The Impact of Heart Disease and Stroke in Utah 2012

UTAH DEPARTMENT OF HEALTH
Heart Disease & Stroke Prevention Program

Acknowledgments and Citation

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Utah Heart Disease and Stroke Prevention Program

Program Overview

The aim of Utah Department of Health's Heart Disease and Stroke Prevention Program (HDSPP) is to improve the health and quality of life for all Utahns by reducing death and disability from cardiovascular diseases. HDSPP, in collaboration with many partners, has reduced the impact of heart disease and stroke through strategies that target health systems, worksites, and communities.

Components of Utah's Heart Disease and Stroke Prevention Program

Improving Blood Pressure Control

Status: Ongoing

Since 2007, HDSPP has worked with the Association for Utah Community Health (AUCH) to improve their systems of care for prevention and treatment of cardiovascular disease. Between 2007 and 2012, participating clinics improved high blood pressure control rates from 28% to 54%.

In FY2012, HDSPP began working the Utah Diabetes Prevention and Control Program and AUCH to implement the Patient Centered Medical Home (PCMH) initiative in 10 community health centers. PCMH helps clinics redesign their processes to improve patient care and chronic disease prevention, treatment, and outcomes. This project reaches approximately 59,000 adults ages 18-84.

New for FY2013, HDSPP will provide training for more than 6,000 Utah health care providers on the latest clinical guidelines for measuring and treating hypertension. In addition, HDSPP will work with HealthInsight to design and implement high blood pressure registries. The registries will help clinics quickly identify patients diagnosed with high blood pressure, determine how well they are managing those patients, and help guide quality improvement efforts.

Improving Chronic Disease Self-Management

Status: Ongoing

HDSPP partners with the Utah Arthritis Program developing infrastructure for a chronic disease self-management program titled Living Well. HDSPP provides resources that help five counties in Southwest Utah to expand classes, train teachers, and develop a sustainable referral system to the classes from primary care providers.

Engaging Community Health Workers

Status: New for FY2013

HDSPP, in partnership with the University of Utah, is conducting a statewide assessment of community health workers in Utah. The results of the assessment will be used to develop a statewide plan for how to best utilize community health workers for chronic disease prevention, including heart disease and stroke.

Improving Worksite Health Insurance

Status: New for FY2013

HDSPP will work with other Utah Department of Health Programs to educate employers about the benefits of including preventive services as a part of comprehensive insurance packages for employees.

Supporting WISEWOMAN

Status: Ongoing

HDSPP works with the Utah WISEWOMAN Program to improve clinic systems that affect lifestyle patient education and follow-up procedures for patients with hypertension, reaching approximately 2,400 women in Utah.

The "Get to Know Your Blood Pressure" Campaign

Status: Ongoing

Through radio and online ads, print materials, and news articles, HDSPP's awareness campaign motivates the general public to understand their blood pressure, its important link to cardiovascular disease, and what they can do to achieve and maintain a healthy value. Messages reach English- and Spanish-speaking Utahns statewide, with targeted efforts in rural areas. In FY2011, more than 890,000 Utahns were reached through statewide media efforts.

Reducing Sodium Intake

Status: Ongoing

The HDSPP partners with the Utah Food Bank and was successful in lowering sodium content in more than 24,000 senior meal boxes during FY2012. These activities will continue and be expanded in FY2013. In FY2013, HDSPP will partner with the Davis County Health Department to improve low sodium food options on menus and establish low sodium purchasing policies for area vendors.

Evaluation and Surveillance

Status: Ongoing

HDSPP regularly tracks data that describe how Utahns are affected by cardiovascular diseases and their risk factors. The data are used to assess the magnitude of the problem, monitor the implementation of our interventions, assess changes in disease trends or distribution, and identify the populations that are most affected.

Increasing Access to AEDs

Status: Ongoing

HDSPP, jointly with the American Heart Association and the South Jordan Fire Department, is working with employers, governments, and schools to improve access to Automatic External Defibrillators (AEDs) throughout the state.

Improving Emergency Response

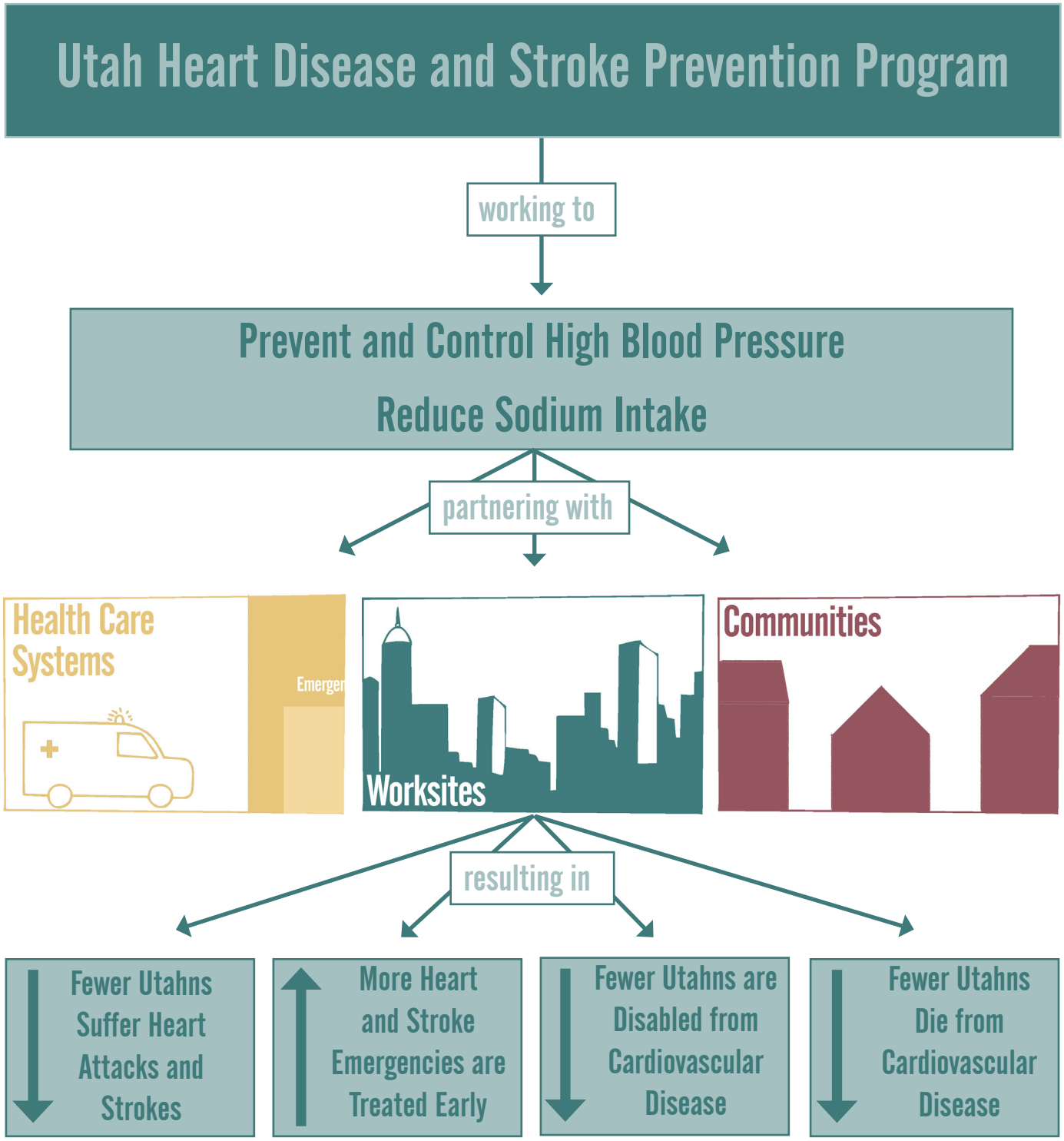
Status: Maintenance

HDSPP worked with the UDOH Bureau of Emergency Medical Services and Preparedness and the Utah Hospital Association to implement a Stroke Transport Verification System. Since statewide interventions began, the system has increased the use of tPA (a life-saving drug given to stroke patients) by 33%. HDSPP also initiated a stroke registry, which represents 82% of Utah's stroke volume.

Looking Forward

Despite Utah's success in improving cardiovascular health, more remains to be done. HDSPP is currently the only organization in Utah charged with coordinating statewide efforts to prevent heart disease and stroke and reduce risk factors, including high blood pressure and high cholesterol. Health systems, local health departments, and community organizations look to HDSPP as the primary leader in cardiovascular health efforts and the sole source of state cardiovascular health data.

Continued federal and state-level support for heart disease and stroke prevention is necessary to make further strides in reducing the disease, disability, and death associated with cardiovascular disease. Prevention saves lives and money.


Utah Heart Disease and Stroke Prevention Program
working to
Prevent and Control High Blood Pressure
Reduce Sodium Intake
partnering with
Health Care Systems
Emergen
Worksites
Communities
resulting in
Fewer Utahns Suffer Heart Attacks and Strokes
More Heart and Stroke Emergencies are Treated Early
Fewer Utahns are Disabled from Cardiovascular Disease
Fewer Utahns Die from Cardiovascular Disease

Did You Know?

Approximately **49%** of adults have **at least one major risk factor** for heart disease and stroke. Below are the percentages of U.S. adults with heart disease and stroke risk factors.

Risk Factor	%
No Exercise in Past 30 Days (2010)	23.8
Obesity (2010)	27.4
High Blood Pressure (2009)	28.1
Cigarette Smoking (2010)	17.3
High Cholesterol (2009)	28.9
Diabetes (2010)	8.5

Source: BRFSS

Executive Summary

Cardiovascular disease (CVD) refers to diseases that affect the heart and blood vessels. Diseases of the heart include coronary heart disease, heart failure, sudden cardiac death, and hypertensive heart disease. Diseases of the blood vessels include stroke, atherosclerosis, and hypertension.

The prevention of heart disease and stroke is a public health priority because:

- Cardiovascular disease is the leading cause of death in Utah and the U.S. [36]
- One in three U.S. adults has some form of cardiovascular disease. [36]
- CVD costs more than any other diagnostic group. [36]

No single statistic or data source describes the burden completely. The way cardiovascular disease and its risk factors are distributed among the Utah population follows some national trends and departs from others. The exact causes and extent of the differences are complex, difficult to quantify, and variable by CVD subtype or risk factor. For this reason, and because some data are derived from sources available only at the national level, this report provides both Utah and U.S. data.

To understand the impact of CVD among Utah adults, the Heart Disease and Stroke Prevention Program (HDSPP) measures the prevalence, morbidity, and mortality from CVD and its risk factors on an ongoing basis. This report describes the findings of the HDSPP.

Utah has lower CVD mortality and risk factor prevalence than other states.

Between 2005 and 2007, Utah ranked favorably among other states for cardiovascular mortality rates. [36]

Table 1: Disease Rate and State Rank, 2005-2007

Disease	Age-Adjusted Rate per 100,000	State Rank (1 is lowest)
Coronary Heart Disease	78.5	1
All Cardiovascular Diseases	213.2	3
Stroke	40.4	13

Source: Roger VL, 2011.

Utah's relatively low mortality rates are often attributed to the relatively low prevalence of risk factors, such as cigarette smoking, in the adult population.

Table 2: Health Measure Prevalence and State Rank

Health Measure, Most Recent Year	Age-Adjusted Prevalence	State Rank (1 is lowest)
Cigarette Smoking, 2010	8.8%	1
High Cholesterol, 2010	25.9%	7
High Blood Pressure, 2009	25.4%	9
Obesity, 2010	24.1%	10
Diabetes, 2010	7.2%	15
Exercise in Last 30 Days, 2010	81.5%	45

Source: Utah BRFSS.

Utah also has one of the highest rates of physical activity (71.8%) of the 50 states.

Utah's relative advantages over other states could be construed to mean that addressing CVD should not be a public health priority. However, state rankings are just one perspective on a complex issue and do not describe the impact of heart disease and stroke on Utah residents.

Utah departs from national trends in several key areas.

- Nationally in 2008, stroke dropped from the third leading cause of death to the fourth. Stroke remains the third leading cause of death in Utah.
- Utah has a relatively high heart failure death rate and a low heart failure hospitalization rate compared to other states. Utah's heart failure death rate is so high it places Utah among states with very high overall cardiovascular disease burdens, such as Mississippi and Oklahoma. Yet, Utah's 2009 age-specific heart failure hospitalization rates were already below the national targets for Healthy People 2020.
- Utah has the lowest rate of cholesterol screening among the 50 states. This suggests that the prevalence of high cholesterol is underestimated.

Utah's mortality trends are changing.

- From 1996 to 2010, Utah's mortality rate from stroke followed the U.S. rate through significant declines.
- Utah's mortality rate from heart disease declined more slowly than the national rate and did not decline at all between 2009 and 2010.
- Utahns are dying from cardiovascular disease at younger ages than in the past. Between 1999 and 2009, the percentage of stroke deaths occurring among Utahns under age 65 nearly doubled, from 8.9% to 15.3%. In the same time period, the percentage of coronary heart disease deaths occurring among Utahns under age 65 increased from 14.9% to 21.0%.

The prevalence of risk factors for CVD increased between 1989 and 2010.

- The adult obesity rate more than doubled, from 10.4% to 24%. Presently, three in five Utah adults are overweight or obese.
- The adult diabetes rate nearly doubled, from 3.9% to 7.3%.
- The percentage of adults who reported being told they had high cholesterol increased from 16.1% to 25.9%.

The percentage of adults who reported being told they had high blood pressure remained steady over the 22-year period.

The burden of CVD varied among groups depending on age, gender, race, ethnicity, education, income, and geographic location.

- Utahns with lower education and household income levels had higher CVD mortality and risk factor prevalence than Utahns with higher education and household income levels.
- White Utahns had higher CVD mortality rates than racial and ethnic minority Utahns. However, minority Utahns died from CVD at younger ages than Whites.
- Geographic differences varied by disease subtype (i.e., all CVD, coronary heart disease, and stroke) and by type of impact (i.e., prevalence, hospitalization, and mortality). Among small areas, Juab/Millard/Sanpete counties and Sevier/Piute/Wayne counties had higher mortality rates than the state for coronary heart disease (CHD), stroke, and heart failure across CVD subtypes. The small areas in western Salt Lake County, Riverdale, and Roy/Hooper had higher hospitalization rates than the rest of the state for CHD, stroke, and heart failure. While most small areas had one or no risk factors (e.g., obesity, cigarette smoking, or physical inactivity) higher than the state rate, Tooele County had four and TriCounty had three.

Cardiovascular disease is expensive.

In 2009, cardiovascular disease and its risk factors accounted for three of the five top chronic diseases driving health care costs in Utah.

Table 3: Percentage of Total Utah Health Care Costs and Rank by Disease Type, 2009

Disease	Percentage of Total Utah Health Care Costs	Rank (1 is most expensive)
Diabetes	11.1%	1
High Blood Pressure	5.9%	2
Asthma	4.6%	3
Coronary Heart Disease	3.3%	4
Breast Cancer	1.9%	5

Source: Utah Office of Health Care Statistics, 2010.

Additionally, in 2010, four CVD-related conditions ranked among the top 10 most expensive chronic conditions in the state, with a combined annual treatment expense of more than $206 million.

Table 4: Most Expensive Chronic Diseases, 2010

Chronic Disease	Annual Cost to Treat	Individuals Treated
1. Diabetes	$202,885,766	48,108
2. High Blood Pressure	$111,284,114	60,381
3. Asthma	$78,642,310	30,970
4. Coronary Heart Disease	$52,236,140	7,995
5. Breast Cancer	$30,563,297	3,150
6. Depression	$28,162,682	32,415
7. End Stage Renal Disease	$26,188,497	2,051
8. Heart Failure	$21,696,168	2,081
9. Stroke	$21,301,554	2,039
10. Chronic Obstructive Pulmonary Disease (COPD)	$13,335,058	1,647

Source Utah APCD

Despite declining lengths of stay for CVD-related hospitalizations, hospital charges doubled or tripled between 1999 and 2009.

- Average length of stay for stroke hospitalization decreased from 5.7 days to 4.3 days; average charge per hospitalization increased from $13,228 to $29,795.
- Average length of stay for heart failure decreased from 4.9 days to 4.5 days; average charge per hospitalization increased from $10,352 to $28,423.

- Average length of stay for acute myocardial infarction (heart attack) decreased from 4.8 days to 4.1 days; average charge per hospitalization increased from $22,534 to $50,080.

Because hospitalization rates for CVD occur overwhelmingly in the population aged 65 and above, the cost burden falls on taxpayers as Medicare pays most of those bills.

Utah has significant room for improvement.

In 2011, the Centers for Disease Control and Prevention (CDC) advised state Heart Disease and Stroke Prevention programs to invest the majority of their resources on the "ABCS" of heart disease and stroke prevention, with the main focus on controlling high blood pressure and reducing sodium intake. The ABCS are:[16]

- Aspirin: Increase low-dose aspirin therapy according to recognized prevention guidelines
- Blood Pressure: Prevent and control high blood pressure; reduce sodium intake
- Cholesterol: Prevent and control high cholesterol
- Smoking: Increase the number of smokers counseled to quit; increase the availability of low-cost and no-cost cessation products.

The CDC requires that states receiving heart disease and stroke prevention funds implement science-based interventions that focus on policy and systems change and that will have a broad population impact. In 2010, the Institute of Medicine published two reports that reinforce the CDC's focus on high blood pressure and sodium as a means to reduce death and disability from cardiovascular disease: *A Policy and Systems Change Approach to Prevent and Control Hypertension* and *Strategies to Reduce Sodium Intake.*

This report provides state-specific data to help mobilize partners and allies in planning and interventions around CVD and its risk factors. *Impact of Heart Disease and Stroke in Utah 2012* reflects these priority areas in describing the major cardiovascular diseases (all cardiovascular disease, coronary heart disease, heart failure, and stroke) and the major modifiable risk factors (high blood pressure, high cholesterol, diabetes, obesity, and cigarette smoking).

Did You Know?

Many people mistakenly think of heart disease and stroke as conditions that affect only older adults. However, a large number of **younger people suffer heart attacks and strokes**. In the U.S., more than 150,000 heart disease and stroke deaths occur every year among people younger than 65.

Source: Centers for Disease Control and Prevention.
For more information, please visit www.millionhearts.hhs.gov.

Introduction

Cardiovascular disease (CVD) has been the leading cause of death in Utah and in the United States for a century, except for the year 1918 due to pandemic influenza. Cardiovascular disease encompasses a broad spectrum of diseases including coronary heart disease, hypertensive diseases, cerebrovascular disease (stroke), and other diseases of the heart and peripheral vascular system.

Each year, CVD claims the lives of more than 3,500 Utahns. Nearly one in three Utah deaths (32.9%) is related to heart disease and stroke, and the proportion of deaths that occur among those under age 65 has increased 5% in the past 10 years. Most CVD deaths are from coronary heart disease. Coronary heart disease accounted for 36% of all CVD-related deaths and 10% of all Utah deaths in 2009.

Men have higher CVD mortality rates compared to women. The age-adjusted mortality rate from CVD in 2009 in Utah was 191.6 per 100,000 for men and 171.6 for women. Other at-risk groups, according to national data, include racial and ethnic minority groups such as Blacks, Hispanic persons, and American Indians/Alaska Natives. CVD mortality rates are higher among Utahns living in frontier areas compared to those living in rural and urban areas.

Mortality is only part of the burden of CVD. In 2009, more than 18,600 Utah residents were hospitalized with CVD-related illnesses. This represents a huge cost to the individuals and the State. Hospitalization charges in Utah exceeded $665 million. Two-thirds (66.6%) of those charges were billed to government programs.

Cardiovascular disease is not only the leading cause of death, it is a leading cause of disability. Between 2007 and 2009, 48% of adults who had experienced a stroke or heart attack, or who had coronary heart disease, reported being limited in their activities, compared to 18% of all Utahns. More than 22% of persons who have had a stroke, heart attack, or coronary heart disease reported at least seven days of poor mental health within the last month, compared to 15% of all Utahns. Thirty-eight percent of those who had a heart attack and 30% who had a stroke in 2009 attended rehabilitation. Such programs help people develop skills to compensate for disabilities that result from a cardiovascular event.

Multiple risk factors contribute to CVD. Risk factors that cannot be controlled include age and family history. Risk factors that can be controlled include high blood pressure, high cholesterol, cigarette smoking, diabetes, physical inactivity, and obesity. From 2007 through 2009, 27% of Utah adults reported having at least one risk factor for CVD, while more than one-third (37%) had at least two risk factors. Rates for adults with high blood pressure or who are physically inactive have not declined. The percentage of adults who have high blood cholesterol, diabetes, or who are obese has risen in the past 10 years.

Although mortality from CVD has declined, Utah now faces the prospect that the increasing prevalence of risk factors could reverse this trend. Efforts to address high blood pressure, high cholesterol, smoking, diabetes, physical inactivity, and unhealthy weight must be coordinated, complementary, and aimed at the highest level of systems change. Moreover, they must target the subpopulations that carry the highest burdens. *The Impact of Heart Disease and Stroke in Utah 2012* describes the major cardiovascular diseases and their associated risk factors. This document serves as the foundation for strategic planning related to CVD in the State.

Utah Demographics

The burden of heart disease and stroke is dynamic. Within Utah, population subgroups experience cardiovascular disease risk factors, prevalence, and consequences differently. Because the population and disease burden are constantly changing, it is critical that public health and health care systems be alert to these changes so they can better respond to Utah's needs.

Population Growth

Utah's population is growing rapidly. As it grows, it has diversified by race, ethnicity, religion, and socioeconomic status. Since 1970, migration to Utah from other states and countries has exceeded the rate of people leaving the state. This trend has been propelled largely by relatively favorable economic conditions and augmented by high fertility rates, especially among foreign-born residents.[35] Between 2000 and 2010, Utah's population grew by 24%. The five fastest-growing counties in the state were Wasatch (54.7%), Washington (52.9%), Tooele (42.9%), Utah (40.2%), and Iron (36.7%).

Population Density

Utah is the sixth most urbanized state in the U.S., with 27.2 persons per square mile compared to 79.6 nationally. The majority of Utah's population resides along the Wasatch Front, a 75-mile strip running from Ogden (North) to Provo (South), with the capital of Salt Lake City in-between. The Wasatch Front comprises 5% of the state's land mass but is home to 75% of the state's population. The remainder of the population resides in 95% of the state's land mass comprised of rural areas of more than 6 but fewer than 100 persons per square mile and frontier areas of fewer than six persons per square mile. Approximately one-fifth (21%) of the state's population lives in rural areas (41.2% of the land mass) and 3.7% lives in frontier areas (54.8% of the land mass). Having to travel long distances for primary care can make it harder for Utahns to be diagnosed with and manage chronic conditions.

Additionally, emergency medical services (EMS) response times for acute cardiovascular events may be compromised by greater distances to hospitals with the necessary facilities.

Age

Utah has the youngest population and the highest birthrate of the 50 states. In 2008, Utah's median age was 28.7 years compared with the national median age of 36.8 years.[34] Utah's relatively high birthrate is reflected in the fact that 31.2% of its population is under age 18, compared with 24.3% of the U.S. population. [39] Only 9.0% of Utah's population is aged 65 and older, compared with 13.0% of the U.S. population. [39]

Table 5: Percentage of Population Age 65 and Older by Small Area, 2010

Small Area Name (Number)	Percentage Age 65+
State	9.0%
Brigham City (1)	12.1%
Other Box Elder County (2)	9.8%
Logan (3)	7.4%
Other Cache/Rich County (4)	8.3%
Ben Lomond (5)	10.6%
Morgan/East Weber County (6)	10.2%
Downtown Ogden (7)	8.0%
South Ogden (8)	12.5%
Roy/Hooper (9)	8.1%
Riverdale (10)	12.4%
Clearfield/Hill AFB (11)	5.7%
Layton (12)	7.2%
Syracuse/Kaysville (13)	6.8%
Farmington/Centerville (14)	7.8%
Woods Cross/North Salt Lake (15)	7.9%
Bountiful (16)	15.1%
Rose Park (17)	8.5%
Avenues (18)	13.9%
Foothill/U of U (19)	13.5%
Magna (20)	6.1%
Glendale (21)	7.8%

Small Area Name (Number)	Percentage Age 65+
West Valley West (22)	6.1%
West Valley East (23)	8.7%
Downtown Salt Lake (24)	9.7%
South Salt Lake (25)	9.8%
Millcreek (26)	15.6%
Holladay (27)	18.7%
Cottonwood (28)	13.9%
Kearns (29)	5.8%
Taylorsville (30)	9.0%
Murray (31)	13.5%
Midvale (32)	9.8%
West Jordan North (33)	3.5%
West Jordan/Copperton (34)	5.0%
South Jordan (35)	3.6%
Sandy Center (36)	4.1%
NE Sandy (37)	2.8%
SE Sandy (38)	5.8%
Riverton/Draper (39)	8.2%
Tooele Co. (40)	8.4%
Lehi/Cedar Valley (41)	5.8%
American Fork/Alpine (42)	4.6%
Pleasant Grove/Lindon (43)	8.2%
North Orem (44)	5.1%
West Orem (45)	7.0%
East Orem (46)	6.0%
Provo/BYU (47)	6.3%
Provo South (48)	6.7%
Springville/Spanish Fork (49)	9.8%
South Utah County (50)	8.6%
Summit County (51)	4.2%
Wasatch County (52)	7.3%

Small Area Name (Number)	Percentage Age 65+
TriCounty LHD (53)	6.8%
Juab/Millard/Sanpete Counties (54)	8.2%
Sevier/Piute/Wayne Counties (55)	9.2%
Carbon/Emery Counties (56)	10.8%
Grand/San Juan Counties (57)	11.1%
St. George (58)	13.6%
Other Washington County (59)	13.3%
Cedar City (60)	12.0%
Other Southwest Dist. (61)	17.7%
W. Jordan Northeast (62)	13.9%
W. Jordan Southeast (63)	9.4%
W. Jordan West, Copperton (64)	15.8%

Source: Utah Population Estimates.

Education

Between 2005 and 2009, 90.4% of Utah adults aged 25 and older had a high school degree or higher and 28.7% had at least a bachelor's degree. This was similar to the national average, with 85% of adults having at least a high school degree and 28.5% having at least a bachelor's degree. [41]

Income

In 2009, median household income in Utah was $55,183, with an average of 3.1 persons per household. The median household income in the U.S. was $50,221, with an average of 2.6 persons per household Twelve percent of Utahns had household incomes below the poverty level. Between 2005 and 2009, Utah had a significantly lower per capita income than the U.S. overall: $22,684 compared to $27,041.[40]

Race and Ethnicity

In most parts of the U.S., racial and ethnic minorities have lower rates of access to health care, receive lower quality health care, and have higher morbidity and mortality from certain diseases than Whites. In Utah, measuring differences in disease impact by race and ethnicity has been challenging due to very small populations of minorities. However, the expansion of minority populations in Utah and increased documentation of race and ethnicity in medical records have contributed to higher quality data.
Utah's trend toward racial and ethnic diversity launched in the 1990s, with one-fifth of the population growth attributed to international immigrants and one-third to expanding racial and ethnic minority populations.[33] In 2008, the population of every racial and ethnic group grew faster than the overall state population. Among racial groups between 2003 and 2008, the highest growth rate occurred among the

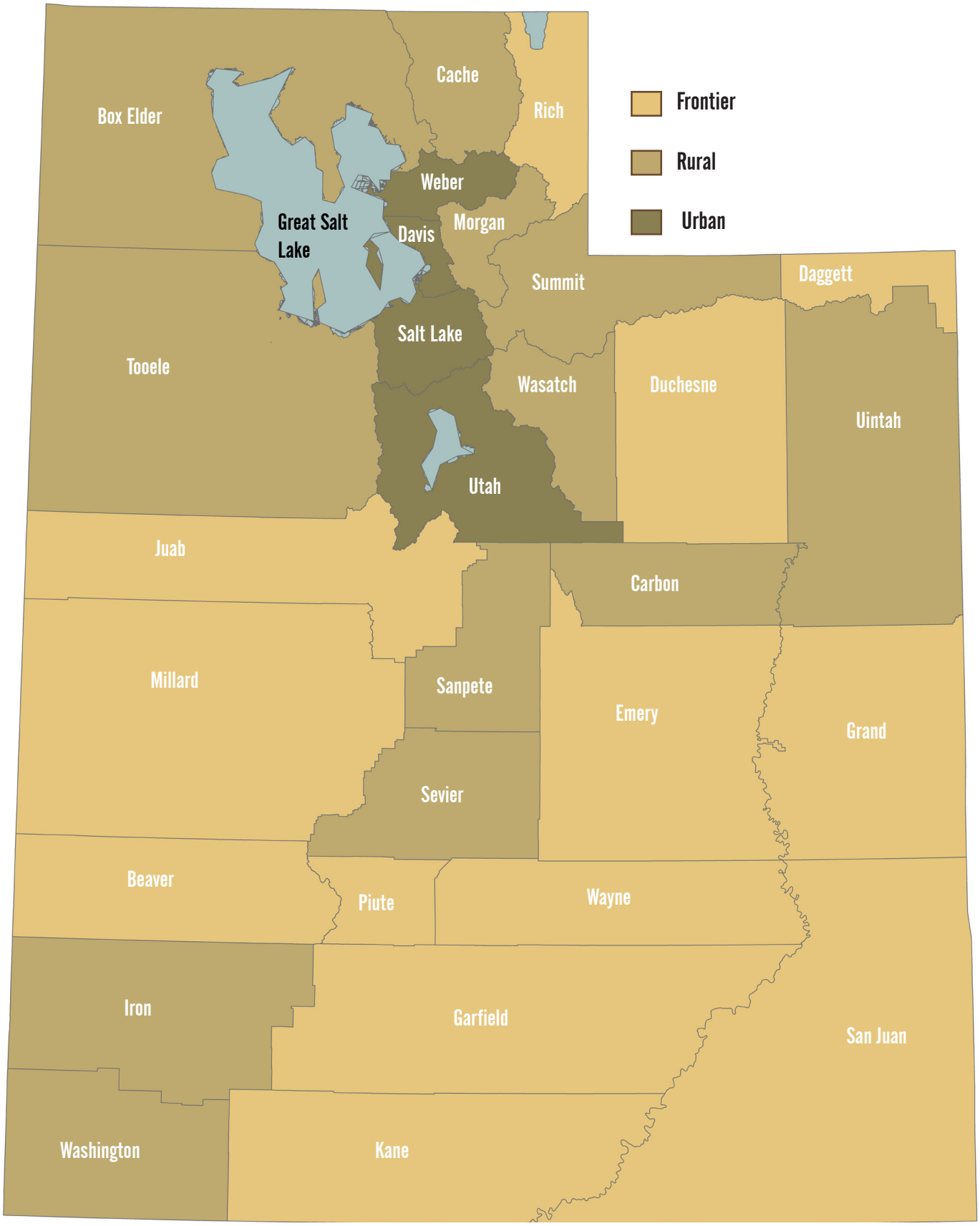
Black population (47.1%), followed by Asian (38.1%), Native Hawaiian/Pacific Islander (30.6%), and American Indian/Alaska Native (21.5%). In 2010, minorities comprised 19.6% of the state population and 26.0% of the Salt Lake County population.[34]

Foreign-Born and Language

Although being U.S.-born and having strong English proficiency does not guarantee good health or increased access to health care, data show that some health risk factors are lower among foreign-born residents than others. However, the health care system is often less accessible to those who are foreign-born and who do not have strong English proficiency.

While the percentage of foreign-born residents in Utah is higher than in the past, it remains lower than the U.S. overall. Utah's foreign-born population increased from 3.4% in 1990 to 8.3% in 2008.[34] In 2007, 63% of Utah's foreign-born population were of Latin American origin, 18% were of Asian origin, and 11% were of European origin. Fourteen percent of Utahns spoke a language other than English at home.[42]

Map 1: Population Density of Utah Counties, 2010



Source: Utah Population Estimates.

Table 6: Utah Population Density by County, 2000 and 2010

County Number	County	2000	2010	Percent Change	2010 Density
1	Beaver	6,023	6,692	11.1%	Frontier
2	Box Elder	42,860	50,263	17.3%	Rural
3	Cache	91,104	116,229	27.6%	Rural
4	Carbon	20,396	20,105	-1.4%	Rural
5	Daggett	933	988	5.9%	Frontier
6	Davis	240,204	312,918	30.3%	Urban
7	Duchesne	14,397	17,671	22.7%	Frontier
8	Emery	10,782	11,034	2.3%	Frontier
9	Garfield	4,763	5,235	9.9%	Frontier
10	Grand	8,537	9,644	13.0%	Frontier
11	Iron	34,079	47,627	39.8%	Rural
12	Juab	8,310	10,373	24.8%	Frontier
13	Kane	6,037	6,863	13.7%	Frontier
14	Millard	12,461	13,939	11.9%	Frontier
15	Morgan	7,181	10,117	40.9%	Rural
16	Piute	1,436	1,479	3.0%	Frontier
17	Rich	1,955	2,331	19.2%	Frontier
18	Salt Lake	902,777	1,059,955	17.4%	Urban
19	San Juan	14,360	15,910	10.8%	Frontier
20	Sanpete	22,846	28,113	23.1%	Rural
21	Sevier	18,938	21,134	11.6%	Rural
22	Summit	30,048	41,146	36.9%	Rural
23	Tooele	41,549	60,129	44.7%	Rural
24	Uintah	25,297	31,825	25.8%	Rural
25	Utah	371,894	540,541	45.3%	Urban
26	Wasatch	15,433	23,837	54.5%	Rural
27	Washington	91,897	147,960	61.0%	Rural
28	Wayne	2,515	2,693	7.1%	Frontier
29	Weber (29)	197,541	231,146	17.0%	Urban

Source: Utah Population Estimates.

Did You Know?

Men and women of all economic backgrounds are at risk for heart disease and stroke. However, individuals with **low incomes** are much **more likely** to **suffer from high blood pressure, high cholesterol, heart attack, and stroke** than their higher-income peers.

This discrepancy is due to numerous factors, including **early life environment, quality of health education, availability of nutritious food, proximity to recreational facilities, cultural and financial barriers to seeking treatment, and accessibility of cardiovascular care.**

Source: Centers for Disease Control and Prevention.
For more information, please visit www.millionhearts.hhs.gov.

Access to Health Care

Health care access is a key determinant of health. The ability to obtain high quality health care is affected by factors in the health care system, such as eligibility requirements, and in communities, such as the availability of health care providers.

Health care access describes the affordability of care and the ability to access preventive care and timely treatment. This is commonly measured by the proportion of the population that reports having health insurance coverage, having a consistent primary care provider, and being able to afford treatment. The state data in this section are drawn from the 2010 Utah Behavioral Risk Factor Surveillance System (BRFSS).

Health Insurance Coverage

Uninsured patients with chronic disease are less likely than insured patients 1) to have visited a health care provider and 2) to have a standard site for care.[12] Not having insurance is also associated with lower use of preventive services and medical treatment, especially among racial and ethnic minorities.[12]

Utah's rate of uninsured has remained fairly stable since the early 1990s. In 2010, 14.2% of Utah adults reported that they did not have health insurance, including HMOs and government plans.

Among racial groups, all minorities had higher rates of no insurance than Whites (11.6%).

Two in five (40%) Hispanic persons had no insurance.

Among adults aged 25 and older, not having insurance was significantly more common among Utahns with lower educational attainment compared with college graduates. Nearly 38.8% of Utahns with less than a high school education reported not having insurance compared with 5.6% of Utah college graduates (age-adjusted).

Not having insurance was 10 times more common among Utah households with incomes less than $25,000 (40.6%) than among Utah households with incomes of $75,000 or more (4.6%).

