Burden of Cardiovascular Disease in California

California Department of Public Health
Chronic Disease Control Branch
2016

Burden of Cardiovascular Disease in California, 2016

This publication was prepared in October 2016 by the California Department of Public Health, Chronic Disease Control Branch. The content included in this report may be reproduced with the following citation:

Conroy SM, Darsie B, Ilango S, Bates JH (2016). Burden of Cardiovascular Disease in California. Sacramento, California: Chronic Disease Control Branch, California Department of Public Health.

Inquiries regarding the content of this report may be directed to:

Data and Information Section
Chronic Disease Control Branch
California Department of Public Health
MS 7208, PO Box 997377
Sacramento, CA 95899-7377
Phone: (916) 552-9900

cdcb@cdph.ca.gov

This publication was supported by Grants/Cooperative Agreements 6NU58DP004795, 5NU58DP004795, and 2B01OT009006 from the Centers for Disease Control and Prevention (CDC). Its contents are solely the responsibility of the authors and do not necessarily represent the official view of CDC.

This project was supported by California Department of Public Health. The Heart Disease and Diabetes Prevention Unit is the State's public health program for the prevention and control of cardiovascular disease.

Table of Contents

Executive Summary

Despite advances in prevention and treatment, cardiovascular disease (CVD) claims more California lives than any other condition. While mortality from overall CVD has declined by more than one third since 2000, CVD still accounted for one in three deaths in the state and claimed the lives of 78,000 Californians in 2014. This is more than the next two leading causes of death, cancer (58,200 deaths) and chronic lower respiratory disease (12,750 deaths), combined.

Nearly one in three adults—over eight million Californians—are living with at least one of the most common forms of CVD—heart disease, heart failure, stroke, or hypertension (high blood pressure). Annual health care costs for CVD in California have been estimated at $37 billion—far greater than any other chronic condition.

This report provides an overview of the burden of CVD in California. Key findings include:

- In 2014, cancer surpassed heart disease as the leading cause of death in California for the first time.
- Mortality from coronary heart disease (CHD) has decreased by 50 percent in California since 2000, and mortality from stroke has decreased by 45 percent. These declines are similar to declines seen in the United States overall during the past 15 years.
- Mortality from heart failure in California increased between 2000 and 2006, then leveled off and has stayed stable since. This is in contrast to trends in heart failure mortality in the United States, which declined between 2000 and 2014. The reason for this difference between California and the United States is not clear.
- Although mortality from CVD has declined among all racial and ethnic groups in California, disparities persist. Death rates from CVD overall, and from CHD, heart failure, and stroke among African Americans and Pacific Islanders are substantially higher than those of other groups. African Americans are hospitalized for heart attack, heart failure, and stroke far more frequently than other groups.
- Californians with lower levels of education and income are more likely to report having at least one form of CVD than other groups.

Much can be done to improve cardiovascular health and reduce the likelihood of developing CVD. The American Heart Association has identified seven key components of cardiovascular health that all Americans should strive to achieve: normal blood pressure, normal cholesterol, normal blood sugar levels, not smoking, maintaining a normal weight, eating a healthy diet, and meeting recommendations for physical activity. Key findings on these metrics for cardiovascular health in California include:

- High blood pressure is present in one in four adults
- High cholesterol is present in one in three adults
- Nearly one in four adults is obese
- Smoking prevalence in California is among the lowest in the nation at 12 percent
- Over half of California adults report meeting current recommendations for physical activity
- Only one out of five adults is getting the recommended daily servings of fruits and vegetables.

The California Department of Public Health has a number of ongoing initiatives and activities to improve cardiovascular health in the state by supporting evidence-based programs that promote healthy behaviors and healthy communities, and improve the prevention, diagnosis, and management of chronic disease.

Introduction

In every year since 1900, except for 1918, cardiovascular disease (CVD) has killed more Americans than any other health condition.[1] In 2014, one in three deaths in the United States (U.S.) was caused by CVD for a total of more than 800,000 deaths.[2] In addition to being the leading cause of death, CVD is a serious health condition that millions of Americans are living with every day. The American Heart Association (AHA) estimates that 85.6 million American adults alive today (more than one in three) have been diagnosed with at least one form of CVD. The most common forms of CVD are hypertension (HTN), (high blood pressure), which affects 80 million Americans; coronary heart disease (CHD) (15.5 million); and, stroke (6.6 million). CVD places a large economic burden on the U.S.; the estimated annual direct and indirect cost of CVD for 2011-2012 is $316.6 billion. By 2030, the AHA projects that total direct costs of CVD will increase to $918 billion.[1]

A large proportion of deaths from CVD are preventable through reduction of risk factors that contribute to poor cardiovascular health and increase the likelihood of disease. The AHA has initiated a strategic goal to improve cardiovascular health for all Americans by focusing on seven health factors and behaviors that determine ideal cardiovascular health:

- normal blood pressure
- normal cholesterol
- normal blood sugar
- normal weight
- healthy diet
- physical activity
- no tobacco use[3]

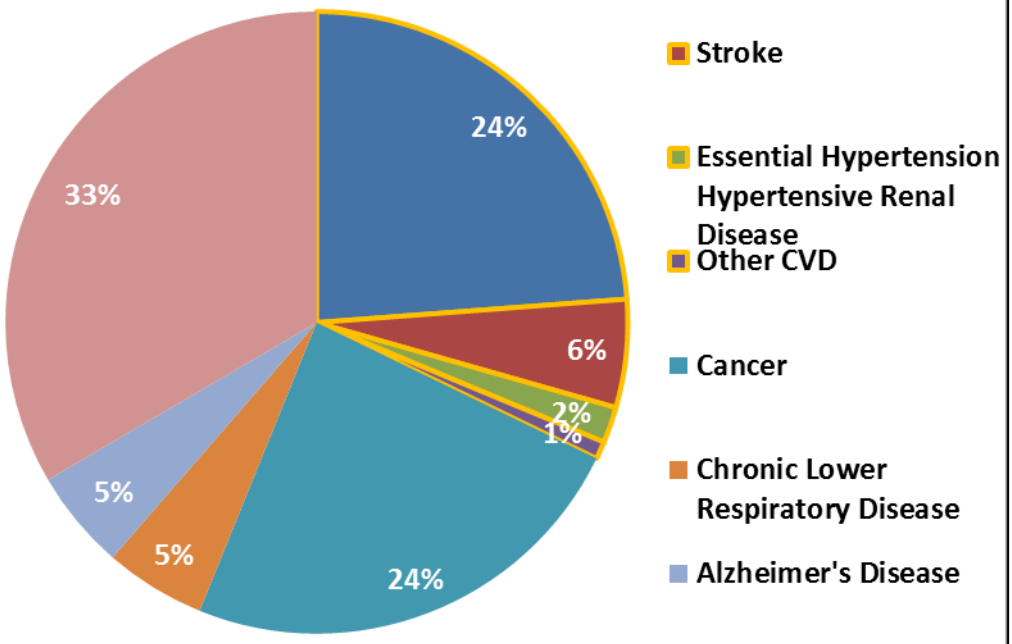
Persons meeting a greater number of these cardiovascular heath targets have significantly lower mortality from CVD, but less than 1 percent of U.S. adults meet all seven targets, and less than 10 percent meet at least six of them.[4]

In California, the burden of CVD mirrors that of the nation. CVD accounts for one in three of all deaths in the state with over 78,000 deaths in 2014 (Figure 1). The majority of CVD deaths were from heart disease (24 percent of all deaths) and stroke (6 percent of all deaths), making them the second and third leading causes of death, respectively (Figure 2). The number of deaths from heart disease has been steadily declining in California and 2014 marks the first time that the number of deaths from heart disease has fallen below the number of deaths attributed to cancer in the state (Figure 3). In addition, nearly 2 percent of deaths among Californians are attributed to HTN and hypertensive renal disease, making it the tenth leading cause of death in the state. The seventh leading cause of death, diabetes, is itself a major risk factor for the

development of CVD. CVD also places a large economic burden on the state; estimated health care costs for CVD in California totaled over $37 billion in 2010.[5]

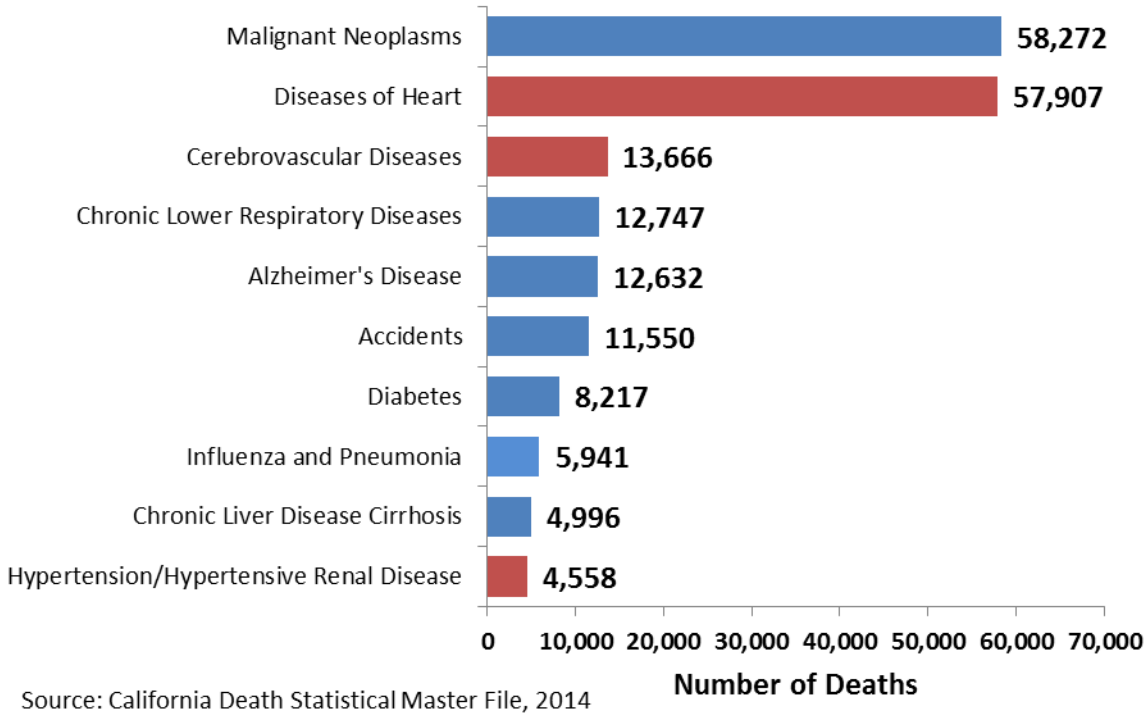
This report describes the status of CVD and its primary risk factors among adults in California, and describes activities of the California Department of Public Health (CDPH) in CVD prevention and control. Data items that are included as metrics for Let's Get Healthy California (LGHC),[6] and the California Wellness Plan (CWP)[7] are noted, which together set priorities for improving and tracking the health of Californians. Metrics that have been established by the Centers for Disease Control and Prevention (CDC) as Chronic Disease Indicators (CDIs) for surveillance of chronic disease in states[8] are also noted.

