td>14.7%</td>
<td>32.0%</td>
<td>31.3%*</td>
</tr>
<tr>
<td>Multnomah</td>
<td>22.4%</td>
<td>22.5%*</td>
<td>14.6%</td>
<td>14.5%*</td>
<td>14.9%</td>
<td>15.0%*</td>
</tr>
<tr>
<td>Polk</td>
<td>27.4%</td>
<td>27.2%</td>
<td>13.2%</td>
<td>14.2%</td>
<td>16.8%</td>
<td>16.4%</td>
</tr>
<tr>
<td>Tillamook</td>
<td>29.1%</td>
<td>27.9%</td>
<td>19.8%</td>
<td>23.0%</td>
<td>17.9%</td>
<td>15.3%</td>
</tr>
<tr>
<td>Umatilla</td>
<td>34.4%</td>
<td>34.8%*</td>
<td>20.6%</td>
<td>21.0%*</td>
<td>26.2%</td>
<td>26.2%*</td>
</tr>
<tr>
<td>Union</td>
<td>27.4%</td>
<td>28.1%</td>
<td>10.8%</td>
<td>11.6%</td>
<td>16.0%</td>
<td>16.3%</td>
</tr>
<tr>
<td>Wallowa</td>
<td>18.3%</td>
<td>18.1%</td>
<td>14.9%†</td>
<td>16.9%†</td>
<td>32.6%</td>
<td>35.1%†</td>
</tr>
<tr>
<td>Washington</td>
<td>21.9%</td>
<td>21.9%*</td>
<td>12.7%</td>
<td>12.6%*</td>
<td>16.7%</td>
<td>16.7%</td>
</tr>
<tr>
<td>Wheeler</td>
<td>22.6%†</td>
<td>–</td>
<td>12.1%†</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Yamhill</td>
<td>34.8%</td>
<td>35.0%*</td>
<td>18.4%</td>
<td>18.5%</td>
<td>28.4%</td>
<td>28.2%*</td>
</tr>
<tr>
<td>Gilliam/Sherman/Wasco</td>
<td>35.2%</td>
<td>35.3%*</td>
<td>13.7%</td>
<td>14.4%</td>
<td>19.6%</td>
<td>18.1%</td>
</tr>
</tbody>
</table>

* Statistically significant difference compared with all other counties (p-value ≤ 0.05)
† This number may be statistically unreliable and should be interpreted with caution.
– This number is suppressed because it is statistically unreliable.

**Data source:** Oregon BRFSS County Combined Dataset 2008–2011

**Note:** Age-adjusted estimates are adjusted to the 2000 Standard Population using three age groups (18–34, 35–54 and 55+).
**APPENDIX B: DATA SOURCES**

The data sources used in this report are listed below. Data sources are described with brief limitations.

### Behavioral Risk Factor Surveillance System (BRFSS)

**Description:** The BRFSS is a random-digit dialed telephone survey that is conducted year-round among Oregon adults aged 18 years or older. The BRFSS includes questions on health behavior risk factors such as diet, weight control, tobacco and alcohol use, physical activity, preventive health screenings, and use of health care services. The data are weighted to represent all adults aged 18 years and older. A core set of questions is asked annually, and other topics are surveyed on a rotating basis.

Every few years, Oregon conducts additional BRFSS surveys among under-represented races and ethnicities. The results of these surveys are combined with statewide BRFSS data to provide more stable estimates for chronic diseases and related risk factors among these groups of Oregonians. The most recent race/ethnicity oversamples were conducted in 2010–2011. In addition, BRFSS surveys from 2008–2011 were aggregated to produce more reliable county-level prevalence estimates.

Starting in 2010, Oregon began collecting data from those who use cell phones, causing the method for adjusting (weighting) the data to the demographics of the state to change. This new method is called “raking.” Because of these changes, data prior to 2010 are not directly comparable to the data from 2010 forward. In addition, the national BRFSS also made these changes but did not implement the changes until 2011.

**Limitations:** BRFSS estimates pertain only to the adult population aged 18 years or older living in households. Respondents are identified through telephone-based methods. The survey started collecting data for cell phones in 2009. Cell phone data were incorporated for analysis in Oregon in 2010. According to a recent publication from the National Center for Health Statistics, in 2011 more than 38% of households in Oregon were wireless-only. Finally, results obtained through BRFSS surveys also are limited in that they represent self-reported responses. Not all questions in the BRFSS have been validated.