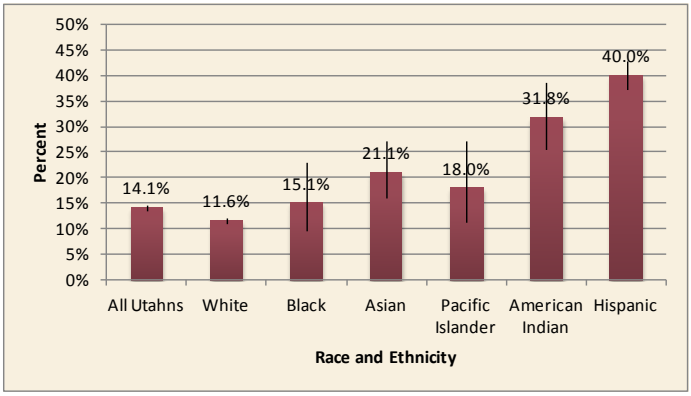
Usual Doctor or Place of Care

Better health is associated with having a consistent source of health care. In 2010, 20.9% of Utah adults reported that they did not have a personal doctor or health care provider. The rate for males (26.6%) was nearly double that for females (13.6%). Among Utah adults aged 25 and over, those with less than a high school diploma/GED had more than double the rate of not having a personal doctor (37.3%) compared to those with at least some college education (17.5%).

Utah adults living in households with incomes below $25,000 had a significantly higher rate (31.6%) of not having a personal doctor than the overall state rate (20.9%). Those with household incomes of at least $75,000 per year had a significantly lower rate of not having a personal doctor (14.1%) than the state rate (20.9%).

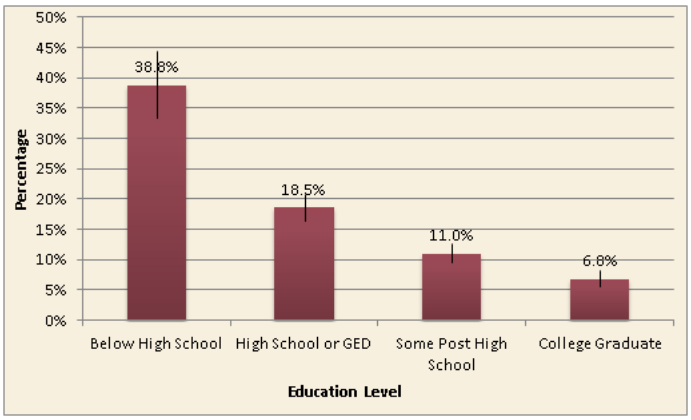
Between 2006 and 2010, American Indians (29.0%) and Hispanic persons (37.7%), reported not having a personal doctor at significantly higher rates than the state rate (21.3%).

Figure 1: Percentage of Utah Adults Without Health Insurance by Race and Ethnicity, 2006-2010 Combined



Source: Utah BRFSS. Age-adjusted using age groups (18-34, 35-54, 55+).

Figure 2: Percentage of Utah Adults (Age 25+) Without Health Insurance by Education, 2010



Source: Utah BRFSS. Age-adjusted using three age groups.

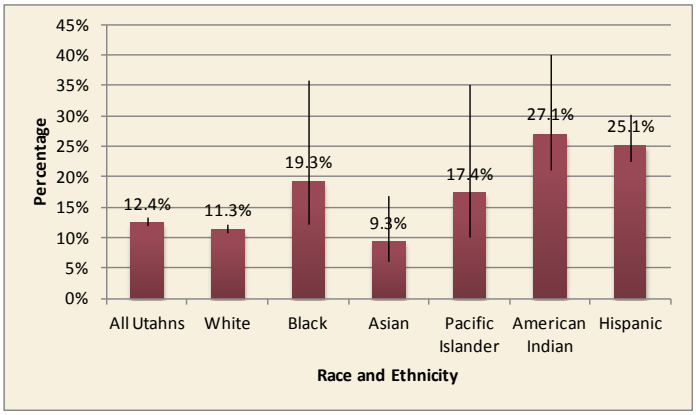
Cost Barriers to Health Care

Between 2000 and 2010, the percentage of Utah adults who reported that they were unable to afford health care increased from 10.2% to 13.4%. In 2010, females had higher rates of this problem (15.4%) than males (11.6%). For 2006 through 2010, Blacks, American Indians, and Hispanic persons had higher rates of being unable to afford health care than Whites.

The rate of being unable to afford health care was more than four times higher among Utahns with less than a high school education (28.5%) than among college graduates (6.5%). The difference was even higher by household income ,with 34.5% of persons with household incomes below $25,000 unable to purchase insurance compared to 4.4% of Utahns with household incomes above $75,000.

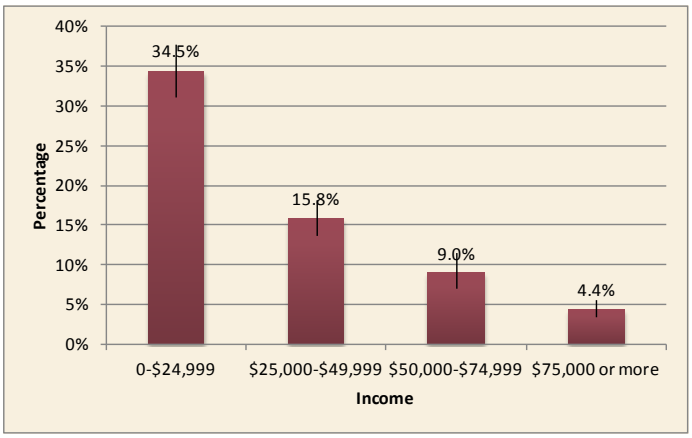
Other sections of this Report provide data on the health care costs associated with cardiovascular disease subtype.

Figure 3: Percentage of Utah Adults Unable to Afford Care by Race and Ethnicity, 2006-2010 Combined



Source: Utah BRFSS. Age-adjusted using three age groups (18-34, 35-54, 55+).

Figure 4: Percentage of Utah Adults Unable to Afford Health Care by Income, 2010



Source: Utah BRFSS, Age-adjusted.

Did You Know?

Stroke is among the **five leading causes of death** for people of all races and ethnicities. But the risk of having a stroke varies. Compared to Whites, African Americans are at nearly twice the risk of having a first stroke. Hispanic Americans' risk falls between the two. Moreover, **African Americans and Hispanics are more likely to die following a stroke than are Whites.**

Source: Centers for Disease Control and Prevention.
For more information, please visit www.millionhearts.hhs.gov.

Cardiovascular diseases (CVD)

Cardiovascular diseases are all diseases that affect the heart and blood vessels, including coronary heart disease, heart failure, hypertensive disease, atherosclerosis, and stroke.

Quick Facts

- CVD mortality has declined significantly over the past 20 years while the cost of CVD has increased. The majority of hospitalization charges are billed to Medicare.
- CVD remains the leading cause of death and hospitalizations in the U.S. and Utah.
- In contrast to national trends, Utah's racial and ethnic minorities have lower rates of CVD mortality compared to Whites. However, they die from CVD at younger ages.

Prevalence

Utah

In 2009, Utah adults had significantly more heart attacks, strokes, and coronary heart disease than all Americans combined.[9] In the same year, about 8% of Utah men and 5% of Utah women over age 18 reported they had been told that they had a heart attack, stroke, or coronary heart disease.[9]

Mortality

U.S.*

From 1997 to 2007, the CVD death rate declined by 27.8%.

About every 39 seconds, an American dies from CVD. [36]

In 2007, heart disease and stroke, the most common forms of CVD, accounted for 33.6% of all deaths nationally.

Nearly one-third of CVD deaths occurred before the age of 75 years, which is lower than the average life expectancy of 77.9 years.

The elimination of all major forms of CVD could increase life expectancy by seven years.[36]

Utah**

More Utahns die from CVD than from any other cause.

In 2010, CVD accounted for 3,554 deaths. This is more than the next three leading causes of death combined.

Between 2000 and 2010, the state age-adjusted mortality rate for CVD decreased by 33%, from 266.9 per 100,000 to 180.0 per 100,000.†

The burden of CVD mortality falls heavily on those over age 65 in Utah, with 82.6% of CVD-related deaths occurring in this group.

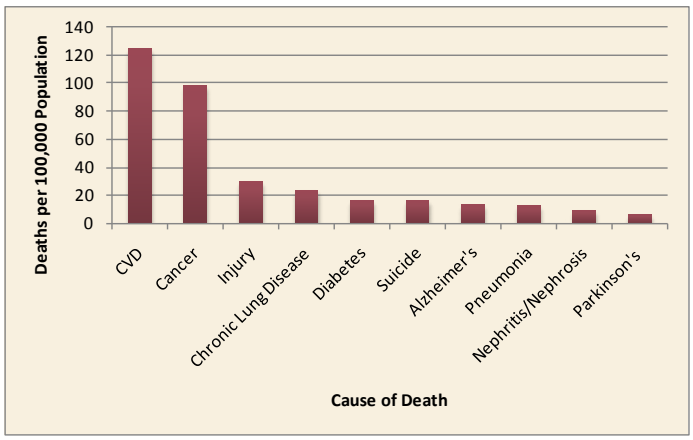
* ICD 10 I00-I99, Q20-Q28
** ICD 10 I00-I78
† Age-adjusted to the 2000 U.S. Standard Population using three age groups.

Table 7: Percentage of Adults Who Have Had a Heart Attack, Stroke, or Coronary Heart Disease, 2009

	Utah	U.S.	Difference
Men	8.0	4.8	60%
Women	5.0	3.4	68%

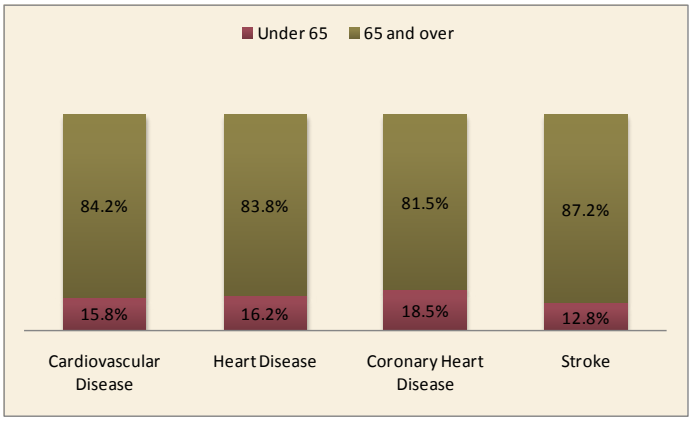
Source: BRFSS

Figure 5: Leading Causes of Death, Utah, 2010



Source: Utah Death Certificate Database. Age-adjusted.

Figure 6: Distribution of Cardiovascular Disease Deaths by Age Group, Utah, 2010



Source: Utah Death Certificate Database.

Between 2005 and 2009, Utah Asians, American Indian/Alaska Natives, and Hispanic persons had significantly lower rates of cardiovascular disease deaths compared with all Utahns.

Despite the lower rates of cardiovascular disease death, racial and ethnic minority adults (ages 18 and over) died from CVD at younger ages than White adults and all Utah adults.

Hospitalization

U.S.*

In 2007, CVD ranked highest among all disease categories in hospital discharges.

From 1997 to 2007, despite a growing population, the number of short-stay inpatient discharges with CVD as the first-listed diagnosis decreased from 6,097,000 to 5,890,000.

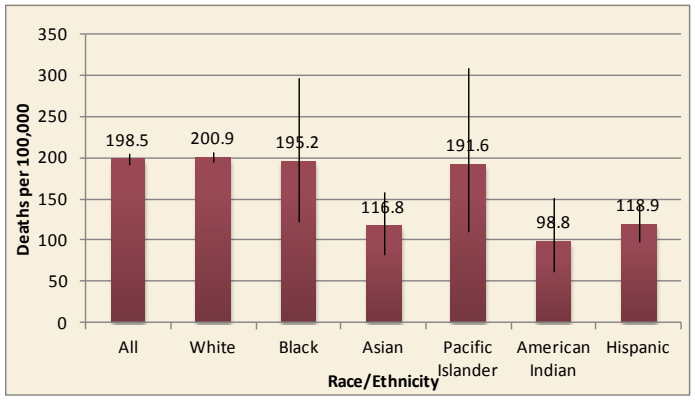
Utah**

In 2009, CVD was responsible for 18,608 hospitalizations among Utah residents, significantly more than any other cause.

Between 1999 and 2009, the CVD hospitalization rate per 10,000 dropped from 123.9 to 86.3.† Utahns aged 45 and older were most affected by the decline. There was no evidence of a significant decline among the 25- to 34-year age group.

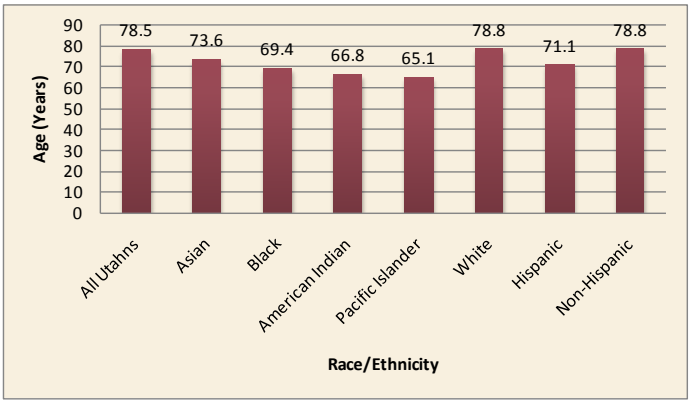
* ICD 9 390-459, 745-757
** ICD 9 390-434, 436-448
† Age-adjusted to the 2000 U.S. Standard Population using three age groups.

Figure 7: Utah Cardiovascular Disease Mortality by Race and Ethnicity, 2005-2009, Combined



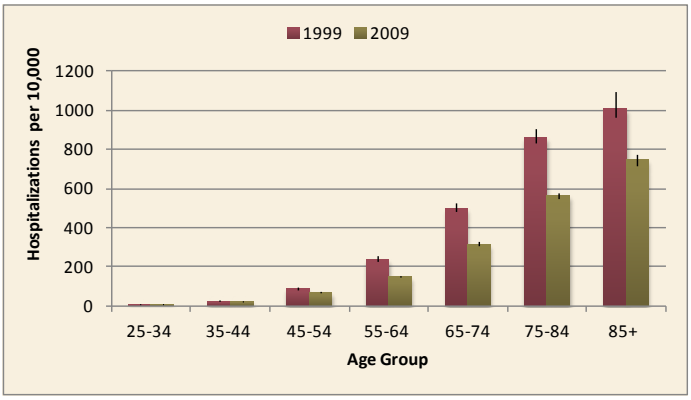
Source: Utah Death Certificate Database. Age-adjusted using three age groups (0-44, 45-64, 65+).

Figure 8: Average Age at CVD Death by Race and Ethnicity, Utah Adults (18+), 2005-2009 Combined



Source: Utah Death Certificate Database. Age-adjusted.

Figure 9: Cardiovascular Disease Hospitalization by Age Group (25+), Utah, 1999 and 2009



Source: Utah Inpatient Hospital Discharge Database.

Costs

U.S.

In 2008, cardiovascular disease subtypes comprised 5 of the 20 most expensive hospitalization conditions: coronary atherosclerosis, acute myocardial infarction (heart attack), congestive heart failure, acute cerebrovascular disease (stroke), and cardiac dysrhythmias. [27]

The total cost of cardiovascular disease in the U.S. in 2010 was estimated to be $503.2 billion, with direct costs accounting for $324.1 billion. [6]

Utah

Between 1999 and 2009, the average charge per CVD hospitalization more than doubled, from $17,500 to $37,500.

Consequently, total hospital charges for CVD also more than doubled in this period, from $312.5 million to $665.5 million. In 2009, 49% of hospital charges were billed to Medicare and $9 million was billed to individuals.

Coronary heart Disease and Acute Myocardial Infarction

Coronary heart disease (CHD), also known as coronary artery disease, is the most common form of heart disease. CHD is a condition in which blood flow to the heart is reduced. When the coronary arteries become narrowed or clogged, an inadequate amount of blood oxygen reaches the heart tissue. The part of the heart not receiving oxygen begins to die, and some of the heart muscle may be permanently damaged. CHD can cause angina (chest pain), acute myocardial infarction (AMI) or heart attack, and sudden cardiac death.

Quick Facts

- CHD mortality has declined significantly over the past 20 years.
- About four in five CHD deaths occur among the population aged 65+.
- Men have higher CHD mortality than women.
- Women have higher AMI mortality than men. Nationally, women are more likely to experience delays between AMI onset and treatment than men. In Utah, women have lower rates of EMS transport for cardiac-related emergencies than men.
- Although Utah's racial and ethnic minorities have lower rates of CHD death compared to Whites, they die from CHD at younger ages.

Mortality

U.S.

Between 1980 and 2000, age-adjusted CHD mortality rates per 100,000 declined from 542.9 to 266.8 among men and from 263.3 to 134.4 deaths among women.[24] About 47% of this decline has been attributed to advances in medicine, including treatments for AMI, heart failure, high blood pressure, and high cholesterol.[24] About 44% is attributed to lowered total cholesterol, lower systolic blood pressure,

lower smoking prevalence, and increased physical activity in the population.[24] Despite these improvements in risk factors, increases in body mass index (BMI) and diabetes prevalence increased the number of deaths by 8% and 10%, respectively.[24]

Between 1997 and 2007, the annual death rate due to CHD declined 26.3%. CHD caused about one in six deaths in 2007. [36]

About four in five people who die from CHD are aged 65 years or older.[36]

Men have greater mortality from all CHD types than women. Blacks die from CHD at earlier ages than Whites.[18]

Women have greater mortality from AMI than men. Forty-two percent of women who experience AMI die within one year, compared with 24% of men.[6]

Utah

Between 2000 and 2010, the Utah age-adjusted CHD mortality rate per 100,000 decreased 39%, from 108.9 to 66.2.*

In 2010, CHD claimed the lives of 1,408 Utahns.

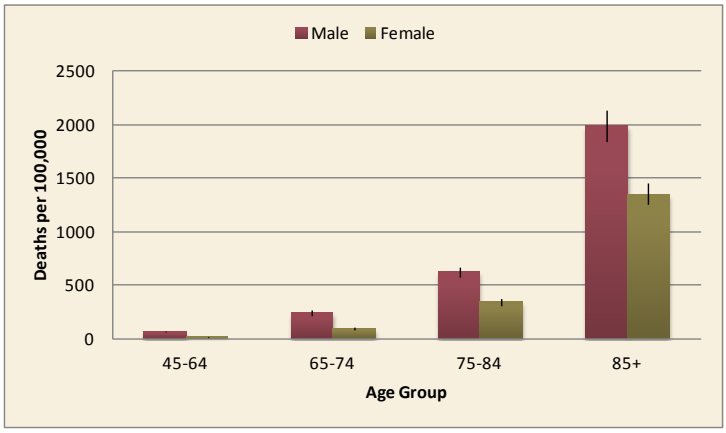
Men died from CHD at higher rates than women across all age groups.

Between 2005 and 2009, Utah Asian and Hispanic persons had significantly lower CHD mortality rates per 100,000 (37.0 and 45.3, respectively) than the state overall (72.6).

Among adults, all racial and ethnic minorities had younger average ages at CHD death than White Utahns.

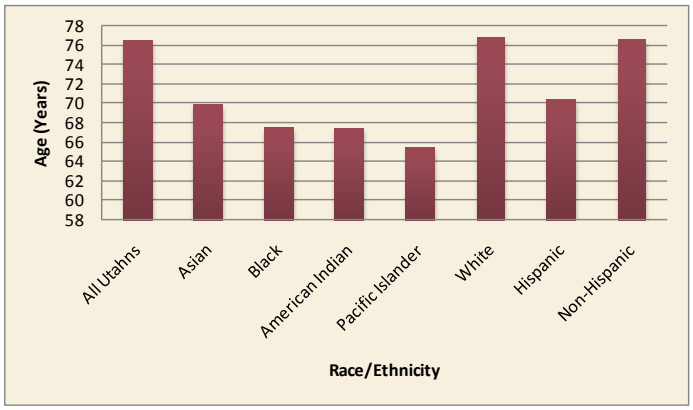
* Age-adjusted to 2000 U.S. Standard Population using three age groups.

Figure 10: Utah Coronary Heart Disease Mortality by Age and Sex, 2008-2010 Combined



Source: Utah Death Certificate Database.

Figure 11: Average Age at Coronary Heart Disease Death by Race and Ethnicity, Utah Adults (18+), 2005-2009 Combined



Source: Utah Death Certificate Database. Age-adjusted.

Prehospital

U.S.

About 7 in 10 CHD deaths occur outside a hospital setting.[36]

Utah

In 2009, Utah EMS agencies responded to complaints of chest pain or other heart problems 7,246 times. The age-adjusted rates per 10,000 transports with these characteristics were 36.0 for males and 28.3 for females. Within each age group, males had higher rates of EMS transport than women. The mean response time was 7.2 minutes.

Hospitalization

U.S.

In 2008, coronary heart disease and non-specific chest pain were among the 10 most common principal diagnoses for hospitalization.[4]

Between 1997 and 2008, hospital stays for coronary heart disease declined 35%. AMI dropped from the 4th-leading cause of hospitalization to the 11th between 1997 and 2008, representing a drop of 12%.[4]

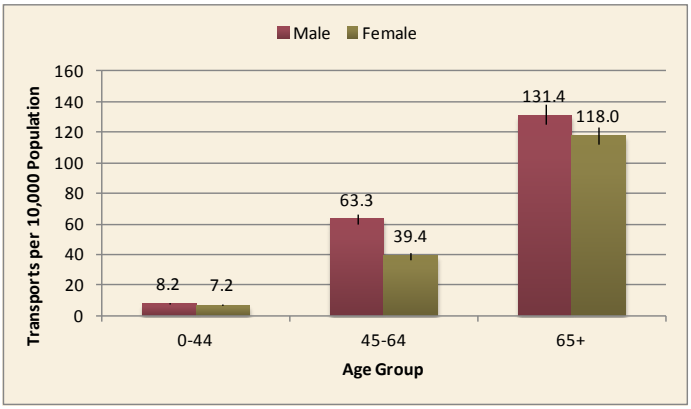
Women are more likely than men to experience delays between heart attack symptom onset and emergency care.[19]

Utah

In 2009, AMI caused 2,082 emergency department (ED) visits among Utah residents. Utah males had significantly higher rates of AMI ED visits compared to females for every age category except 85+ years.

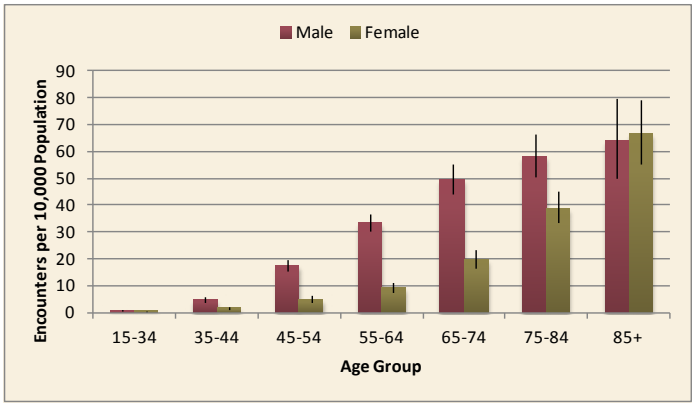
Between 2007 and 2009, the statewide age-adjusted rate for emergency department encounters for AMI was 9.5 per 10,000. Among small areas, the rate per 10,000 ranged from 4.6 in the Avenues to 15.6 in West Jordan North (2007-2008).

Figure 12: Utah Cardiac-Related EMS Transports by Sex, 2009



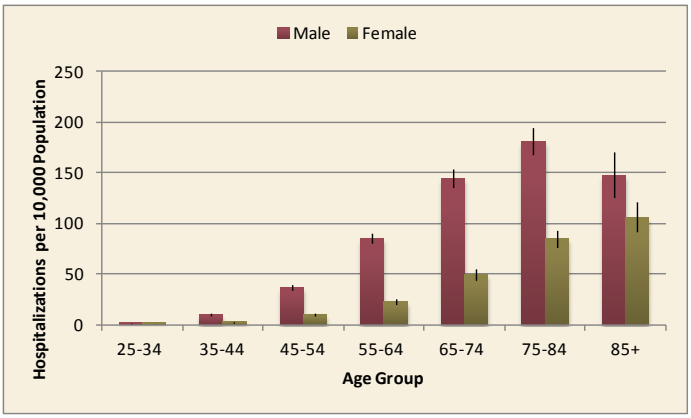
Source: Utah Prehospital Database.

Figure 13: Utah Emergency Department Encounters for Acute Myocardial Infarction by Age and Sex, 2009



Source: Utah Emergency Department Encounters Database.

Figure 14: Utah Coronary Heart Disease Hospitalizations by Age and Sex, 2009



Source: Utah Inpatient Hospital Discharge Database.

The same year, CHD led to 5,077 inpatient hospitalizations among Utah residents. Men had significantly higher hospitalization rates than women for every age category.*

Between 2007 and 2009, among racial groups, Whites had the highest rate of CHD inpatient hospitalization (279.8/10,000), followed by Blacks (203.4/10,000). American Indians had the lowest rate of CHD hospitalization (98.5/10,000).**

Costs

U.S.

The estimated direct and indirect cost of heart disease for 2010 was $108.9 billion.[11]

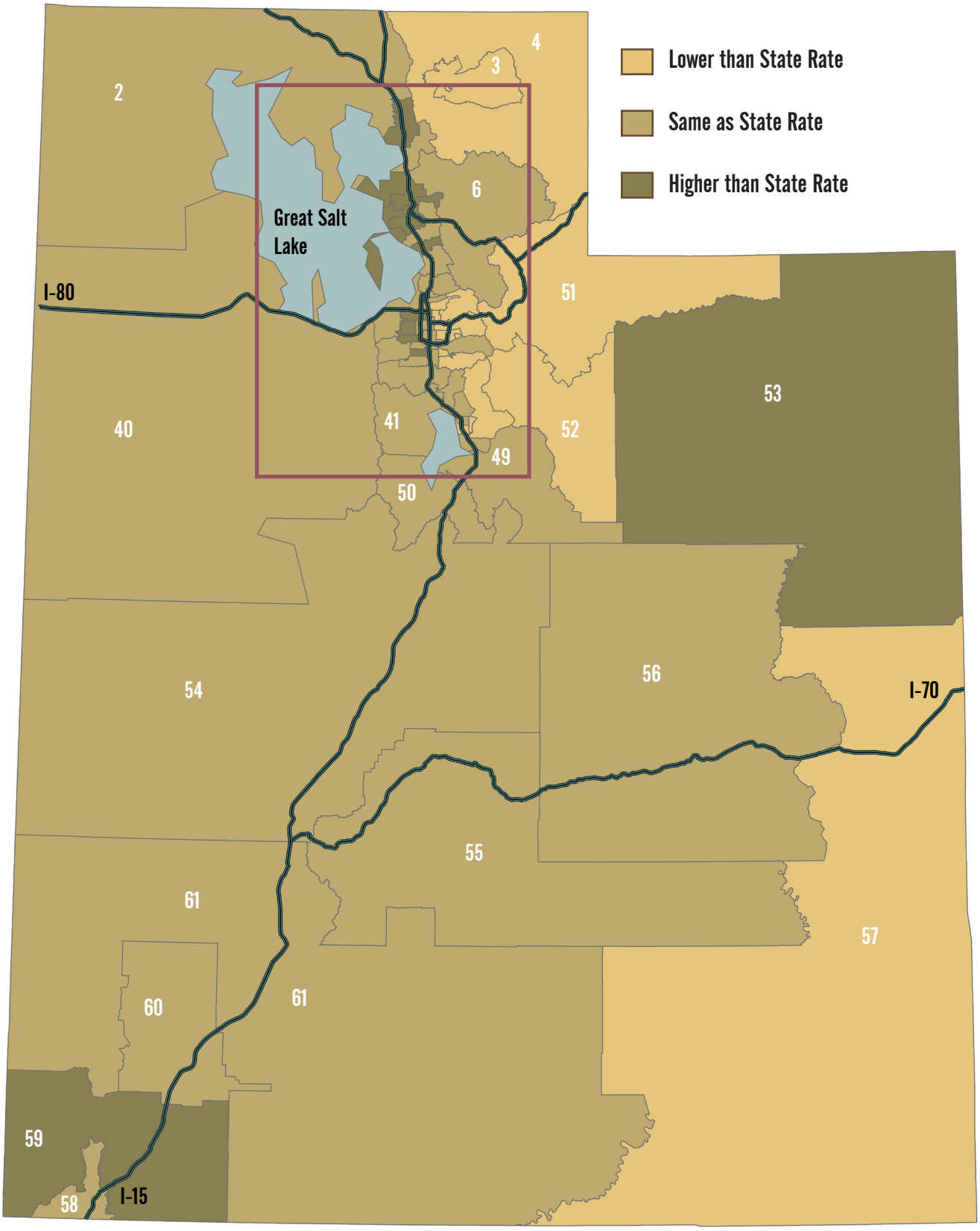
In 2008, the total inflation-adjusted hospital cost for AMI was $11.6 billion, making AMI the fourth most expensive principal diagnosis.[27]

Utah

In 2009, hospital charges for CHD totaled $240.2 million. Nearly one-third ($85.5 million) was for emergency department visits for AMI. The average charge per inpatient CHD hospitalization was $50,200, more than double the average charge of $21,800 in 1999.

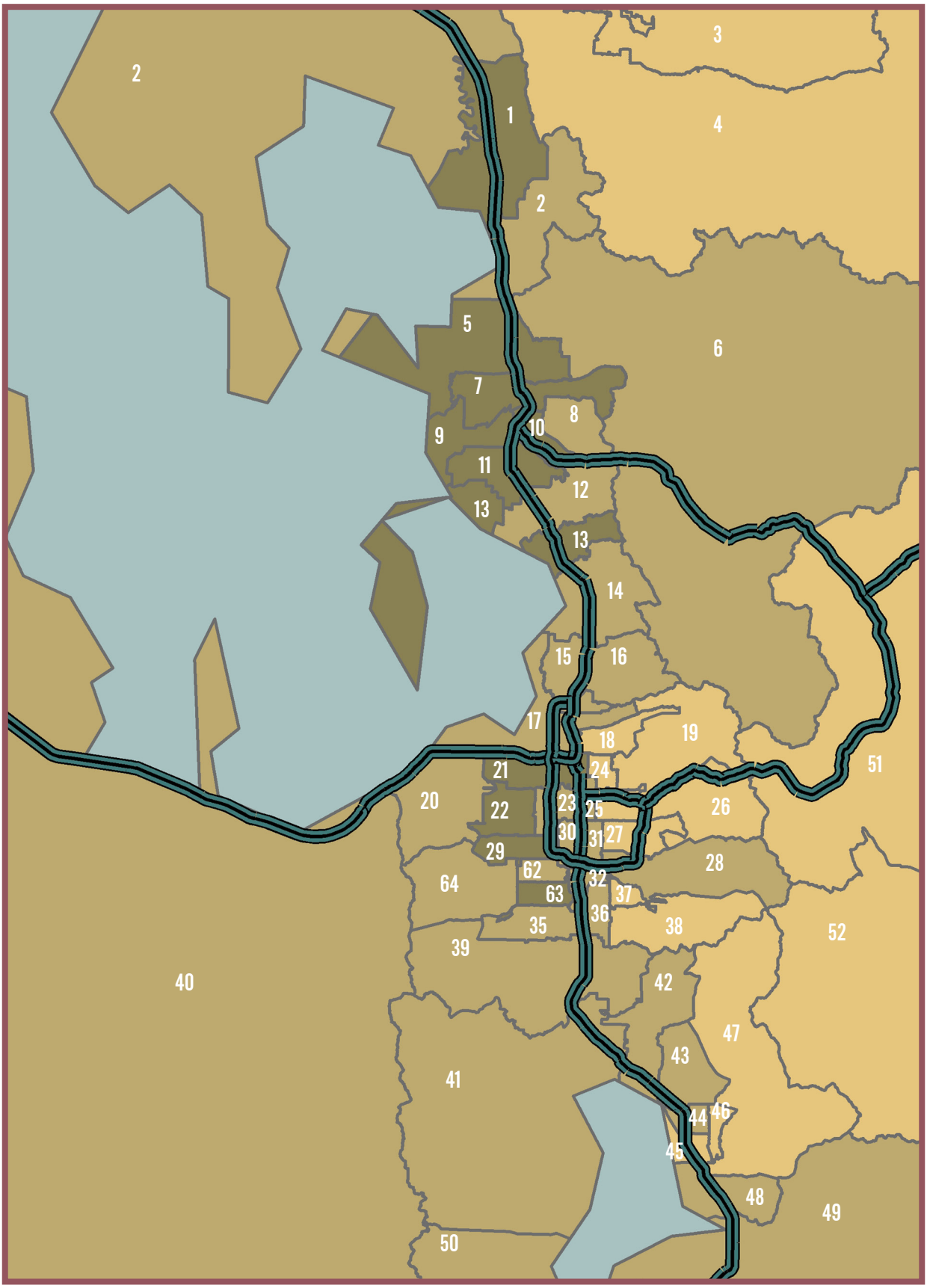
* ICD 9 Codes 410-414, 429.2
** Age-adjusted to the 2000 U.S. Standard Population using three age groups

Map 2: Utah Acute Myocardial Infarction Emergency Department Visits by Small Area, 2007-2009



Source: Utah Emergency Department Encounters Database, Age-adjusted using three age groups.

Map 3: Utah Acute Myocardial Infarction Emergency Department Visits by Small Area, 2007-2009, Wasatch Front



Source: Utah Emergency Department Encounters Database, Age-adjusted using three age groups.