Figure 1. Cardiovascular Disease as a Leading Cause of Death in California, 2014



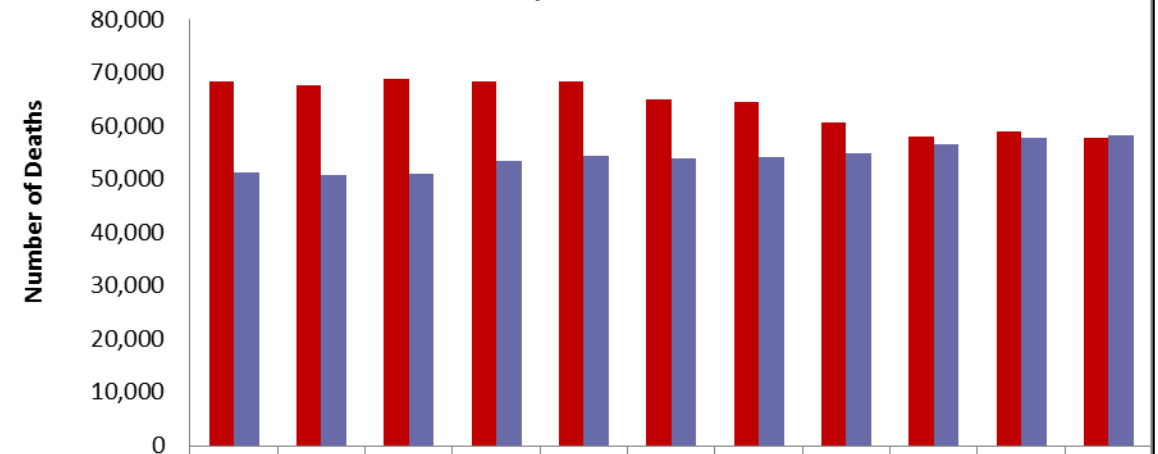
Source: California Death Statistical Master File, 2014

Figure 2. Top 10 Leading Causes of Death in California, 2014



Source: California Death Statistical Master File, 2014

Figure 3. Deaths from Heart Disease and Cancer, California, 1994–2014



	1994	1996	1998	2000	2002	2004	2006	2008	2010	2012	2014
Heart Disease	68,312	67,676	68,946	68,521	68,381	65,000	64,641	60,734	58,031	59,051	57,907
Cancer	51,247	50,904	51,186	53,466	54,331	53,927	54,304	54,890	56,673	57,876	58,272

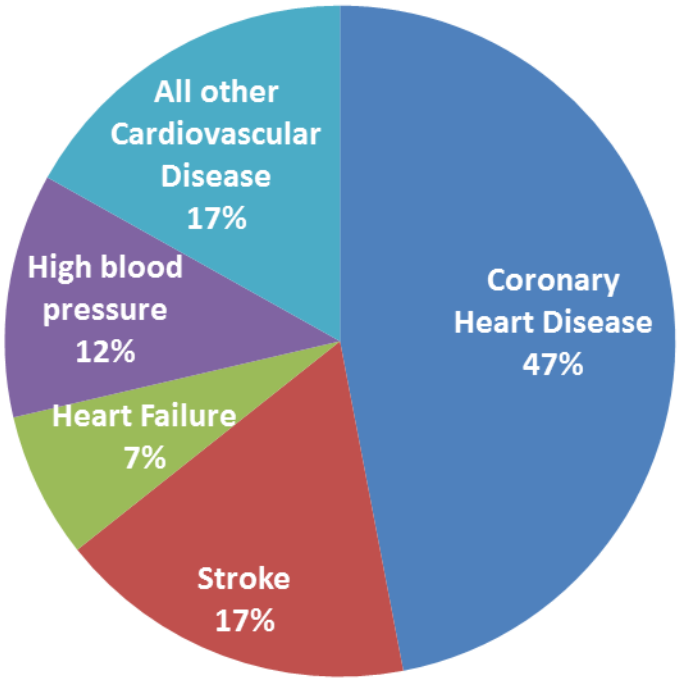
Source: California Death Statistical Master File, 1994-2014

What is Cardiovascular Disease?

Cardiovascular Disease (CVD) is not a single disease, but a spectrum of diseases that occur in the heart and circulatory system. The most common forms of CVD are:

- Coronary Heart Disease (CHD), also known as coronary artery disease, is a narrowing of the blood vessels that supply blood and oxygen to the heart caused by a buildup of plaque in the vessel walls. This narrowing may lead to angina (chest pain) and myocardial infarction (heart attack). In 2014, CHD killed over 36,000 Californians, accounting for nearly half of all CVD deaths in the state (Figure 4).
- Stroke (also known as cerebrovascular accident, or CVA) is a "brain attack" that occurs when blood flow to the brain is disrupted, either by a blockage (ischemic stroke) or a ruptured blood vessel (hemorrhagic stroke). Stroke is responsible for 17 percent of CVD deaths in California.
- Heart Failure, also known as congestive HF, occurs when the heart muscle becomes weakened and does not pump blood as strongly as it should to meet the body's need for circulating blood and oxygen. The most common underlying causes of HF are CHD and HTN.[1]
- Hypertension (HTN), also known as high blood pressure, is a major risk factor for heart disease and stroke. Approximately 12 percent of CVD deaths are attributable to HTN, hypertensive heart disease, or hypertensive kidney disease.

Figure 4. Percentage Breakdown of Deaths Attributable to Cardiovascular Disease, California, 2014



Source: California Death Statistical Master File, 2014

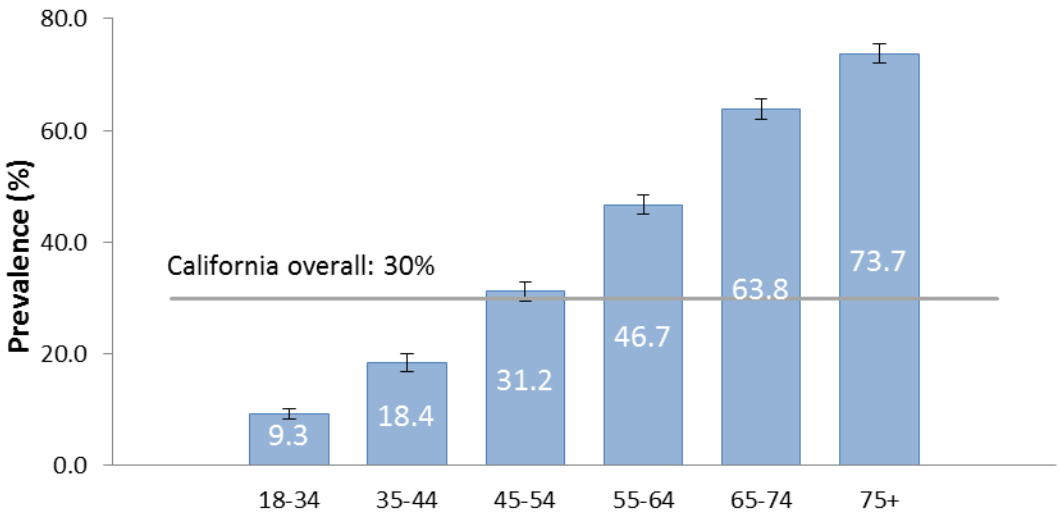
Cardiovascular Disease in California

Cardiovascular Disease Prevalence

Over 8.3 million Californians—nearly one in three adults in the state—have at least one of the four most common forms of CVD (HTN, heart disease, HF, and stroke). The most recent data available for overall CVD prevalence is the California Health Interview Survey (CHIS) 2011-2012. The likelihood of having CVD increases with age (Figure 5), with almost half of Californians aged 55-64 years having been diagnosed with CVD. Although, CVD is most common among older adults, CVD also affects Californians younger than 45 years old: one in eleven (9.3 percent, 0.8 million) Californians aged 18-34 years and about one in six (18.4 percent, 0.9 million) Californians aged 35–44 years report having CVD.

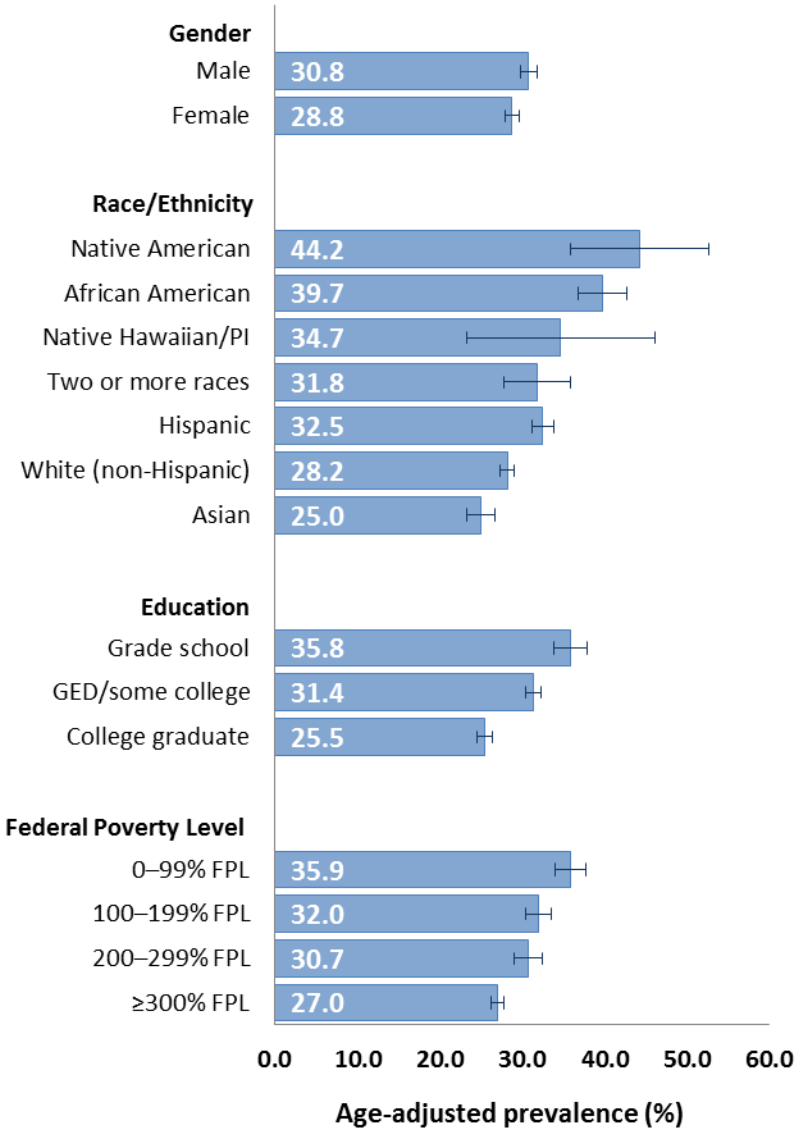
CVD is common among both men and women in California; a slightly greater proportion of men than women are affected (Figure 6). CVD prevalence varies by race and ethnicity. The highest prevalence is reported by Native Americans (44 percent) and African Americans (40 percent), and the lowest is among Asians (25 percent) and non-Hispanic whites (28 percent). CVD is also more common among those with lower levels of education and income.

Figure 5. Cardiovascular Disease Prevalence by Age Group, California, 2011-2012



Source: California Health Interview Survey (CHIS) 2011-2012 Adult Survey.
Cardiovascular disease prevalence based on the answers to multiple questions: "Has a doctor ever told you that you had a stroke, have high blood pressure, have any kind of heart disease, or have heart failure or congestive heart failure?" Stroke question not asked in 2013-14.
Vertical lines represent 95% confidence intervals.

Figure 6. Cardiovascular Disease Prevalence in Adults by Gender, Race/Ethnicity, Education, and Federal Poverty Level, California, 2011-2012



Source: California Health Interview Survey (CHIS) 2011-2012 Adult Survey.
Cardiovascular disease prevalence based on the answers to multiple questions: "Has a doctor ever told you that you had a stroke, have high blood pressure, have any kind of heart disease, or have heart failure or congestive heart failure?" Stroke question not asked in 2013-14.
Horizontal lines represent 95% confidence intervals.
Abreviations: PI, Pacific Islander; GED, General Educational Development (High-School Equivalency test).

Cardiovascular Disease Mortality

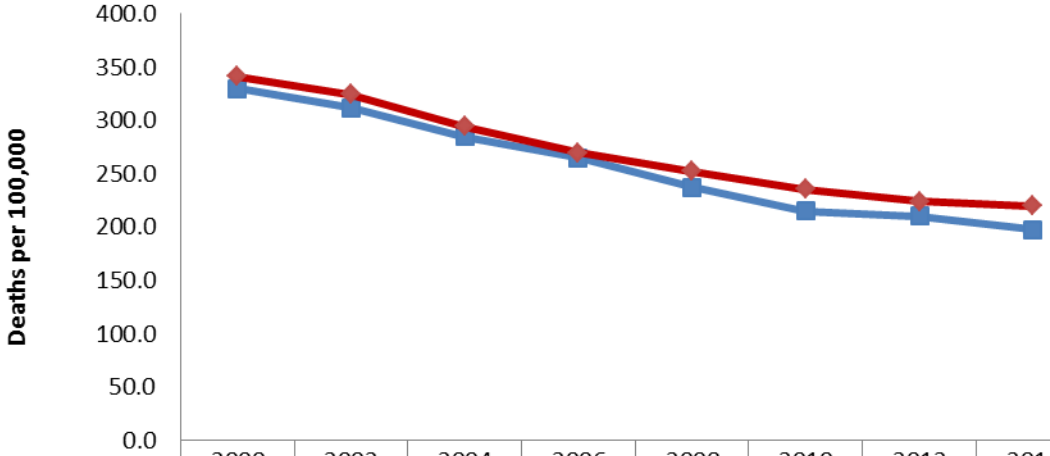
- Mortality from total CVD is a CDI measure for CVD (Indicator CVD 1.1).

Mortality from overall CVD—including all heart disease, HTN, stroke, HF, and other circulatory diseases—has declined by more than one-third since 2000 in both California and the United States, and has been consistently lower in California than in the United States as a whole (Figure 7). Nevertheless, CVD still accounted for one in three deaths in the state in 2014.

Cardiovascular death rates are declining similarly among both men and women in California, but remain approximately 40 percent higher among men compared to women (Figure 8).

There is wide variability in CVD mortality by race/ethnicity (Figure 9). Mortality has declined by 30–35 percent in all groups, but rates have been consistently highest among African American and Pacific Islanders, and lowest among Asians and Hispanics. CVD mortality rates among African Americans are more than double those of Asians, and 40 percent higher than non-Hispanic whites.