<table>
<thead>
<tr>
<th>County</th>
<th>Unadjusted</th>
<th>Age-adjusted</th>
<th>Unadjusted</th>
<th>Age-adjusted</th>
<th>Unadjusted</th>
<th>Age-adjusted</th>
</tr>
</thead>
<tbody>
<tr>
<td>OREGON</td>
<td>24.8%</td>
<td>–</td>
<td>16.3%</td>
<td>–</td>
<td>17.5%</td>
<td>–</td>
</tr>
<tr>
<td>Lincoln</td>
<td>27.5%</td>
<td>26.6%</td>
<td>22.8%</td>
<td>27.4%</td>
<td>21.3%</td>
<td>20.1%</td>
</tr>
<tr>
<td>Linn</td>
<td>30.5%</td>
<td>30.6%</td>
<td>18.2%</td>
<td>19.0%</td>
<td>24.4%</td>
<td>24.6%</td>
</tr>
<tr>
<td>Malheur</td>
<td>27.7%</td>
<td>27.9%</td>
<td>22.0%</td>
<td>22.9%</td>
<td>19.2%</td>
<td>18.3%</td>
</tr>
<tr>
<td>Marion</td>
<td>28.0%</td>
<td>28.0%</td>
<td>14.2%</td>
<td>14.4%</td>
<td>18.1%</td>
<td>18.0%</td>
</tr>
<tr>
<td>Morrow</td>
<td>29.5%</td>
<td>29.7%</td>
<td>14.5%</td>
<td>14.7%</td>
<td>32.0%</td>
<td>31.3%</td>
</tr>
<tr>
<td>Multnomah</td>
<td>22.4%</td>
<td>22.5%</td>
<td>14.6%</td>
<td>14.5%</td>
<td>14.9%</td>
<td>15.0%</td>
</tr>
<tr>
<td>Polk</td>
<td>27.4%</td>
<td>27.2%</td>
<td>13.2%</td>
<td>14.2%</td>
<td>16.8%</td>
<td>16.4%</td>
</tr>
<tr>
<td>Tillamook</td>
<td>29.1%</td>
<td>27.9%</td>
<td>19.8%</td>
<td>23.0%</td>
<td>17.9%</td>
<td>15.3%</td>
</tr>
<tr>
<td>Umatilla</td>
<td>34.4%</td>
<td>34.8%</td>
<td>20.6%</td>
<td>21.0%</td>
<td>26.2%</td>
<td>26.2%</td>
</tr>
<tr>
<td>Union</td>
<td>27.4%</td>
<td>28.1%</td>
<td>10.8%</td>
<td>11.6%</td>
<td>16.0%</td>
<td>16.3%</td>
</tr>
<tr>
<td>Wallowa</td>
<td>18.3%</td>
<td>18.1%</td>
<td>14.9%†</td>
<td>16.9%†</td>
<td>32.6%</td>
<td>35.1%†</td>
</tr>
<tr>
<td>Washington</td>
<td>21.9%</td>
<td>21.9%</td>
<td>12.7%</td>
<td>12.6%</td>
<td>16.7%</td>
<td>16.7%</td>
</tr>
<tr>
<td>Wheeler</td>
<td>22.6%†</td>
<td>–</td>
<td>12.1%†</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Yamhill</td>
<td>34.8%</td>
<td>35.0%</td>
<td>18.4%</td>
<td>18.5%</td>
<td>28.4%</td>
<td>28.2%</td>
</tr>
<tr>
<td>Gilliam/Sherman/Wasco</td>
<td>35.2%</td>
<td>35.3%</td>
<td>13.7%</td>
<td>14.4%</td>
<td>19.6%</td>
<td>18.1%</td>
</tr>
</tbody>
</table>

TABLE A.3. AGE-ADJUSTED AND UNADJUSTED PREVALENCE OF OBESITY, CURRENT SMOKER AND LACK OF PHYSICAL ACTIVITY AMONG ADULTS, BY COUNTY, OREGON, 2008–2011, CONTINUED
Hospital Discharge Dataset

Description: The Hospital Discharge Dataset provides information on hospital discharges from all acute care hospitals in Oregon except two Veterans Administration hospitals. The dataset includes admit and discharge dates, diagnosis and procedural codes, financial charges, primary payer, and patient demographic information.

Limitations: Prior to 2008, the Hospital Discharge Dataset did not include identifying information that would allow us to ascertain when a single person had multiple hospitalizations; therefore, the calculated rate was the number of hospitalizations per the Oregon population rather than number of different people hospitalized per the Oregon population. In addition, prior to 2008, the dataset did not include information on race or ethnicity. Starting in 2008, the data necessary for investigating repeat hospitalizations for chronic diseases and hospitalizations by race/ethnicity were available and reported.