Table 8: Utah Acute Myocardial Infarction Emergency Department Visits by Small Area, 2007-2009

Small Area Name (Number)	Age-adjusted Rate	Lower Confidence Bound	Upper Confidence Bound	Compared to State Rate
State	9.5	9.3	9.8	
Brigham City (1)	12.9	10.3	15.9	Higher
Other Box Elder County (2)	11.1	8.6	14.0	Same
Logan (3)	7.9	6.4	9.5	Lower
Other Cache/Rich County (4)	6.9	5.3	8.9	Lower
Ben Lomond (5)	12.4	10.6	14.4	Higher
Morgan/East Weber County (6)	9.6	7.9	11.7	Same
Downtown Ogden (7)	13.0	10.6	15.9	Higher
South Ogden (8)	8.9	7.3	10.9	Same
Roy/Hooper (9)	13.0	10.8	15.4	Higher
Riverdale (10)	12.5	10.0	15.4	Higher
Clearfield/Hill AFB (11)	12.6	10.6	15.0	Higher
Layton (12)	10.3	8.8	12.1	Same
Syracuse/Kaysville (13)	12.0	9.8	14.4	Higher
Farmington/Centerville (14)	7.9	5.9	10.3	Same
Woods Cross/North Salt Lake (15)	7.7	5.6	10.3	Same
Bountiful (16)	8.2	6.9	9.7	Same
Rose Park (17)	9.6	7.6	12.1	Same
Avenues (18)	4.6	3.2	6.4	Lower
Foothill/U of U (19)	5.6	4.1	7.5	Lower
Magna (20)	9.6	7.0	12.9	Same
Glendale (21)	12.4	9.8	15.4	Higher
West Valley West (22)	12.1	10.3	14.2	Higher
West Valley East (23)	10.2	8.5	12.1	Same
Downtown Salt Lake (24)	7.0	5.7	8.6	Lower
South Salt Lake (25)	10.5	8.2	13.4	Same
Millcreek (26)	7.1	6.0	8.4	Lower
Holladay (27)	5.9	4.9	7.1	Lower
Cottonwood (28)	8.7	7.3	10.3	Same
Kearns (29)	13.7	11.7	16.0	Higher
Taylorsville (30)	11.5	9.4	13.9	Same
Murray (31)	9.2	7.4	11.3	Same
Midvale (32)	8.7	6.7	11.1	Same
West Jordan North 2007-2008 (33)	15.6	12.0	20.1	Higher

Small Area Name (Number)	Age-adjusted Rate	Lower Confidence Bound	Upper Confidence Bound	Compared to State Rate
West Jordan/Copperton 2007-2008 (34)	11.0	7.8	14.9	Same
South Jordan (35)	10.0	7.8	12.7	Same
Sandy Center (36)	9.2	7.6	11.0	Same
NE Sandy (37)	7.0	5.1	9.4	Lower
SE Sandy (38)	6.4	4.3	9.0	Lower
Riverton/Draper (39)	10.1	8.3	12.2	Same
Tooele Co. (40)	10.4	8.8	12.4	Same
Lehi/Cedar Valley (41)	8.4	6.5	10.8	Same
American Fork/Alpine (42)	7.8	6.1	9.7	Same
Pleasant Grove/Lindon (43)	8.4	6.6	10.6	Same
North Orem (44)	10.4	8.2	13.0	Same
West Orem (45)	6.6	4.7	9.0	Lower
East Orem (46)	6.8	5.0	9.2	Lower
Provo/BYU (47)	7.4	5.9	9.2	Lower
Provo South (48)	7.5	5.7	9.6	Same
Springville/Spanish Fork (49)	9.5	8.1	11.2	Same
South Utah County (50)	11.8	9.2	14.8	Same
Summit County (51)	5.3	4.0	7.0	Lower
Wasatch County (52)	6.5	4.6	9.1	Lower
TriCounty LHD (53)	12.7	10.9	14.8	Higher
Juab/Millard/Sanpete Counties (54)	10.7	9.0	12.6	Same
Sevier/Piute/Wayne Counties (55)	8.6	6.6	10.9	Same
Carbon/Emery Counties (56)	9.0	7.3	11.1	Same
Grand/San Juan Counties (57)	4.8	3.3	6.7	Lower
St. George (58)	10.2	9.0	11.5	Same
Other Washington County (59)	11.5	10.0	13.1	Higher
Cedar City (60)	9.8	7.9	12.1	Same
Other Southwest Dist. (61)	10.8	8.7	13.2	Same
W. Jordan Northeast 2009-2010 (62)	9.7	5.9	15.0	Same
W. Jordan Southeast 2009-2010 (63)	14.9	9.7	21.9	Higher
W. Jordan West, Copperton 2009-2010 (64)*	6.8	2.9	13.4	Same

Source: Utah Emergency Department Encounters Database, Age-adjusted using three age groups.

*Interpret with caution (relative standard error >0.3)

Heart Attack Awareness

Heart attack [also known as acute myocardial infarction (AMI)] is a life-threatening emergency. Time is critical. By calling 9-1-1 at the first sign of heart attack, witnesses can help get emergency assistance to victims faster and increase their chances of survival. The term "heart attack awareness" refers to the percentage of adults who know all five signs and symptoms of heart attack and would call 9-1-1.

Quick Facts

- Although more than half of Utahns recognize any single sign of heart attack, only one-third know all five signs and symptoms and say they would call 9-1-1 if they believed someone was having a heart attack.
- Heart attack awareness was higher among women, Whites, and people with at least a college degree than among men, non-Hispanic Blacks, Hispanic persons, and those with less than a high school education.

The benefits of early treatment for heart attack are clear. Increased time from symptom onset to treatment for heart attack is associated with increased morbidity and death. Yet, delays in treatment persist. Use of Emergency Medical Services (EMS) is important to ensure prompt assistance in the case of heart attack, and pre-hospital notification is needed for prompt intervention to reduce damage to the heart muscle. Research suggests that patients' delay in seeking help for their illness is a major factor in delayed heart attack treatment.[21]

The five warning signs of heart attack are

- Pain or discomfort in the jaw, neck, or back
- Feeling weak, lightheaded, or faint
- Chest pain or discomfort
- Pain or discomfort in the arm or shoulder
- Shortness of breath

U.S.

According to the 2005 BRFSS, just over a quarter (27%) of adults were aware of all five heart attack signs and symptoms and said they would call 9-1-1 if they thought someone was having a heart attack.[36]

Utah

In 2009, nearly 9 in 10 Utahns recognized the traditional hallmark signs of a heart attack: chest pain, shortness of breath, and pain in the arm or shoulder. However, less than two-thirds (65.5%) recognized feeling weak, lightheaded, or faint, and only about half (53.4%) recognized pain in the jaw, neck, or back as indicative of a cardiovascular emergency.

Overall, fewer than one in three Utah adults (30.1%) knew all five signs and symptoms of heart attack and would call 9-1-1.

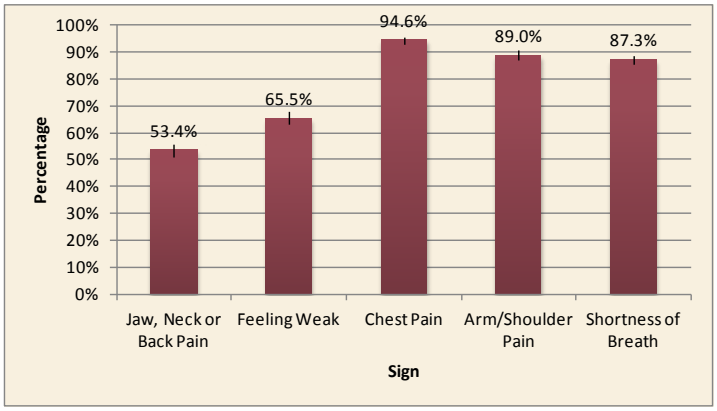
Heart attack awareness was higher among females (35.2%) than males (25.7%).

Between 2007 and 2009, heart attack awareness was significantly higher among Utah adults who had at least some college education compared to those with a high school diploma/GED or less education.

Utah adults with households in the highest income category, $75,000 and above, had a significantly higher heart attack awareness rate (34.6%) than those with annual household incomes less than $50,000.

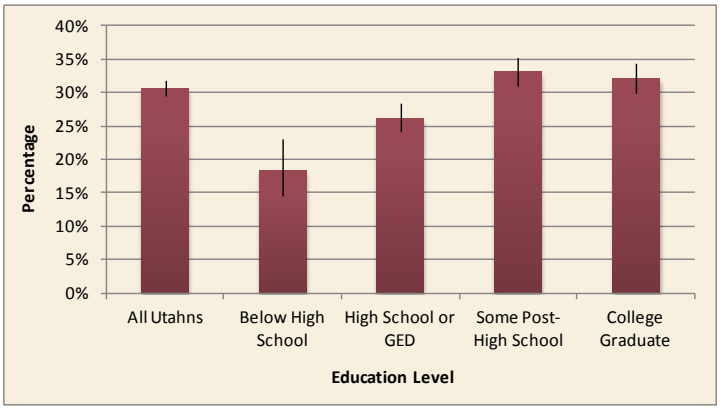
Heart attack awareness varied across racial and ethnic groups. In combined years 2005 and 2007 through 2009, the lowest rate of awareness was among Blacks at 9.8%; however, this rate should be interpreted with caution due to low statistical reliability (RSE>0.3). The heart attack awareness rate among Native Hawaiian and other Pacific Islanders (40.8%) was not statistically different from the state rate.

Figure 15: Heart Attack Awareness Among Utah Adults by Sign, 2009



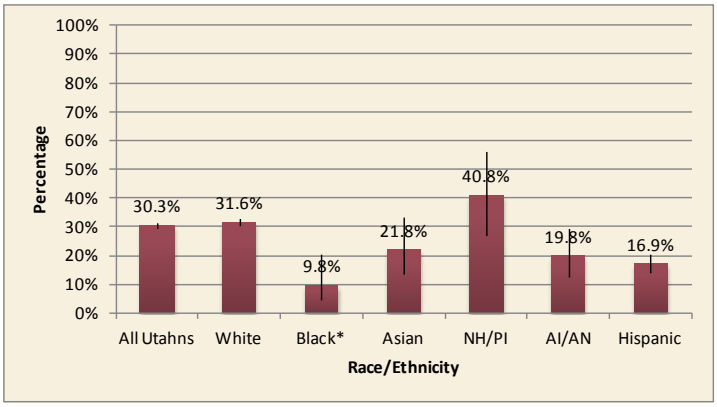
Source: Utah BRFSS. Age-adjusted.

Figure 16: Heart Attack Awareness Among Utah Adults by Education Level, 2007-2009



Source: Utah BRFSS. Age-adjusted.

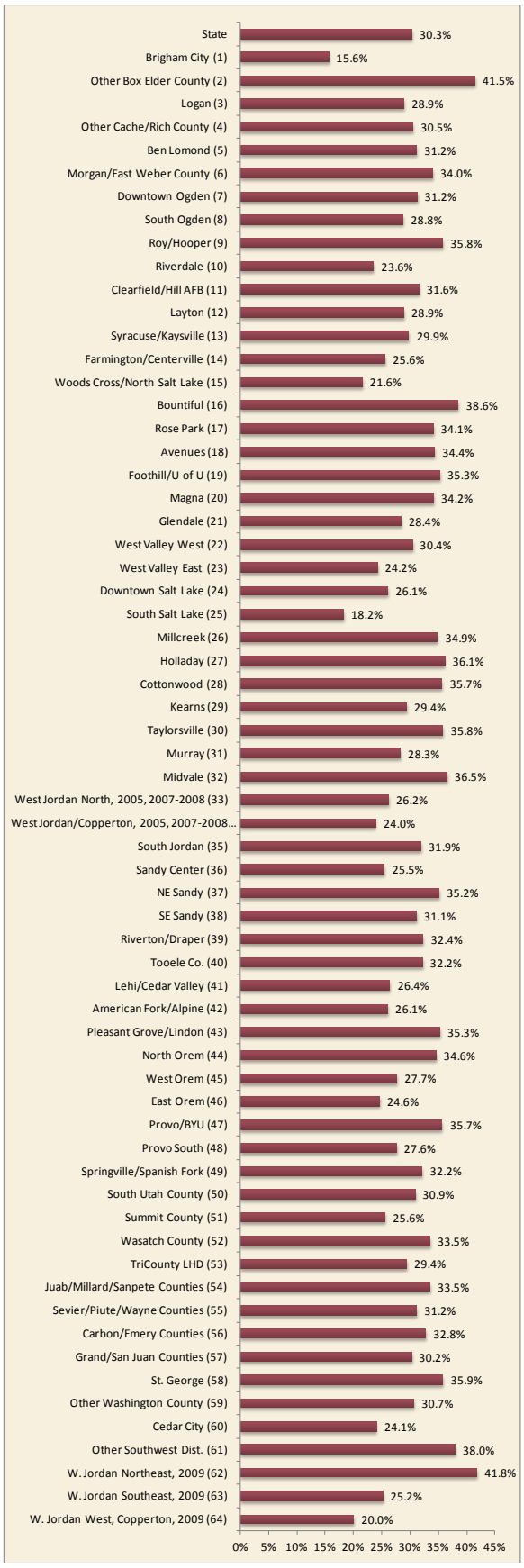
Figure 17: Heart Attack Awareness Among Utah Adults by Race and Ethnicity, 2005, 2007-2009 Combined



Source: Age-adjusted using standard age groups. *RSE>0.3. Interpret with caution.

Heart attack awareness varied little by geographic area. In combined years 2005 and 2007 through 2009, four small areas had lower heart attack awareness rates than the state overall (30.3%): Brigham City (15.6%); South Salt Lake (18.2%); Summit County (25.6%); and West Jordan West, Copperton (20.0%). Two small areas had higher heart attack awareness than the state overall: Other Box Elder County (41.5%) and Bountiful (38.6%).

Figure 18: Heart Attack Awareness by Small Area, Utah, 2005, 2007-2009



Source: Utah BRFSS. Age-adjusted.

Cardiac Arrest

The heart has an electrical system that regulates heartbeat. When the electrical system is disturbed, the heartbeat can become irregular. Some irregular heartbeats cause the heart to stop, resulting in cardiac arrest. People who look and feel healthy can develop sudden cardiac arrest, which is not the same as a heart attack. However, an automated external defibrillator (AED), applied within the first minutes of cardiac arrest, can shock the heart back into a normal rhythm and save a life.

Quick Facts

- Cardiac arrest is fatal if not immediately treated.
- Although most cardiac arrests are witnessed and occur at home, bystander CPR is uncommon. Use of an AED is very rare.
- For every minute defibrillation is delayed, the victim's chance of survival is reduced by 10%.
- In Utah in 2010, the median EMS response times for cardiac arrest were five minutes in urban areas, seven minutes in rural areas, and 10 minutes in frontier areas.

Prehospital Care

U.S.

It is estimated that 295,000 cardiac arrests* occur in the U.S. each year.[36] The estimated incidence of cardiac arrest in North America is 5.5 per 10,000 population.[7]

More than 60% of out-of-hospital cardiac arrests are treated by EMS. [36]

About 80% of sudden cardiac arrests occur at home and 60% are witnessed.[8]

* ICD 9 code 427.5

Only one-third of cardiac arrests treated by EMS have symptoms within one hour of the arrest.[36]

Only one-third of cardiac arrests receive bystander CPR, although this simple measure can be lifesaving.[36]

Without bystander CPR, a cardiac arrest victim's chance of survival is reduced by about 10% for each minute that defibrillation is delayed.[8]

About 90% of sudden cardiac arrest victims die before reaching a hospital.[8]

Survival of out-of-hospital cardiac arrest is low. The factors most associated with survival to hospital discharge for out-of-hospital cardiac arrest were:

- Witness by a bystander
- Witness by EMS
- Bystander CPR performed
- Being found in ventricular fibrillation (VF) or ventricular tachycardia (VT), types of abnormal cardiac rhythms that can be shocked with an AED to normalize the cardiac rhythm and achieve the return of spontaneous circulation
- Achieving return of spontaneous circulation (resumption of a pulse and blood pressure)[36]

Between October 1, 2005 and December 31, 2010, records from the Utah Cardiac Arrest Registry to Enhance Survival (CARES) indicated that out of 31,645 cardiac arrests, 36.7% were witnessed by a layperson, 23.7% had VR, VT, or another "shockable" rhythm, and 33.3% had CPR initiated by a layperson. Laypersons applied an AED in only 3.7% of cases. Cases that had all of these characteristics (witnessed by layperson, found in shockable rhythm, and received some lay intervention (CPR and/or AED) comprised 6.6% of all records).[15]

Utah

According to the Utah Prehospital OnLine Active Reporting Information System (POLARIS), in 2010, Utah EMS agencies were involved in 1,737 responses to cardiac arrests. Of those with a documented etiology, three-fourths (74.2%) were presumed of cardiac origin. Other, non-cardiac causes of cardiac arrest are trauma, drowning, or respiratory problems. The following statistics will refer to those arrests that are presumed to be of cardiac origin.

EMS documented the presence of a witness in 33.8% of cardiac arrests. Of cardiac arrests with witnesses, 247 (74.2%) were witnessed by laypersons and the remainder (86, 25.8%) were witnessed by health care providers.

Among the 986 EMS responses for cardiac arrests, 13.5% took place at a health care facility. Supporting the need for widespread public training in CPR and the use of AEDs, nearly two-thirds of the remaining responses (554, 64.9%) were to a home or residence, 15.1% were to a street or highway, and 15.8% were to public buildings, trade/services locations, places of recreation or sport, industrial premises, and farms. Responses to residential institutions, including nursing homes, assisted living, and jails/prisons, comprised 2.5% of responses to non-health care locations.

Gender was not documented in 5.6% of records. Among records with gender documentation, males accounted for nearly two-thirds (64.0%) of patients.

Age was not documented in 16.9% of records. Among records with age documentation, more than half (58.8%) of patients were aged 50 and above. Although cardiac arrest in adolescents frequently gains attention from the media, it is a rare event. Among 10-year age groups, those ages 10-19 had the lowest rate of EMS involvement for cardiac arrest, for only 1.2% of all records.

Cardiac arrest records documenting witnesses present had much better outcomes than records documenting no witness. First, those with witnesses had higher rates of patients alive at time of EMS response than records documenting no witness. Among the 333 responses with witnesses present, only 41 (12.1%) found patients dead on scene. In contrast, in the 604 responses without a witness present, 133 (22.0%) found patients dead on scene. Whether the witness was a health care provider or layperson did not seem to affect the rate of patients found dead at scene. Records with cardiac arrest patients dead at scene comprised 12.1% of responses with lay witnesses and 12.8% of responses with health care provider witnesses. Second, return of spontaneous circulation either prior to ED arrival and/or at ED was sixteen times higher in records with witnessed CAs (41.0%) compared to unwitnessed CAs (2.5%).

Table 9: Return of Spontaneous Circulation Prior to ED Among Cardiac Arrests Delivered to Hospital, by Witness, 2010

Witness	Count	Total	Percent
Health Care Provider	32	75	42.7%
Layperson	86	213	40.4%
Any	118	288	41.0%
None	37	445	8.3%

Source: Utah Prehospital Database.

Ventricular fibrillation (VF) and ventricular tachycardia (VT) are dysfunctional rhythms that can be shocked with an AED to normalize rhythm and achieve the return of spontaneous circulation (ROSC). Among EMS records for presumed CA responses in 2010, 129 (15.9%) had a rhythm of VF or VT. These "shockable" rhythms were present in 29.6% of records with lay witnesses and 24.4% of records with health care provider witnesses.

Among records where first monitored rhythm and ROSC were documented, the ROSC rate was 62.0% among VF/VT records, 4.5 times higher than the ROSC rate among records with other rhythms (13.4%). Additionally, VF/VT comprised just 12.9% of all records but accounted for 40.5% of records in which ROSC occurred.

Table 10: Return of Spontaneous Circulation Among Cardiac Arrests, by First Monitored Rhythm, 2010

	Count	Total	Percent
VF/VT	62	100	62.0%
Other Rhythm	91	677	13.4%
Total	153	777	19.7%

Source: Utah Prehospital Database.

According to 563 EMS records where time from 9-1-1 call to arrival at scene was documented, 62.3% of responses occurred in less than 10 minutes, 30.9% occurred in 10 to 19 minutes, and 5.2% occurred in 20 to 29 minutes.

Heart Failure

Heart failure is a condition in which the heart cannot pump enough blood to the body's other organs. It can result from narrowed arteries that supply blood to the heart muscle or from other factors. As the flow of blood from the heart slows, blood returning to the heart backs up, causing congestion in the tissues. Swelling commonly occurs in the legs and ankles. Fluid may collect in the lungs and interfere with breathing, causing shortness of breath.

Quick Facts

- Compared to other states, Utah has one of the highest rates of heart failure death but one of the lowest rates of heart failure hospitalization.
- Within Utah, women have a higher heart failure death rate than men, but men have a higher heart failure hospitalization rate.
- Although Utah blacks have a higher heart failure hospitalization rate than other races, Whites and Pacific Islanders have higher death rates than Blacks.
- Heart failure could potentially be prevented through high quality primary and preventive care, which includes improvements in the health care delivery system.

Mortality

U.S.

In 2006, heart failure was the underlying cause of death for more than 60,000 Americans, for a crude rate of 20.2 per 100,000.[13] In addition, heart failure was a contributing factor in nearly 283,000 additional deaths.[13]

Heart failure mortality increases exponentially with age. The heart failure death rate per 100,000 was nearly four times higher (544.4) among ages 85+ compared to the next youngest group (122.4, ages 75-84).

Across racial groups, men had higher heart failure death rates than women. Blacks had higher heart failure death rates compared to other racial groups.[13]

Utah

In 2007, Utah had one of the highest age-adjusted heart failure death rates in the 50 states, along with states that generally have very high cardiovascular disease burdens, such as Mississippi, Alabama, and Oklahoma. Utah generally compares favorably with other states for all cardiovascular disease mortality, and the reasons for its very high heart failure mortality rate are poorly understood.[13]

Unlike mortality from other causes, mortality from heart failure did not decline over the last decade. According to the Utah Death Certificate Database, the heart failure death rate per 100,000 was 29.7 in 2000 and 26.3 in 2010. These rates were not significantly different.

In 2010, the average age at heart failure death was 84.3 years.

Contrary to national trends, Utah women (34.0) had a higher age-adjusted rate of heart failure death per 100,000 than men (26.2).

Also departing from national trends, between 2005 and 2009, Utah Whites and Pacific Islanders had the highest heart failure death rates per 100,000 (32.0 and 29.1, respectively) compared to Blacks (12.2), Asians (13.4), and American Indian/Alaska Natives (8.8).

Mortality rates varied dramatically across geographic areas. Between 2008 and 2010, the top five small areas with heart failure mortality rates higher than the state rate (28.6/100,000) were Carbon/Emery Counties (58.3), So. Utah County (51.5), North Orem (51.0), Magna (49.8) and South Jordan (48.1). Only six small areas had mortality rates lower than the state rate: Farmington/Centerville (5.62*), St. George (11.8), Other Washington County, (13.4), Logan (16.7), West Valley East (18.7), and Bountiful (19.4).

Hospitalization

U.S.

Heart failure is considered an ambulatory care-sensitive condition (ACSC) by the Agency for Healthcare Research and Quality (AHRQ). This means that it is a condition that could potentially have been prevented with high quality primary and preventive care, and that improvements in health care delivery systems and process of care could be made to improve health outcomes and lower costs.[37]

In 2008, heart failure was the third most common principal diagnosis for inpatient hospital stays, following pregnancy/childbirth/infants and pneumonia.[5] Heart failure accounted for 2.6% of all hospital discharges. The number of heart failure discharges in 2008 has not changed significantly since 1997.

About 20% of patients hospitalized with a principal diagnosis of heart failure are re-hospitalized for a condition related to heart failure within 30 days.[3]

The National Priorities Partnership (NPP), a coalition representing 48 key health care organizations, found that the quality of patient discharge instructions is improving among patients hospitalized for heart failure.[3] From 2005 to 2008, the overall percentage of patients with heart failure who received

* This statistic has a relative standard error greater than 0.3. Interpret with caution.

recommended care improved from 87.7% to 95.0%. Race-related disparities in care remain persistent. Although the percentage of Asian patients who received recommended care for heart failure improved from 86.6% to 96.6%, American Indians/Alaska Natives were 1.7 times less likely than Whites to receive recommended hospital care. [3] Hispanic persons also did not receive recommended hospital care for heart failure at the same rate as Whites. Among adults aged 65 and older, women with congestive heart failure did not receive the same care as men.[20]

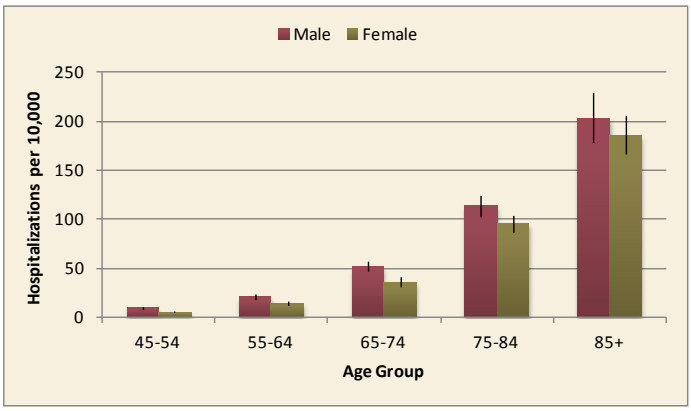
In 2003, the rate for heart failure hospitalization among Blacks was 2.5 times higher than the corresponding rate for non-Hispanic Whites. The rate for heart failure hospitalization among Hispanic persons was 1.7 times greater than the rate among non-Hispanic persons.[37]

Race continues to be a key predictor of preventable heart failure hospitalizations among the elderly. Differences that may contribute to the disparity include variation in access to primary care, quality of care, and physician practice.[32]

Utah

The rate of hospitalization for heart failure increased with age. Hospitalization rates were consistently higher for males than females across age groups.

Figure 19: Utah Heart Failure Hospitalizations by Age (45+) and Sex, 2009



Source: Utah Inpatient Hospital Discharge Database.

Between 1999 and 2009, the heart failure hospitalization rate per 10,000 declined from 16.5 to 13.4.* In 2009, the rate of heart failure hospitalizations per 10,000 for Blacks was 30.86, more than double the rate for Whites (13.17).[27]

According to the Utah Inpatient Hospital Discharge Database, between 2007 and 2009, the statewide age-adjusted hospitalization rate for heart failure was 13.6 per 10,000. Among small areas, the rate per 10,000 ranged from 6.4 in Summit County to 24.5 in South Salt Lake.

The average length of hospital stay for heart failure decreased from 4.9 days in 1999 to 4.5 days in 2009. This difference was statistically significant.

* Age-adjusted to the 2000 U.S. Standard Population using three age groups.

Costs

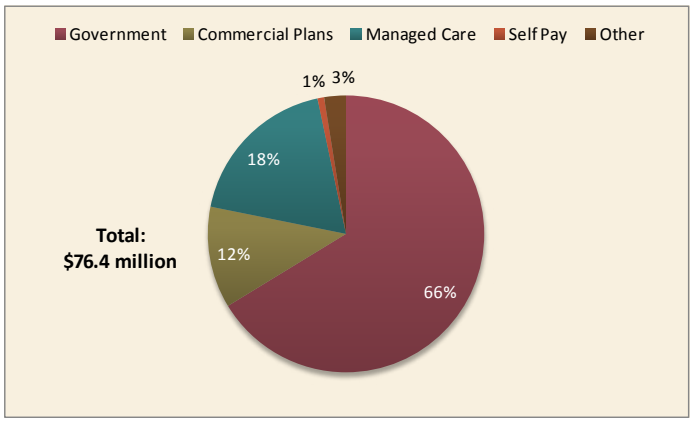
U.S.

The estimated cost for heart failure in the U.S. in 2010 was $39.2 billion.[36]

Utah

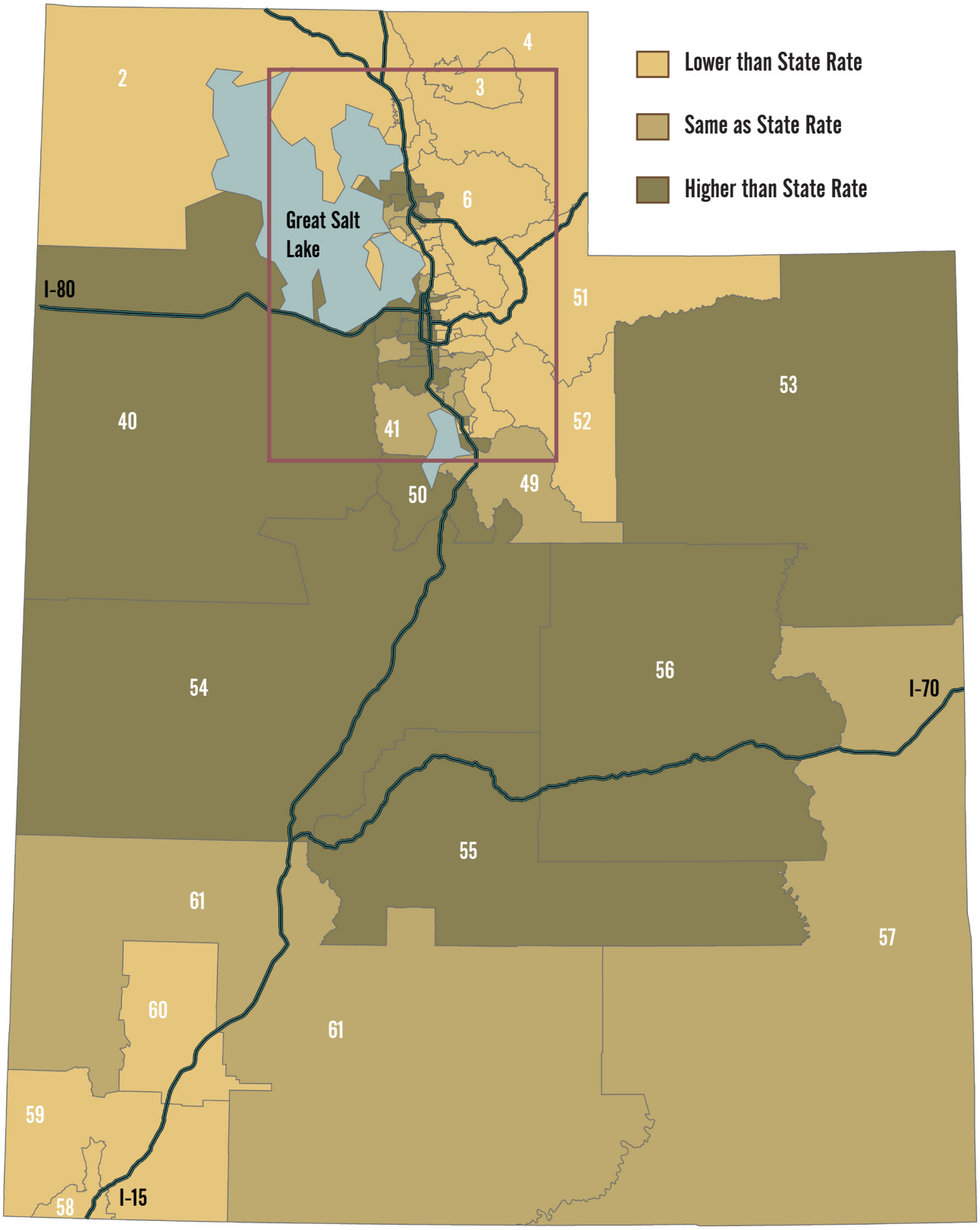
Between 1999 and 2009, the sum of heart failure hospitalization charges nearly tripled, from $25 million to $76 million. Two-thirds (66%) of these charges were billed to government plans, including Medicare.

Figure 20: Distribution of Charges for All Heart Failure Hospitalizations by Primary Payer, Utah, 2009



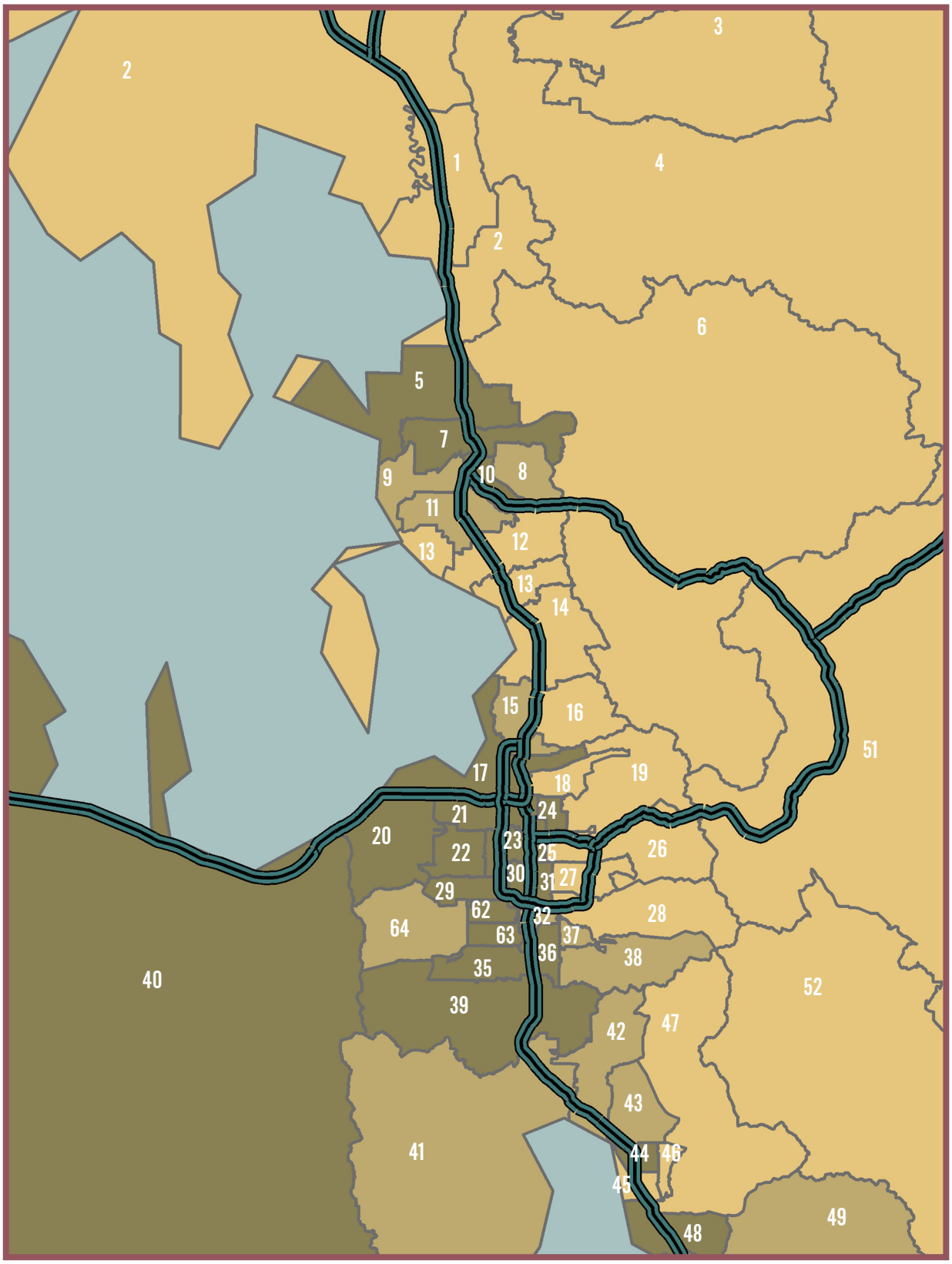
Source: Utah Inpatient Hospital Discharge Database.

Map 4: Utah Heart Failure Hospitalizations by Small Area, 2007-2010



Source: Utah Inpatient Hospital Discharge Database, Age-adjusted using three age groups.

Map 5: Utah Heart Failure Hospitalizations by Small Area, 2007-2010, Wasatch Front



Source: Utah Inpatient Hospital Discharge Database, Age-adjusted. using three age groups.