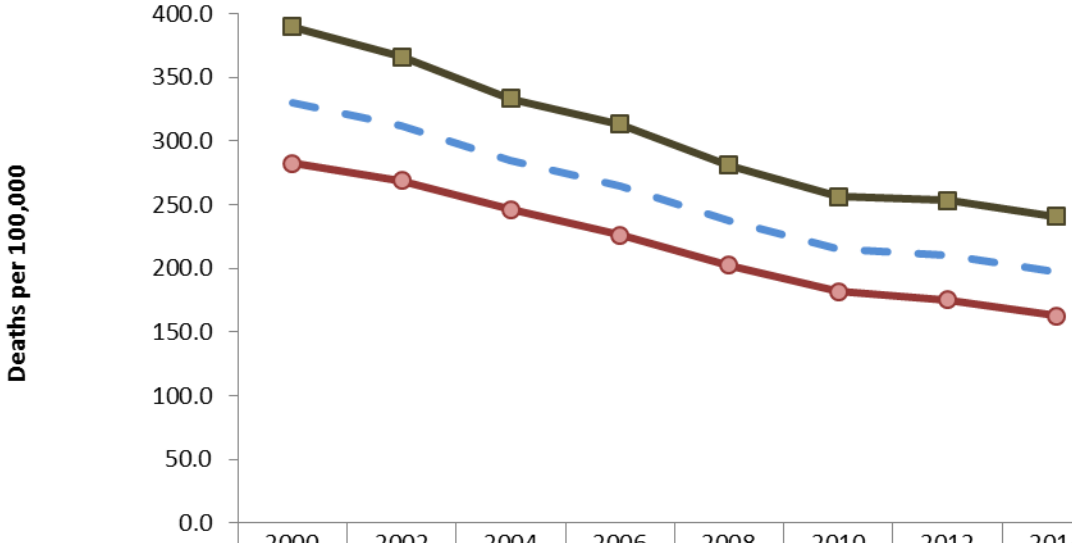
Figure 7. Age-Adjusted Cardiovascular Disease Mortality in California and the United States, 2000—2014



	2000	2002	2004	2006	2008	2010	2012	2014
California	329.7	312.0	285.0	264.9	237.5	215.1	210.2	197.6
United States	341.3	324.3	294.4	269.6	252.2	235.5	224.3	219.9

Sources: CDC Wonder, and California Death Statistical Master File, 2000-2014

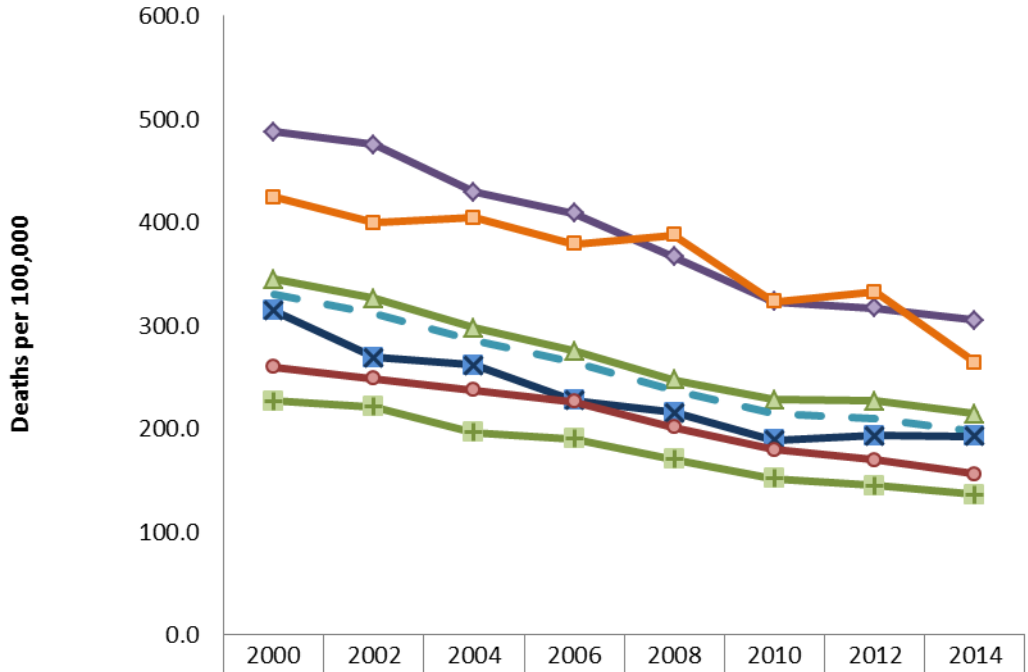
Figure 8. Age-Adjusted Cardiovascular Disease Mortality by Gender, California, 2000—2014



	2000	2002	2004	2006	2008	2010	2012	2014
Male	390.1	366.4	333.6	313.4	281.0	256.1	253.3	240.5
California overall	329.7	312.0	285.0	264.9	237.5	215.1	210.2	197.6
Female	282.7	269.0	246.2	225.9	202.3	181.7	175.4	162.6

Source: California Death Statistical Master File, 2000-2014

Figure 9. Age-adjusted Cardiovascular Disease Mortality by Race/Ethnicity, California, 2000–2014



	2000	2002	2004	2006	2008	2010	2012	2014
African American	487.3	475.1	429.4	408.9	366.6	322.8	316.7	305.3
Pacific Islander	424.4	399.3	404.5	379.0	387.8	323.1	332.5	264.0
White (non-Hispanic)	344.9	326.3	297.8	275.1	247.6	228.4	226.8	214.5
California overall	329.7	312.0	285.0	264.9	237.5	215.1	210.2	197.6
Native American	314.6	269.3	261.8	227.7	215.4	188.7	193.2	192.6
Hispanic	259.9	248.4	237.6	226.5	201.3	179.7	169.9	156.4
Asian	227.0	221.1	196.2	190.0	170.1	151.7	145.0	136.3

Source: California Death Statistical Master File, 2000-2014

Heart Disease in California

Heart disease is not a single disease, but encompasses a range of conditions that affect the heart. The most common forms of heart disease are CHD and HF, but the term also includes valvular, rheumatic, and congenital heart diseases and other less common conditions. Comparisons of trends or patterns in heart diseases should be made with attention to the specific types of heart diseases that are being included in any analysis.

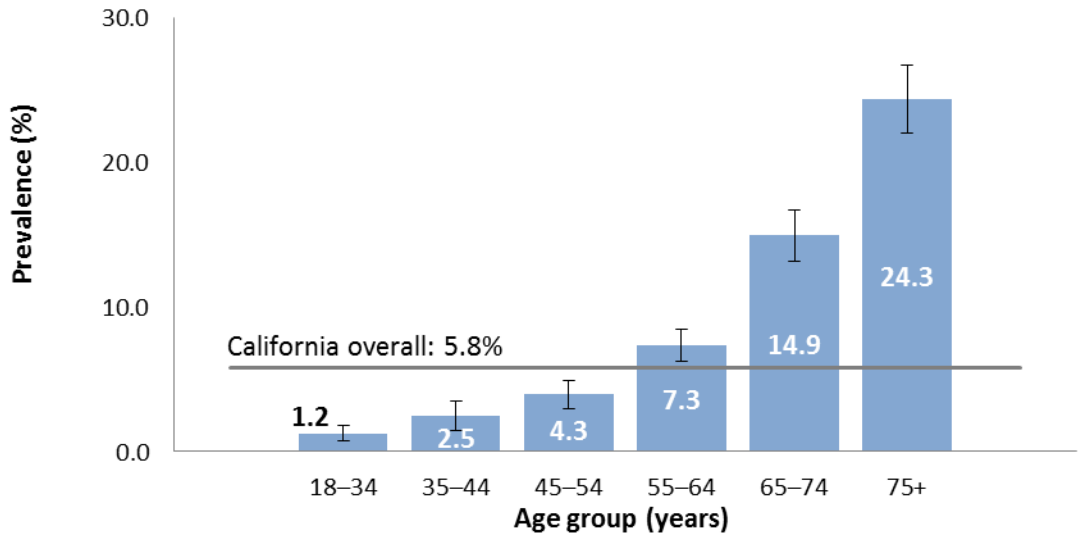
Heart Disease Prevalence

Current surveys in California do not distinguish heart disease by type, so data presented here from the CHIS are for heart disease overall, based on responses to the survey question, “Has a doctor ever told you that you have any kind of heart disease?”

Overall, 5.8percent of California adults (1.65 million) report having some form of heart disease. Heart disease risk increases sharply with age (Figure 10), from one in 100 at age 18–34 years to more than one in four after age 75 years.

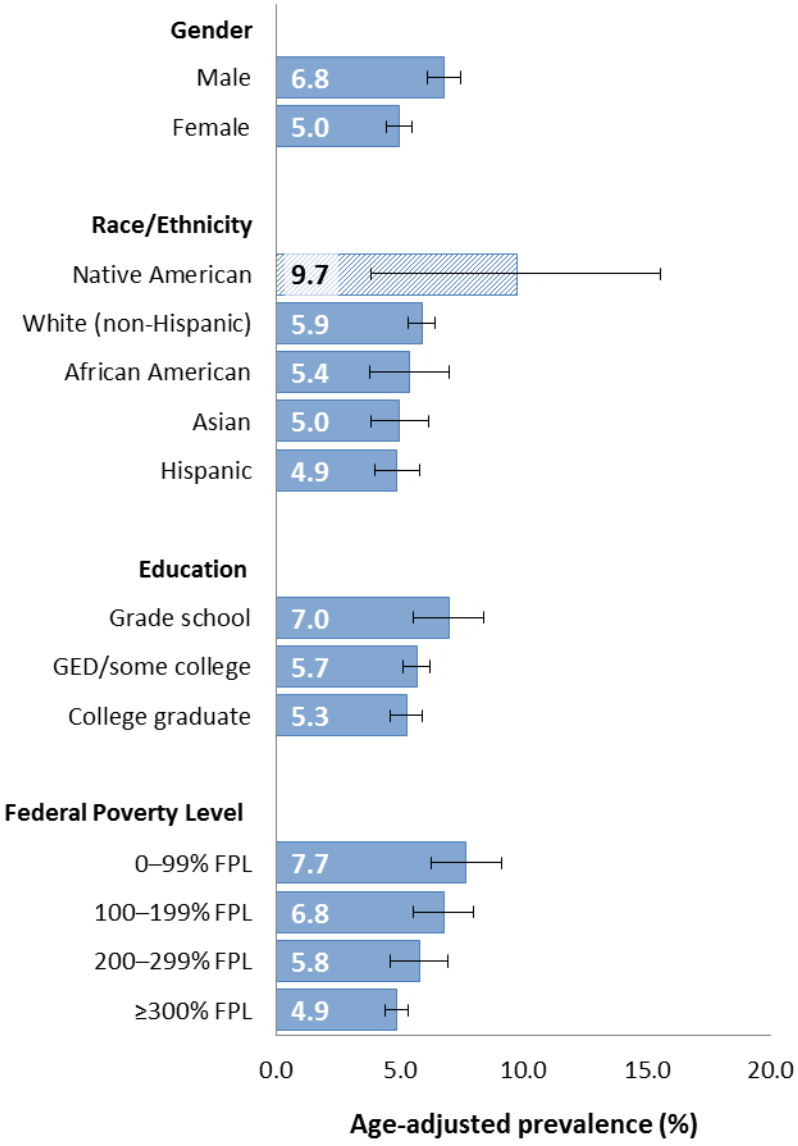
Heart disease is more common among men than women (Figure 11). After adjusting for age difference, heart disease occurrence is similar among Hispanics and non-Hispanic whites, Asians, and African Americans. Californians with the lowest levels of education and income have more heart disease than those with the highest levels.

Figure 10. Heart Disease Prevalence in Adults by Age Group, California, 2013–2014



Source: California Health Interview Survey (CHIS) 2013–2014 Adult Survey.
Heart disease prevalence based on answers to the question: "Has a doctor ever told you that you have any kind of heart disease?"
Vertical lines represent 95% confidence intervals.