Oregon Health Panel Survey (OHPS)

Description: The Oregon Health Panel Survey was conducted in 2012 among non-institutionalized adults aged 18 years or older. Panel members were recruited using random digit dialing sampling based on landline telephone numbers and/or address-based sampling methodologies. A sample of panel members was then drawn at random for the survey. Topics on the survey include knowledge and attitudes toward colorectal screening, trans fats, sugary drinks, and other tobacco products. The data are weighted to represent all adults aged 18 years and older.

Limitations: OHPS estimates pertain only to the adult population aged 18 years or older living in households.

Oregon Healthy Teens (OHT) Survey

Description: Since 2000, the Youth Risk Behavior Survey (developed by the CDC) and the Oregon Public School Drug Use Survey were combined for Oregon into a single annual survey called Oregon Healthy Teens (OHT) Survey. The sample size varies from 1,600 to 32,000 per year, and the final data are weighted to more accurately represent Oregon eighth- and 11th-graders. The survey assesses health topics such as tobacco and alcohol use, HIV knowledge and attitudes, eating behaviors, nutrition and exercise.

Limitations: One limitation is that participation by school systems in the OHT is voluntary. However, participation rates have been high thus far. Another limitation is that the OHT questionnaire is not currently available in non-English versions except for a Spanish booklet that can be used as a reference when filling out the English version of the survey. A third limitation is that 3% of surveys were eliminated due to combinations of “dubious” answers and another 5% were eliminated because the student did not fill out grade or gender information.

Vital records data (full count data)

Birth Certificate Statistical File

The Birth Certificate Statistical File includes all births occurring in Oregon and births occurring out of state to Oregon
residents. This database includes parental demographic information, conditions of the newborn, congenital abnormalities, medical factors of pregnancy, method of delivery, and complications of labor and delivery. It also includes tobacco, alcohol or illicit drug use during pregnancy. Information about maternal diabetes and gestational diabetes is also included.

**Death Certificate Statistical File**

The Death Certificate Statistical File includes all deaths occurring in Oregon and deaths occurring out of state to Oregon residents. Data are obtained from death certificates that are collected from the state registrar. The data are used to examine trends in mortality and causes of death. This database includes cause of death, date and place of death, and decedent demographic information. The mortality data analyzed for this report consists of deaths among Oregon residents.

**Limitations of birth and death files:** The accuracy of the data depends on the accuracy with which the birth attendant, certifying physician or medical examiner describes the circumstances surrounding the birth or the underlying causes of death.

**CDC Wonder database**

The CDC Wonder database provides National Center for Health Statistics (NCHS) national statistical analysis and reporting of deaths from specific diseases.
In this report, some numbers include a warning that they are potentially unreliable or they are unreliable and suppressed (not shown). In general, reliability refers to the stability of a number being reported.

The guidelines used to gauge reliability differ depending on the type of data used. Some data sources include all events under study (such as births, deaths or hospitalizations). These will be referred to as “full count.” Other data sources are from surveys of randomly selected individuals, adjusted to represent the full population. These will be referred to as “survey.” The text below briefly describes the methods used to determine if the information in this report includes a warning for reliability or is suppressed.

**Full count**
Determine the number of events (n).
- \( n \geq 12 \): Report the estimate.
- \( n \geq 5 \) and \( n < 12 \): Report the estimate and include a warning regarding reliability.
- \( n < 5 \): Do not report the estimate and state that it is suppressed.

**Survey**
Determine the total number of persons surveyed (x) for a particular question and calculate the standard error (SE) for the reported number. Use the SE to calculate a statistic called the relative standard error (RSE). RSE is a measure of the variability of an estimate compared with the estimate itself.
1. Determine if the estimate is being calculated on a full population (i.e., everyone) or a subpopulation (i.e., a smaller group of all people surveyed who share a common trait such as race, county or medical condition).

2. If the full population, determine if the denominator is $\geq 50$. If yes, proceed; if not, suppress.

3. If a subpopulation, determine if the denominator is $\geq 20$. If yes, proceed; if not, suppress.

4. Apply the following logic to each RSE:
   - RSE $< 30\%$: Report the estimate.
   - RSE $\geq 30\%$ and RSE $< 50\%$: Report the estimate and include a warning regarding reliability.
   - RSE $\geq 50\%$: Do not report the estimate and state that it is suppressed.