Table 11: Utah Heart Failure Hospitalizations by Small Area, 2007-2010

Small Area Name (Number)	Age-adjusted Rate	Lower Confidence Bound	Upper Confidence Bound	Relative Standard Error	Compared to State Rate
State	13.6	13.3	13.8		
Brigham City (1)	8.0	6.2	10.0	11.9	Lower
Other Box Elder County (2)	9.7	7.7	12.1	11.3	Lower
Logan (3)	9.0	7.7	10.6	7.9	Lower
Other Cache/Rich County (4)	9.6	7.9	11.5	9.5	Lower
Ben Lomond (5)	16.8	15.0	18.8	5.7	Higher
Morgan/East Weber County (6)	9.9	8.3	11.7	8.6	Lower
Downtown Ogden (7)	16.8	14.3	19.5	7.7	Higher
South Ogden (8)	11.9	10.2	13.7	7.5	Same
Roy/Hooper (9)	14.5	12.5	16.9	7.5	Same
Riverdale (10)	17.1	14.6	20.0	7.8	Higher
Clearfield/Hill AFB (11)	13.9	11.9	16.1	7.3	Same
Layton (12)	9.7	8.3	11.2	7.3	Lower
Syracuse/Kaysville (13)	10.5	8.7	12.6	9.0	Lower
Farmington/Centerville (14)	10.8	8.7	13.2	10.1	Lower
Woods Cross/North Salt Lake (15)	11.9	9.5	14.8	10.8	Same
Bountiful (16)	10.0	8.7	11.3	6.6	Lower
Rose Park (17)	18.5	16.0	21.3	7.2	Higher
Avenues (18)	8.9	7.1	10.9	10.4	Lower
Foothill/U of U (19)	9.2	7.4	11.3	10.3	Lower
Magna (20)	21.2	17.7	25.3	8.5	Higher
Glendale (21)	18.6	15.7	21.9	8.1	Higher
West Valley West (22)	15.7	13.9	17.8	5.9	Higher
West Valley East (23)	17.6	15.6	19.8	6.0	Higher
Downtown Salt Lake (24)	15.9	14.0	17.9	6.1	Higher
South Salt Lake (25)	24.5	21.3	28.0	6.8	Higher
Millcreek (26)	10.6	9.4	11.8	5.7	Lower
Holladay (27)	11.1	9.9	12.5	5.8	Lower
Cottonwood (28)	9.4	8.1	10.8	7.2	Lower
Kearns (29)	19.4	17.2	21.8	5.7	Higher
Taylorsville (30)	18.3	15.9	20.9	6.7	Higher
Murray (31)	17.3	15.1	19.6	6.5	Higher
Midvale (32)	14.4	12.2	17.0	8.4	Same

Small Area Name (Number)	Age-adjusted Rate	Lower Confidence Bound	Upper Confidence Bound	Relative Standard Error	Compared to State Rate
West Jordan North 2007-2008 (33)	26.0	20.8	32.2	9.9	Higher
West Jordan/Copperton 2007-2008 (34)	18.8	14.2	24.3	12.1	Higher
South Jordan (35)	22.2	19.1	25.6	7.0	Higher
Sandy Center (36)	16.9	14.9	19.1	6.1	Higher
NE Sandy (37)	10.9	8.7	13.6	11.0	Same
SE Sandy (38)	12.0	9.5	15.0	10.2	Same
Riverton/Draper (39)	17.4	15.2	19.7	6.1	Higher
Tooele Co. (40)	18.5	16.4	20.7	5.7	Higher
Lehi/Cedar Valley (41)	11.8	9.8	14.1	8.8	Same
American Fork/Alpine (42)	14.3	12.3	16.6	7.4	Same
Pleasant Grove/Lindon (43)	13.7	11.6	16.2	8.2	Same
North Orem (44)	20.3	17.5	23.5	7.3	Higher
West Orem (45)	10.5	8.4	13.0	10.5	Lower
East Orem (46)	10.6	8.5	13.1	10.8	Lower
Provo/BYU (47)	10.6	9.1	12.4	7.7	Lower
Provo South (48)	16.9	14.5	19.6	7.4	Higher
Springville/Spanish Fork (49)	14.9	13.2	16.7	5.8	Same
South Utah County (50)	17.3	14.5	20.4	8.2	Higher
Summit County (51)	6.4	5.0	8.1	11.5	Lower
Wasatch County (52)	7.6	5.7	9.9	13.5	Lower
TriCounty LHD (53)	20.1	18.0	22.3	5.4	Higher
Juab/Millard/Sanpete Counties (54)	15.5	13.7	17.4	6.0	Higher
Sevier/Piute/Wayne Counties (55)	16.9	14.5	19.5	7.5	Higher
Carbon/Emery Counties (56)	16.5	14.4	18.9	6.8	Higher
Grand/San Juan Counties (57)	12.9	10.7	15.4	9.1	Same
St. George (58)	10.6	9.6	11.6	4.8	Lower
Other Washington County (59)	10.4	9.2	11.7	6.1	Lower
Cedar City (60)	10.1	8.3	12.0	9.1	Lower
Other Southwest Dist. (61)	12.9	11.0	15.1	8.1	Same
W. Jordan Northeast 2009-2010 (62)	21.7	17.0	27.2	11.0	Higher
W. Jordan Southeast 2009-2010 (63)	23.0	17.5	29.6	12.2	Higher
W. Jordan West, Copperton 2009-2010 (64)	11.5	7.4	17.2	17.4	Same

Source: Utah Inpatient Hospital Discharge Database, Age-adjusted using three age groups.

Cerebrovascular Disease (Stroke)

Stroke occurs when the blood supply to the brain is interrupted. There are two major types of stroke—ischemic and hemorrhagic. Ischemic strokes occur when a blood clot obstructs blood flow to the brain. Ischemic strokes may result from clogged arteries or atherosclerosis. Hemorrhagic strokes occur when a blood vessel in part of the brain breaks open.

Quick Facts

- Stroke mortality has declined significantly in the last 40 years.
- In the U.S., stroke dropped from the third to the fourth leading cause of death (age-adjusted). However, stroke remains the third leading cause of death in Utah.
- Stroke is the seventh most expensive cause of hospitalization.
- Tissue Plasminogen Activator (tPA) is a protein that can be administered during an ischemic stroke to dissolve a blood clot. Stroke treatment protocols recommend that tPA be administered within 3 hours of symptom onset.
- Utahns are not getting to the hospital quickly enough to be eligible for tPA. Among Utah hospitals participating in a stroke quality improvement program in 2010, only two-thirds of strokes arrived by ambulance and only 45% arrived within three hours of symptom onset.

Mortality

U.S.

From 1997 to 2007, the annual stroke death rate decreased 34.3%.[36]

A larger number of women die from stroke each year compared to men. In 2007, 60% of stroke deaths occurred among women.[36] Men die from stroke at younger ages than women.
Blacks have higher rates of premature stroke mortality compared to other racial groups.[13]

Years of potential life lost (YPLL) is a measure of premature mortality (death before age 75 years). In 2006, Whites had the lowest YPLLs for stroke (158), compared with Blacks (432), Hispanic persons (185), American Indian/Alaska Native (AI/AN) (178), and Asian/Pacific Islanders (164).[13]

Utah

Between 2000 and 2010, the stroke mortality rate per 100,000 dropped 45%, from 63.0 to 34.5.

In 2010, stroke comprised 23.6% of all cardiovascular disease deaths.

In 2007, Utah had the 15th lowest age-adjusted mortality rate for stroke (38.5 per 100,000) of all states and Washington, D.C.[13] The U.S. stroke mortality rate in 2007 was 42.2 per 100,000. [13]

Stroke mortality is associated with age. Women have higher stroke mortality rates above age 75 than men.

Prehospital Care

U.S.

About 54% of stroke deaths in 2007 occurred outside a hospital setting.

Utah

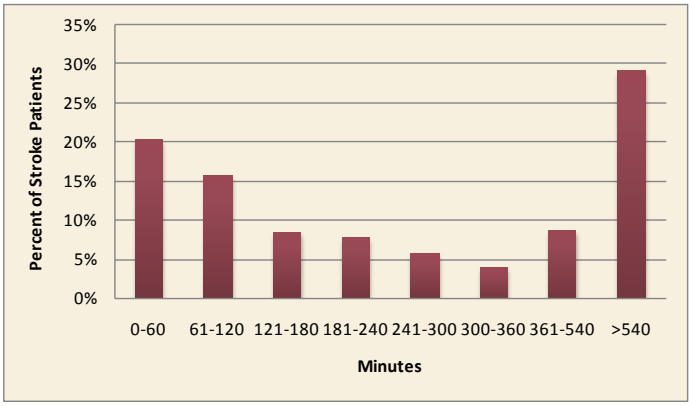
In 2010, the number of Utah emergency medical services (EMS) responses to 9-1-1 calls with a primary impression of stroke exceeded 1,500. Although nearly 300 patient records were missing information on patient age, 69% of responses where age was recorded involved a patient over age 65. More than 1,000 responses were to the patient's home or residence.

Despite the stroke patient volume by EMS and the importance of timely stroke treatment, about one-third of Utah strokes reached hospitals by personal vehicle instead of ambulance.* Rates of ambulance transport were similar for males and females.

Fewer than half of patients (45%) arrive to the hospital within 180 minutes (3 hours) of symptom onset.*

* Outcome Sciences, Get With The Guidelines (GWTG)-Stroke for Jan-Dec 2010. Please note: GWTG aggregate comparative data are intended for internal quality improvement. Permission is required from the American Heart Association and Outcome Sciences, Inc. d/b/a Outcome, for external presentation or publication of benchmark data.

Figure 21: Minutes from Stroke Symptom Onset to Hospital Arrival, Get With The Guidelines® Hospitals, Utah 2010



Source: Outcome Sciences.

U.S.

Between 1997 and 2005, the hospitalization rate for ischemic stroke decreased from 54.4 to 35.9 stays per 10,000 population. The hospitalization rate for hemorrhagic stroke remained relatively constant.[36]

In 1997, acute cerebrovascular disease ranked 6th among most frequent principal diagnoses for inpatient hospital stays. In 2008, it ranked 14th.[27]

In 2008, 67% of stroke hospitalizations occurred among adults aged 65 and older. More than a quarter (28%) occurred in the 45-64 age group.

The length of time to recover from a stroke depends on its severity. Between 50% and 70% of stroke survivors regain functional independence, but 15% to 30% are permanently disabled. Twenty percent require institutional care after onset.[36]

One-third of stroke survivors are likely to experience a recurrent stroke within five years. Recurrent strokes can be prevented. However, women and Blacks received incomplete preventive interventions. Women were also less likely than men to receive completed discharge regimens, including medication and outpatient follow up.[1]

Utah

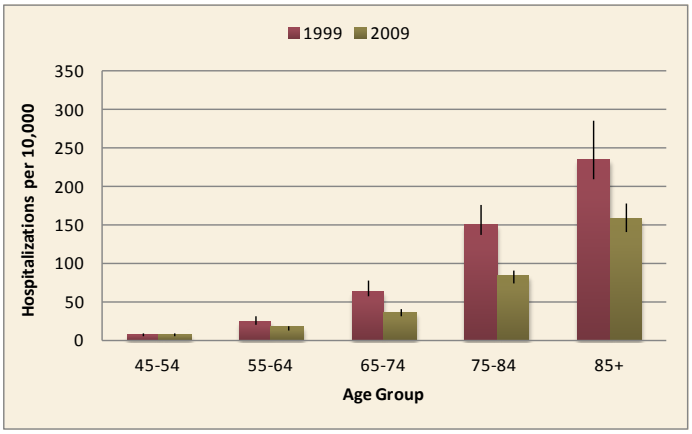
In 2009, Utah residents aged 18 and older experienced 2,797 hospitalizations for stroke. Forty-four percent of these hospitalizations occurred among adults aged 75 and older.

Between 1999 and 2009, the Utah stroke hospitalization rate declined significantly among ages 55 and older. The rate did not decline in the 45-55 age group.

Between 2007 and 2009, the statewide age-adjusted rate for emergency department encounters for stroke was 13.5 per 10,000. Among small areas, the age-adjusted rate per 10,000 varied from 9.0 in Grand/San Juan Counties to 22.5 in West Jordan North (2007-2008).

Among hospitals using the Get With The Guidelines patient management tool, 74% of eligible ischemic stroke patients who arrived to hospitals within three-and-a-half hours of symptom onset received tPA within four-and-a-half hours of symptom onset.*

Figure 22: Utah Stroke Hospitalization by Age Group (45+), 1999 and 2009



Source: Utah Inpatient Hospital Discharge Database.

According to the Utah Inpatient Hospital Discharge Database ischemic strokes accounted for 71% of stroke hospital discharges in 2009. Nearly one in two ischemic strokes (49.3%) were discharged to home, compared with fewer than one in three (31.3%) hemorrhagic strokes.

Hemorrhagic stroke was more fatal than ischemic stroke. Eighteen percent of hemorrhagic stroke inpatients died compared to 4.5% of ischemic stroke inpatients. Hemorrhagic strokes resulted in longer average hospital stays (6.3 days) compared to ischemic strokes (3.6 days).

Costs

U.S.

For 2007, estimated direct medical costs for stroke totaled $25.2 billion. This included hospital outpatient provider visits, hospital inpatient stays, emergency room visits, prescription medication, and home health care.

Table 12: Projected Total Costs for Stroke 2005-2050, in 2005 Dollars

Population	Cost
Non-Hispanic Whites	$1.52 trillion
Hispanic persons	$313 billion
Blacks	$379 billion

Source: Brown et al (2006). Projected costs of ischemic stroke in the United States. Neurology; 67: 1390-1395.

* Outcome Sciences, Get With The Guidelines-Stroke for Jan-Dec 2010. Please note: GWTG aggregate comparative data is intended for internal quality improvement. Permission is required from the American Heart Association and Outcome Sciences, Inc. d/b/a Outcome for external presentation or publication of benchmark data.

In 2008, acute cerebrovascular disease ranked 11th in cost among principal diagnoses for inpatient hospital stays, totaling $7.6 billion in inflation-adjusted hospital costs.[27]

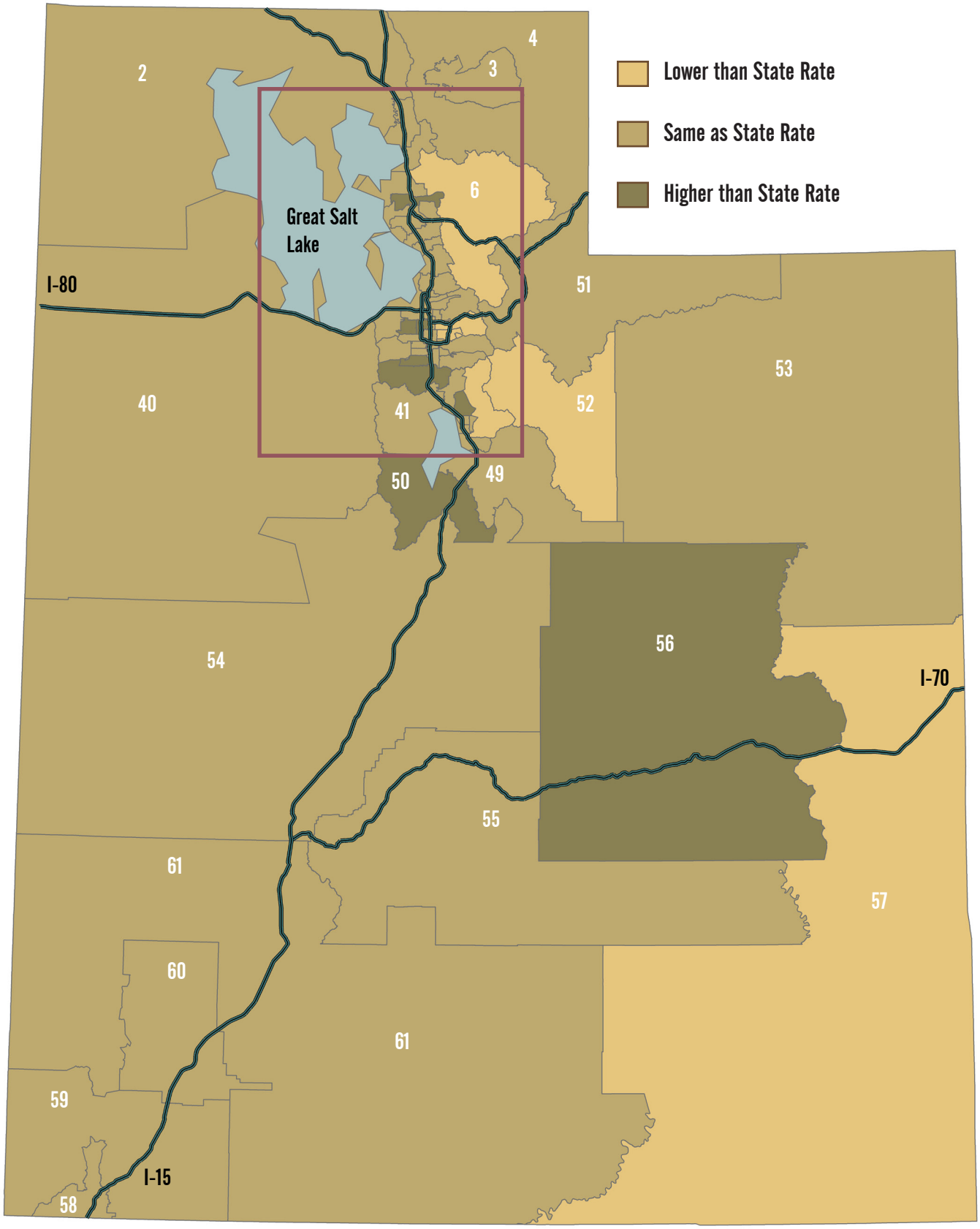
Between 1997 and 2004, the inability of stroke survivors to afford medication increased from 8.1% to 12.7%. Compared to stroke survivors who could afford medication, those unable to afford medication reported more frequently not having transportation, health insurance, or a usual place of care.[30]

Utah

Between 1999 and 2009, the average length of stay for stroke hospitalization decreased from 5.7 days to 4.3 days; the average charge per hospitalization more than doubled from $13,228 to $29,765.

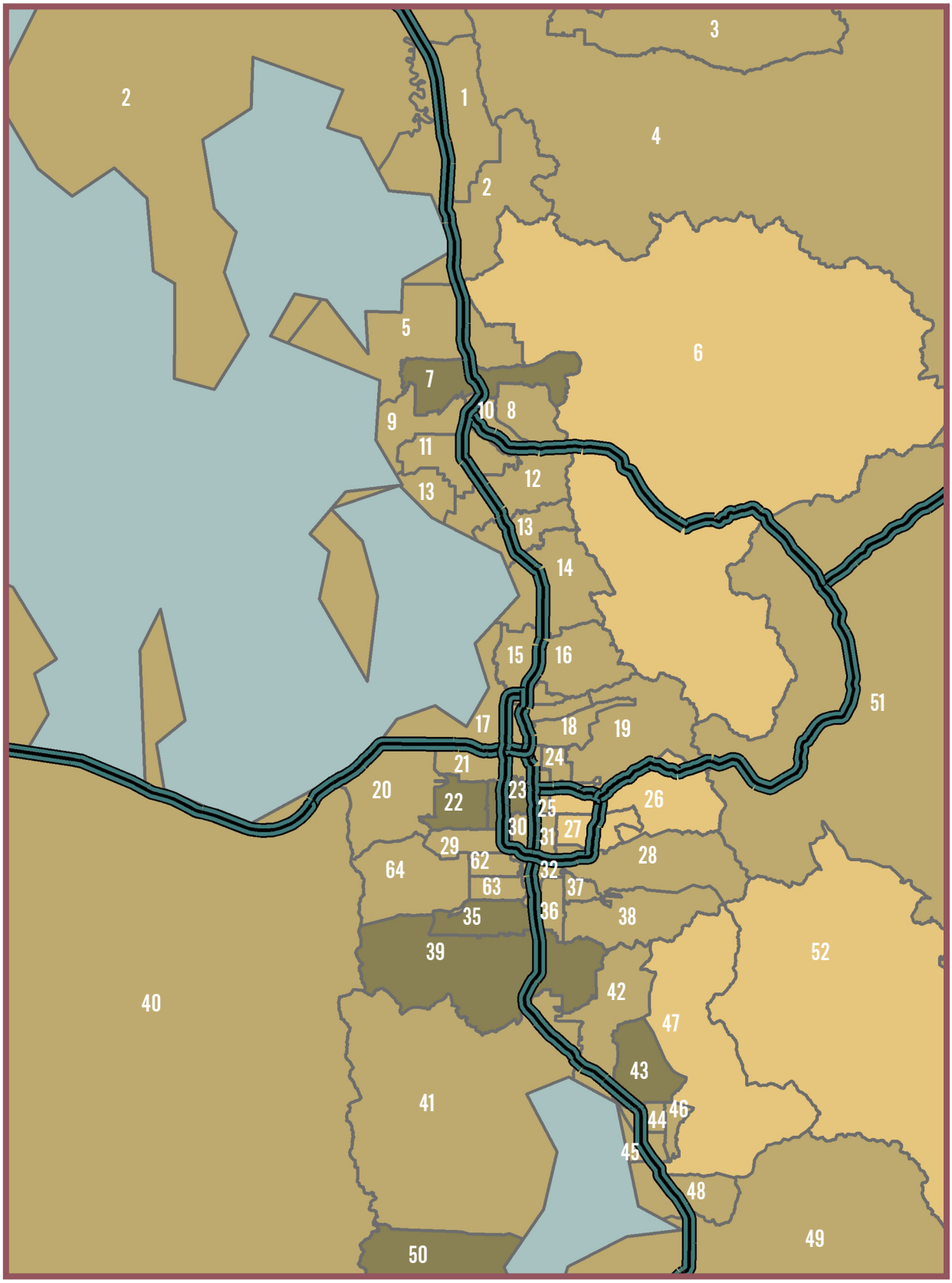
The relative charges for cerebrovascular disease compared to other hospitalization causes dropped from 5th most expensive to 7th most expensive.

Map 6: Utah Stroke Emergency Department Visits by Small Area, 2007-2009



Source: Utah Emergency Department Encounters Database, Age-adjusted using three age groups.

Map 7: Utah Stroke Emergency Department Visits by Small Area, 2007-2009, Wasatch Front



Source: Utah Emergency Department Encounters Database, Age-adjusted using three age groups.

Table 13: Utah Stroke Emergency Department Visits by Small Area, 2007-2009

Small Area Name (Number)	Age-adjusted Rate	Lower Confidence Bound	Upper Confidence Bound	Relative Standard Error	Compared to State Rate
State	13.5	13.2	13.8		
Brigham City (1)	12.3	9.8	15.2	11.0	Same
Other Box Elder County (2)	14.4	11.5	17.7	10.6	Same
Logan (3)	12.3	10.5	14.3	7.7	Same
Other Cache/Rich County (4)	12.4	10.2	14.9	9.4	Same
Ben Lomond (5)	15.1	13.1	17.3	6.9	Same
Morgan/East Weber County (6)	11.1	9.2	13.3	9.2	Lower
Downtown Ogden (7)	16.8	14.0	20.1	8.9	Higher
South Ogden (8)	14.4	12.3	16.8	7.9	Same
Roy/Hooper (9)	15.4	13.0	18.2	8.3	Same
Riverdale (10)	15.6	12.8	18.8	9.5	Same
Clearfield/Hill AFB (11)	13.3	11.2	15.7	8.0	Same
Layton (12)	12.0	10.3	13.8	7.3	Same
Syracuse/Kaysville (13)	14.9	12.4	17.7	8.7	Same
Farmington/Centerville (14)	13.0	10.4	16.0	10.5	Same
Woods Cross/North Salt Lake (15)	15.0	11.8	18.8	11.2	Same
Bountiful (16)	15.0	13.3	17.0	6.2	Same
Rose Park (17)	14.3	11.8	17.2	9.2	Same
Avenues (18)	11.3	9.1	14.0	10.7	Same
Foothill/U of U (19)	12.0	9.7	14.7	10.4	Same
Magna (20)	15.2	11.8	19.2	11.5	Same
Glendale (21)	15.1	12.2	18.5	10.1	Same
West Valley West (22)	15.9	13.8	18.3	6.7	Higher
West Valley East (23)	16.6	14.4	19.1	7.0	Higher
Downtown Salt Lake (24)	12.2	10.4	14.3	7.8	Same
South Salt Lake (25)	12.6	10.0	15.7	11.0	Same
Millcreek (26)	11.1	9.7	12.6	6.5	Lower
Holladay (27)	9.8	8.5	11.4	7.2	Lower
Cottonwood (28)	11.9	10.2	13.8	7.4	Same
Kearns (29)	13.6	11.6	16.0	7.5	Same
Taylorsville (30)	12.4	10.2	14.8	9.1	Same
Murray (31)	13.5	11.3	15.9	8.5	Same

Small Area Name (Number)	Age-adjusted Rate	Lower Confidence Bound	Upper Confidence Bound	Relative Standard Error	Compared to State Rate
Midvale (32)	13.9	11.3	16.8	9.8	Same
West Jordan North 2007-2008 (33)	22.5	17.8	28.1	9.9	Higher
West Jordan/Copperton 2007-2008 (34)	19.2	14.8	24.5	11.0	Higher
South Jordan (35)	17.9	14.8	21.5	8.7	Higher
Sandy Center (36)	14.1	12.1	16.4	7.5	Same
NE Sandy (37)	13.1	10.3	16.4	11.2	Same
SE Sandy (38)	15.7	12.4	19.7	10.5	Same
Riverton/Draper (39)	18.5	16.0	21.4	6.7	Higher
Tooele Co. (40)	15.1	13.1	17.5	7.1	Same
Lehi/Cedar Valley (41)	13.4	10.8	16.4	9.8	Same
American Fork/Alpine (42)	13.2	11.0	15.7	8.5	Same
Pleasant Grove/Lindon (43)	17.4	14.6	20.6	8.4	Higher
North Orem (44)	14.6	11.9	17.7	9.6	Same
West Orem (45)	12.1	9.5	15.1	11.3	Same
East Orem (46)	10.7	8.3	13.7	12.3	Same
Provo/BYU (47)	9.2	7.6	11.1	9.5	Lower
Provo South (48)	12.6	10.3	15.4	9.5	Same
Springville/Spanish Fork (49)	11.9	10.2	13.7	7.2	Same
South Utah County (50)	16.8	13.7	20.5	9.9	Higher
Summit County (51)	11.1	8.9	13.6	10.1	Same
Wasatch County (52)	10.2	7.7	13.3	13.4	Lower
TriCounty LHD (53)	14.6	12.6	16.8	7.3	Same
Juab/Millard/Sanpete Counties (54)	14.5	12.5	16.7	7.2	Same
Sevier/Piute/Wayne Counties (55)	15.5	12.9	18.6	9.1	Same
Carbon/Emery Counties (56)	18.8	16.2	21.8	7.5	Higher
Grand/San Juan Counties (57)	9.0	6.9	11.5	12.6	Lower
St. George (58)	13.0	11.7	14.4	5.1	Same
Other Washington County (59)	12.9	11.4	14.6	6.3	Same
Cedar City (60)	13.1	10.9	15.7	9.1	Same
Other Southwest Dist. (61)	12.9	10.6	15.5	9.5	Same
W. Jordan Northeast 2009-2010 (62)	17.4	11.7	24.9	17.1	Same
W. Jordan Southeast 2009-2010 (63)	18.0	11.7	26.5	18.0	Same
W. Jordan West, Copperton 2009-2010 (64)	10.3	5.2	18.2	24.3	Same

Source: Utah Emergency Department Encounters Database, Age-adjusted using three age groups.

Did You Know?

The country's **highest death rates** due to stroke are in the **southeastern United States.**

Source: Centers for Disease Control and Prevention.
For more information, please visit www.millionhearts.hhs.gov.

Stroke Awareness

Stroke is a life-threatening emergency. Some strokes can be treated with a clot-dissolving drug that can reduce disability from stroke if given within three hours of symptom onset. By calling 9-1-1 at the first sign of stroke, witnesses can get help to victims fast and increase their chances of survival.

Quick Facts

- Only 44% of Utah adults know all five signs and symptoms and say they would call 9-1-1 if they witnessed a stroke.
- Stroke awareness was higher among women, Whites, and people with at least a college degree than among men, non-Hispanic Blacks, Hispanic persons, and those with less than a high school education.

The benefits of early treatment for stroke are clear. Increased time from symptom onset to treatment for stroke is associated with increased morbidity and death. Yet, delays in treatment persist. Use of Emergency Medical Services (EMS) is important to ensure prompt assistance in the case of stroke, and prehospital notification is needed for prompt intervention to reduce brain damage. Research suggests that patients' delay in seeking help for their illness is a major factor in delayed heart attack treatment;[21] the same may be true for stroke. Because the brain is affected by the stroke, patients may not be able to recognize the emergency or effectively seek help.

The five warning signs of stroke are:

- Sudden severe headache with no known cause
- Sudden difficulty seeing in one or both eyes
- Sudden loss of balance or coordination
- Sudden numbness or weakness of the face, arm, or legs
- Sudden confusion or trouble speaking

The term "stroke awareness" refers to the percentage of adults who know all five signs and symptoms of stroke and would call 9-1-1 at any sign.

U.S.

In the 2005 BRFSS, 38.0% of adults were aware of all five stroke signs and symptoms and said they would call 9-1-1 if they thought someone was having a stroke. Stroke awareness was higher among women, Whites, and people with higher educational attainment than among men, non-Hispanic Blacks, Hispanic persons, and those with lower educational attainment.[36]

Utah

In 2009, about 9 in 10 Utahns recognized any one of the traditional hallmark signs of a stroke: sudden numbness or tingling, sudden confusion or trouble speaking, or sudden loss of balance. About three-fourths (73.9%) recognized trouble seeing, and just over two-thirds (67.9%) recognized sudden severe headache as a possible stroke sign.

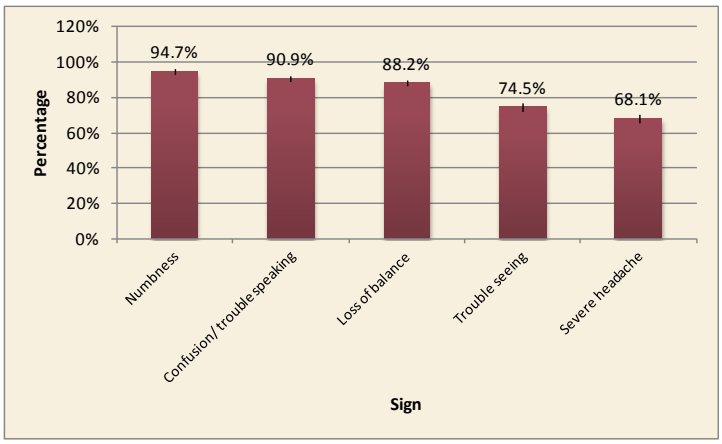
Fewer than half of adults (45%) knew all five signs and symptoms of stroke and would call 9-1-1.

Stroke awareness was higher among females than males across age groups.

In combined years 2005 and 2007 through 2009, stroke awareness was significantly higher among Utah adults who had at least some college than those with educational attainment of a high school diploma/GED or below.

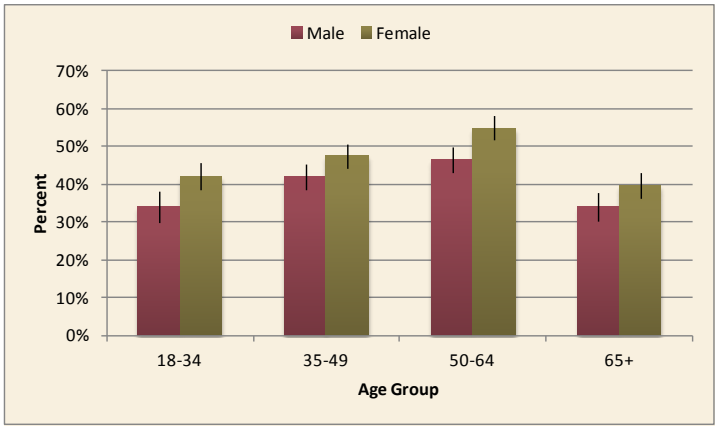
Utah adults in the highest household income category, $75,000 and above, had a significantly higher stroke awareness rate (48.6%) than those with lower household incomes.

Figure 23: Stroke Awareness Among Utah Adults by Sign, 2009



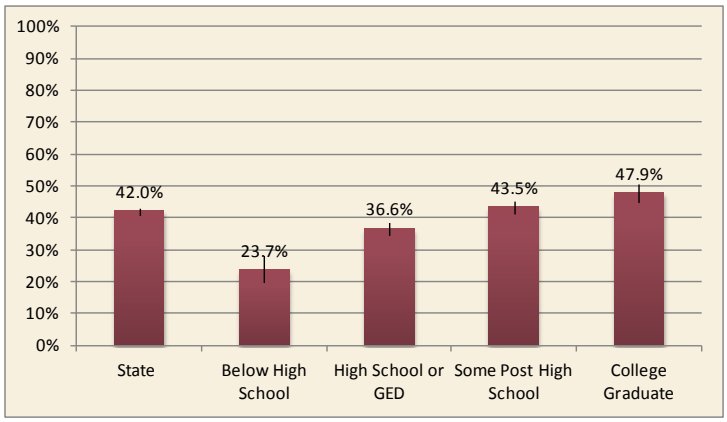
Source: Utah BRFSS. Age-adjusted using age groups (18-44, 45-64, 65+).

Figure 24: Stroke Awareness Among Utah Adults by Age and Sex, 2009



Source: Utah BRFSS.

Figure 25: Stroke Awareness Among Utah Adults by Education Level, 2005, 2007-2009 Combined

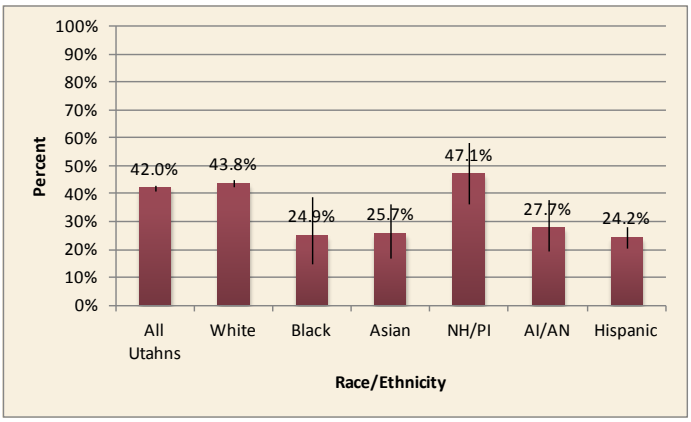


Source: Utah BRFSS. Age-adjusted.

In combined years 2005 and 2007 through 2009, stroke awareness varied across racial and ethnic groups. The lowest rate of awareness was among persons who selected "Other" race, at 22.8%. The heart attack awareness rate among Native Hawaiian (NH) or other Pacific Islanders (PI) (47.1%) was not statistically different from the state rate.