Figure 11. Heart Disease Prevalence in Adults by Gender, Race/Ethnicity, Education, and Poverty, California, 2013–2014



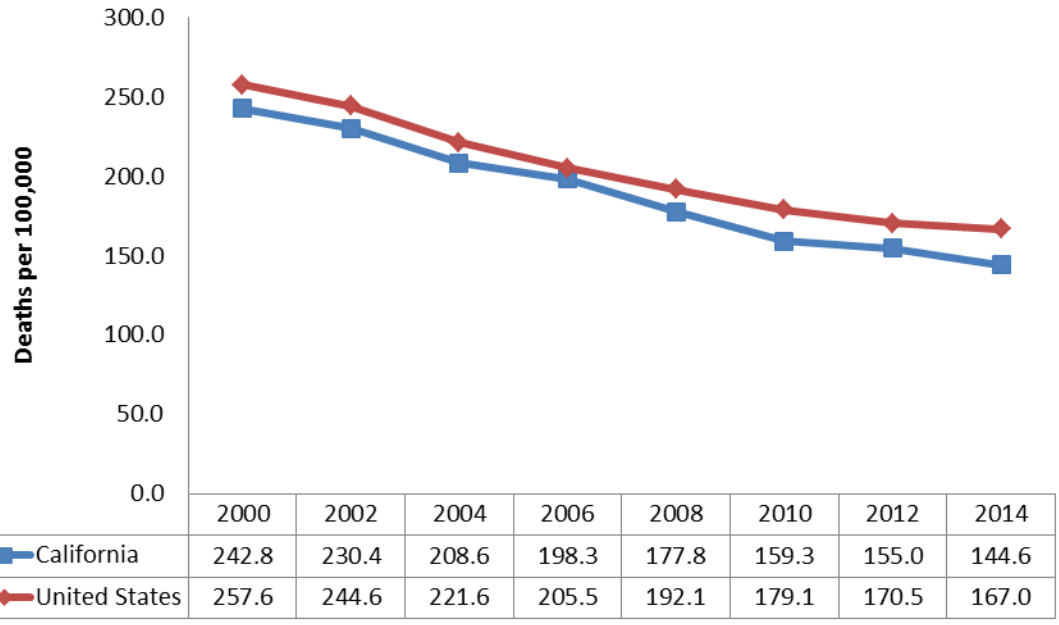
Source: California Health Interview Survey (CHIS) 2013–2014 Adult Survey.
Heart disease prevalence is based on answers to the question: "Has a doctor ever told you that you have any kind of heart disease?"
Horizontal lines represent 95% confidence intervals.
Native American estimate is unstable due to small sample size.
Native Hawaiian/Pacific Islander not shown due to insufficient sample size.
GED = General Educational Development (High-school equivalency test)

Heart Disease Mortality

- Mortality from diseases of the heart is a CDI for CVD (Indicator CVD 1.2).
- Decreasing the heart disease mortality rate is an objective of the CWP (CWP Objective 2.6.9L).

Heart disease mortality has declined by 35 percent in California and the United States since 2000, with rates consistently lower in California. Mortality from diseases of the heart overall is lower in California in comparison with the United States (Figure 12). The number of deaths from heart disease has been steadily declining in California and 2014 marks the first time that the number of deaths from heart disease has fallen below the number of deaths from cancer in the state (Figure 3).

Figure 12. Age-adjusted Heart Disease Mortality in California and the United States, 2000–2014



	2000	2002	2004	2006	2008	2010	2012	2014
California	242.8	230.4	208.6	198.3	177.8	159.3	155.0	144.6
United States	257.6	244.6	221.6	205.5	192.1	179.1	170.5	167.0

Sources: CDC Wonder, and California Death Statistical Master File, 2000-2014

Coronary Heart Disease in California

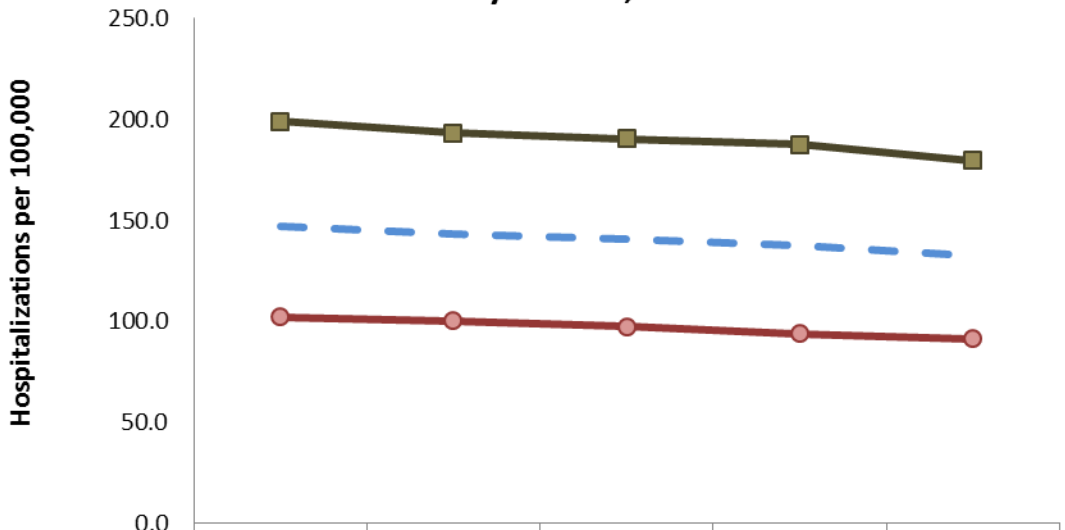
Coronary Heart Disease (CHD) is the most common form of heart disease, and includes the conditions of angina (chest pain) and myocardial infarction (heart attack). Current California surveys identify occurrence of heart attack, but not angina. Data from the 2014 California Behavioral Risk Factor Surveillance System (BRFSS) show that 3.7 percent of adults (1 in 27) in the state have been told they have had a heart attack. CHD risk increases with age – among Californians age 65 years and older, 9.7 percent (nearly one out of ten) report having had a heart attack.[9]

Hospitalizations for Heart Attack in California

- Hospitalization for acute myocardial infarction (heart attack) is a CDI measure for CVD (Indicator CVD 3.2).

From 2010 to 2014, overall heart attack hospitalization rates in California have slightly declined. Men are hospitalized for heart attacks at rates that are nearly double those of women (Figure 13). African Americans are hospitalized for heart attacks more frequently than any other group (Figure 14). Their hospitalization rates have decreased somewhat since 2010, but this decrease was not statistically significant. However, heart attack hospitalization rates did decline significantly among Hispanics (average decrease of 2.7 percent per year), and among non-Hispanic whites (average decrease of 2.8 percent per year). Although hospitalization rates were lowest for Native Americans, these results should be interpreted with some caution as misclassification of Native Americans in health and vital status records has been recognized as an issue that can result in an underestimate of CVD burden in this group.[10]

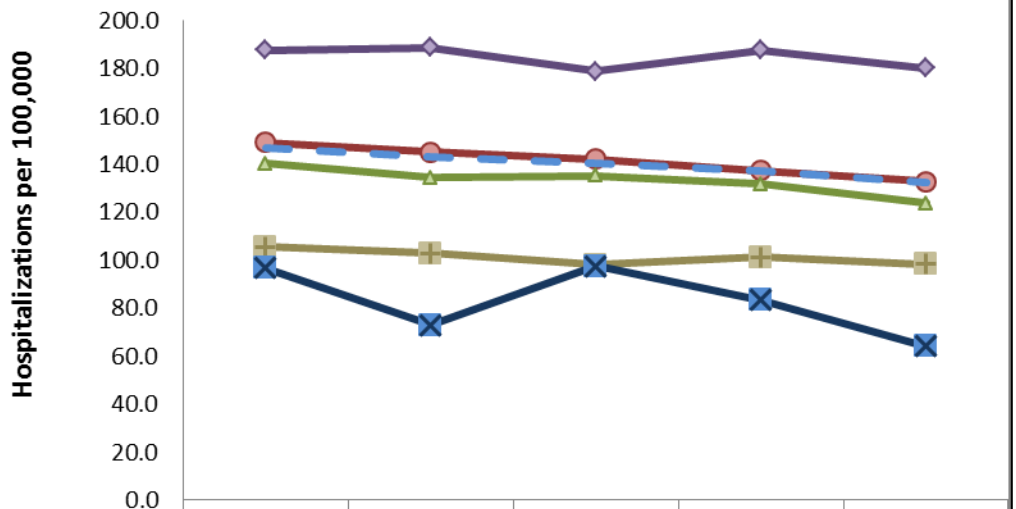
Figure 13. Age-Adjusted Heart Attack Hospitalization Rate in California by Gender, 2010–2014



	2010	2011	2012	2013	2014
Male	198.7	192.9	190.2	187.3	179.4
California overall	147.0	143.3	140.6	137.3	132.5
Female	102.0	100.0	97.2	93.7	91.4

Source: California Office of Statewide Health Planning and Development, 2010-2014

Figure 14. Age-Adjusted Heart Attack Hospitalizations in California, by Race/Ethnicity, 2010–2014



	2010	2011	2012	2013	2014
African American	187.7	188.9	178.9	187.7	180.3
White (non-Hispanic)	149.1	145.1	142.1	137.5	132.9
California overall	147.0	143.3	140.6	137.3	132.5
Hispanic	140.3	134.6	135.3	131.7	123.9
Asian/PI	105.6	103.0	98.1	101.4	98.5
Native American	96.7	72.9	97.6	83.5	64.1

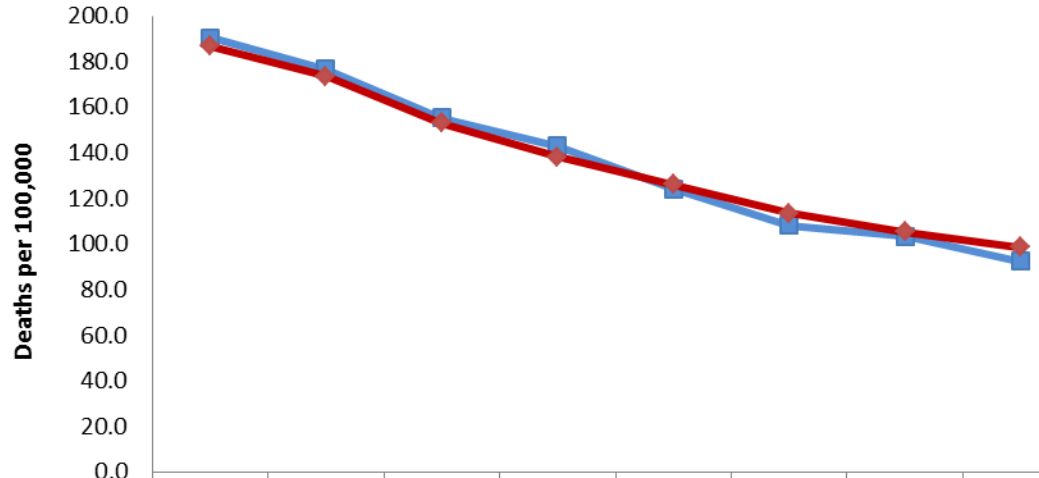
Source: California Office of Statewide Health Planning and Development, 2010-2014
PI = Pacific Islander

Coronary Heart Disease Mortality

- Mortality from CHD is a CDI measure for CVD (Indicator CVD 1.3).

CHD mortality rates in California are similar to those of the United States overall, and rates for both have declined by 45percent since 2000 (Figure 15). CHD death rates are declining similarly among both men and women in California, but remain approximately 40% higher among men compared to women (Figure 16). There is wide variability in CHD mortality by race/ethnicity (Figure 17). Mortality has declined by 30–45 percent since 2000 in all groups. However, these rates have been consistently highest among African Americans and Pacific Islanders, and lowest among Asians and Hispanics. CHD mortality rates among African Americans are more than double those of Asians, and 25percent higher than those of non-Hispanic whites.

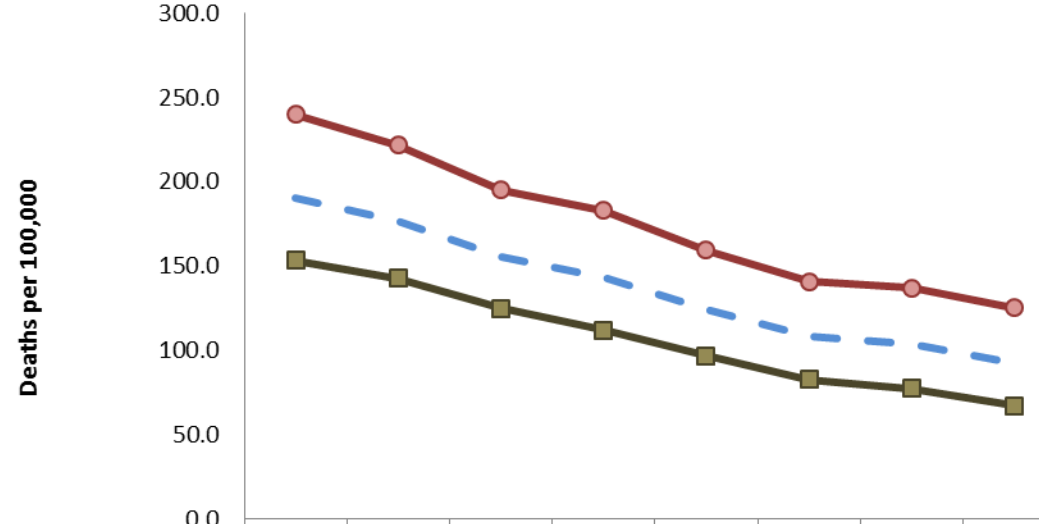
Figure 15. Age-Adjusted Coronary Heart Disease Mortality, California vs. United States, 2000–2014



	2000	2002	2004	2006	2008	2010	2012	2014
California	190.4	176.8	155.3	142.9	124.2	108.1	103.3	92.6
United States	186.8	173.5	153.2	138.3	126.1	113.6	105.4	98.8

Sources: CDC Wonder, and California Death Statistical Master File, 2000-2014

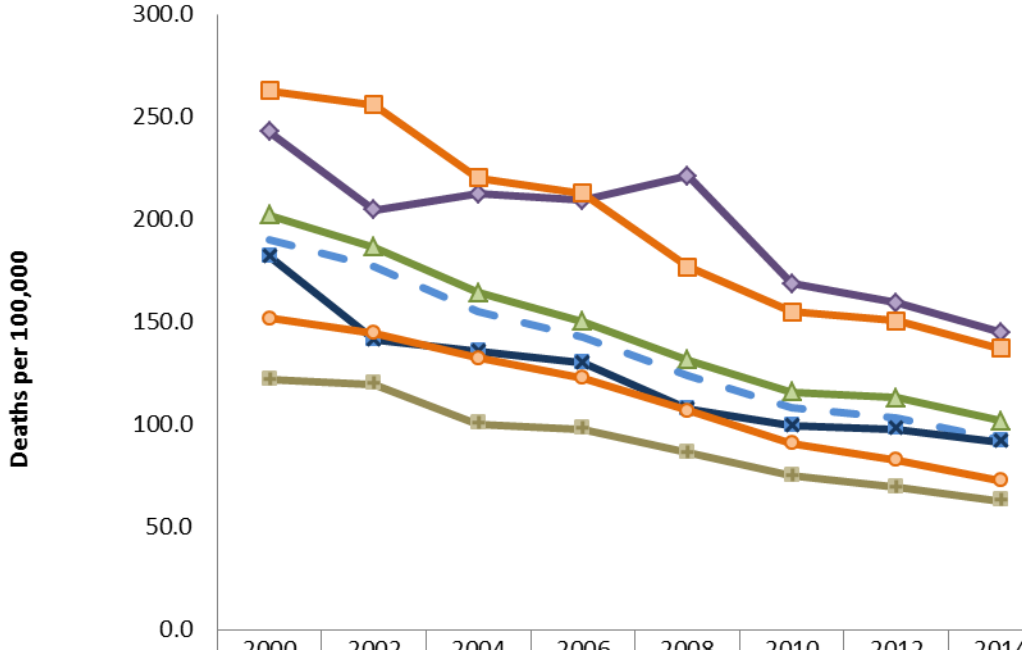
Figure 16. Age-Adjusted Coronary Heart Disease Mortality, by Gender, California, 2000–2014



	2000	2002	2004	2006	2008	2010	2012	2014
Male	239.7	221.6	195.1	183.0	159.5	140.6	136.8	125.2
California overall	190.4	176.8	155.3	142.9	124.2	108.1	103.3	92.6
Female	153.1	142.6	124.8	111.9	96.6	82.7	77.3	67.2

Source: California Death Statistical Master File, 2000-2014

Figure 17. Age-Adjusted Coronary Heart Disease Mortality by Race/Ethnicity, California, 2000–2014



	2000	2002	2004	2006	2008	2010	2012	2014
Pacific Islander	242.9	204.6	212.5	209.4	221.3	168.9	159.4	144.9
African American	262.8	255.9	220.2	212.8	177.0	155.0	150.6	137.3
Non-Hispanic White	202.1	186.7	164.4	150.3	131.7	116.1	113.1	101.9
California overall	190.4	176.8	155.3	142.9	124.2	108.1	103.3	92.6
Native American	181.8	141.3	135.6	130.0	107.5	99.3	97.9	91.6
Hispanic	151.8	144.7	132.4	122.9	106.8	90.8	82.7	72.9
Asian	121.9	119.7	100.2	97.9	86.3	75.1	69.3	62.8

Source: California Death Statistical Master File, 2000-2014

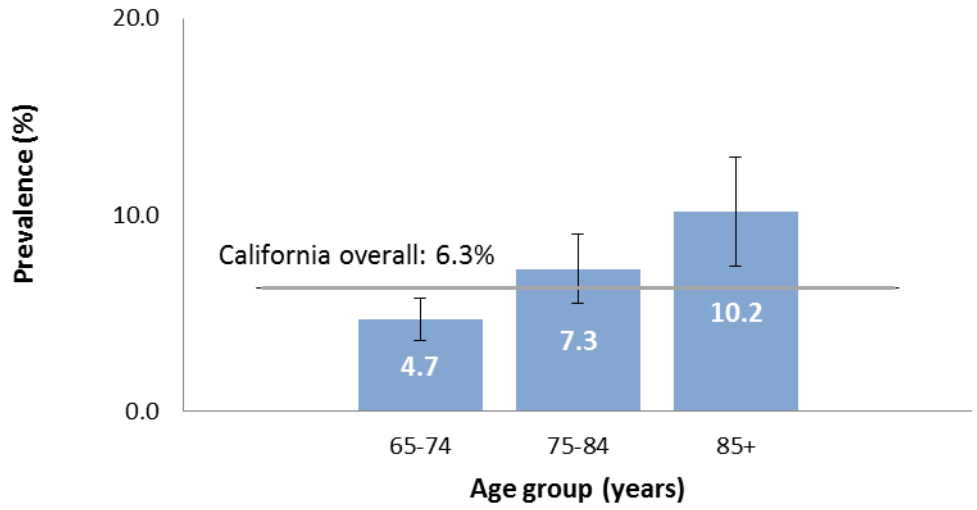
Heart Failure in California

Heart Failure Prevalence

HF (also referred to as "congestive HF") occurs when the heart muscle is weakened and unable to pump efficiently. Although HF may occur as an end-stage of many types of heart disease, CHD, HTN, smoking and diabetes are key risk factors.[1]

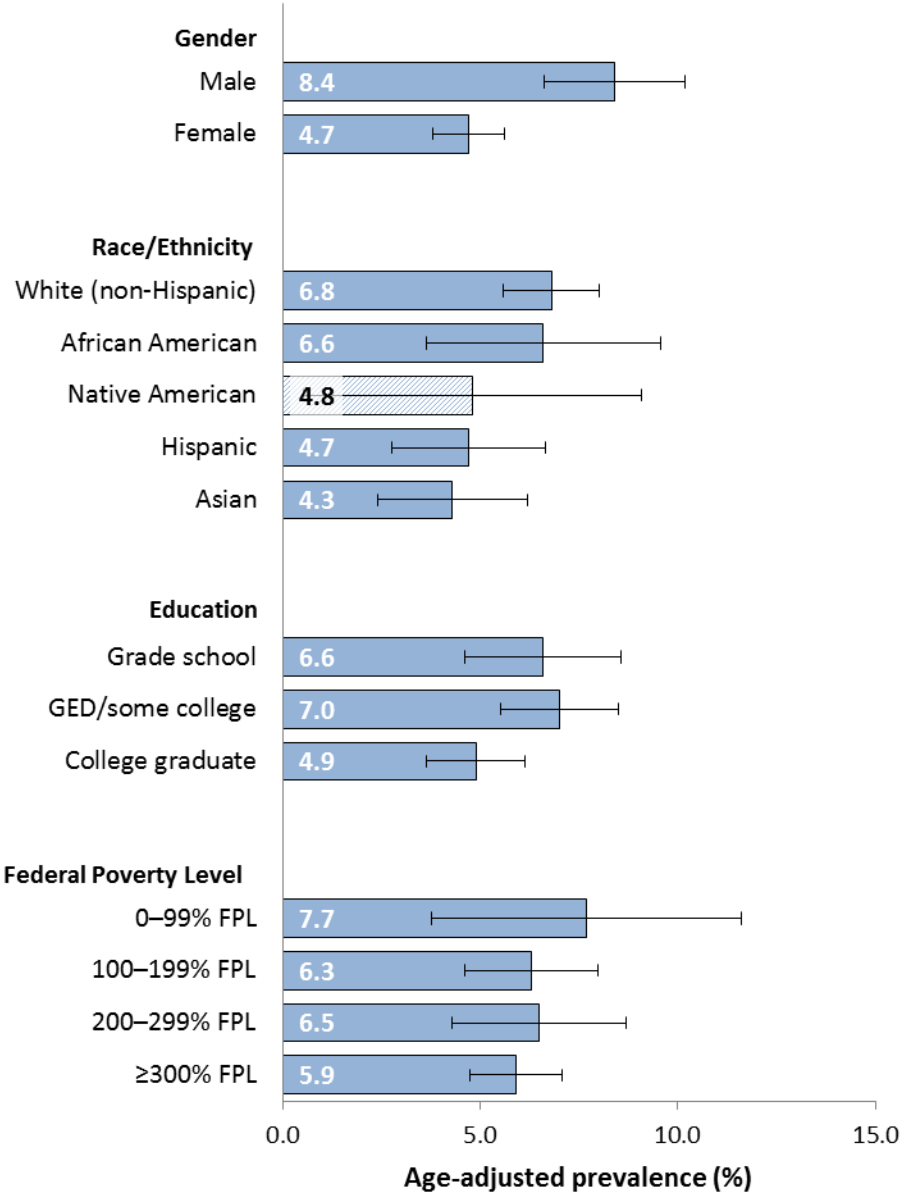
The prevalence of HF increases markedly with age (Figure 18). In California, 6.3percent (1 in 16) of adults age 65 and older have HF. After age 85 years, HF is present in 10.2 percent of adults. The frequency of HF among men age 65 and older is nearly double that of women (Figure 19). African American and non-Hispanic white respondents were more likely to report having HF than Hispanics or Asians, but these differences were not statistically significant. The frequency of HF among Californians with a grade school education is nearly double that among those of college graduates and the poorest Californians have HF more frequently than those with higher income levels.

Figure 18. Heart Failure Prevalence in Adults 65 Years and Older, by Age-Group, California, 2013–2014



Source: California Health Interview Survey (CHIS) 2013-2014 Adult Survey.
Heart disease prevalence based on answers to the questions: "Has a doctor ever told you that you have heart failure or congestive heart failure?"
Vertical lines represent 95% confidence intervals.

Figure 19. Heart Failure Prevalence in Adults 65 Years and Older, by Gender, Race/Ethnicity, Education, and Poverty, in California, 2013-2014



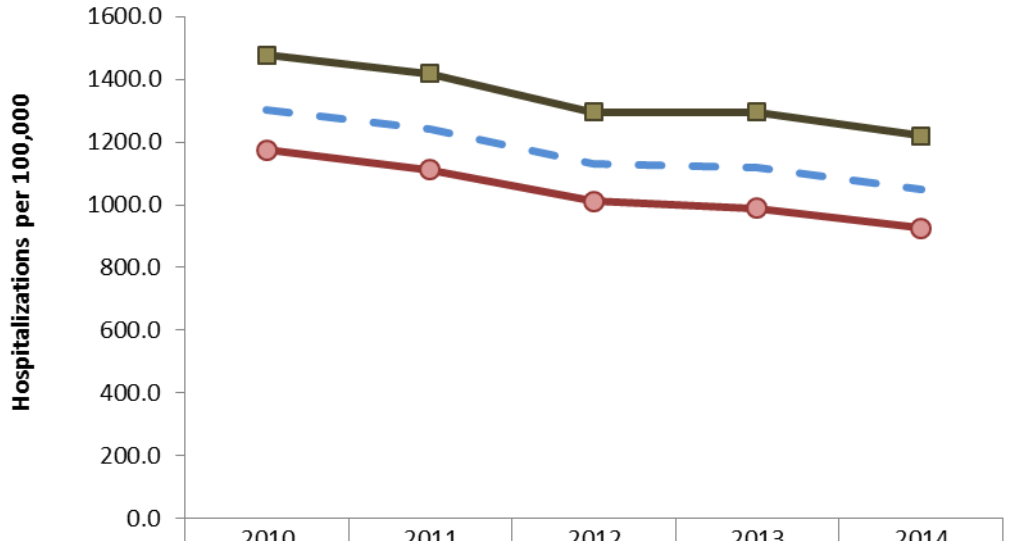
Source: California Health Interview Survey (CHIS) 2013-2014 Adult Survey. Heart failure prevalence based on answers to the questions: "Has a doctor ever told you that you have heart failure or congestive heart failure?"
Horizontal lines represent 95% confidence intervals.
Native American estimate is unstable due to small sample size.
Native Hawaiian/Pacific Islander not shown due to insufficient sample size.
GED = General Educational Development (High-school equivalency test)

Hospitalizations for Heart Failure in California

- Hospitalizations for HF among persons aged 65 years and older is a CDI measure for CVD (Indicator CVD 2).
- Decreasing the rate of hospitalizations for adults 65 and over is an objective of the CWP (Objective 2.6.7L).