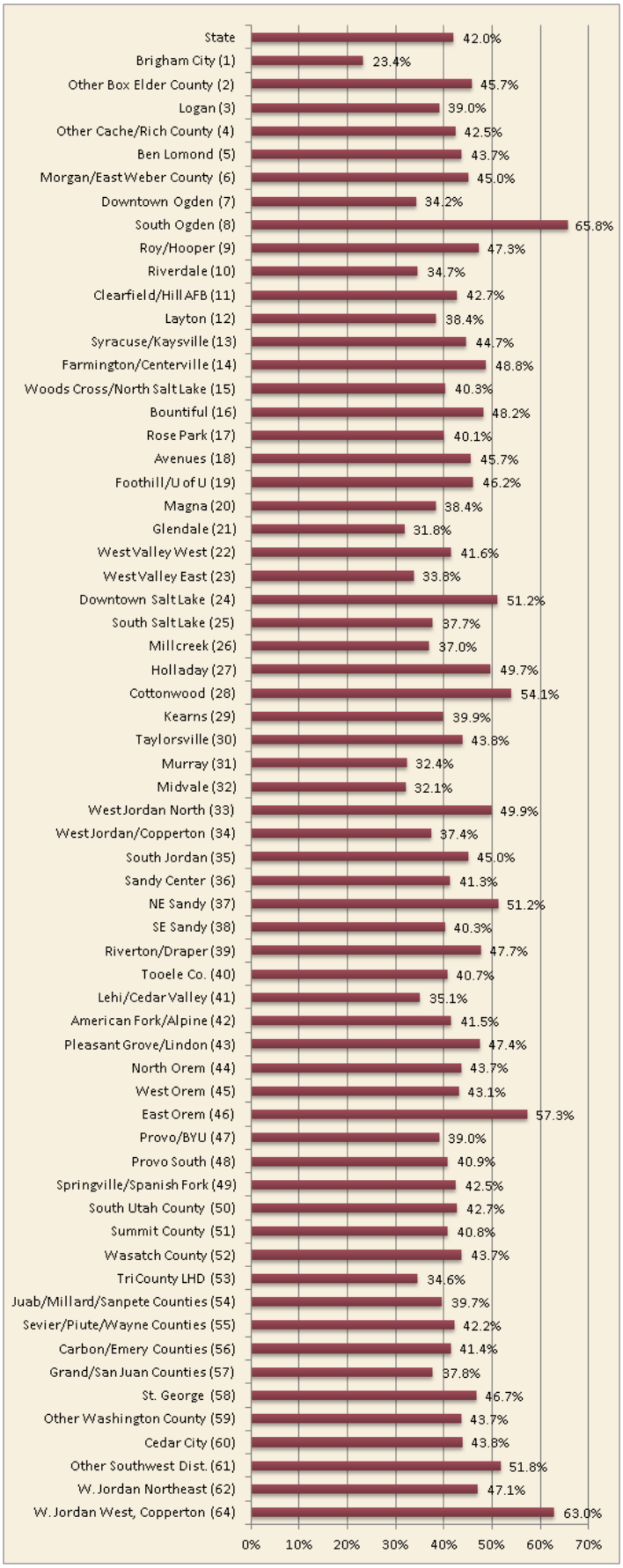
Stroke awareness varied little by geographic area. In combined years 2005 and 2007 through 2009, three small areas had significantly lower stroke awareness rates than the state overall (42.0%): Brigham City (23.4%), Murray (32.4%) and TriCounty (34.6%). Five small areas had significantly higher stroke awareness than the state overall: Downtown Ogden (65.8%), Downtown Salt Lake (51.2%), Cottonwood (54.1%), East Orem (57.3%), and West Jordan West (63.0%).

Figure 26: Stroke Awareness Among Utah Adults by Race and Ethnicity, 2005, 2007-2009 Combined



Source: Utah BRFSS. Age-adjusted.

Figure 27: Stroke Awareness Among Utah Adults by Small Area, 2005, 2007-2009 Combined



Source: Utah BRFSS. Age-adjusted using 11 age groups.

The rate for West Jordan Southeast (63) had a relative standard error >0.5 and does not meet UDOH standards for reliability.

High Blood Pressure (HBP)

High blood pressure (HBP), or hypertension, is a condition in which the heart has to work too hard to pump blood to the body's vital organs. This results in an increased risk of heart attack or stroke. Blood pressure is considered high when the systolic (top) measure is 140 mmHg or greater, or when the diastolic (bottom) measure is 90 mmHg or greater. In patients with diabetes, blood pressure is considered high when the systolic measure is 130 mmHg or greater, or when the diastolic measure is 80mmHg or greater. HBP is often called "the silent killer" because it does not produce observable symptoms. HBP is one of the most important contributors to coronary heart disease, stroke, and heart failure. It is considered an ambulatory care-sensitive condition (ACSC), a condition for which appropriate primary care could prevent hospitalizations.

Quick Facts

- In the U.S., total life expectancy is about five years shorter for adults with HBP compared to those without it.[36]
- HBP can be controlled through medication and healthy lifestyle, and being under a doctor's care is important to help manage medication and monitor HBP. Among Utah HBP patients under a doctor's care, 74% reported taking medication.
- However, 38% of Utahns with HBP are not under the care of a physician and only 9.5% report taking medication to control their HBP.
- Significant racial and ethnic disparities have been documented in HBP prevalence, control, and consequences. In the U.S., hospitalization rates for Black and Hispanic persons were nearly 5 times and 2.4 times higher, respectively, than the rate for non-Hispanic Whites.[37]
- For 2009, the direct and indirect costs of HBP as a primary diagnosis in the U.S. totaled $73.4 billion.[28]

Prevalence

U.S.

HBP is one of the most common chronic conditions among older adults.[36] Its prevalence is similar in men and women.[28]

Data from National Health and Nutrition Examination Survey (NHANES) 2005 to 2008 indicated that HBP prevalence varies by age group, race/ethnicity, education, income, foreign-born status, health insurance status, and diabetes, obesity, and disability status.[12] Similarly, HBP control rates among adults with hypertension varied by sex, race/ethnicity, foreign-born status, and health insurance status.[12] However, control rates were not associated with education or income.[12]

About one in five adults with HBP are not aware of their condition.[12]

The prevalence of HBP among Blacks is among the highest in the world. Blacks develop HBP earlier in life and have much higher average HBP levels than Whites. They are also less likely to achieve established treatment targets for blood pressure control.[36]

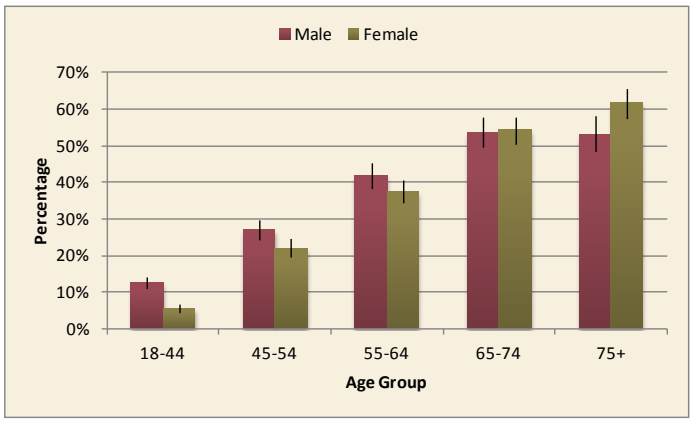
Among immigrant populations, acculturation is associated with high blood pressure prevalence, even after adjusting for age, income, and education.[31]

Utah

According to the 2009 Utah BRFSS in 2009, 25.3% of Utah adults reported having been diagnosed with high blood pressure.* This was significantly lower than the national rate of 28.2% for the same year.*

High blood pressure is positively associated with advanced age. Although men have higher rates of HBP in younger age groups, the prevalence of HBP by gender is similar among adults aged 65 to 74, and higher among women than men for ages 75+.

Figure 28: Percentage of Utah Adults with High Blood Pressure by Age and Sex, 2007 and 2009 Combined



Source: Utah BRFSS.

High blood pressure prevalence is similar among ethnic groups but varies by race. During 2005, 2007, and 2009, 27.7% of non-Hispanic non-Whites reported a higher rate of doctor-diagnosed high blood pressure than Hispanic persons of all races (22.2%) and non-Hispanic Whites (22.4%). Among populations by race, Blacks had the highest rate (34.6%).

* Age-adjusted to the 2000 U.S. Standard Population using 3 age groups.

Nine out of ten Utah adults (91.8%) with high blood pressure reported taking some action to control their condition. The most common actions were exercising (80.1%), changing diet (66.6%), and controlling sodium intake (64.8%).

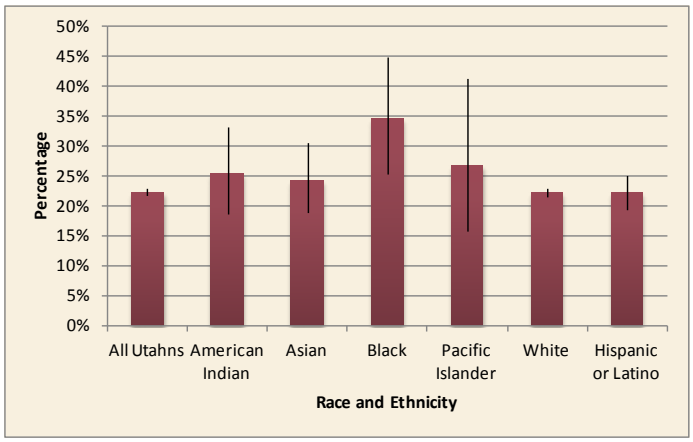
Although high blood pressure is a chronic disease best managed by medication, only 64.9% of Utah women and 59.1% of Utah men with high blood pressure reported being under a doctor's care.

Of those under a doctor's care for high blood pressure, 95.4% reported that the doctor advised them to take medication. Nearly three quarters (74%) of those who had been advised said they were actually taking it.

Regardless of whether they were under a doctor's care, the rate of taking medication to control HBP was higher among women (58.7%) than men (52.9%).

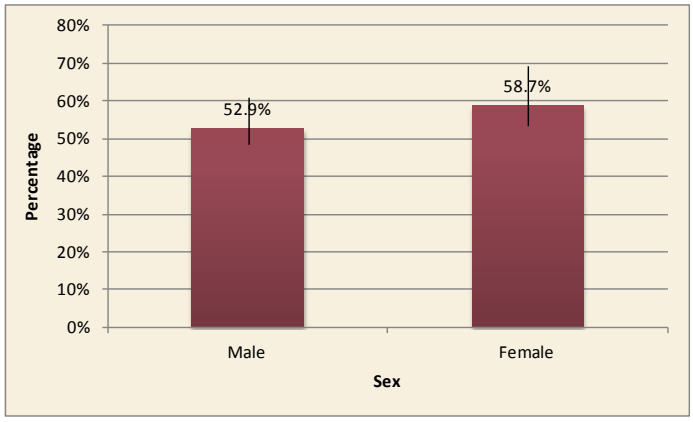
In addition to taking medication, Utah adults with HBP reported that doctors advised them to change lifestyle risk factors, such as increasing exercise.

Figure 29: Percentage of Utah Adults with High Blood Pressure by Race, 2005, 2007, and 2009 Combined



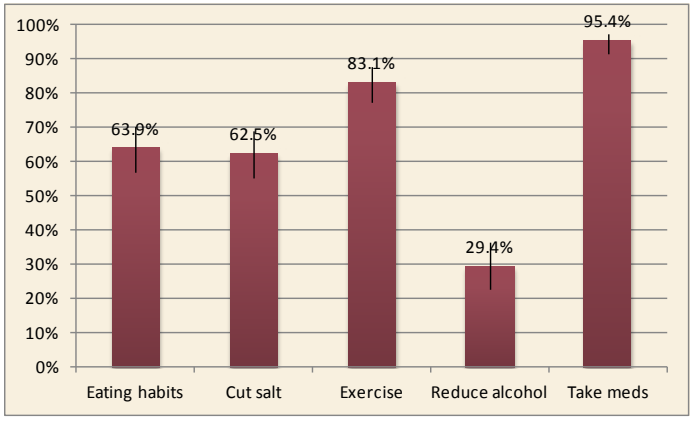
Source: Utah BRFSS. Age-adjusted.

Figure 30: Percentage of Utah Adults with High Blood Pressure Who Reported Taking Medication by Sex, 2009



Source: Utah BRFSS. Age-adjusted.

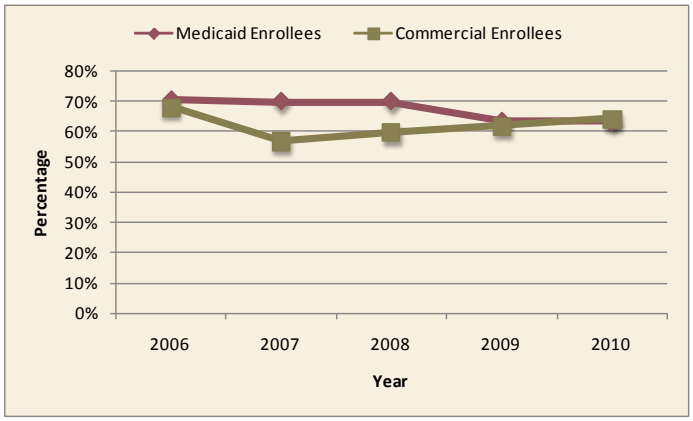
Figure 31: Change Advised by Physician to Control High Blood Pressure, 2009



Source: Utah BRFSS. Age-adjusted.

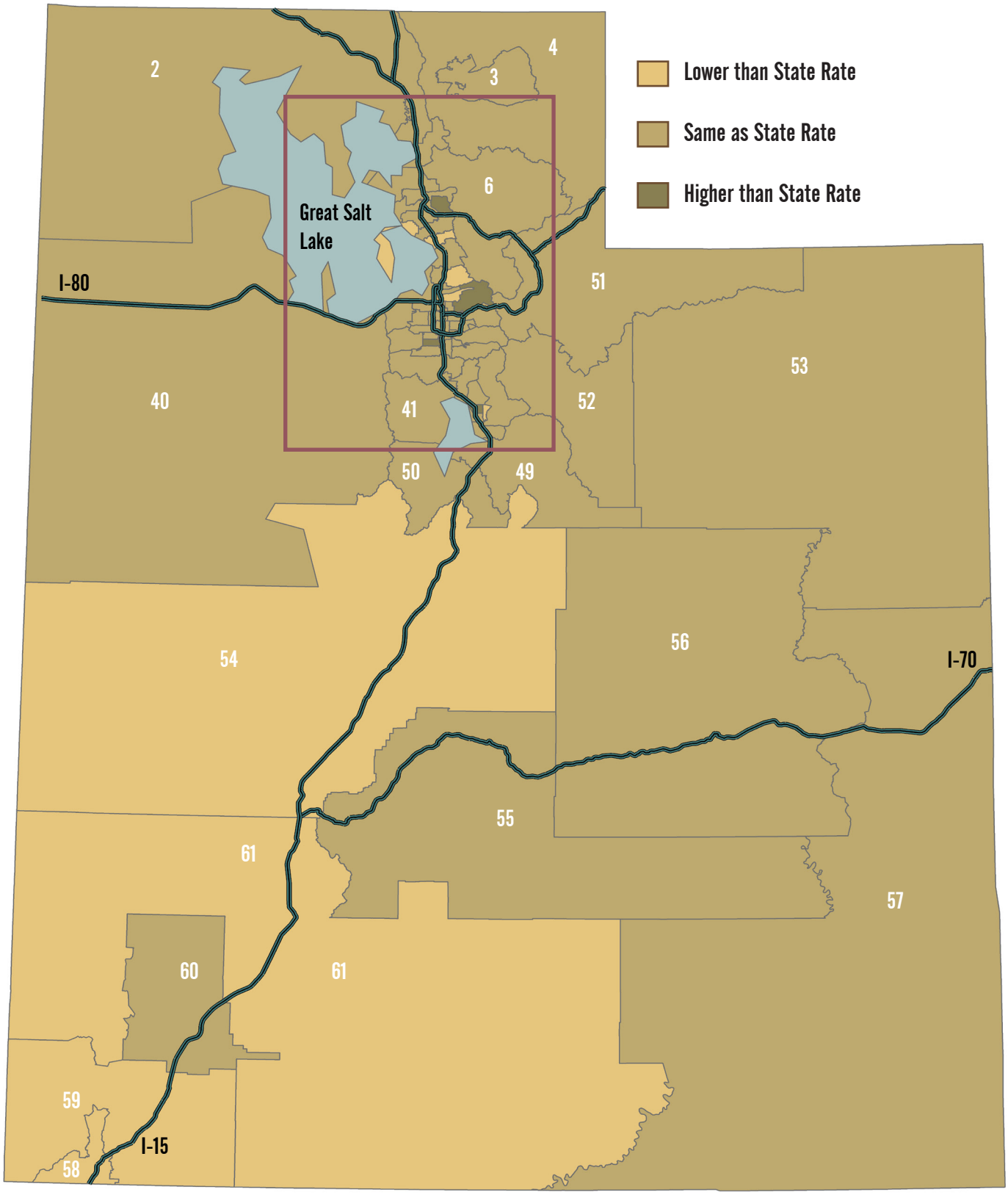
According to the 2010 HEDIS, in 2010, 63.9% of Utah health plan enrollees with high blood pressure had their HBP under control. Control rates were similar among enrollees in Medicaid and commercial plans.

Figure 32: Percentage of Utah HMO Enrollees with Controlled High Blood Pressure by Plan Type and Year, 2006-2010



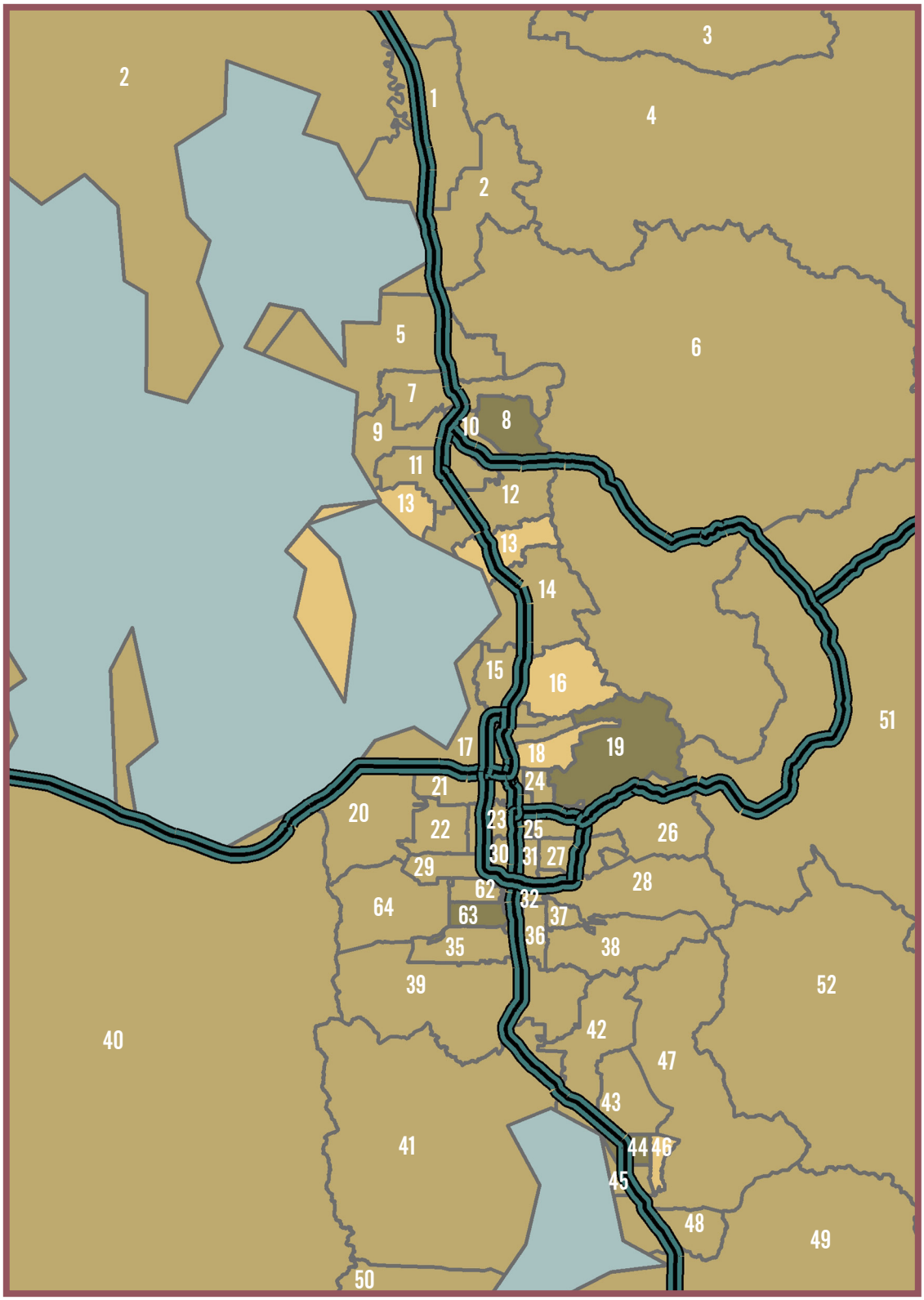
Source: Utah BRFSS. Age-adjusted.

Map 8: Taking Medication for High Blood Pressure Among Utah Adults by Small Area, 2005, 2007, and 2009 Combined



Source: Utah BRFSS, Age-adjusted using three age groups.

Map 9: Taking Medication for High Blood Pressure Among Utah Adults by Small Area, 2005, 2007, and 2009 Combined, Wasatch Front



Source: Utah BRFSS, Age-adjusted using three age groups.

Table 14: Taking Medication for High Blood Pressure Among Utah Adults by Small Area, 2005, 2007, and 2009 Combined

Small Area Name (Number)	Age-adjusted Rate	Lower Confidence Bound	Upper Confidence Bound	Compared to State Rate
State	55.9	53.5	58.3	
Brigham City (1)	59.5	39.0	77.1	Same
Other Box Elder County (2)	48.6	28.9	68.8	Same
Logan (3)	56.8	41.2	71.1	Same
Other Cache/Rich County (4)	55.8	40.2	70.4	Same
Ben Lomond (5)	51.9	39.4	64.2	Same
Morgan/East Weber County (6)	65.5	49.6	78.6	Same
Downtown Ogden (7)	56.3	37.4	73.5	Same
South Ogden (8)	90.2	83.3	94.5	Higher
Roy/Hooper (9)	58.6	43.2	72.4	Same
Riverdale (10)	82.8	53.2	95.3	Same
Clearfield/Hill AFB (11)	69.2	52.1	82.2	Same
Layton (12)	60.1	42.9	75.2	Same
Syracuse/Kaysville (13)	43.6	35.2	52.3	Lower
Farmington/Centerville (14)	69.7	43.7	87.3	Same
Woods Cross/North Salt Lake (15)	51.0	38.8	63.1	Same
Bountiful (16)	41.3	32.0	51.1	Lower
Rose Park (17)	51.8	27.0	75.8	Same
Avenues (18)	31.9	23.9	41.0	Lower
Foothill/U of U (19)	90.2	72.8	97.0	Higher
Magna (20)	58.2	40.9	73.7	Same
Glendale (21)	50.1	31.3	69.0	Same
West Valley West (22)	66.7	48.4	81.0	Same
West Valley East (23)	65.9	48.1	80.1	Same
Downtown Salt Lake (24)	46.3	29.4	64.1	Same
South Salt Lake (25)	42.6	26.3	60.6	Same
Millcreek (26)	49.3	39.5	59.2	Same
Holladay (27)	50.6	33.3	67.8	Same
Cottonwood (28)	62.6	43.3	78.6	Same
Kearns (29)	64.1	46.8	78.4	Same
Taylorsville (30)	64.9	38.7	84.4	Same
Murray (31)	56.7	38.3	73.5	Same
Midvale (32)	74.9	52.2	89.0	Same

Small Area Name (Number)	Age-adjusted Rate	Lower Confidence Bound	Upper Confidence Bound	Compared to State Rate
West Jordan North 2007-2008 (33)	71.0	52.4	84.5	Same
West Jordan/Copperton 2008-2009 (34)	69.2	43.7	86.7	Same
South Jordan (35)	47.2	37.1	57.4	Same
Sandy Center (36)	53.7	41.6	65.4	Same
NE Sandy (37)	67.8	38.2	87.7	Same
SE Sandy (38)	51.6	30.6	72.1	Same
Riverton/Draper (39)	61.0	47.5	73.0	Same
Tooele Co. (40)	61.3	53.4	68.6	Same
Lehi/Cedar Valley (41)	56.5	38.4	73.0	Same
American Fork/Alpine (42)	50.2	27.6	72.8	Same
Pleasant Grove/Lindon (43)	58.1	41.1	73.3	Same
North Orem (44)	78.2	59.5	89.7	Higher
West Orem (45)	45.3	23.1	69.5	Same
East Orem (46)	36.8	29.8	44.4	Lower
Provo/BYU (47)	53.6	30.1	75.6	Same
Provo South (48)	51.7	36.3	66.8	Same
Springville/Spanish Fork (49)	64.6	49.3	77.4	Same
South Utah County (50)	45.1	28.8	62.5	Same
Summit County (51)	60.1	48.9	70.4	Same
Wasatch County (52)	60.0	50.0	69.3	Same
TriCounty LHD (53)	58.6	48.6	67.9	Same
Juab/Millard/Sanpete Counties (54)	45.7	37.0	54.7	Lower
Sevier/Piute/Wayne Counties (55)	62.1	41.4	79.2	Same
Carbon/Emery Counties (56)	50.1	40.4	59.7	Same
Grand/San Juan Counties (57)	55.2	35.0	73.8	Same
St. George (58)	41.7	37.2	46.4	Lower
Other Washington County (59)	35.0	24.3	47.4	Lower
Cedar City (60)	66.2	45.8	82.0	Same
Other Southwest Dist. (61)	43.5	35.0	52.4	Lower
W. Jordan Northeast 2009-2010 (62)	66.6	42.3	84.5	Same
W. Jordan Southeast 2009-2010 (63)	97.2	83.8	99.6	Higher
W. Jordan West, Copperton 2009-2010 (64)	63.7	40.5	81.9	Same

Source: Utah Behavioral Risk Factor Surveillance System, Age-adjusted using three age groups.

Sodium

Sodium is an element that helps to regulate blood pressure and blood volume. It also helps muscles and nerves to function. Too much sodium can cause high blood pressure and make high blood pressure harder to control.

Based on recommendations from the 2010 U.S. Dietary Guidelines for Americans, the recommended maximum daily sodium allowance is 1,500mg. This applies to adults over age 50, Blacks, and people with high blood pressure, diabetes, or chronic kidney disease.

According to the Centers for Disease Control and Prevention (CDC), 87% of Americans consume sodium in excess of 2,400 mg daily. Much of the sodium in the U.S. food supply comes from processed, packaged, and prepared foods, including restaurant foods.[28]

High sodium intake is responsible for an estimated 21% of new hypertension cases in the U.S.[28]

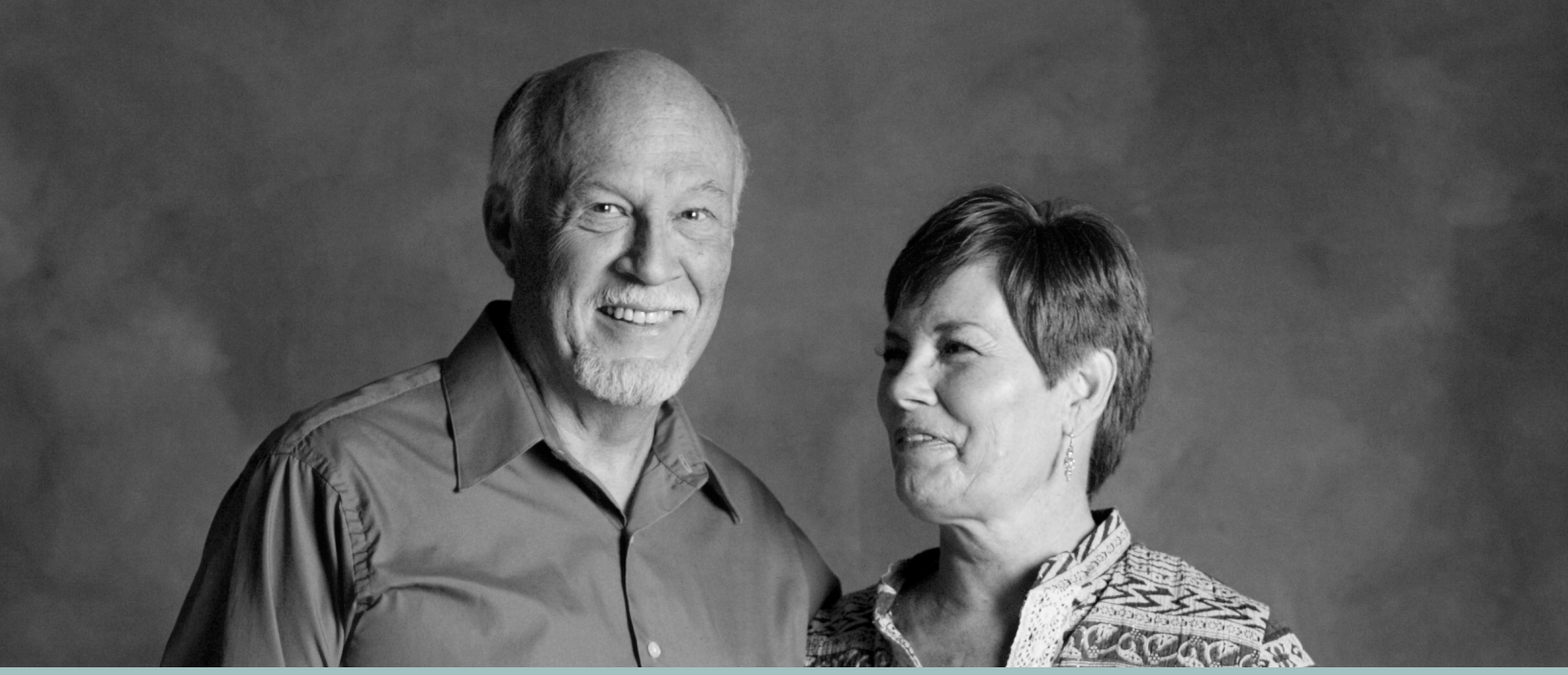
Compared to other dietary risk factors, including consumption of trans fats, low intake of fruits and vegetables, and alcohol use, more deaths are attributable to sodium than any other single dietary factor.[29]

Population-wide reductions in sodium consumption could result in a decrease of 100,000 deaths per year. [29]

Reducing average population sodium intake from current levels to even the high recommendation of 2,300mg per day could prevent 11 million cases of high blood pressure, save $18 billion in health care dollars, and increase quality-adjusted life years by 312,000.[29]

Reducing sodium consumption by 800mg per day could result in a 20% reduction in the risk for heart attack and stroke.[26]

Decreasing mean sodium intake by 9.5% could avert more than 513,000 strokes and 480,000 heart attacks over the lifetime of adults aged 40 to 85, and save $32.1 billion in direct costs. Forty-four percent of the savings would be attributed to reduction in hospitalization costs for stroke and heart attack. The remainder would be attributed to reduced long-term medical costs associated with these events. Including the costs associated with decreased high blood pressure prevalence and increased control rates would further increase these estimated savings.[39]



High Cholesterol

High levels of cholesterol in the blood can build up in the vessel walls, blocking blood flow to the heart, brain, and other important organs. Treatment of high blood cholesterol can decrease the risk of cardiovascular disease.

Quick Facts

- Utah has the lowest rate of cholesterol screening in the U.S.
- In Utah and in the U.S., women receive cholesterol screening at higher rates than men, but men have higher rates of high cholesterol diagnosis.
- Cholesterol screening and diagnosis rates vary by race and ethnicity.
- The American Heart Association estimates that lowering total cholesterol levels in the U.S. population by 10% could result in a 30% reduction in the incidence of coronary heart disease.

Detection

U.S.

In 2009, the median rate of adults who reported having had their cholesterol checked within the past five years was 77.0%.[36] Among those reporting a five-year cholesterol screen, 37.5% had been told that their cholesterol was high.[36]

The rate of five-year cholesterol screens was higher among women than men and among Whites than Blacks or Mexican Americans.[25]

About 8% of adults who have high cholesterol have not yet been diagnosed.[36]

Utah

According to the 2009 BRFSS, 69% of Utah adults report having had their cholesterol checked within the past five years. This was the lowest rate among the 50 states.

Utah Asians (58%) and Hispanics (57.3%) reported having a cholesterol screen within the past five years at a lower rate than the state overall.

The small areas of Foothill/U of U (80.0%), Farmington/Centerville (77.7%), Southeast Sandy (81.1%%), Morgan/Weber Counties (76.7%), Syracuse/Kaysville (75.4%), and Tooele County (73.4%) had significantly higher rates of cholesterol screening compared to the state rate (68.0%). Eight small areas had significantly lower rates of cholesterol screening compared to the state rate: Glendale (50.7%), Grand/San Juan Counties (56.3%), Provo/BYU (58.0%), Sevier/Piute/Wayne Counties (59.9%), Logan (60.1%), TriCounty LHD (60.5%), Springville/Spanish Fork (61.5%), and Carbon/Emery Counties (61.8%).

Prevalence

U.S.

In 2009, 28.9% of Americans had been diagnosed with high cholesterol.*

Between 1999 and 2006, the prevalence of high cholesterol did not change significantly among U.S. adults. However, there were increases in the percentage of adults who had their cholesterol checked, who were told that they had high cholesterol, and who reported using medication to control their cholesterol. Despite these trends, cholesterol control rates remain low.[23]

Also during this period, men who had been screened for high cholesterol were slightly more likely than women to have been told they had high cholesterol (RR=1.06). Men were also more likely than women to report using cholesterol medications (RR=1.2) and having their cholesterol under control (RR=1.4).[23]

Whites were more likely to have been told by a health professional that they had high cholesterol compared to African Americans (RR=0.89) and Mexican Americans (RR=0.87). There were no significant differences by race or ethnicity for use of cholesterol medications.[23]

Utah

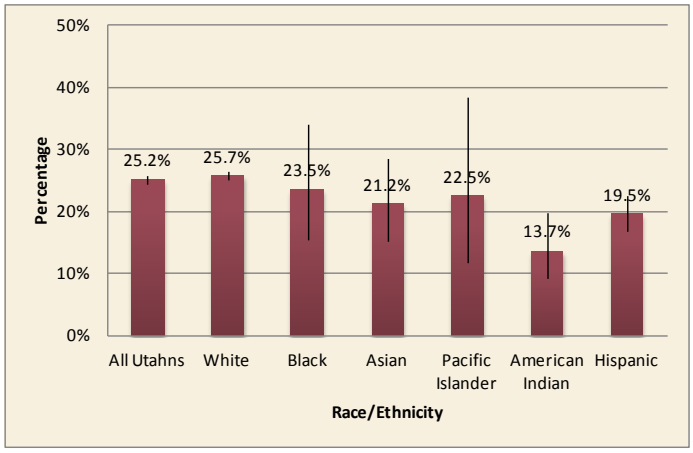
About one in four Utah adults have been told they have high cholesterol. The rate of doctor-diagnosed high cholesterol was higher overall among males (27.5%) than females (23.3%).**

Males in younger age groups (18-35 and 35-54) had higher rates of high cholesterol than females. No significant differences were observed by sex in the older age categories.

American Indian/Alaska Native (13.7%) and Hispanic persons (19.5%) were the only racial populations that had significantly lower rates of doctor-diagnosed high cholesterol compared to the state rate (25.2%).†

* Age-adjusted to 2000 U.S. Standard Population using 11 age groups
** Age-adjusted to 2000 U.S. Standard Population using 3 age groups: 18-44, 45-64, 65+
† Years 2005, 2007, and 2009 combined. Age-adjusted to the 2000 U.S. Standard Population using three age groups: 18-34, 35-50, 51+

Figure 33: Percentage of Utah Adults with High Cholesterol by Race and Ethnicity, 2005, 2007, and 2009 Combined



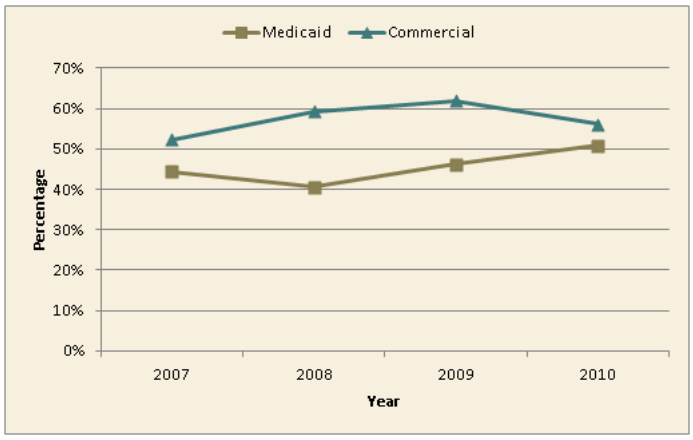
Source: Utah BRFSS. Age-adjusted.