Nationwide, HF is a leading cause of hospitalization among those age 65 years and older.[11] In California, HF hospitalization rates for this age group did not change significantly from 2010 to 2014. Men had consistently higher rates of hospitalization for HF than women during this time. Rates declined significantly among women (average decline of 5.8 percent per year) and also among men (average decline of 4.7 percent per year) (Figure 20). African Americans were hospitalized for HF more frequently than all other race/ethnic groups during this time period (Figure 21). HF hospitalizations among non-Hispanic whites declined significantly by 4.5 percent annually over the period, by 5.4 percent among African Americans, by 7.8 percent among Hispanics, and by 5.7 percent among Asian/Pacific Islanders. There was no significant increase or decrease among Native Americans.

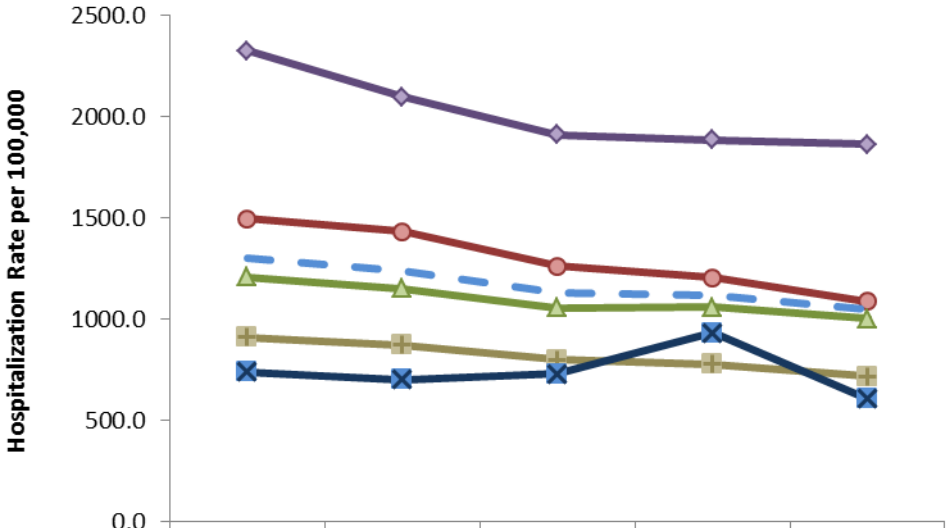
Figure 20. Heart Failure Hospitalization Rate in Adults 65 Years and Older, by Gender, in California, 2010-2014



	2010	2011	2012	2013	2014
Male	1478.4	1418.2	1295.3	1295.7	1220.0
California overall	1303.6	1241.0	1130.6	1117.6	1049.7
Female	1175.3	1112.4	1012.1	988.8	926.2

Source: California Office of Statewide Health Planning and Development, 2010-2014

Figure 21. Heart Failure Hospitalization Rate, by Race/Ethnicity, in California, for those Age 65+, 2010–2014



	2010	2011	2012	2013	2014
African American	2324.6	2097.5	1911.7	1885.3	1863.1
Hispanic	1495.2	1434.9	1263.6	1205.7	1088.0
California overall	1303.6	1241.0	1130.6	1117.6	1049.7
White (non-Hispanic)	1209.2	1151.5	1056.5	1059.9	1003.4
Asian/PI	913.0	874.0	799.4	779.9	719.2
Native American	739.4	703.7	731.7	933.6	608.8

Source: California Office of Statewide Health Planning and Development, 2010-2014
PI = Pacific Islander

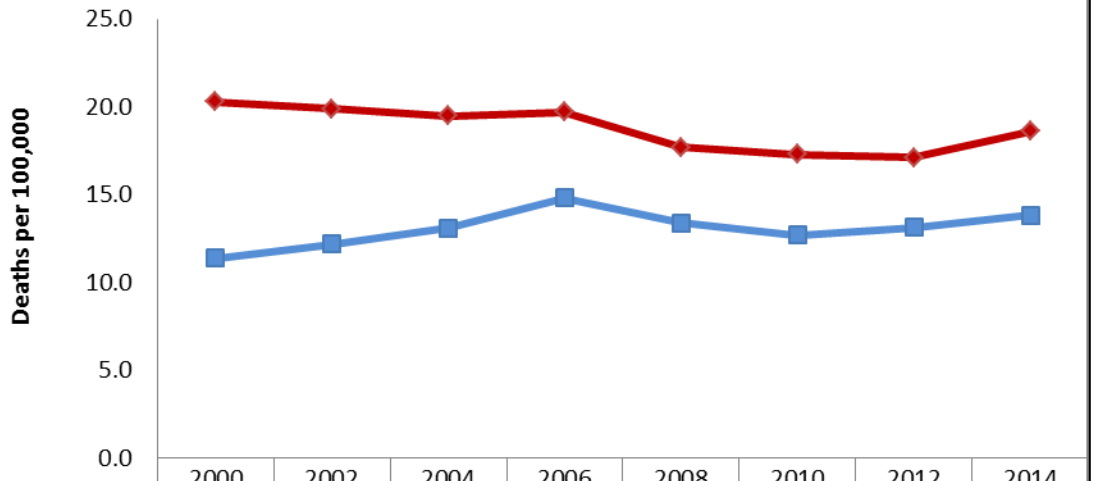
Heart Failure Mortality

- Mortality from HF is a CDI measure for CVD (CVD 2).
- Decreasing HF mortality is an objective of the CWP (CWP Objective 2.6.9).

HF death rates in the United States have decreased by 1.2 percent annually since 2000. In contrast, HF death rates increased by 3.5 percent annually in California between 2000 and 2006, and subsequently have leveled off (Figure 22). HF mortality rates are higher for men than women (Figure 23). Since 2000, HF mortality rates in California among men have steadily increased by 1.1 percent annually while among women there was a significant increase between 2000 and 2006 of nearly 4 percent annually, but no significant change since 2006. African Americans experience the highest rates of HF mortality of all race/ethnic groups, followed by non-Hispanic whites (Figure 24). These rates have increased significantly since 2000 in both groups, with an average annual increase of 2.0 percent for African Americans and of 1.1 percent for non-Hispanic whites. Rates fluctuated among Hispanics, but there was no overall

significant increase in HF mortality. Asians experienced the lowest HF mortality rates throughout the period, with no significant increase or decrease.

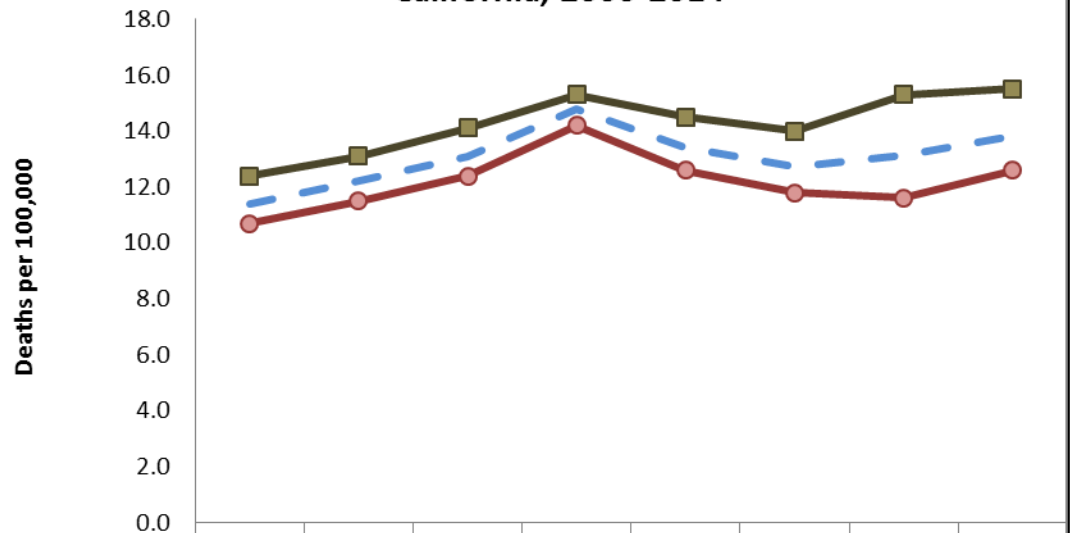
Figure 22. Age-Adjusted Heart Failure Mortality in California and the United States, 2000–2014



	2000	2002	2004	2006	2008	2010	2012	2014
California	11.4	12.2	13.1	14.8	13.4	12.7	13.1	13.8
United States	20.3	19.9	19.5	19.7	17.7	17.3	17.1	18.6

Source: CDC Wonder, and California Death Statistical Master File, 2000-2014

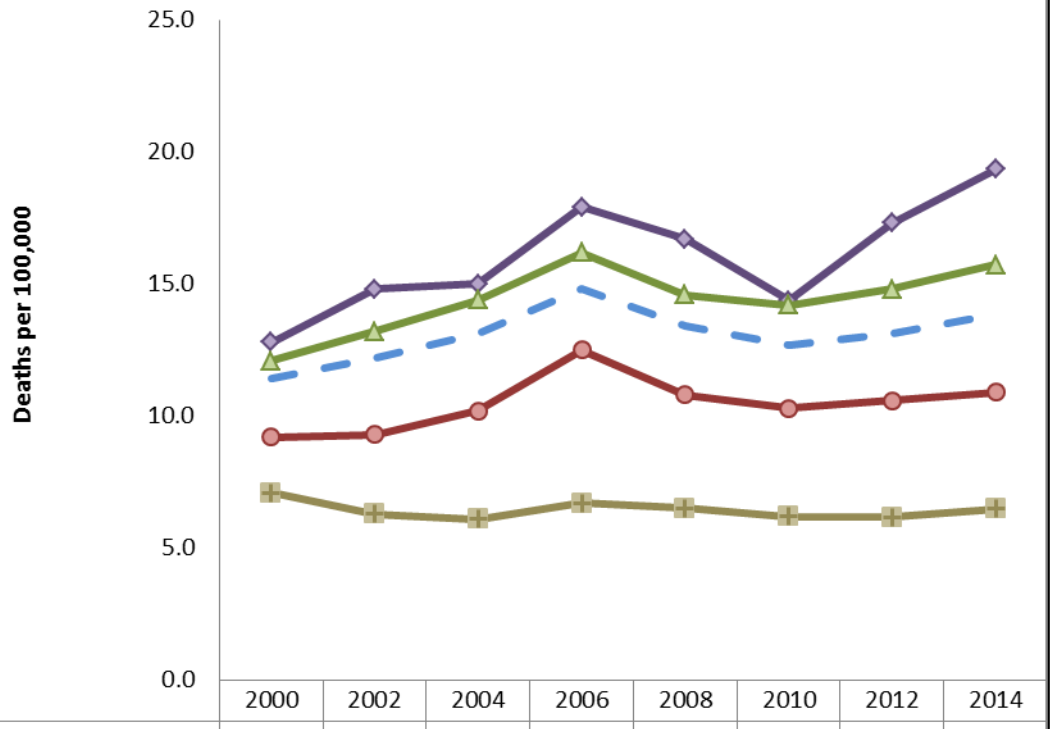
Figure 23. Age-Adjusted Heart Failure Mortality by Gender, California, 2000-2014



	2000	2002	2004	2006	2008	2010	2012	2014
Male	12.4	13.1	14.1	15.3	14.5	14.0	15.3	15.5
California overall	11.4	12.2	13.1	14.8	13.4	12.7	13.1	13.8
Female	10.7	11.5	12.4	14.2	12.6	11.8	11.6	12.6

Source: California Death Statistical Master File, 2000-2014

Figure 24. Age-Adjusted Heart Failure Mortality by Race/Ethnicity, California, 2000-2014



	2000	2002	2004	2006	2008	2010	2012	2014
African American	12.8	14.8	15.0	17.9	16.7	14.4	17.3	19.3
White (non-Hispanic)	12.1	13.2	14.4	16.2	14.6	14.2	14.8	15.7
California overall	11.4	12.2	13.1	14.8	13.4	12.7	13.1	13.8
Hispanic	9.2	9.3	10.2	12.5	10.8	10.3	10.6	10.9
Asian	7.1	6.3	6.1	6.7	6.5	6.2	6.2	6.5

Source: California Death Statistical Master File, 2000-2014

Native American and Pacific Islander rates were not shown due to insufficient sample size

Stroke in California

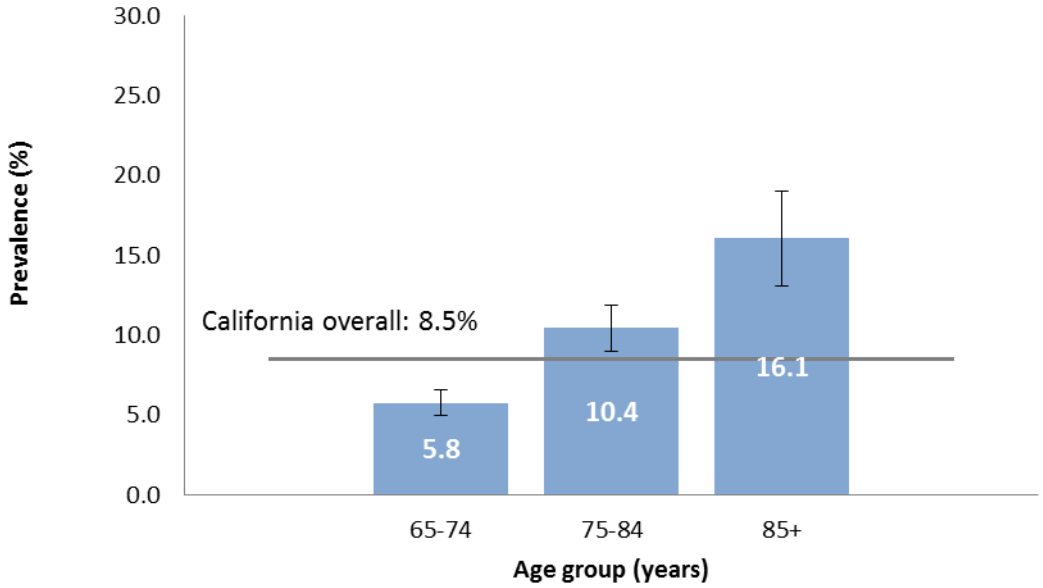
Stroke occurs when blood flow to the brain is disrupted as a result of blockage or rupture of a blood vessel in the brain. Stroke is a leading cause of long-term disability in the United States.[1] The majority of strokes (87 percent) are caused by a blocked blood vessel (ischemic strokes), usually due to a blood clot. Each year nearly 800,000 people in the United States suffer a stroke. Nearly 25 percent of these strokes are recurrent attacks—that is they occur in a person who previously suffered a stroke.[1] High blood pressure is the most important determinant of stroke risk, and the relationship is nearly linear, so that as blood pressure increases the risk of stroke rises with it.[12]

Stroke Prevalence

An estimated 2.3 percent of California adults report having had a stroke (CHIS, 2011-2012, estimates of stroke prevalence were not available in 2013-2014). Because of the low stroke prevalence among adults younger than 65 years (0.2 percent prevalence among those ages 18–34 years; 0.6 percent among those ages 35–44 years; 1.5 percent among those ages 45–54 years; 3.1 percent among those ages 55–64 years), the subsequent calculated stroke estimates describe the older adult population, adults 65 years and older. Among adults 65 years and older, the prevalence of stroke is 8.5 percent (1 in 12) overall, and risk continues to climb with age and has approximately doubled after age 85 years to 16.1 percent (1 in 6) (Figure 25).

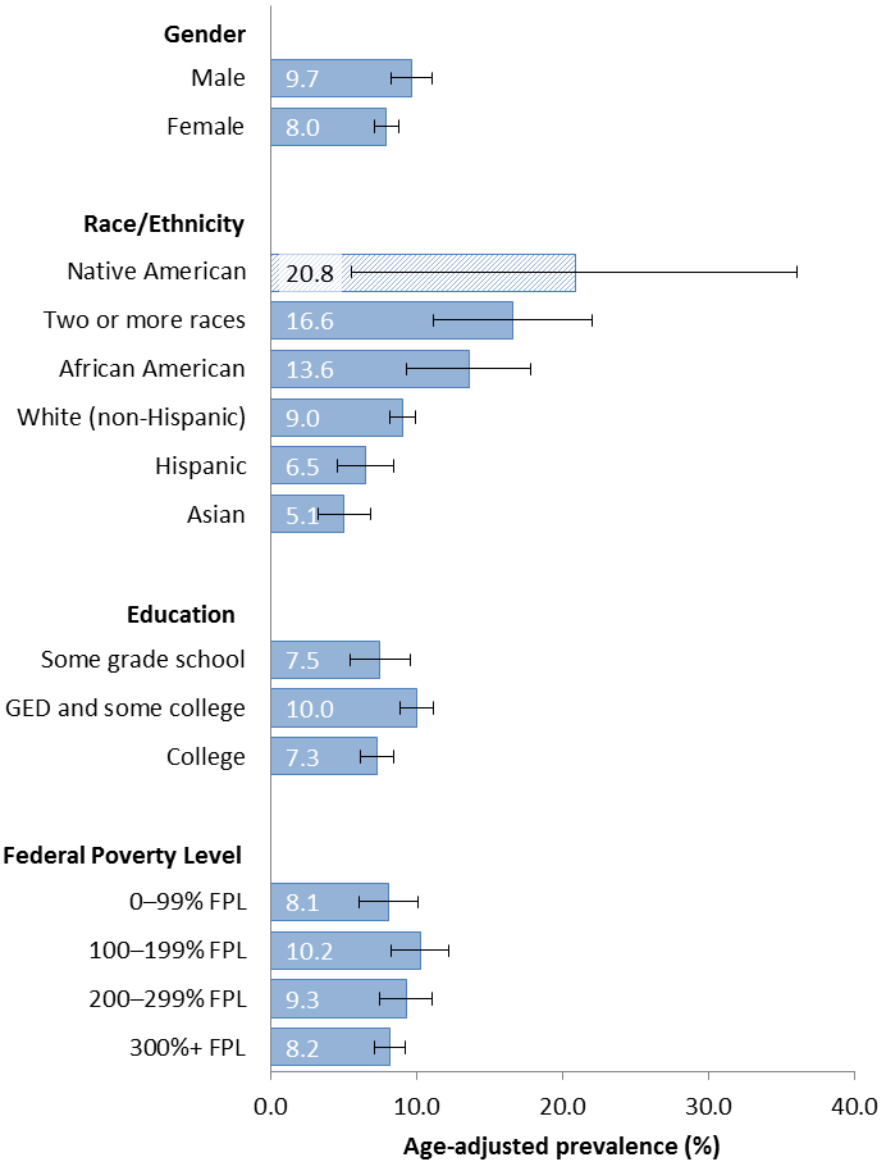
The prevalence of stroke among older adults is higher among men than women (Figure 26). Stroke occurs most often in multiracial and African American adults than other groups, and the least often in Asians. Stroke frequency was similar among all levels of education and income.

Figure 25. Stroke Prevalence in Adults 65 Years and Older, by Age Group, California, 2011-2012



Source: California Health Interview Survey (CHIS) 2011–2012 Adult Survey. Stroke prevalence is based on answers to the question "Has a doctor ever told you that you had a stroke?" Stroke question not asked in 2013-14.

Figure 26. Stroke Prevalence in Adults 65 Years and Older, by Gender, Race/Ethnicity, Education, and Poverty, California, 2011–2012



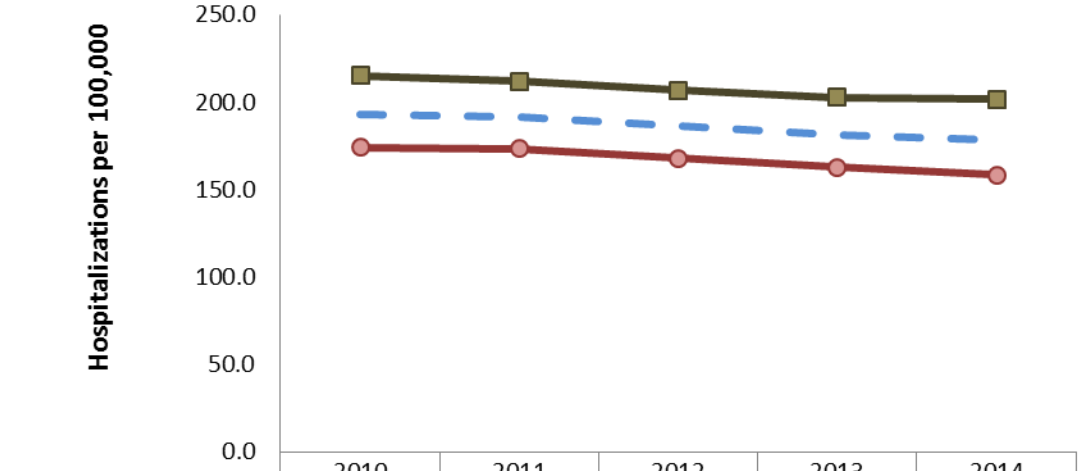
Source: California Health Interview Survey (CHIS) 2011–2012 Adult Survey.
Stroke prevalence is based on answers to the question : "Has a doctor ever told you that you had a stroke?" Stroke question not asked in 2013-14.
Horizontal lines represent 95% confidence intervals.
Native American estimate is unstable due to small sample size.
Native Hawaiian/Pacific Islander not shown due to insufficient sample size
GED = General Educational Development (High-school equivalency test)

Stroke Hospitalizations in California

- Hospitalization for stroke is a CDI measure for CVD (CVD indicator 3.1).
- Decreasing the rate of hospitalization with acute stroke as a principal diagnosis is an objective of the CWP (CWP objective 2.6.5L).

Stroke hospitalization rates have decreased in recent years among both men and women in California, but remain approximately 20 percent higher among men compared to women (Figure 27). African Americans have the highest stroke hospitalization rate among all of the race/ethnicity categories, nearly 40 percent higher than the state rate overall (Figure 28). Stroke hospitalization rates for Asian/Pacific Islanders and Native Americans did not change significantly over the 2010 to 2014 time period. However, stroke hospitalization rates did decrease significantly among African Americans (average decrease of 1.9 percent per year), among Hispanics (average decrease of 2.5 percent per year), and among non-Hispanic whites (average decrease of 2.2 percent per year). The lowest rates were seen among Native Americans. As noted previously, misclassification of Native Americans in health and vital statistics documents has resulted in underestimates of CVD burden in this group,[10] so these results should be considered with some caution.

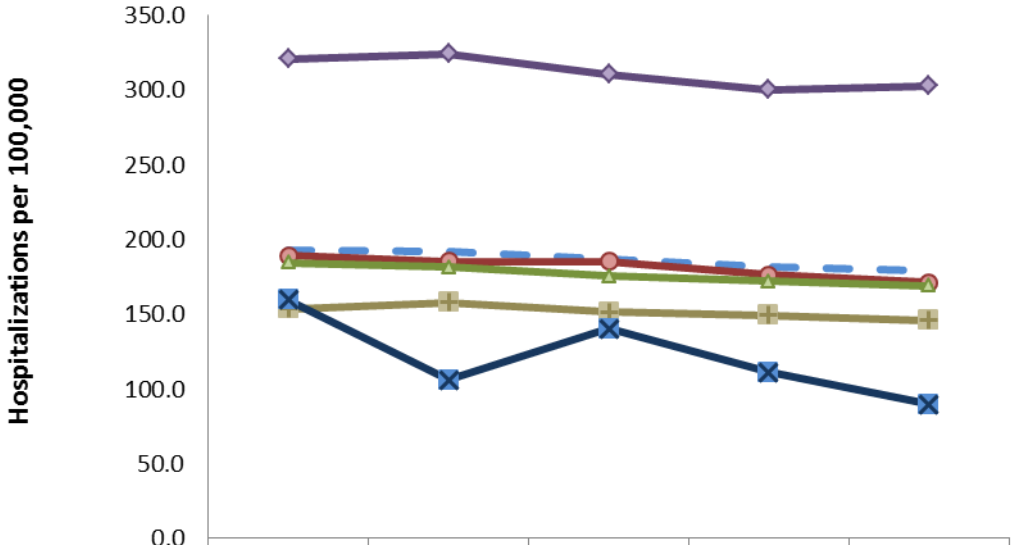
Figure 27. Age-Adjusted Stroke Hospitalizations in California by Gender, 2010-2014



	2010	2011	2012	2013	2014
Male	215.3	212.1	207.0	202.8	201.7
California overall	193.1	191.5	186.3	181.6	178.6
Female	174.1	173.4	168.1	162.8	158.4

Source: California Office of Statewide Health Planning and Development, 2010-2014

Figure 28. Age-Adjusted Stroke Hospitalizations in California by Race/Ethnicity, 2010–2014



	2010	2011	2012	2013	2014
African American	320.7	324.2	310.3	300.2	302.5
California overall	193.1	191.5	186.3	181.6	178.6
Hispanic	189.2	185.3	185.4	176.0	171.2
White (non-Hispanic)	184.2	181.2	175.3	172.0	168.9
Asian/PI	153.5	157.6	151.4	149.1	145.8
Native American	159.5	106.1	140.2	110.8	89.5

Source: California Office of Statewide Health Planning and Development, 2010-2014
PI = Pacific Islander

Stroke Mortality

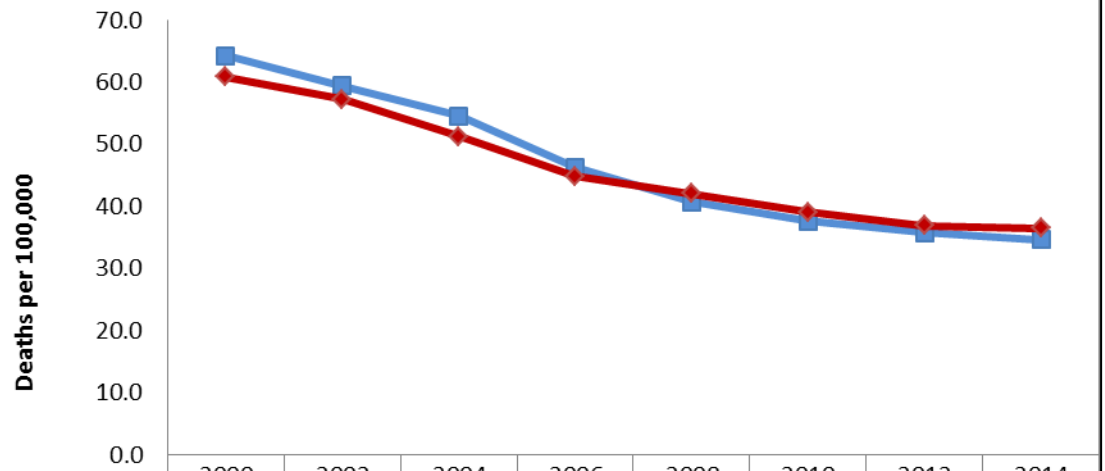
- Mortality from stroke is a CDI measure for CVD (CVD indicator 1.5).
- Decreasing the stroke mortality rate is an objective of the CWP (CWP objective 2.6.5L).