Doctor-diagnosed high cholesterol varied little by geographic area. Four small areas had significantly higher rates of high cholesterol compared to the state rate: Farmington/Centerville (32.7%), Midvale (36.3%), Tooele County (28.9%), and West Jordan Northeast (2009 only, 39.5%). Two small areas had significantly lower rates of high cholesterol compared to the state rate: Juab/Millard/Sanpete Counties (20.4%) and Grand/San Juan Counties (17.1%).*

In 2009, about half of Utah adults with high cholesterol reported being under a doctor's care for their condition. Females had a slightly lower rate of being under a doctor's care (46.1%) compared to males (51.4%), but this difference was not statistically significant. Utah adult women with high cholesterol had significantly lower rates of taking medication to control their high cholesterol (31.1%) than men (43.5%).

Clinical guidelines support cholesterol screening following acute cardiovascular events, such as an acute myocardial infarction (AMI), and procedures. In 2010, only 75% of health plan enrollees who experienced a cardiovascular event received an LDL-C cholesterol screen. Of those who were screened, only 53.5% had an LDL level below 100mg/dl.

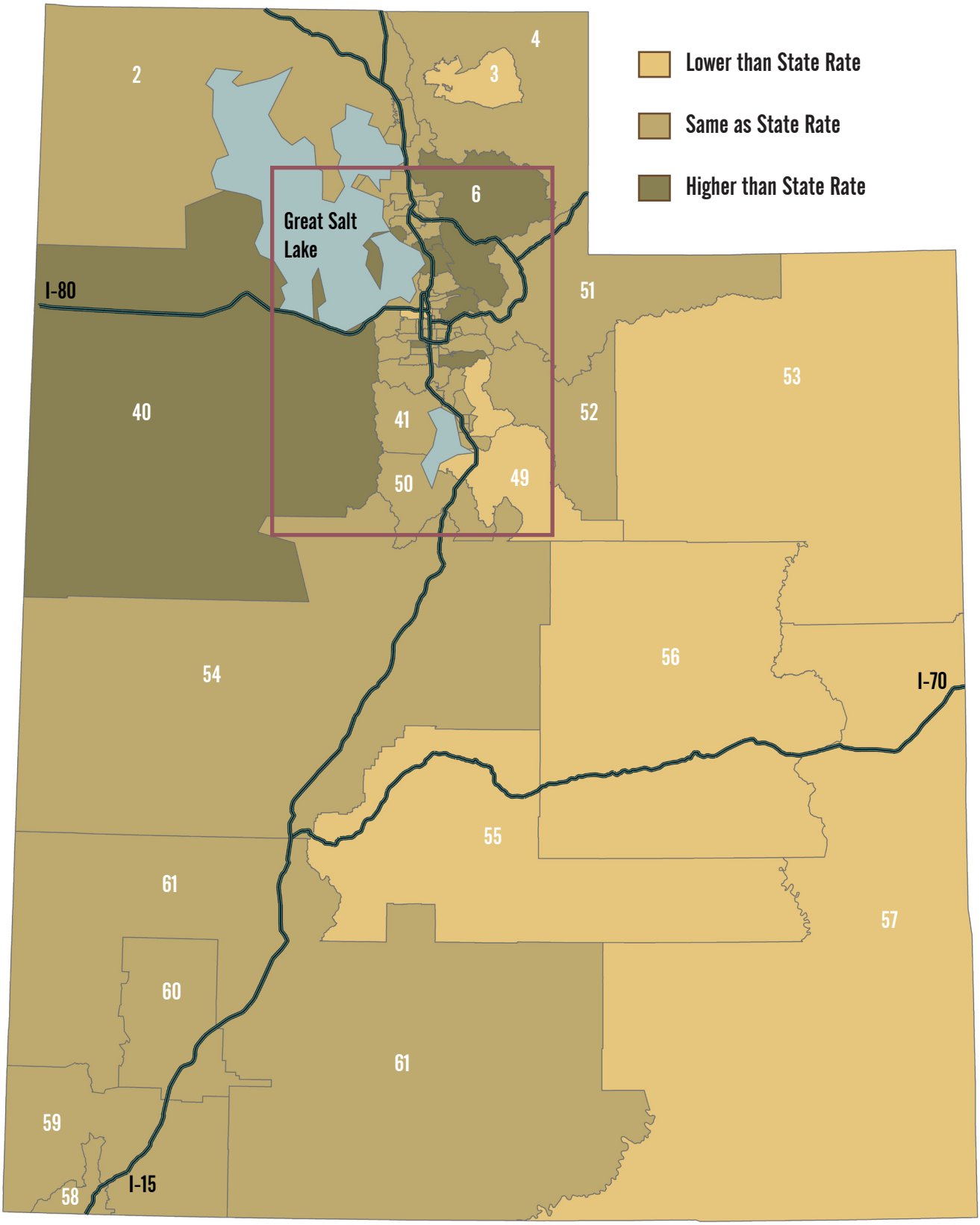
Figure 34: Percentage of Utah HMO Enrollees with High LDL-C Whose LDL-C is Under Control, by Year and Plan Type



Source: Utah HEDIS.

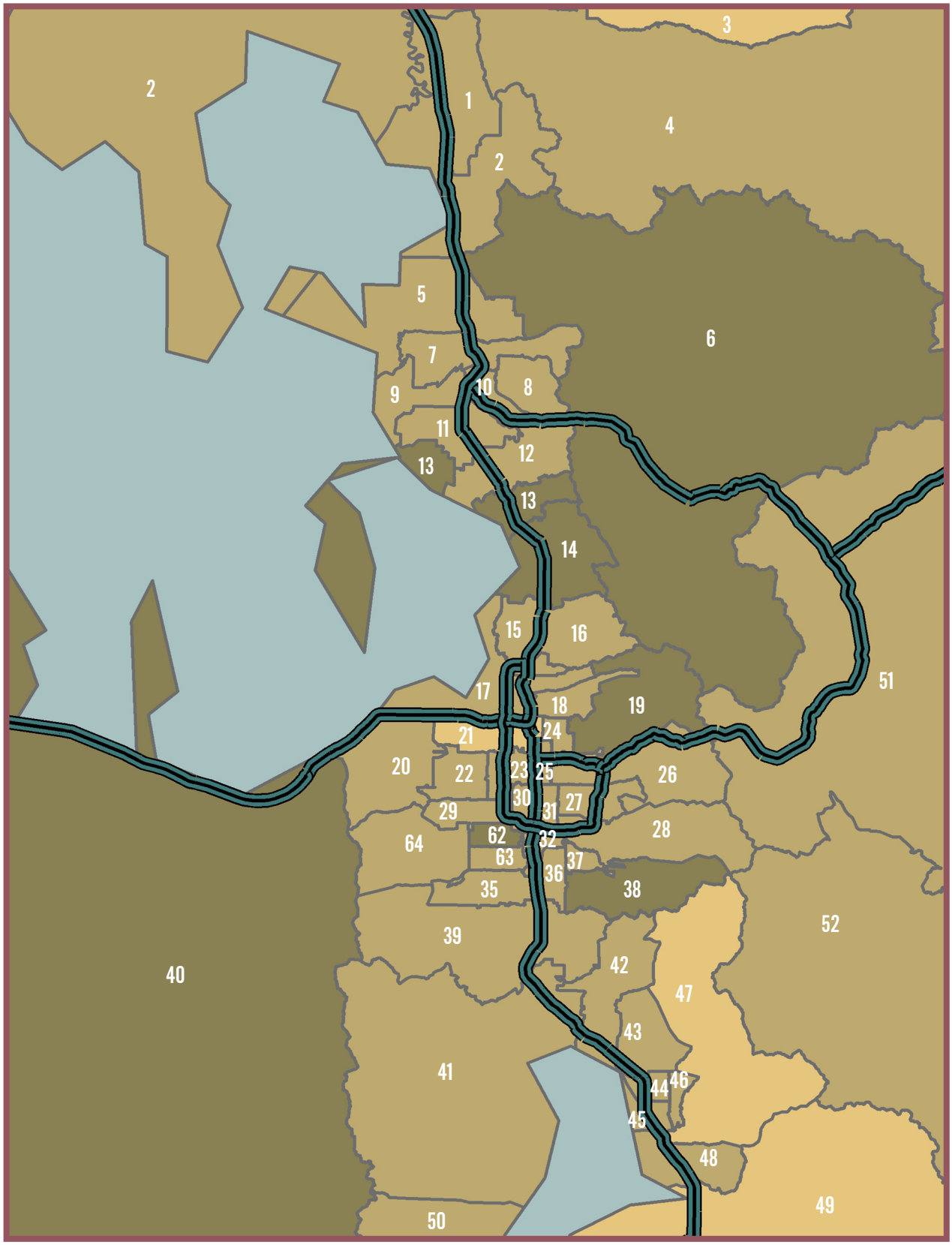
* Years 2005, 2007, and 2009 combined. Age-adjusted to 2000 U.S. Standard Population using 3 age groups: 18-44, 45-64, 65+

Map 10: Five-Year Cholesterol Screening Among Utah Adults by Small Area, 2005, 2007, and 2009 Combined



Source: Utah BRFSS, Age-adjusted using three age groups.

Map 11: Five-Year Cholesterol Screening Among Utah Adults by Small Area, 2005, 2007, and 2009 Combined, Wasatch Front



Source: Utah BRFSS, Age-adjusted using three age groups.

Table 15: Five-Year Cholesterol Screening Among Utah Adults by Small Area, 2005, 2007, and 2009 Combined

Small Area Name (Number)	Age-adjusted Rate	Lower Confidence Bound	Upper Confidence Bound	Compared to State Rate
State	68.0	67.1	68.9	
Brigham City (1)	67.1	56.7	76.1	Same
Other Box Elder County (2)	63.6	54.4	71.9	Same
Logan (3)	60.1	54.4	65.5	Lower
Other Cache/Rich County (4)	67.1	60.4	73.2	Same
Ben Lomond (5)	68.4	61.8	74.4	Same
Morgan/East Weber County (6)	76.7	70.5	82.0	Higher
Downtown Ogden (7)	70.1	60.4	78.2	Same
South Ogden (8)	69.6	62.2	76.1	Same
Roy/Hooper (9)	70.4	63.7	76.3	Same
Riverdale (10)	71.5	63.1	78.7	Same
Clearfield/Hill AFB (11)	65.9	59.6	71.7	Same
Layton (12)	70.8	64.7	76.3	Same
Syracuse/Kaysville (13)	75.4	69.3	80.7	Higher
Farmington/Centerville (14)	77.7	69.1	84.4	Higher
Woods Cross/North Salt Lake (15)	74.4	65.3	81.8	Same
Bountiful (16)	75.3	67.0	82.1	Same
Rose Park (17)	62.4	53.2	70.8	Same
Avenues (18)	62.6	52.5	71.7	Same
Foothill/U of U (19)	80.0	70.1	87.1	Higher
Magna (20)	62.6	54.3	70.3	Same
Glendale (21)	50.7	41.2	60.1	Lower
West Valley West (22)	64.1	57.9	69.9	Same
West Valley East (23)	64.4	56.7	71.4	Same
Downtown Salt Lake (24)	70.8	63.8	77.0	Same
South Salt Lake (25)	64.5	51.9	75.3	Same
Millcreek (26)	71.6	65.2	77.2	Same
Holladay (27)	68.3	61.0	74.7	Same
Cottonwood (28)	69.7	62.7	75.9	Same
Kearns (29)	65.4	59.6	70.8	Same
Taylorsville (30)	71.5	64.0	77.9	Same
Murray (31)	71.6	61.4	80.0	Same
Midvale (32)	72.3	63.9	79.4	Same

Small Area Name (Number)	Age-adjusted Rate	Lower Confidence Bound	Upper Confidence Bound	Compared to State Rate
West Jordan North (33)	75.1	68.0	81.1	Same
West Jordan/Copperton (34)	72.3	64.3	79.1	Same
South Jordan (35)	71.8	65.1	77.7	Same
Sandy Center (36)	69.5	63.5	74.8	Same
NE Sandy (37)	70.1	60.8	78.0	Same
SE Sandy (38)	81.1	72.8	87.4	Higher
Riverton/Draper (39)	72.2	67.9	76.1	Same
Tooele Co. (40)	73.4	69.9	76.6	Higher
Lehi/Cedar Valley (41)	66.9	59.3	73.8	Same
American Fork/Alpine (42)	69.6	61.6	76.6	Same
Pleasant Grove/Lindon (43)	66.9	59.3	73.8	Same
North Orem (44)	65.3	54.3	74.8	Same
West Orem (45)	62.7	52.8	71.6	Same
East Orem (46)	71.4	58.4	81.7	Same
Provo/BYU (47)	58.0	47.9	67.4	Lower
Provo South (48)	63.9	55.0	71.9	Same
Springville/Spanish Fork (49)	61.5	56.1	66.7	Lower
South Utah County (50)	67.2	58.5	75.0	Same
Summit County (51)	69.9	65.9	73.6	Same
Wasatch County (52)	67.4	63.6	71.0	Same
TriCounty LHD (53)	60.5	56.8	64.2	Lower
Juab/Millard/Sanpete Counties (54)	65.3	60.3	70.0	Same
Sevier/Piute/Wayne Counties (55)	59.9	53.4	66.1	Lower
Carbon/Emery Counties (56)	61.8	57.0	66.4	Lower
Grand/San Juan Counties (57)	56.3	49.8	62.7	Lower
St. George (58)	68.1	61.1	74.4	Same
Other Washington County (59)	62.4	54.9	69.2	Same
Cedar City (60)	62.7	54.7	70.2	Same
Other Southwest Dist. (61)	63.5	52.7	73.2	Same
W. Jordan Northeast 2009-2010 (62)	78.0	68.7	85.1	Higher
W. Jordan Southeast 2009-2010 (63)	69.8	59.7	78.2	Same
W. Jordan West, Copperton 2009-2010 (64)	80.4	67.3	89.1	Same

Source: Utah BRFSS, Age-adjusted using three age groups.

Did You Know?

- Many **risk factors** for heart disease and stroke—including high blood pressure and high cholesterol—**may not have any symptoms.**
- Most **risk factors** for heart disease and stroke—specifically high blood pressure, high cholesterol, smoking, and obesity—**are preventable and controllable.**
- Controlling these risk factors could **reduce risk** of heart attack or stroke **by more than 80%.**

Source: Centers for Disease Control and Prevention.
For more information, please visit www.millionhearts.hhs.gov.

Diabetes Mellitus

Diabetes is a condition in which the body is unable to produce the amount of insulin it needs, or is unable to use the insulin it has. Insulin is the hormone that allows cells to absorb glucose (sugar) from the bloodstream. Some people with diabetes must inject themselves with insulin every day to maintain a healthy glucose level. Others are able to control the condition with medications, diet, and exercise. There are two types of diabetes: Type I and Type II, which is also called adult-onset diabetes.

Quick Facts

- Lifestyle risk factors, including physical activity level, nutrition, cigarette smoking, and alcohol use, are each independently associated with risk of diabetes onset.
- Aggressive treatment of high blood pressure (HBP) can help to prevent cardiovascular complications in patients with diabetes. The NHANES study from 1999 to 2004 showed evidence that the percentage of patients with diabetes who are being treated for HBP increased from 76.5% to 87.8%, and the percentage whose blood pressure (BP) was under control increased from 15.9% to 29.6%.

Prevalence

U.S.

An estimated 18.3 million Americans aged 20 and older, or about 7.7% of the population, have diagnosed diabetes. Women have a slightly higher prevalence of diabetes (8.3%) than men (7.2%). An additional 7.1 million have undiagnosed diabetes.[36]

The increasing prevalence of obesity has resulted in increased incidence of Type 2 diabetes. The incidence of diabetes has doubled over the past 30 years, especially among individuals with a body mass index (BMI) above 30.[36]

The prevalence and incidence of diabetes have increased since the mid-1990s, with disproportionate burdens on racial and ethnic minority groups and other disadvantaged socioeconomic groups.[12]

Non-Hispanic Blacks have a higher prevalence of diabetes than non-Hispanic Whites.[36]

American Indians have 2.8 times the diabetes rate as the U.S. overall. [36]

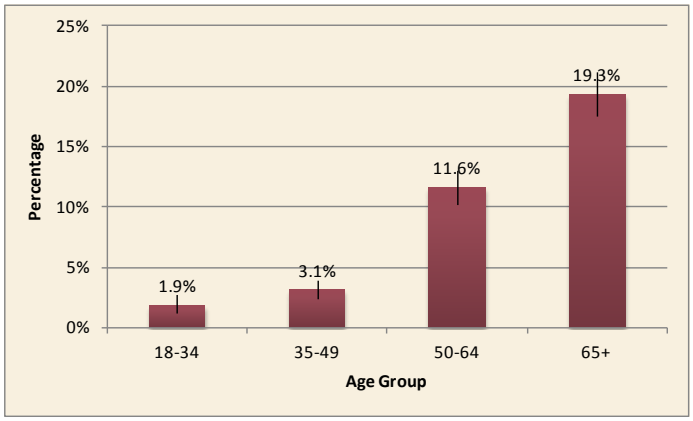
Major groups within the Asian and Pacific Islander communities (Japanese Americans, Chinese Americans, Filipino Americans, and Korean Americans) all had higher prevalences of diabetes than Whites.[2]

Utah

Estimates for diabetes prevalence have nearly doubled over the past two decades. Between 1989 and 2010, the age-adjusted rate for diabetes among Utah adults increased from 3.9% to 7.3%.

The prevalence of diabetes increases with age. The rate for adults aged 65 and over is 10 times the rate for adults aged 18 to 34.

Figure 35: Percentage of Utah Adults with Diabetes by Age, 2010



Source: Utah BRFSS.

Overall, males (7.6%) have significantly higher rates of diabetes than females (6.5%).

In general, the diabetes rates for all racial and ethnic minority populations are higher than the state rate (6.9%) for 2006-2010. Highest rates are observed for Pacific Islanders (19.7%), Blacks (9.5%), and American Indians (12.4%). Among Hispanic adults, the age-adjusted rate is 11.0%, and among non-Hispanic adults, the age-adjusted rate is 6.7%.

Mortality

U.S.

At least 65% of people with diabetes die from some form of heart disease or stroke.[36]

Heart disease death rates among adults with diabetes are two to four times higher than the rates for adults without diabetes.[36]

Between 1971 and 2000, age-adjusted mortality rates for men with diabetes for declined 43%. Mortality rates for women with diabetes did not decline and the difference in mortality rates between women with and without diabetes doubled.[36]

From 1950 to 2005, mortality from all causes and from CVD declined among U.S. adults with and without diabetes. However, all-cause and CVD mortality rates remain nearly double for people with diabetes compared to those without diabetes.[36]

Diabetes also increases the risk of stroke. Although the magnitude of this risk varies by study, the rate ratio ranges from 1.8 to nearly 6.0. Diabetes increases risk of stroke most prominently before age 55 years for Blacks and before age 65 for Whites.[36]

Utah

Rates for diabetes as the underlying cause of death have declined since 1999. In 1999, the age-adjusted rate of diabetes deaths was 30.5 per 100,000 population. The trend remained fairly constant through 2005. Beginning in 2006, rates began to decline and reached their lowest level in the past decade at 14.5/100,000.*

Males have higher rates of diabetes-related CVD deaths than females. In 2009, the age-adjusted rate per 100,000 population was 14.2 for males and 11.0 for females.

Prehospital Care

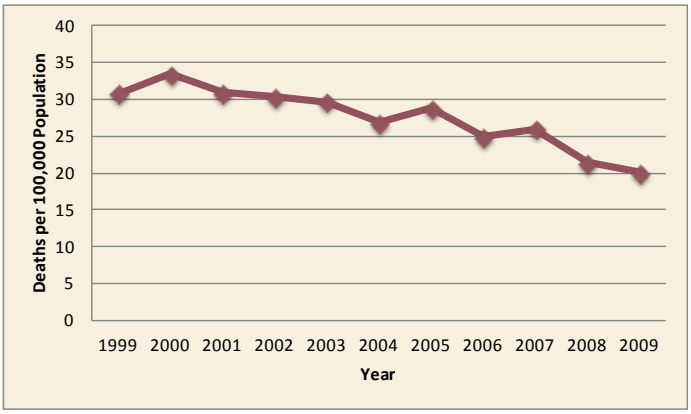
Utah

In 2010, Utah Emergency Medical Services (EMS) agencies responded 3,026 times to 9-1-1 calls with a primary impression of diabetic symptoms. Twenty-one percent of case records were missing patient ages. The percentages of EMS responses were similar across age groups above age 24.

The median EMS response time was six minutes statewide, six minutes in urban areas, seven minutes in rural areas, and 10 minutes in both frontier and sub-frontier areas.

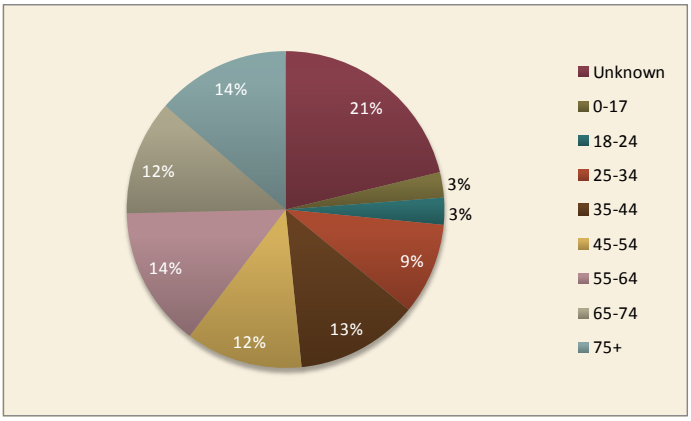
* Age-adjusted to the 2000 U.S. Standard Population using three age groups: 18-44, 45-64, 65+

Figure 36: Utah Diabetes Mortality , 1999-2009



Source: Utah Death Certificate Database. Age-adjusted.

Figure 37: Percentage of Utah Emergency Medical Services Responses to Diabetic Emergencies by Age Group, 2010



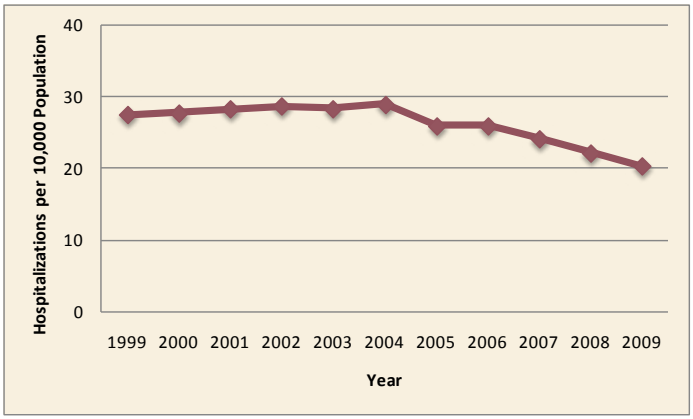
Source: Utah Prehospital Database.

Hospitalizations

Utah

In 2009, there were 2,224 hospitalizations for diabetes as the primary diagnosis. However, diabetes contributed to 4,443 hospitalizations for cardiovascular disease.

Figure 38: Utah Diabetes Hospitalizations for CVD as Primary Diagnosis with Diabetes Contributing, 1999-2009



Source: Utah Inpatient Hospital Discharge Database. Age-adjusted.

Hospitalization rates for cardiovascular disease with diabetes contributing declined from 27.6/10,000 in 1999 to 20.4/10,000 in 2009. Males had higher hospitalization rates per 10,000 (25.4) than females (15.9).

Nearly two-thirds (62.6%) of hospital discharges for CVD with diabetes contributing occur in individuals aged 65 and over. Individuals aged 45 to 64 made up one-third (33.4%) of the discharges, and 4.1% of discharges were for individuals younger than 45.

The distribution of hospital discharges for CVD reflects the population density of the state. Three-fourths (75.5%) of hospital discharges for CVD with diabetes contributing are for patients who reside in the four Wasatch Front counties. Only 11.4% of patients from urban counties are hospitalized in a county other than their county of residence. In contrast, nearly half (49.4%) of patients from rural counties cross county lines for hospitalization.

Costs

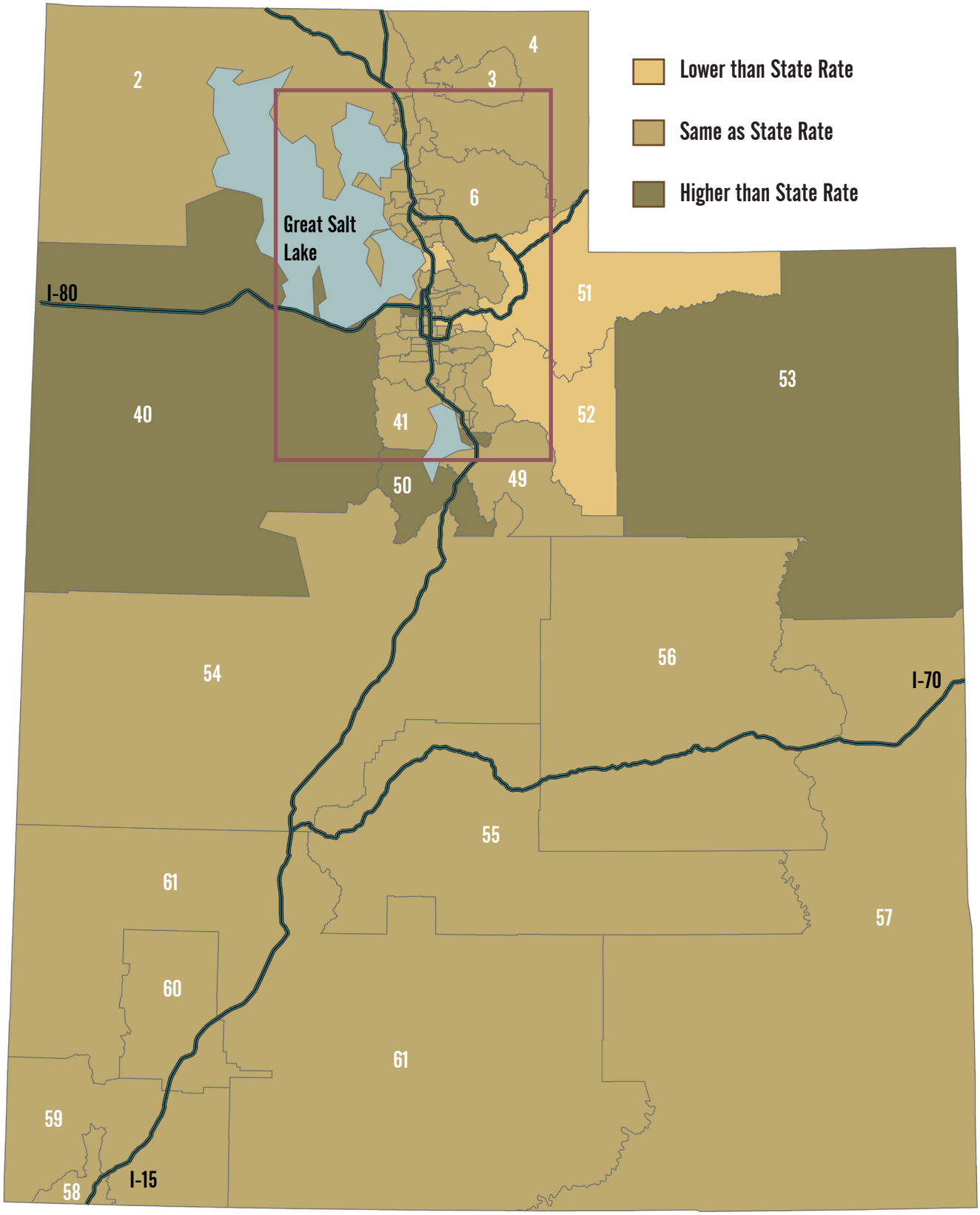
U.S.

In 2007, the direct and indirect costs attributed to diabetes and its long-term complications totaled $174 billion.[36]

Utah

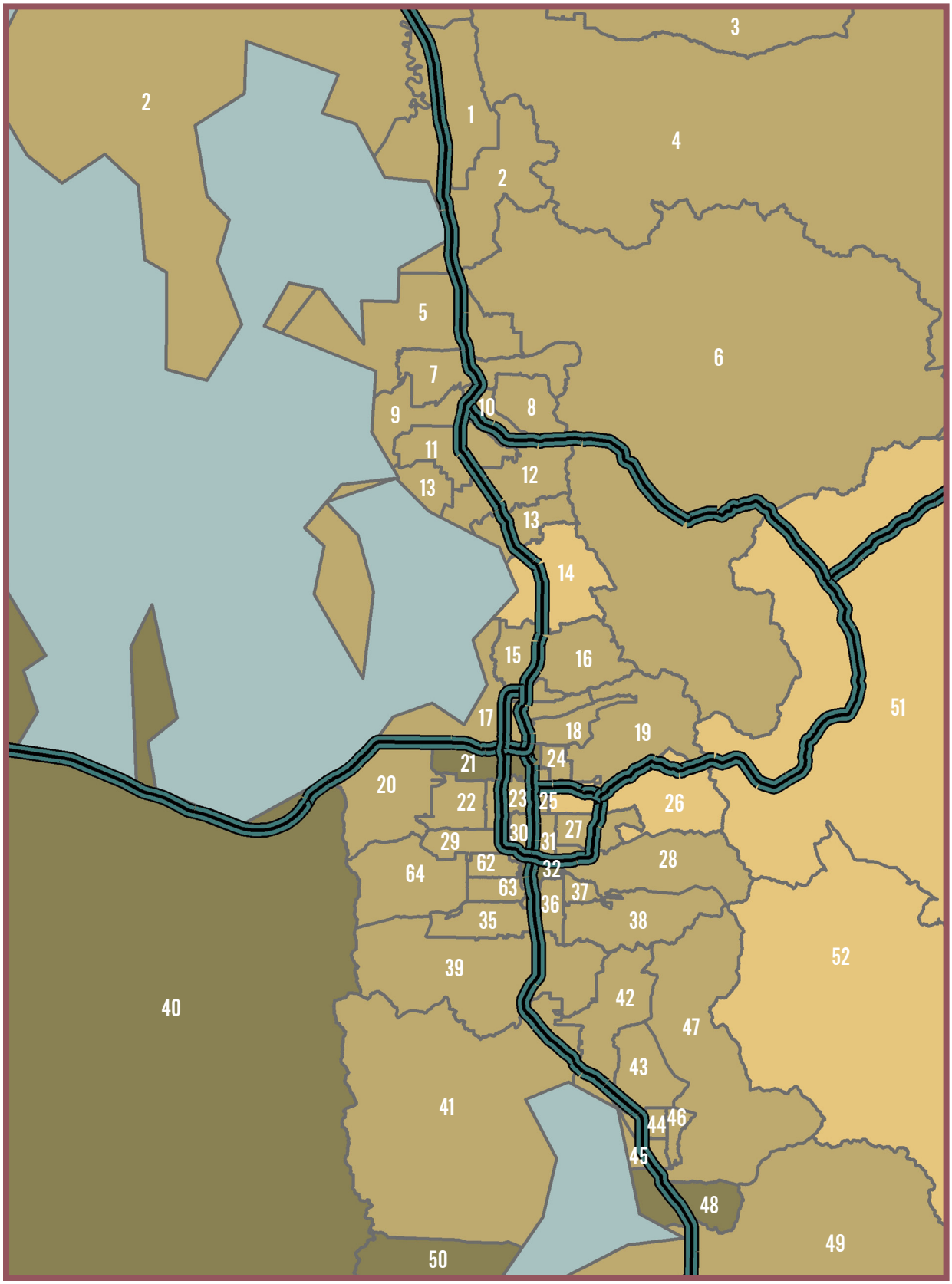
In 2010, the median charge per hospital discharge for CVD as primary with diabetes contributing was $23,171. In contrast, the median charge for diabetes as primary diagnosis was $11,476.

Map 12: Diabetes Prevalence Among Utah Adults by Small Area, 2007-2010



Source: Utah BRFSS, Age-adjusted using three age groups.

Map 13: Diabetes Prevalence Among Utah Adults by Small Area, 2007-2010, Wasatch Front



Source: Utah BRFSS, Age-adjusted using three age groups.

Table 16: Diabetes Prevalence Among Utah Adults by Small Area, 2007-2010

Small Area Name (Number)	Age-adjusted Rate	Lower Confidence Bound	Upper Confidence Bound	Compared to State Rate
State	6.9	6.6	7.3	
Brigham City (1)	6.6	4.5	9.5	Same
Other Box Elder County (2)	5.8	3.6	9.2	Same
Logan (3)	6.3	4.4	9.0	Same
Other Cache/Rich County (4)	6.9	4.7	10.0	Same
Ben Lomond (5)	7.7	5.9	10.0	Same
Morgan/East Weber County (6)	7.7	5.7	10.5	Same
Downtown Ogden (7)	6.6	4.3	9.9	Same
South Ogden (8)	5.0	3.4	7.2	Same
Roy/Hooper (9)	8.4	6.2	11.2	Same
Riverdale (10)	8.9	5.6	13.8	Same
Clearfield/Hill AFB (11)	7.1	5.0	10.0	Same
Layton (12)	6.5	4.7	8.8	Same
Syracuse/Kaysville (13)	5.3	3.5	7.7	Same
Farmington/Centerville (14)	3.0	1.6	5.6	Lower
Woods Cross/North Salt Lake (15)	4.9	2.9	8.2	Same
Bountiful (16)	6.1	4.0	9.0	Same
Rose Park (17)	10.0	6.4	15.2	Same
Avenues (18)	7.3	4.2	12.2	Same
Foothill/U of U (19)	4.4	2.8	7.0	Same
Magna (20)	10.3	6.9	15.2	Same
Glendale (21)	11.6	7.6	17.3	Higher
West Valley West (22)	8.6	6.5	11.2	Same
West Valley East (23)	8.9	6.5	12.1	Same
Downtown Salt Lake (24)	7.1	5.1	9.8	Same
South Salt Lake (25)	10.3	6.9	15.0	Same
Millcreek (26)	5.0	3.7	6.8	Lower
Holladay (27)	5.1	3.4	7.4	Same
Cottonwood (28)	6.1	4.5	8.3	Same
Kearns (29)	9.0	6.9	11.6	Same
Taylorsville (30)	6.8	4.7	9.9	Same
Murray (31)	7.9	5.4	11.5	Same
Midvale (32)	13.4	8.7	20.1	Higher

Small Area Name (Number)	Age-adjusted Rate	Lower Confidence Bound	Upper Confidence Bound	Compared to State Rate
West Jordan North 2007-2008 (33)	8.0	4.6	13.6	Same
West Jordan/Copperton 2007-2008 (34)	6.8	3.5	12.9	Same
South Jordan (35)	5.5	3.6	8.4	Same
Sandy Center (36)	6.5	4.5	9.3	Same
NE Sandy (37)	6.2	4.2	9.2	Same
SE Sandy (38)	6.4	4.2	9.6	Same
Riverton/Draper (39)	6.7	4.9	9.1	Same
Tooele Co. (40)	9.8	8.4	11.5	Higher
Lehi/Cedar Valley (41)	4.6	2.5	8.3	Same
American Fork/Alpine (42)	6.5	4.4	9.4	Same
Pleasant Grove/Lindon (43)	6.2	4.0	9.5	Same
North Orem (44)	8.9	5.7	13.7	Same
West Orem (45)	10.8	6.7	17.1	Same
East Orem (46)	4.6	2.3	9.0	Same
Provo/BYU (47)	5.0	3.0	8.1	Same
Provo South (48)	11.0	7.1	16.7	Higher
Springville/Spanish Fork (49)	7.6	5.2	10.9	Same
South Utah County (50)	10.9	7.4	15.6	Higher
Summit County (51)	3.2	2.3	4.4	Lower
Wasatch County (52)	5.3	4.3	6.6	Lower
TriCounty LHD (53)	9.9	8.4	11.7	Higher
Juab/Millard/Sanpete Counties (54)	6.1	4.8	7.8	Same
Sevier/Piute/Wayne Counties (55)	7.0	5.0	9.6	Same
Carbon/Emery Counties (56)	8.2	6.6	10.1	Same
Grand/San Juan Counties (57)	9.3	5.5	15.2	Same
St. George (58)	6.4	4.0	10.0	Same
Other Washington County (59)	6.2	4.1	9.3	Same
Cedar City (60)	5.0	3.2	7.8	Same
Other Southwest Dist. (61)	7.2	4.8	10.8	Same
W. Jordan Northeast 2009-2010 (62)	8.0	5.2	12.0	Same
W. Jordan Southeast 2009-2010 (63)	7.3	4.7	11.3	Same
W. Jordan West, Copperton 2009-2010 (64)	3.6	1.4	8.8	Same

Source: Utah BRFSS, Age-adjusted using three age groups.

Obesity

Overweight and obesity describe ranges of weight that are above what is generally considered healthy for a given height. Obesity increases the risk of heart disease, stroke, and diabetes. For adults, overweight and obesity ranges are determined by calculating a ratio of weight to height called the Body Mass Index (BMI). A BMI between 25 and 29.9 is considered overweight. A BMI of 30 or higher is considered obese.

Quick Facts

- Obesity accounts for 20.6% of U.S. health care costs—about $190.2 billion per year.[38]
- An estimated 24% to 28% of existing cases of high blood pressure in the U.S. can be attributed to overweight and obesity.[28]
- Increasing rates of obesity in the U.S. are likely to influence the prevalence and consequences of cardiovascular disease.
- Obesity data show significant racial, ethnic, and socioeconomic disparities in Utah and the U.S.

Prevalence

U.S.

Obesity is very common among U.S. adults. In 2001, the U.S. Surgeon General issued the *Call to Action to Prevent and Decrease Overweight and Obesity*, yet no state met the Healthy People 2010 objective to reduce adult obesity prevalence to 15%.[18]

In 2007 and 2008, the age-adjusted prevalence among men was 32.2% and among women was 35.5%.[23] Based on NHANES 2003 to 2006, about two out of three obese adults were told by a doctor that they were overweight.[36]

Among non-Hispanic Blacks and all Hispanics, the prevalence of overweight/obesity is much higher among females than males. Nearly half of Hispanic and Black women are overweight or obese compared to just over one-third of Black and Hispanic men.[23]

Within most income categories, Black women had a higher prevalence of obesity than White or Mexican American women. Family income was positively associated with obesity prevalence among Black men greater than 20 years of age.[12]

In 1990, among states participating in the Behavioral Risk Factor Surveillance System, no state had a prevalence of 15% or above. By 2009, only one state (Colorado) and the District of Columbia had an obesity rate below 20%. Thirty-three states had an obesity rate greater than or equal to 25%: nine of these states (Alabama, Arkansas, Kentucky, Louisiana, Mississippi, Missouri, Oklahoma, Tennessee, and West Virginia) had a prevalence of obesity greater than or equal to 30%.[17]

Utah

Following the U.S. trend, Utah's adult obesity rate has increased over time.

According to the 2010 BRFSS, 24.1% of Utah adults were considered obese. A larger proportion of men were obese (26.8%) than women (21.0%). Across age groups, males consistently had higher rates of obesity except 65+.

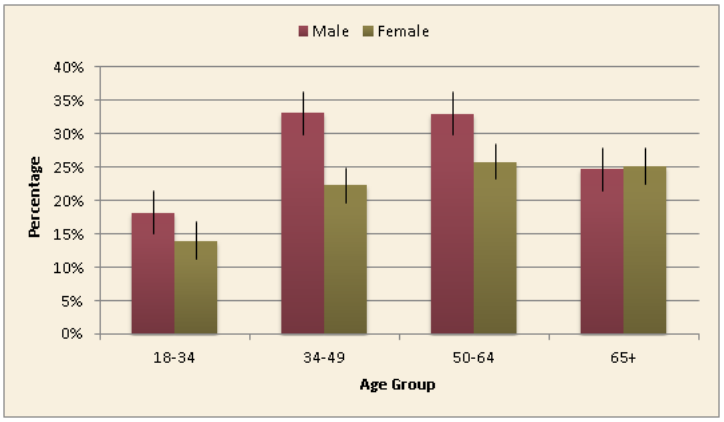
Between 2006 and 2010, the rate of obesity was higher for each racial minority group, except Asian (10.9%), compared to Whites. The highest rate of obesity (49.3%) was nearly five times greater than the lowest rate (11.1%).

Table 17: Overweight/Obesity Prevalence Among U.S. Adults Aged 20 and Over, by Race and Sex, U.S, NHANES 2007-2008

	Men	Women
Non-Hispanic White	31.9% (28.1%-35.7%)	33.0% (29.3%-36.6%)
All Hispanics	35.9% (26.3, 44.4%)	45.1% (38.9%, 51.2%)
Non-Hispanic Black	37.3% (32.3%-42.4%)	49.6% (45.5%-53.7%)

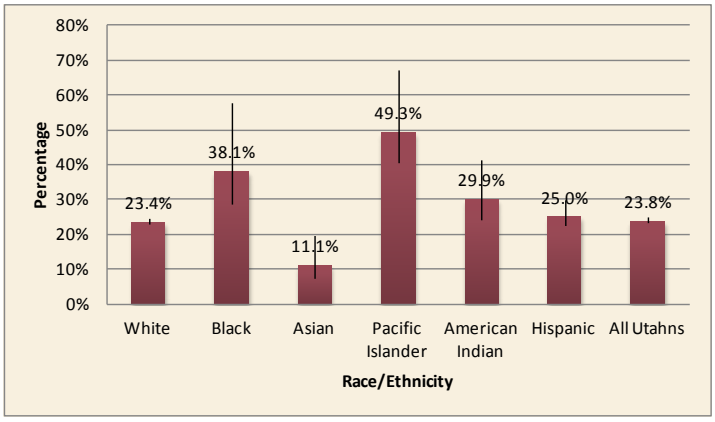
Source: Source: Flegal, KM (2010).

Figure 39: Percentage of Utah Adults Who Were Obese by Age and Sex, 2010



Source: Utah BRFSS.

Figure 40: Percentage of Utah Adults Who Were Obese by Race and Ethnicity, 2006-2010

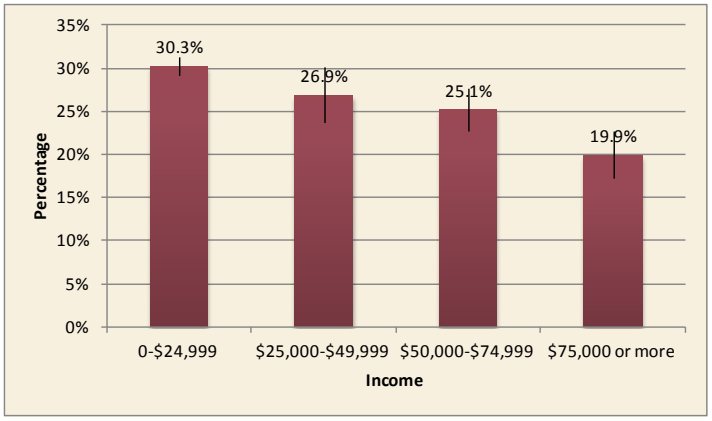


Source: Utah BRFSS. Age-adjusted.

Among Utah adults aged 25 and older, college graduates had a lower rate of obesity (21.7%) compared to Utahns with some post-high school education or below (29.6%).

Among Utah adults aged 18 and older, Utahns with an annual household income of $75,000 or more had a lower rate of obesity (19.9%) compared to Utahns with lower household income levels.

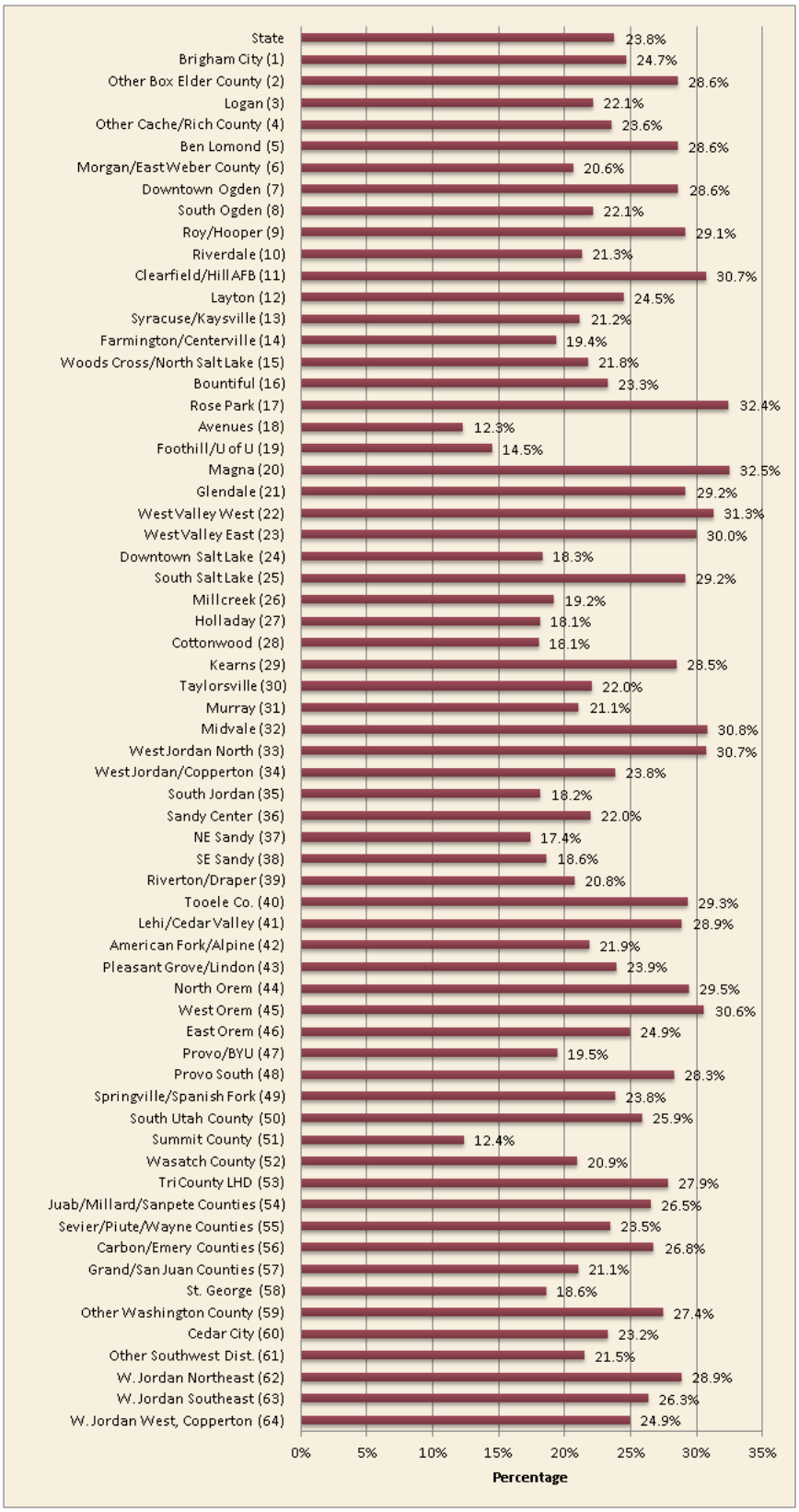
Figure 41: Percentage of Utah Adults Who Were Obese by Income, 2010



Source: Utah BRFSS. Age-adjusted.

2006-2010 obesity rates varied by geographic area. The top five small areas with rates higher than the state (23.8%) were Magna (32.5%), Midvale (30.8%), Rose Park (32.4%), West Jordan North (2007-2008—30.7%) and West Valley West (31.3%). The top five small areas with rates lower than the state rate were Avenues (12.3%), Summit County (12.4%), Foothill/U of U (14.5%), Northeast Sandy (17.4%), and Cottonwood (18.1%).

Figure 42: Percentage of Utah Adults Who Were Obese by Small Area, 2006-2010 Combined



Source: Utah BRFSS. Age-adjusted.

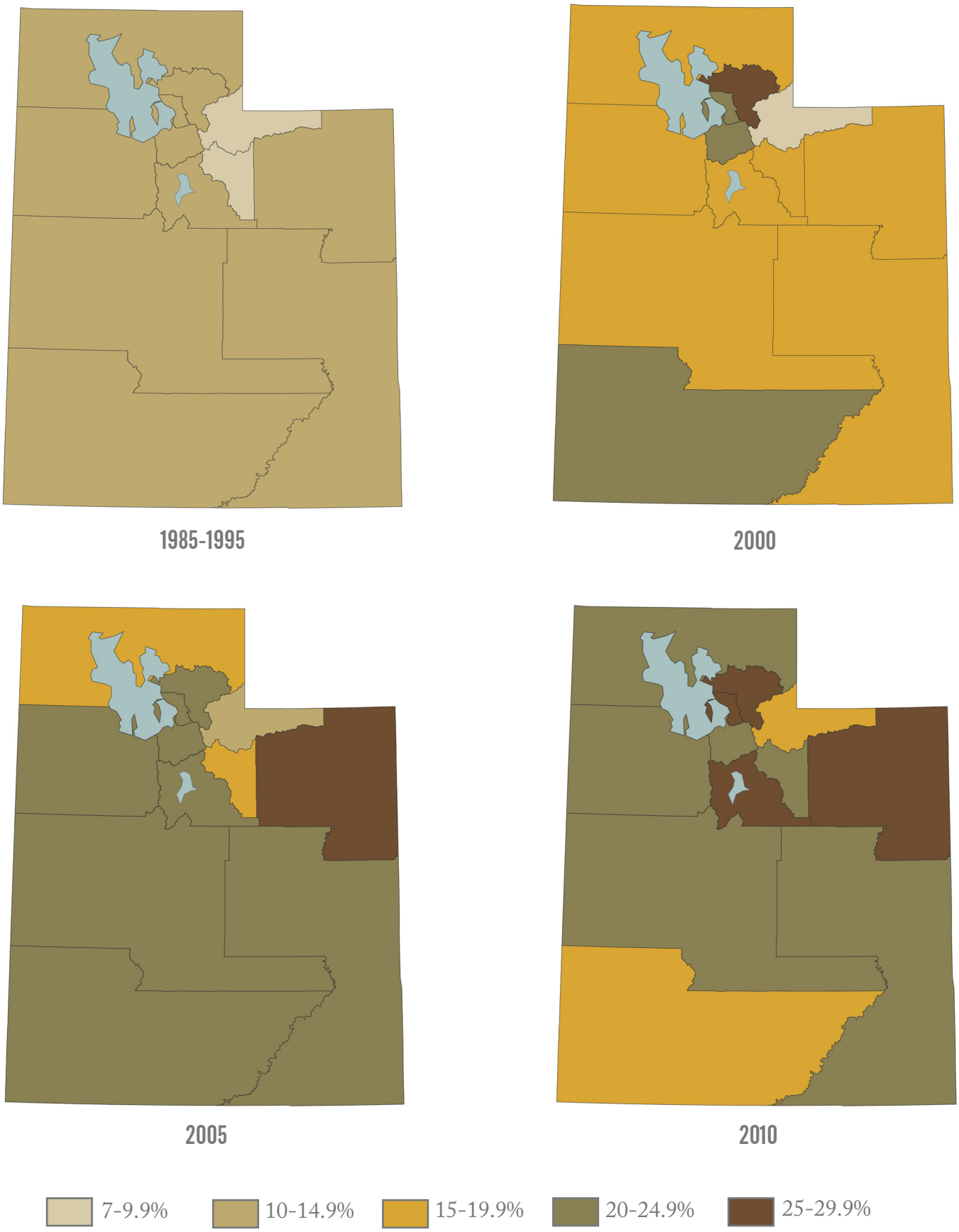
Costs

U.S.

If current obesity trends continue, total health care costs associated with obesity could total $957 billion by 2030, representing 16% to 18% of U.S. health care expenditures.[36]

In 2008, the estimated medical costs due to obesity totaled $147 billion.[22]

Map 14: Obesity Prevalence Among Utah Adults by Local Health District Over Time



Source: Utah BRFSS, Age-adjusted using standard age groups.

Cigarette Smoking

Cigarette smoking causes coronary heart disease and other conditions by contributing to the buildup of fatty substances in the arteries (atherosclerosis). Smoking decreases "good" HDL cholesterol and makes high blood pressure harder to control.

Quick Facts

- Approximately 1,500 Utahns die each year from tobacco-related diseases, including heart disease and stroke.[43]
- Cigarette smoking increases the risk of developing coronary heart disease (CHD) and stroke by two to four times.[14]
- Secondhand smoke exposure increases the risk of developing coronary heart disease by 25% to 30% and potentially increasing the risk of heart attack.[36]
- In Utah, the highest rates of cigarette smoking occur among adults with the lowest education and household income levels.

Prevalence

U.S.

Cigarette smoking is the leading cause of preventable illness and death in the U.S.[12]

About one in five U.S. adults smokes cigarettes.

In 2010, cigarette smoking was more common among men (21.5%) than women (17.3%).

Cigarette smoking predicts cardiac arrest among patients with coronary heart disease.[36]

From 2005 to 2009, the percentage of U.S. adults who were current smokers did not change significantly.[36]

Cigarette smoking rates are lowest among the 65+ age group.

The cigarette smoking rate is lower among Hispanic/Latino and Asian adults than other racial and ethnic adult populations. The disparity in smoking between non-Hispanic White men and non-Hispanic Black men diminished substantially in recent years.[36]

Cigarette smoking rates are highest among adults with less education compared to adults with more education.

Cigarette smoking rates are higher among persons with histories of mental health and substance abuse conditions; people who identify as lesbian, gay, bisexual, and transgendered; and persons living in the South and Midwest regions of the U.S.[12]

Utah

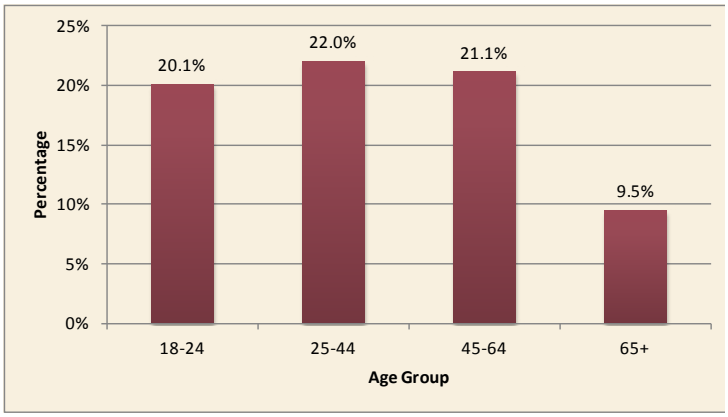
In 2010, 10% of Utah males and 7.5% of Utah females were current smokers. This population comprised about 190,000 Utah adults.

Utahns consumed 26.7 packs of cigarettes per capita.[43]

In 2009, 26.9% of Utah adults who smoked reported that they had high blood pressure. Nearly one-third of Utah adult smokers had high cholesterol.[9]

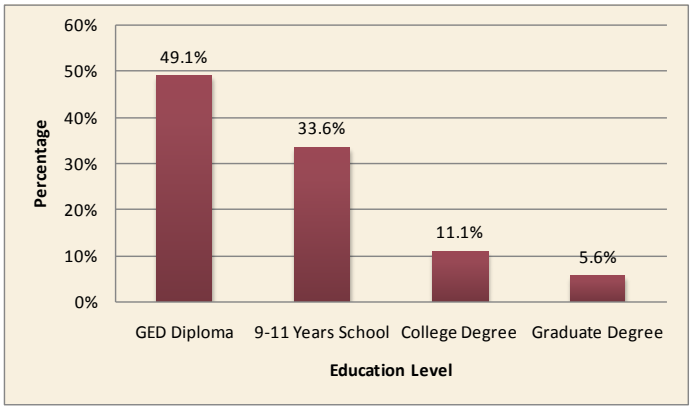
In 2010, two-thirds of current smokers who had seen a health care provider in the past year reported that their provider had advised them to quit smoking. Approximately 37% of current smokers who had seen a health care provider in the past year reported that their provider recommended or discussed medications to assist with quitting.

Figure 43: Percentage of U.S. Adults Who Were Current Smokers by Age Group, 2009



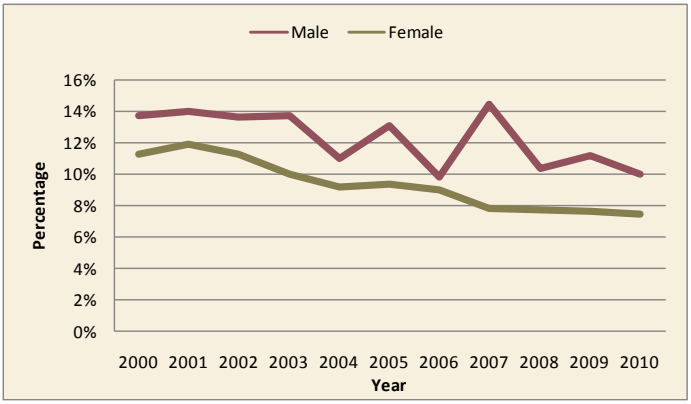
Source: Utah Tobacco Facts Report 2010.

Figure 44: Percentage of U.S. Adults Who Were Current Smokers by Education Level, 2010



Source: Centers for Disease Control and Prevention, 2011.

Figure 45: Percentage of Utah Adults Who Were Current Smokers by Year and Sex, 2000-2010



Source: Utah BRFSS. Age-adjusted.

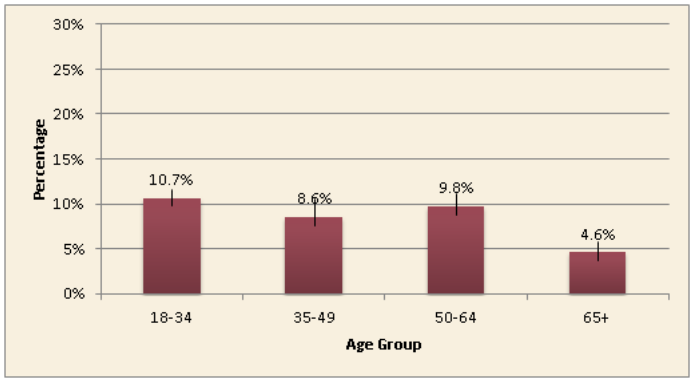
Secondhand smoke is associated with coronary heart disease in non-smoking adults. In Utah, 16,000 children live in homes where they are exposed to secondhand smoke.

Smoking rates were similar across age groups among 18- to 64-year-olds. The smoking rate among persons aged 65 and older was significantly lower (4.6%).

Less formal education is linked to an increased risk for smoking. Utahns with less than a high school education reported cigarette smoking at nearly 10 times the rate of Utahns with college degrees.

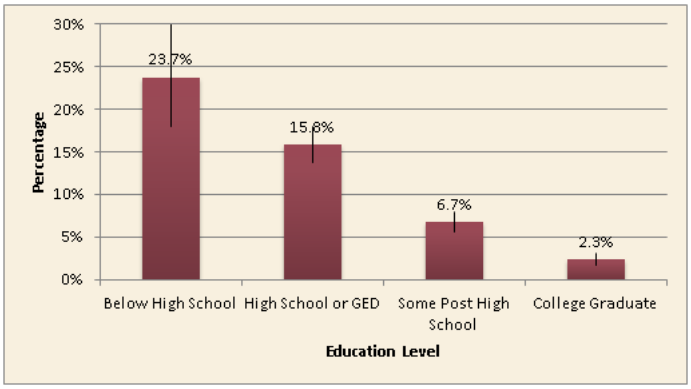
Members of households with higher income levels had a lower smoking risk. Utahns with a household income of less than $25,000 had twice the rate of smoking as those with an income of $25,000 to $49,999 and nearly four times the rate of those with a household income of $75,000 or more.

Figure 46: Percentage of Utah Adults Who Reported Current Smoking by Age, 2010



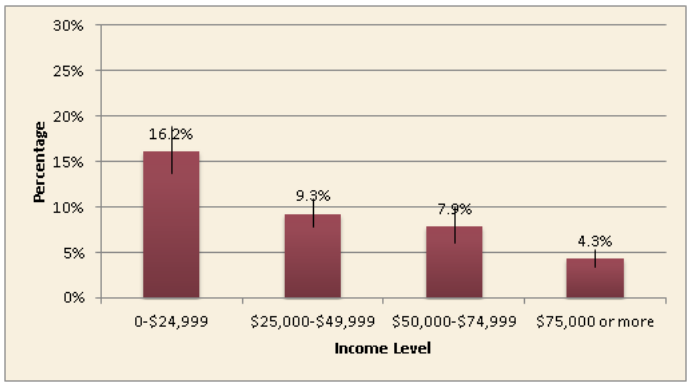
Source: Utah BRFSS.

Figure 47: Percentage of Utah Adults (25+) Who Reported Current Smoking by Education, 2010



Source: Utah BRFSS. Age-adjusted.

Figure 48: Percentage of Utah Adults Who Reported Current Smoking by Income, 2009



Source: Utah BRFSS. Age-adjusted.

Utah American Indian/Alaska Natives had higher rates of cigarette smoking than other racial and ethnic populations.

Although Utah's statewide cigarette smoking rate is lower than the national average, Southeastern Utah's rate of 16.8% was similar to the national rate.

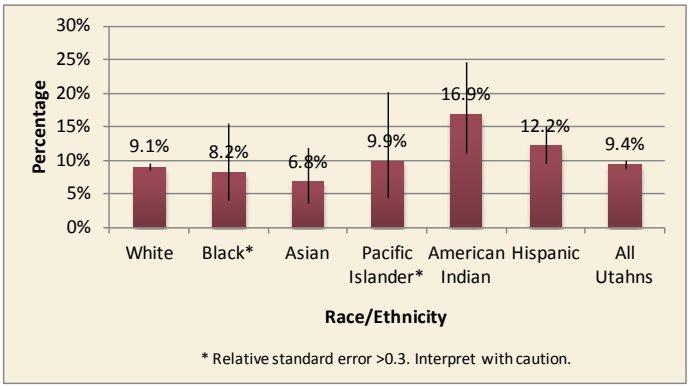
Costs

Utah

The Centers for Disease Control and Prevention (CDC) estimates that medical and productivity costs related to tobacco cost Utah $663 million each year.

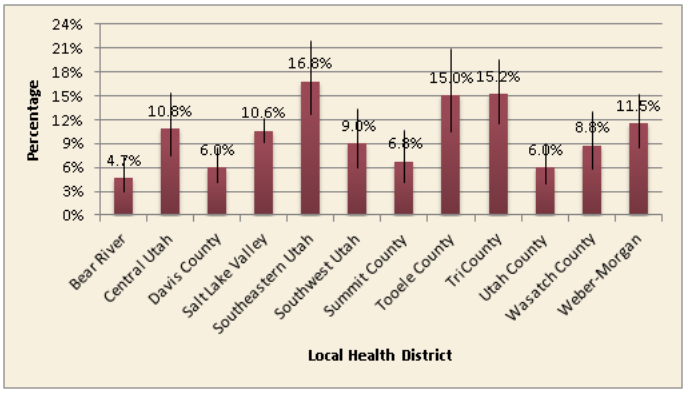
For each 1% decline in the state adult and youth smoking rate, Utah would have 19,100 fewer adult smokers, 540 fewer pregnant smokers, and 1,700 fewer high school smokers. There would be five fewer smoking-caused heart attacks and three fewer smoking-caused strokes in the first year. Over five years, this would mean 61 fewer smoking-caused heart attacks and 33 fewer smoking-caused strokes. Although the numbers seem small, the heart attack and stroke reductions could save Utah more than $4.3 million over five years. About 16.3% of smoking-related health care costs are currently paid by Medicaid.[10]

Figure 49: Percentage of Utah Adults Who Reported Current Smoking by Race and Ethnicity, 2008-2010



Source: Utah BRFSS. Age-adjusted.

Figure 50: Percentage of Utah Adults Who Reported Current Smoking by Local Health District, 2010



Source: Utah BRFSS. Age-adjusted.

Co-morbid Chronic Disease Prevalence in Utah

Managing multiple chronic health conditions is a daily reality for many Utah adults. The number of Utahns with co-morbid conditions and risk factors is likely to increase as the population ages. These conditions represent a significant, and growing, public health and economic burden and a challenge to the health care system. The table below uses data from 2009, which is the most recent year all of these variables were assessed with the Utah Behavioral Risk Factor Surveillance System (BRFSS).

Highlights

- Utah adults with high blood pressure have nearly three times the rate of diabetes compared to the general population.
- Utah adults with high blood pressure or high cholesterol had nearly double the rate of obesity compared to the general population.
- Utah adults with high blood pressure or high cholesterol have higher rates of physical inactivity and arthritis and report that their activities are limited at a higher rate than the general population.

How to Read this Matrix:

The Utah Adults row shows the prevalence of chronic diseases and chronic disease risk factors for the Utah adult population. The rows can be used to identify a subpopulation to look at coexisting diseases. For example, the High Blood Pressure row shows that 54.5 percent of adults with hypertension also have high cholesterol, 17.8 percent have diabetes, and 41.5 percent are obese.

Table 18: Percentage of U.S. Adults with Co-morbid Chronic Disease Prevalence, Utah, 2009

	High Blood Pressure	High Cholesterol	Diabetes	Current Smoker	Obese	Arthritis	Physically Inactive	Activities Limited
Utah Adults	23.1 (22.0-24.2)	33.6 (32.3-35.0)	6.1 (5.6-6.6)	9.8 (8.9-10.8)	24.0 (22.8-25.2)	21.4 (20.4-22.4)	42.4 (40.9-43.9)	18.7 (17.6-19.7)
High Blood Pressure	—	54.5	17.8	11.4*	41.5	40.6	49.7	33.1
High Cho-lesterol	46.7	—	14.4	8.4*	36.8	38.2	48.5	29.6
Diabetes	67.3	60.7	—	7.0	55.2	50.8	58	43.8
Current Smoker	26.9*	33.4*	4.3*	—	23.5*	23.4*	48.6*	28.3
Obese	39.5	46.1	14.1	9.7*	—	31.2	53.4	28.0
Arthritis	43.9	47.9	14.5	10.5*	35.4	—	51.4	44.6
Physically Inactive	26.6	38.4	8.2	11.0	30.4	25.4	—	23.7
Activities Limited	40.9	48.1	14.3	14.8	36.1	51.3	54.5	—

Source: Utah BRFSS 2009, age-adjusted to the 2000 U.S. Standard Population.
All rates are higher than the general population, except where indicated by asterisk (*).

Appendices

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Selected Healthy People 2020 Objectives

The objectives below have data sources available and accessible at the statewide level that allow for ongoing state-level surveillance for heart disease and stroke prevention.

All Healthy People 2020 Objectives and Targets may be found at http://www.healthypeople.gov/2020/default.aspx.

Objective Number	Description	Utah Baseline (Year)*	Utah 2020 Target (% Change)	U.S. Baseline (Year)	U.S. 2020 Target
HDS-2	Reduce coronary heart disease deaths (per 100,000)	67.5 (2010)	54.0 (-20%)	126.0 (2007)	100.8
HDS-3	Reduce stroke deaths (per 100,000)	35.2 (2010)	28.2 (-20%)	42.2 (2007)	33.8
HDS-5	Reduce the proportion of persons in the population with high blood pressure.	25.3% (2009)	22.8% (-10%)		26.9%
HDS-6	Increase the proportion of adults who have had their blood cholesterol checked within the preceding five years.	70.4% (2009	(+10%)	74.6% (2008)	82.1%
HDS-10	Increase the proportion of adults with hypertension who meet the recommended guidelines for body mass index (10.1), sodium intake (10.3), and physical activity (10.5).	Varies	Varies	Not specified	Not specified
HDS-11	Increase the proportion of adults with hypertension who are taking the prescribed medications to lower their blood pressure.	55.8% (2009)	61.4% (+10%)	70.4% (2005-2008)	77.4%
HDS-12	Increase the proportion of adults with hypertension whose blood pressure is under control.	63.9% (2010)	89.5% (+40%)	43.7% (2005-2008)	61.2%

* For comparison to U.S. Healthy People 2020 baselines and targets, Utah rates have been age-adjusted to the 2000 U.S. standard population using standard age-adjustment groups.

Objective Number	Description	Utah Baseline (Year)*	Utah 2020 Target (% Change)	U.S. Baseline (Year)	U.S. 2020 Target
HDS-15	Increase aspirin use as recommended among adults with no history of cardiovascular disease			Not specified	Not specified
HDS-16.1	Increase the proportion of adults aged 20 years and older who are aware of the early warning signs and symptoms of a heart attack and would call 9-1-1	30.4% (2009)	33.4% (+10%)	39.2%	43.1%
HDS-17.1	Increase the proportion of adults aged 20 years and older who are aware of the early warning signs and symptoms of a stroke and would call 9-1-1	45.3%	49.8% (+10%)	Not specified	Not specified
HDS-18	Increase the proportion of out-of-hospital cardiac arrests in which appropriate bystander and emergency medical services (EMS) were administered.			Not specified	Not specified
HDS-19.3 (Developmental)	Increase the proportion of eligible patients with strokes who receive acute reperfusion therapy within three hours of symptom onset.	83.3%* (2010)	91.6% (+10%)	Not specified	Not specified
HDS-21	Increase the proportion of adults with a history of cardiovascular disease who are using aspirin or antiplatelet therapy to prevent recurrent cardiovascular events.			Not specified	Not specified
HDS-24	Reduce hospitalizations (per 1,000) of older adults with heart failure as the principal diagnosis in adults aged 65-74, 75-84, and 85 and older.	65-74: 4.4 75-84: 9.7 85+: 19.0 (2010)	65-74: 4.0 75-84: 8.7 85+: 17.1 (-10%)	65-74: 8.8 75-84: 20.2 85+: 38.665	65-74: 9.8 75-84: 22.4 85+: 42.9
NWS-9	Reduce the proportion of adults who are obese.	24.0% (2010)	24% (+0%)		30.6%

* This Get With The Guidelines® (GWTG) Aggregate Data report was generated using the Outcome™ PMT® system. Copying or distribution of the GWTG Aggregate Data is prohibited without the prior written consent of the American Heart Association and Outcome Sciences, Inc. (Outcome).

HDSPP Policy Recommendations

This section lists selected policies that could reduce morbidity and mortality from cardiovascular disease if implemented statewide. Considered evidence-based, these policies may apply to health care systems and organizations, worksites, schools, and communities.

Improve Primary Care Management of Chronic Diseases

- Expand use of electronic health records
- Expand the availability of no-cost and low-cost medications for smoking cessation and controlling high blood pressure, high cholesterol, and diabetes
- Promote systems to support chronic disease self-management (e.g., telephone follow-up, at-home blood pressure monitoring and reporting, community health workers)
- Promote multidisciplinary health care teams
- Promote systems-wide use of community health workers, pharmacists, and other health care professionals in primary care settings
- Promote active patient participation and goal-setting in medical care
- Engage family members in patient care
- Increase patient medication adherence through provider follow-up
- Develop reimbursement mechanisms for case management support and self-management
- Promote incentives for physician/clinic participation in quality improvement of chronic disease management practices
- Expand the safe use of aspirin or other antiplatelet medications to prevent and control cardiovascular disease
- Expand monitoring and public reporting of health data
- Expand screening for cigarette smoking

Increase Control of High Blood Pressure and High Cholesterol

- Increase accurate measurement of high blood pressure
- Expand cholesterol screening, especially among high-risk populations
- Promote the use of blood pressure home monitoring and clinical feedback loops
- Expand availability and utilization of chronic disease self-management programs (CDSMP), such as Utah's Living Well program
- Expand worksite implementation of evidence-based wellness policies and programs that address high blood pressure, high cholesterol, and diabetes.

Decreasing Sodium in the Food Supply

- Promote procurement policies to limit sodium in foods
- Promote reduced sodium content in packaged and prepared foods
- Promote the availability of low-sodium food options with competitive pricing

Improving Emergency Response for Heart Attack and Stroke

- Expand CPR and AED training in worksites, schools, and communities
- Expand public access to AEDs
- Increase public awareness of the signs and symptoms of stroke and heart attack
- Expand public access to and training in the use of automated external defibrillators (AEDs)
- Establish a statewide stroke registry and use data to improve quality of care
- Establish a statewide system of care for acute myocardial infarction (AMI) and use data to improve quality of care

Classification of Diseases and Conditions

The International Classification of Diseases, 9th and 10th Revisions, Clinical Modification (ICD-9-CM and ICD-10-CM) were used to identify the specific disease categories in this report. The following ICD-9 or ICD-10 codes have been grouped together to determine rates for the specific conditions included in this report. The following codes were chosen to be consistent with chronic disease indicator recommendations.

Diagnosis	ICD-9-CM	ICD-10
	Morbidity	Mortality
Major cardiovascular disease	390-434, 436-448	I00-I78
Diseases of the heart (Heart disease)	390-398, 402, 404, 410-429	I00-I09, I11, I13, I20-I51
Coronary heart disease	410-414, 429.2	I20-I25
Acute myocardial infarction	410	I21-I22
Heart failure	428	I50
Cerebrovascular disease (Stroke)	430-434, 436-438	I60-I69
Hemorrhagic stroke	430-432	I60-I62
Ischemic stroke	433-434	I63-I66
Cardiac arrest	427.5	

Data Sources

Utah Death Certificate Database

Vital statistics death certificates filed with the Utah State Office of Vital Records and Statistics are the primary source of mortality data. The death certificate includes demographic information, the cause and circumstances of death, and is based on the national standard death certificate. The current certificate has been in use since 2005.

All-Payer Claims Database (APCD)

Utah's new, real-time medical, pharmacy, and enrollment claims database covers 70% of the population and features sophisticated risk adjustment and disease progression measurement capabilities to support cost analysis. These data are intended to help us understand the role of primary care providers in the treatment of chronic conditions.

Utah Prehospital OnLine Active Reporting Information System (POLARIS)

Prehospital (ambulance) data come from all emergency medical services (EMS) agencies licensed or designated to operate in Utah. Each record represents a response by an EMS crew to a patient or incident. The database is maintained by the Utah Department of Health, Bureau of Emergency Medical Services and Preparedness. Data are collected using the National Emergency Medical Services Information System (NEMSIS) data standard. The Department has collected data in the NEMSIS format since September 2006. In 2009, approximately 80% of estimated statewide volume was collected. In 2010, approximately 95% was collected. The data standard includes 315 patient care report data elements, of which 196 are required to be reported in Utah. Information is reported about the incident, EMS response, patient situation, assessments, treatments, and transport. These data help to understand how emergency medical services serve Utahns who experience heart attack, stroke, and diabetic emergencies.

Utah Behavioral Risk Factor Surveillance System (BRFSS)

Utah participates in CDC's health behavior telephone survey (BRFSS) and stratifies the data by health district in order to obtain 100 completed interviews in each of Utah's 61 small areas by combining three years of data. The BRFSS is the primary source of information on the prevalence of cardiovascular disease and risk factors.

Utah Hospital Discharge Database (UHDD)

Hospital data are used to estimate the incidence of acute cardiovascular events, such as stroke and heart attack, and to estimate the prevalence of chronic conditions that commonly result in hospitalization, such as heart failure.

Administrative Rule R428 became effective in December 1991. It mandates that all Utah licensed hospitals, both general acute care and specialty, shall report information on inpatient discharges, beginning on January 1, 1992. UHDD contains the consolidated information on complete billing, medical codes, and personal characteristics describing a patient, the services received, and charges billed for each inpatient hospital stay. Fifty-three Utah hospitals submitted data in 2009, including three psychiatric facilities, eight specialty hospitals, and the Veterans Administration Medical Center.

Utah Emergency Department (ED) Encounter Database

The Utah Hospital Emergency Database contains data about all ED encounters, including outpatient ED visits and data that describe inpatient admissions (those leading to a hospital admission). ED data are used to assess the use of certain procedures for the treatment of stroke and heart attack.

Administrative Rule R426-1-7 (I) mandates that all licensed Utah hospitals report information on emergency department patient encounters. The rule defines the data elements hospitals are required to submit to the Bureau of Emergency Medical Services under statute and administrative rules specifically for the purpose of constructing a statewide Emergency Department Encounter Database. The database contains the consolidated information on complete billing, medical codes, personal characteristics describing a patient, services received, and charges billed for each patient emergency department (ED) encounter. The ED Encounter Public Data Set includes combined data on all ED outpatient visits and ED inpatient admissions. Forty-three eligible hospitals submitted data in every calendar quarter (3-month period) in 2009.

Get With The Guidelines (GWTG)

Maintained by Outcome Sciences, GWTG is the largest national hospital-based program dedicated to quality of care improvement for patients with cardiovascular disease. Managed by Outcome Sciences, the GWTG dataset represents hospitals that use the American Heart Association's patient management tools for stroke and heart failure. The UDOH Heart Disease and Stroke Prevention Program has access to statewide and hospital-level data for Utah hospitals participating in these programs.

Healthcare Cost and Utilization Project (HCUP)

Maintained by the Agency for Healthcare Research and Quality, HCUP databases bring together the data collection efforts of state data organizations, hospital associations, private data organizations, and the federal government to create a national information resource of patient-level health care data. These databases enable research on a broad range of health policy issues, including cost and quality of health services, medical practice patterns, access to health care programs, and outcomes of treatments at the national, state, and local market levels.

CDC WONDER Compressed Mortality File

Maintained by the Centers for Disease Control and Prevention (CDC), the Compressed Mortality database contains mortality and population counts for all U.S. counties. Counts and rates of death can be obtained by underlying cause of death, state, county, age, race, sex, and year. Data are also available for Hispanic ethnicity, injury intent, injury mechanism, and urbanization categories.

Race and Ethnicity Data

According to the Utah Office of Health Disparities Reduction, Hispanic persons who may be White by the Census Bureau definition often report their race as "Other." The Hispanic ethnicity question is asked first on surveys such as the BRFSS to allow respondents to self-identify as Hispanic ethnicity prior to hearing the race question. It appears that Hispanic persons often do not embrace the Census Bureau definition of race.

Classifying persons into standard race categories requires that the Census Bureau race definitions are known and understood. In South Asia (e.g., India), the Middle East, and the Philippines, classification errors are probably common.

Different data systems are adopting the Office of Management and Budget standards at different times.

Methods

Age Adjustment

Some rates reported in this document are age-adjusted: they are stated in terms of an age-standardized value. Age-adjusted rates control for age effects, allowing better comparability of rates across small areas, subpopulations, and time. When comparing across geographic areas, such as comparing Utah to the entire United States, age-adjusting controls for area-to-area differences in health events that can be explained by differences in the age distribution of the populations being compared.

For this report, the age categories used in age-adjusting varied dependent on the data and the subgroup being analyzed. BRFSS race/ethnicity data were adjusted using three age groups (18-34, 35-49, 50+). State data for cardiovascular disease subtypes, high blood pressure, cholesterol, and diabetes were adjusted using three age groups (18-44, 45-64, 65+), except where noted. BRFSS data for demographic data, health care access, obesity, and cigarette smoking were adjusted using eight age groups (18-24, 25-34, 35-44, 45-54, 55-64, 65-74, 75-84, 85+). Other data were adjusted using 11 age adjustment groups (less than 1, 1-4, 5-14, 15-24, 25-34, 35-44, 45-54, 55-64, 65-74, 75-84, 85+).

Confidence Intervals

The 95% confidence intervals expressed in this report indicate the range of values within which the statistic would fall 95% of the time if a researcher were to calculate the statistic (e.g., a percentage or rate) from an infinite number of samples of the same size drawn from the same base population. Traditionally, 95% confidence intervals are symmetric and centered at the estimated rate (calculated as 1.96 times the standard error). However, in the context of public health measures, it makes sense that confidence intervals be equal to or greater than zero, since all the rates are non-negative values. Occasionally, when the proportion is close to zero or the number of events is small, the lower interval is less than zero. Sometimes, when a proportion is near 100%, the upper bound is greater than 100%. For these cases, researchers used asymmetric distributions that constrain the upper and lower intervals to lie above zero or below 100%.

Population Count Estimates

Percentage estimates were applied to population counts to derive an estimate for the total number of persons in Utah to whom the behavior applies. For example, the survey estimate of the percentage of persons who smoked was applied to the adult population of Utah to derive an estimate of the total number of smokers in Utah. The population estimates used in the BRFSS, mortality, and hospitalization data tables were prepared by the Utah Governor's Office of Planning and Budget. Population estimates for mortality data tables by race and ethnicity were obtained from the U.S. Census.

Population Density

Utah population density for 2010 was calculated at the county level by dividing the total mid-year population in 2009 for a given county by the total land area for the same county. In 2010, ZIP code groupings in southwestern Salt Lake County were subdivided by the U.S. Postal Service to accommodate increased population. Two small area codes (33 and 34) were retired. With the new area and the two replacement codes, the highest area code went from 61 (for data years 2007-2008) to 64 (for data years 2009-2010). Utah population density for 2000 is from the 2000 U.S. Census.

Persons Per Square Mile	Designation
Less than 6	Frontier
6 to 100	Rural
More than 100	Urban

Small Areas

Utah Department of Health staff developed Utah's 61 small areas in 1997 in order to facilitate the reporting of health information at the community level. ZIP code area boundaries, singly or in combination, were used to define the small areas because they are the smallest commonly-used geographic units that are also identified in most health data sources. In addition, the U.S. Postal Service ZIP code areas roughly follow political boundaries. In some sparsely populated areas of the state, however, entire counties were used to define small areas.

The size of the small areas was established by looking at the incidence rates for a variety of health events and determining the population size that would be required to yield at least 20 events over a three- to five-year period. A numerator of 20 or greater was chosen because it produces relatively stable incidence estimates and simplifies the computation of confidence intervals. The investigators found that populations of 40,000 to 60,000 would suffice. However, some areas with smaller populations were designated as small areas when low population density, community identity, or other factors suggested that was appropriate.

Because local health districts are the primary seat of community public health in Utah, the small areas were designed to not cross local health district boundaries. Whenever possible, the small areas were designed to conform to established political boundaries of cities and towns. To guard against combining ZIP code areas with extremely different economic statuses, the investigators examined median per capita annual income levels of each ZIP code. In many cases, local representatives, including health officers and city officials, were asked to assist in designating small area boundaries based on their knowledge of community characteristics.

Population estimates for the small areas were obtained and several health measures were analyzed and compared. The 61 small areas had an average population size in 1997 of 33,500 persons (range 15,000 to 62,500). Due to local health district boundaries or input from local area residents, population sizes were under 20,000 for six areas. In four cases, a small area encompassed an entire local health district.

Difficulties in Designating Utah's Small Areas Using ZIP Codes

Because ZIP codes are a collection of addresses designed for the convenience of postal carriers, they do not always correspond to other more meaningful boundaries, such as those of cities or towns, school districts, neighborhoods, or political voting districts. ZIP code areas may be heterogeneous

with respect to important health-related demographic variables such as income, education, and household composition. Additionally, ZIP code boundaries are not stable. They are subdivided as the populations within them increase. And, very importantly, ZIP code and small area boundaries may not match health event (e.g., a disease or exposure) boundaries.

However imperfect ZIP code areas may be, they are routinely included on many public health data records or can be gathered easily on surveys such as the BRFSS. Also, estimates of population size and other demographic characteristics are often available for ZIP code areas. These population estimates are especially important, as they are used as denominators in the calculation of disease and mortality rates.

Number	Small Area	Boundary Designation
0	State Total	All counties / ZIP codes in Utah
1	Brigham City	ZIP code 84302
2	Other Box Elder Co.	Box Elder County except ZIP code 84302
3	Logan	ZIP codes 84321, 84322, 84341, 84332
4	Other Cache/Rich Co.	Cache & Rich Co. except 84321, 84322, 84341, 84332
5	Ben Lomond	ZIP codes 84404, 84407, 84412
6	Morgan/East Weber Co.	ZIP codes 84310, 84317, 84414, 84050 or Morgan County
7	Downtown Ogden	ZIP codes 84401, 84402
8	South Ogden	ZIP code 84403, 84408
9	Roy/Hooper	ZIP codes 84067, 84315
10	Riverdale	ZIP codes 84405 in Weber County, 84409
11	Clearfield/Hill AFB	ZIP codes 84015, 84016, 84056
12	Layton	ZIP codes 84040, 84041, 84405 in Davis County
13	Syracuse/Kaysville	ZIP codes 84037, 84075
14	Farmington/Centerville	ZIP codes 84025, 84014
15	Woods Cross/No SL	ZIP codes 84087, 84054
16	Bountiful	ZIP codes 84010, 84011
17	Rose Park	ZIP code 84116
18	Avenues	ZIP codes 84103, 84114
19	Foothill/U of U	ZIP codes 84108, 84112, 84113
20	Magna	ZIP code 84044
21	Glendale	ZIP codes 84104, 84101, 84110, 84152
22	West Valley West	ZIP codes 84128, 84120, 84170
23	West Valley East	ZIP codes 84119, 84199
24	Downtown Salt Lake	ZIP codes 84111, 84102, 84105
25	South Salt Lake	ZIP codes 84115, 84165
26	Millcreek	ZIP Codes 84106, 84151, 84109
27	Holladay	ZIP Codes 84124, 84117

#	Area	Boundary Designation
28	Cottonwood	ZIP Code 84121
29	Kearns	ZIP Code 84118
30	Taylorsville	ZIP Code 84123
31	Murray	ZIP codes 84107, 84157
32	Midvale	ZIP code 84047
33	West Jordan No.	ZIP code 84084 (2008 and before)
33.1	West Jordan Northeast	ZIP code 84084 (2009 and after)
34	W. Jordan, Copperton	ZIP codes 84088, 84006 (2008 and before)
34.1	West Jordan Southeast	ZIP code 84088 (2009 and after)
34.2	W. Jordan West/Copperton	ZIP codes 84081, 84006 (2009 and after)
35	South Jordan	ZIP code 84095 (ZIP code new as of 1993)
36	Sandy Center	ZIP codes 84070, 84091, 84094
37	Sandy, NE	ZIP codes 84093, 84090
38	Sandy, SE	ZIP code 84092
39	Riverton/Draper	ZIP codes 84065, 84020, 84096 (new as of 2006)
40	Tooele Co.	Tooele County
41	Lehi/Cedar Valley	ZIP codes 84043, 84013, 84005, (new) 84045 (new in 2006)
42	American Fork/Alpine	ZIP codes 84004, 84003
43	Pleasant Grove/Lindon	ZIP codes 84062, 84042
44	North Orem	ZIP codes 84057, 84059
45	West Orem	ZIP code 84058
46	East Orem	ZIP code 84097 (new as of 1996)
47	Provo/BYU	ZIP codes 84602, 84604
48	Provo South	ZIP codes 84601, 84603, 84605, 84606
49	Springville/Spanish Fork	ZIP codes 84660, 84663, 84664, 84653
50	Utah Co. South	ZIP codes 84651, 84655, 84626, 84633
51	Summit Co.	Summit County
52	Wasatch Co.	Wasatch County
53	TriCounty LHD	Daggett, Duchesne, and Uintah Counties
54	Juab/Millard/Sanpete Co.	Juab, Millard, and Sanpete Counties
55	Sevier/Piute/Wayne Co.	Piute, Sevier, and Wayne Counties
56	Carbon/Emery Co.	Carbon and Emery Counties
57	Grand/San Juan Co.	Grand and San Juan Counties
58	St. George	ZIP codes 84770, 84771, 84790
59	Other Washington Co.	Washington County except ZIP codes 84770, 84771, 84790
60	Cedar City	ZIP code 84720
61	Other Southwest Dist.	Beaver, Garfield, Iron, & Kane Co. except ZIP code 84720

Statistical Issues in Analyzing Small Area Data

Rates calculated from few events or in a small population typically show relatively large fluctuations with small changes in the number of events. Such fluctuations create challenges for those trying to make valid interpretations. For instance, it is difficult to assess whether rates, such as those in the BRFSS measures included in this report, are either higher or lower than usual, or in relation to some standard such as the state rate. There are a number of statistical approaches for detecting significant differences that are discussed in the article by Haggard, et al. For this report, confidence intervals were used. Confidence intervals describe the precision of an estimate and take into account the variability of the measure, the sample size, and the sampling method. Five years of data were combined to increase sample size in the small areas so as to improve the precision of the BRFSS estimates.

One limitation in the use of confidence intervals to identify small areas that are significantly different from the state is the lack of independence of the small areas and the state. The state includes the small area, so it is not technically appropriate to compare a small area to the state that includes it because they are not independent samples. Another issue is that the state rate also has a confidence interval. For this report, a small area differed from the state rate when its confidence interval did not include the state rate, not taking into consideration the confidence interval for the state rate itself.

Appendix F

Glossary

A

Acute cardiovascular event. A heart attack, stroke, or other emergency related to diseases of the heart and blood vessels.

Acute myocardial infarction (AMI). The damaging or death of an area of heart muscle (myocardium) resulting from a blocked blood supply to that area. Commonly known as a heart attack.

Angina. Condition in which the heart muscle does not get enough blood, resulting in chest pain.

Anticoagulant therapy. The use of a blood-thinning drug to reduce the risk of clots in the blood vessels.

Antithrombotics. A general name for drugs that prohibit blood clotting.

Atherosclerosis. A build up of fatty material and other deposits inside the coronary arteries, which leads to coronary heart disease.

Atrial fibrillation. A disorder in which the heart's two small upper chambers (the atria) quiver instead of beating effectively. When this happens, the blood is not pumped completely out of the atria, potentially causing it to pool and clot. If a blood clot from the atria becomes lodged in an artery to the brain, a stroke results.

Automated external defibrillator (AED). An electronic device that helps reestablish normal contraction rhythms in a malfunctioning heart.

B

Balloon angioplasty. A procedure used to expand narrowed arteries. A catheter with a deflated balloon on its tip is passed into the narrowed artery segment. The balloon is inflated, widening the narrowed artery. The balloon is then deflated and the catheter is removed.

Beta blocker. A medicine used to treat high blood pressure and other heart conditions by reducing the heart rate and the heart's output of blood.

Blood cholesterol. A waxy substance that circulates in the bloodstream. When the level of cholesterol in the body is too high, some cholesterol is deposited on the walls of the blood vessels. Over time, this can cause the vessels to narrow and reduce blood flow. High cholesterol increases the risk of heart disease. Low-density lipoprotein (LDL) cholesterol is considered "bad" cholesterol because it is the main cause of damaging buildup and blockage in the arteries. High density lipoprotein ("good" cholesterol) is thought to carry cholesterol away from other parts of the body to the liver for elimination. Having a high level of HDL and a low level of LDL reduces cardiovascular disease risk.

Category	Total Cholesterol
Desirable	<200
Borderline high	200-239
High	≥240

Category	LDL
Optimal	<100
Near optimal/above optimal	100-129
Borderline high	130-159
High	160-189
Very High	≥190

Category	HDL
Low	<40
High	≥60

Blood pressure. The force or pressure of blood pushing against the walls of the arteries. This is measured as two numbers: the systolic pressure (the first number, which measures the pressure while the heart is contracting) and the diastolic pressure (the second number, which measures the pressure when the heart is resting between beats).

Category	Systolic Blood Pressure (mmHg)		Diastolic Blood Pressure (mmHg)
Normal	<120	And	<80
Prehypertension	120-139	Or	80-89
Hypertension, Stage 1	140-159	Or	90-99
Hypertension, Stage 2	≥160	Or	≥100

The goal blood pressure for persons with diabetes or chronic kidney disease is below 130/80 mmHg.

Body mass index (BMI). A mathematical formula to assess body weight relative to height. This measure is highly correlated with body fat. BMI is an indicator of healthy weight, overweight, and obesity. It is calculated by dividing weight in kilograms by the square of height in meters.

BMI	Weight Status
<18.5	Underweight
18.5-24.9	Normal
25.0-29.9	Overweight
≥ 30.0	Obese

Bypass surgery. A procedure to allow blood flow to the heart muscle even with blocked arteries. The surgery uses a healthy blood vessel from a leg or other limb and uses it to bypass the blockage so that blood is rerouted around the diseased or blocked area. After coronary bypass surgery, normal blood flow is restored.

C

Cardiovascular. Pertaining to the heart and blood vessels. Cardiovascular disease refers to diseases of the heart and blood vessels, including coronary heart disease (coronary artery disease), thrombosis, arrhythmias, myocarditis, pericarditis, cardiomyopathy, ventricular failure, and heart failure.

Chronic disease. An impairment or deviation from the normal functioning of the human body, and having one or more of these characteristics: being permanent, leaving disability, caused by nonreversible pathological alterations, requiring special patient education for rehabilitation, and/or requiring a long period of supervision or care.

Coronary heart disease. A condition in which the flow of blood to the heart muscle is reduced. Like any muscle, the heart needs a constant supply of oxygen and nutrients that are carried to it by the coronary arteries. When the coronary arteries become narrowed or clogged, they cannot supply enough blood to the heart. The heart may respond with pain called angina. When the blood supply is cut off completely, a heart attack occurs. The affected part of the heart muscle begins to die and may be permanently damaged.

D

Diabetes. A condition in which the body doesn't produce the right amount of insulin, or is unable to use the insulin it has. Insulin is the hormone that allows cells to absorb glucose (sugar) from the bloodstream. Some people must inject themselves every day with insulin to maintain a healthy glucose level. Others control the condition with medication, diet, and exercise.

Disparity. The condition or fact of being unequal, as in age, rank, or degree.

Dysphagia. Difficulty chewing and swallowing food that occurs when one side of the mouth is weak due to stroke or other brain injury. One or both sides of the mouth can lack feeling, increasing the risk of choking.

E

Emergency Department (ED) encounters. Patient visits to a hospital emergency department.

EMS. The Emergency Medical Services System (EMS), which provides prehospital care to patients in need of emergency treatment and rapid transportation to an emergency department.

H

Healthy People 2020 (HP2020). A comprehensive, nationwide health promotion and disease prevention agenda, coordinated by the U.S. Department of Health and Human Services. Healthy People objectives and goals for improving health are developed by a broad coalition of experts from many sectors.

Heart attack. Also called acute myocardial infarction (AMI), a heart attack occurs when an artery to the heart becomes blocked, resulting in a lack of oxygen-containing blood flow to the heart muscle. This causes part of the heart muscle to die.

Heart disease. The leading cause of death and a common cause of illness and disability in the United States. Coronary heart disease and ischemic heart disease are specific names for the principal form of heart disease, which is the result of plaque buildup in the arteries (atherosclerosis).

Heart failure. Also known as congestive heart failure, this disease occurs when the heart cannot pump enough blood to meet the body's needs. Swelling often results, most commonly in the legs and ankles. Fluid can collect in the lungs and interfere with breathing, causing shortness of breath.

Hemorrhagic stroke. The injury to brain cells caused by ruptured blood vessels in the brain. Cerebral hemorrhages bleed inside the brain; subarachnoid hemorrhages bleed into the space between the brain and the skull.

High blood pressure (hypertension). A systolic blood pressure of 140 mmHG or greater or a diastolic blood pressure of 90 mmHg or greater. High blood pressure causes the heart to work too hard, resulting in increased risk of heart attack, stroke, heart failure, and other problems. People with high blood pressure are considered to have their blood pressure controlled if the level is less than 140/90 mmHg, or less than 130/80 mmHg for people with diabetes.

High cholesterol. With high cholesterol, fat is deposited along the blood vessel walls, which makes it difficult for blood to flow. This increases the risk of heart attack or stroke.

Hospital discharges. The number of inpatients discharged from short-stay hospitals where some type of disease was the first-listed diagnosis. Discharges include people both living and dead.

Hypertension. See High blood pressure.

I

Incidence. The number of new cases of disease that develop in a population during a specific time period, such as a year.

Ischemic heart disease. Heart problems, including heart attack, caused by the narrowing of the coronary arteries and the decreased supply of blood and oxygen to the heart. Also called coronary artery disease and coronary heart disease.

Ischemic stroke. The death of or injury to brain cells caused when a blood clot or other particle blocks an artery in the brain.

L

LDL-C. Low-density lipoprotein cholesterol, or "bad" cholesterol, is a widely recognized risk factor for coronary heart disease.

Lipid. A fatty substance that will not dissolve in blood.

M

Morbidity. A measure that addresses the prevalence or incidence of disease or the degree or severity of a disease or disability.

Mortality. The total number of deaths from a given disease in a population during a specific interval of time, usually a year.

Myocardial infarction. (See heart attack)

O

Obesity. A body mass index (BMI) of 30 kg of weight per square meter of height.

Overweight. A body mass index (BMI) of greater than 25 kg but less than 30 kg of weight per square meter of height.

Overt symptoms. Symptoms that can be observed or that show themselves because of the disease.

P

Prevalence. The total number of cases of disease existing in a population at a specific point in time.

R

Rate. The basic measure of disease occurrence that expresses probability of risk of disease in a defined population over a specified period of time.

Recommended physical activity (for adults). At least 30 minutes or more of moderate-intensity activity on most, if not all, days of the week, or at least 20 minutes of vigorous activity at least 3 days per week.

Rehabilitation. A process to restore mental and/or physical abilities lost to injury or disease in order to function in a normal or near-normal way.

Rheumatic heart disease. Damage done to the heart, particularly the heart valves, by an infection.

Risk factor. A variable associated with an increased risk of disease or infection. Risk factors are not necessarily causal.

S

Stroke. A form of cerebrovascular disease that affects the arteries of the central nervous system. A stroke occurs when blood vessels bringing oxygen to the brain burst (hemorrhagic stroke) or become clogged by a blood clot or other particle (ischemic stroke). In either case, the brain does not receive the blood it needs and nerve cells begin to die. When these nerve cells do not function, the part of the body controlled by these cells cannot function, either.

T

Tissue plasminogen activator (tPA). An agent used to dissolve clots in ischemic stroke patients. To be effective, tPA must be administered within the first three hours following symptom onset.

Bibliography

1. Agency for Healthcare Research and Quality. (2010). *Cardiovascular Disease and Other Chronic Conditions in Women: Recent Findings.* Rockville, MD.
2. Agency for Healthcare Research and Quality. (2001, November). *Diabetes Disparities among Racial and Ethnic Minorities*. Retrieved 10/17/2011, from AHRQ: http://www.ahrq.gov/research/diabdisp.htm
3. Agency for Healthcare Research and Quality. (2011, February). National Healthcare Disparities Report 2010. Rockville, MD.
4. Agency for Healthcare Research and Quality. (n.d.). *Statistics on Hospital-Based Care in the U.S.* Retrieved from HCUP Facts and Figures 2008.
5. Agency for Healthcare Research and Quality. *Statistics on Hospital-Based Care in the United States-2008*. HCUP Facts and Figures.
6. Agency for Healthcare Research and Quality. (2011). *Women's Health Highlights: Recent Findings*, at http://www.ahrq.gov/research/womenh1.htm#cardio
7. American Heart Association. (2007). *Out of Hospital Cardiac Arrest--Statistics.*
8. American Heart Association. (2004). *Sudden Deaths from Cardiac Arrest--Statistics.*
9. BRFSS. (2009). Behavioral Risk Factor Surveillance System.
10. Campaign for Tobacco-Free Kids. (2010). *Benefits & Savings from Each One Percentage Point Decline in Utah Smoking Rates.*
11. Centers for Disease Control and Prevention. (2011). *Addressing the Nation's Leading Killers: At a Glance 2011*. Retrieved August 23, 2011, from Centers for Disease Control and Prevention: http://www.cdc.gov/chronicdisease/resources/publications/AAG/dhdsp.htm
12. Centers for Disease Control and Prevention. (2011). CDC Health Disparities and Inequalities Report--United States, 2011. *Morbidity and Mortality Weekly Report, 60(Suppl)*.

13. Centers for Disease Control and Prevention. (2010). CDC WONDER Online Database, compiled from Compressed Mortality File 1999-2007 Series 20 No.2M.

14. Centers for Disease Control and Prevention. (2011, March 21). *Health Effects of Cigarette Use*. Retrieved October 17, 2011, from Centers for Disease Control and Prevention: http://www.cdc.gov/tobacco/data_statistics/fact_sheets/health_effects/effects_cig_smoking/

15. Centers for Disease Control and Prevention. Out of Hospital Cardiac Arrest Surveillance—Cardiac Arrest Registry to Enhance Survival (CARES), United States, October 1, 2005 –December 31,2010. MMWR 2011;60(No. SS-8):1-23

16. Centers for Disease Control and Prevention. (Fall 2010). *Strategies for States to Address the "ABCs" of Heart Disease and Stroke Prevention.* Atlanta.

17. Centers for Disease Control and Prevention. (2011, July 21). *U.S. Obesity Trends*. Retrieved July 21, 2011, from http://www.cdc.gov/obesity/data/trends.html

18. Centers for Disease Control and Prevention. (2010). Vital Signs: State-Specific Obesity Prevalence Among Adults --- United States, 2009. *Morbidity and Mortality Weekly Report (MMWR), 59 (Early Release)*, 1-5.

19. Concannon TW, Kent DM, Normand SL, Newhouse JP, Griffith JL, Cohen J, Beshansky JR, Wong JB, Aversano T, Selker HP (2010). Comparative effectiveness of ST-segment-elevation myocardial infarction regionalization strategies. *Circulation, Cardiovascular Quality and Outcomes*, 506-513.

20. Correa-de-Araujo R, Stevens B, Moy E, Nilasena D, Chesley F, McDermott K (2006). Gender differences across racial and ethnic groups in the quality of care for acute myocardial infarction and heart failure associated with comorbidities. *Women's Health Issues, 16*, 44-55.

21. Fang J, Keenan N, Dai S, Denny C (2008). Disparities in Adult Awareness of Heart Attack Warning Signs and Symptoms--14 States 2005. *MMWR, 57* (7), 175-179.

22. Finkelstein EA, Trogdon JG, Cohen JW, Dietz W (2009). Annual medical spending attributable to obesity: Payer- and service-specific estimates. *Health Affairs, 28* (5), W822-W831.

23. Flegal KM, Carroll MD, Ogden CL, Curtin LR (2010). Prevalence and Trends in Obesity Among US Adults, 1999-2008. *Journal of the American Medical Association (JAMA), 303* (3), 235-241.

24. Ford ES, Ajani UA, Croft JB, Critchley JA, Labarthe DR, Kottke TE, Giles WH, Capewell S(2007). Explaining the decrease in U.S. deaths from coronary disease, 1980-2000. *New England Journal of Medicine, 356* (23), 2388-2398.

25. Ford ES, Li C, Pearson WS, Zhao G, Mokdad AH (2010). Trends in hypercholesterolemia treatment and control among United States adults. *International Journal of Cardiology* , 226-235.

26. He F, MacGregor, G (2011). Salt reduction lowers cardiovascular risk: meta-analysis of outcome trials. *Lancet, 378* (9789), 380-382.

27. Health Care Utilization Project (HCUP). (2010, October). Facts and Figures 2008. Agency for Healthcare Research and Quality.

28. Institute of Medicine (IOM). (2010). *A population-based policy and systems change approach to prevent and control hypertension.* Washington, D.C.: National Academies Press.

29. Institute of Medicine. (2010). *Strategies to Reduce Sodium Intake in the United States.*

30. Levine DA, Kiefe CI, Howard G, Howard VJ, Williams OD, Allison JJ (2007). Reduced medication access: a marker for vulnerability in U.S. stroke survivors. *Stroke, 38*, 1557-1564.

31. Moran A, Diez Roux AV, Jackson SA, Kramer H, Manolio TA, Shrager S, Shea S (2007). Acculturation is associated with hypertension in a multiethnic sample. *American Journal of Hypertension, 20* (4), 354-353.

32. O'Neil SS, Lake T, Merrill A, Wilson A, Mann DA, Bartnyska LM (2010). Racial Disparities in Hospitalizations for Ambulatory Care-Sensitive Conditions. *American Journal of Preventive Medicine, 38* (4), 381-388.

33. Perlich, P. (2011). Coming to Our Census. *Pathways to College: Next Steps for Utah.* Salt Lake City.

34. Perlich, P. S. (2005). Demographic Trends Impacting Planning in Utah. *American Planning Association Conference.*

35. Perlich, P. (2009). *Utah's Demographic Transformation: A View into the Future*. Retrieved July 6, 2011, from Slideshare: http://www.slidesharenet/USHE/utahs-demographic-transformation-a-view-into-the-future

36. Roger VL, Go AS, Lloyd-Jones DM, Adams RJ, Berry JD, Brown TM, Carnethon MR, Dai S, de Simone G, Ford ES, Fox CS, Fullerton HJ, Gillespie C, Greenlund KJ, Hailpern SM, Heit JA, Ho PM, Howard VJ, Kissela BM, Kittner SJ, Lackland DT, Lichtman JH, Lisabeth LD, Makuc DM, Marcus GM, Marelli A, Matchar DB, McDermott MM, Meigs JB, Moy CS, Mozaffarian D, Mussolino ME, Nichol G, Paynter NP, Rosamond WD, Sorlie PD, Stafford RS, Turan TN, Turner MB, Wong ND, Wylie-Rosett J (2011). On behalf of the American Heart Association Statistics Committeee and Stroke Statistics Subcommittee. Heart Disease and Stroke Statistics Subcommittee. Heart Disease and Stroke Statistics--2011 Update: A Report from the American Heart Association. *Circulation, 123*, e18-e209.

37. Russo, C. A. (2006). *Racial and Ethnic Disparities in Potentially Preventable Hospitalizations, 2003.* Rockville: Agency for Healthcare Research and Quality.

38. ScienceDaily, 4/9/12. "Obesity Accounts for 21 Percent of U.S. Health Care Costs, Study Finds." Accessed at http://www.sciencedaily.com/releases/2012/120409103247.htm on 4/26/12

39. Smith-Spangler CM, Juusola JL, Enns EA, Owens DK, Garber AM (2010). Population strategies to decrease sodium intake and the burden of cardiovascular disease. *Annals of Internal Medicine, 152*, 481-487.

40. U.S. Census Bureau. (2011). *State and County Quick Facts*. Retrieved October 14, 2011, from U.S. Census Bureau: http://quickfacts.census.gov/qfd/states/00000.html

41. U.S. Census Bureau. (n.d.). *United States Population and Housing Narrative Profile, 2005-2009*. Retrieved August 15, 2011, from FactFinder: http://factfinder.census.gov/servlet/NPTable?_bm=y&-geo_id=01000US&-qr_name=ACS 2009 5YR G00 NP01&-ds_name=&redoLog=false

42. U.S. Census Bureau. (2010). *Utah QuickFacts 2010*. Retrieved July 5, 2011, from QuickFacts.

43. Utah Tobacco Prevention and Control Program. (2010). *Tobacco Facts 2010.* Salt Lake City: Utah Department of Health.