Stroke is the fifth leading cause of death nationally, whereas in California, it ranks third.[13] This difference in ranking is due to the relative positions of other leading causes of death in the United States in comparison to California. Overall, stroke mortality rates in California are similar to those of the nation, and both have declined at a similar pace—by approximately 40 percent (Figure 29).

Unlike CHD, where mortality rates for men are 40 percent higher than those for women, a much smaller gap in stroke mortality rates exists between men and women (Figure 30). Although mortality rates have declined among all major racial/ethnic groups since 2000, stroke mortality among African Americans and among Pacific Islanders remains substantially higher

than among other groups (Figure 31). In 2014, African Americans had the highest stroke death rate. Although the stroke death rate among Pacific Islanders dropped dramatically in recent years, these rates are based on relatively few numbers of deaths. Additional years of data will be needed to determine if this represents a true decline in stroke mortality in this group.

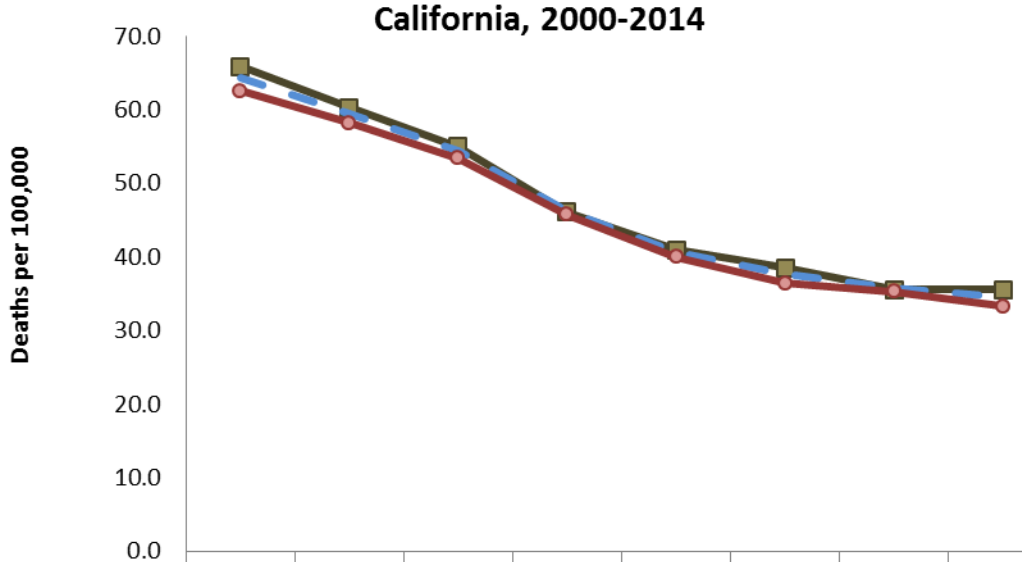
Figure 29. Age-adjusted Stroke Mortality, California and United States, 2000–2014



	2000	2002	2004	2006	2008	2010	2012	2014
California	64.3	59.4	54.5	46.3	40.7	37.6	35.8	34.6
United States	60.9	57.2	51.2	44.8	42.1	39.1	36.9	36.5

Source: CDC Wonder, and California Death Statistical Master File, 2000-2014

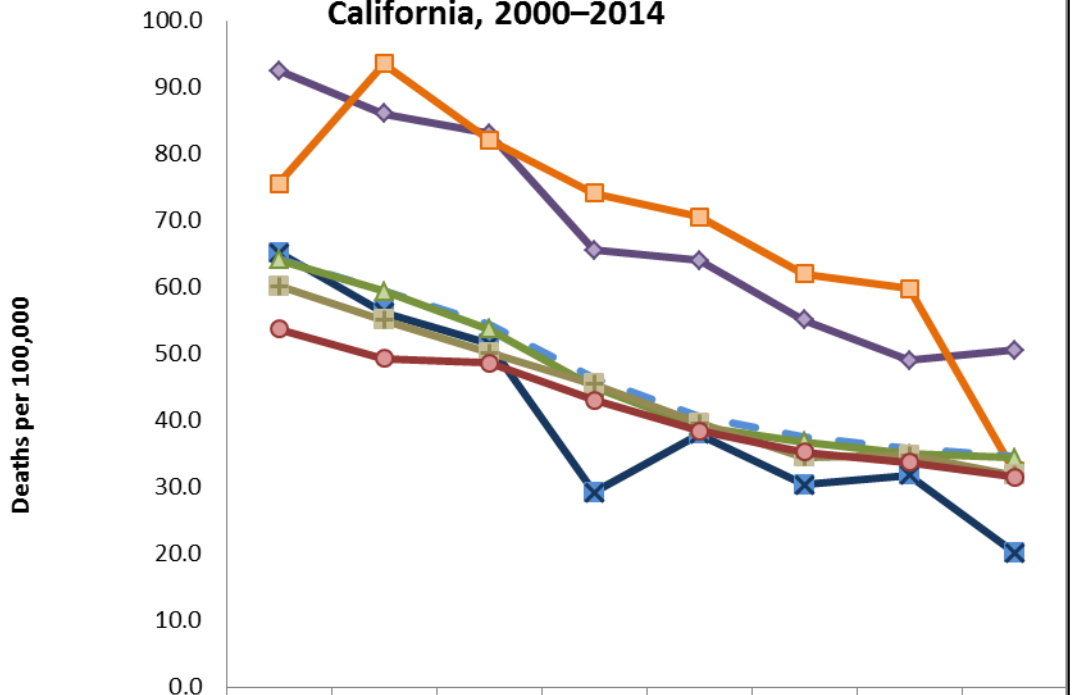
Figure 30. Age-Adjusted Stroke Mortality by Gender, California, 2000-2014



	2000	2002	2004	2006	2008	2010	2012	2014
Male	65.9	60.3	55.0	46.1	41.0	38.5	35.6	35.6
California overall	64.3	59.4	54.5	46.3	40.7	37.6	35.8	34.6
Female	62.6	58.2	53.4	45.8	40.0	36.4	35.3	33.3

Source: California Death Statistical Master File, 2000-2014

Figure 31. Age-Adjusted Stroke Mortality by Race/Ethnicity, California, 2000–2014



	2000	2002	2004	2006	2008	2010	2012	2014
African American	92.5	86.0	83.1	65.6	64.0	55.1	49.1	50.6
Pacific Islander	75.6	93.5	82.1	74.1	70.6	62.0	59.8	32.4
Native American	65.2	56.2	51.5	29.2	38.0	30.4	31.8	20.2
California overall	64.3	59.4	54.5	46.3	40.7	37.6	35.8	34.6
Non-Hispanic White	64.1	59.4	53.7	45.0	39.0	36.8	35.0	34.4
Asian	60.2	55.1	50.2	45.5	39.6	34.5	34.8	31.8
Hispanic	53.7	49.3	48.7	43.1	38.5	35.2	33.7	31.6

Source: California Death Statistical Master File, 2000-2014

Hypertension in California

Hypertension (HTN) (high blood pressure) is a major risk factor for heart disease and stroke and may also lead to vision loss and kidney damage. Blood pressure is the force of blood pushing against arterial walls, and a high pressure over time will damage those walls. Blood pressure measurement has two elements: systolic pressure, which is the maximum pressure on the walls that occurs each time the heart contracts to pump blood, and diastolic pressure, the minimum pressure on the walls which occurs between heart contractions. A blood pressure of 120/80 or less (that is, a systolic pressure of 120 or less and a diastolic pressure of 80 or less) is considered normal. Current evidence-based guidelines from the Eighth Joint National Committee (JNC 8) recommend starting treatment for patients age 59 and older who have a blood pressure of greater than 140/90, and starting treatment for patients age 60 and older who have blood pressure of greater than 150/90.[14] Blood pressures of greater than 120/80 but less than 140/90 are classified as prehypertension.[1] A recent major study found that patients who achieved a lower systolic blood pressure target of 120 had significantly lower cardiovascular events and deaths compared to the standard treatment target of 140.[15] The AHA has identified an untreated blood pressure 120/80 or below as one of the seven components of ideal cardiovascular health.[3]

HTN can be controlled through modification of lifestyle factors and through treatment with medication. Although in the United States 75 percent of patients with high blood pressure report taking medication for the condition, only 52 percent of HTN patients have their blood pressure controlled (reduced to a level below 140/90).[16]

Hypertension Prevalence

- Awareness of high blood pressure among adults is a CDI measure for CVD (CVD indicator 6.1).
- Decreasing the prevalence of high blood pressure is an objective of the CWP (CWP objective 2.6.1L).

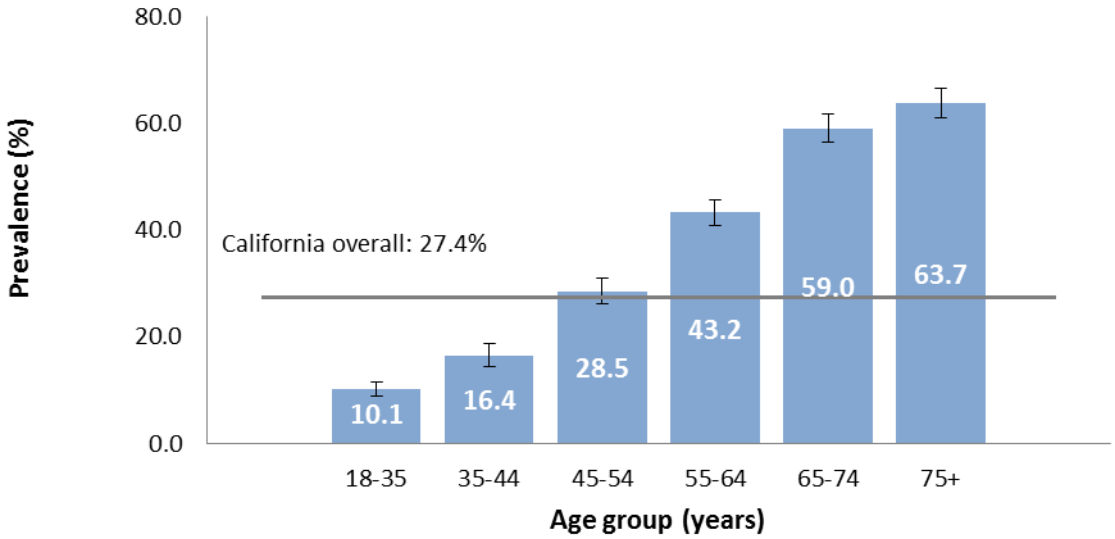
Nearly 7.9 million adults (27 percent) report they have been diagnosed with HTN in California, according to the 2013–2014 CHIS. The prevalence of HTN increases with age, thus by age 65-74 years, over half of Californians have been diagnosed with HTN (Figure 32). Although more common in older adults, HTN affects all ages, including young and middle-aged adults. One in twelve California adults aged 18–34 years have had a diagnosis of HTN. The prevalence doubles in California adults aged 35–45 years; one in six adults in this age group have been diagnosed with HTN.

HTN is reported similarly by men and women (Figure 33). The highest prevalence was reported by African Americans and Native Americans (36.5 percent and 35.5 percent respectively), well

above the overall state level of 27.4 percent. The lowest prevalence was reported by non-Hispanic whites (25.4 percent) and Asians (24.1 percent). As with CVD overall, HTN is more prevalent among those with lower levels of education and income.

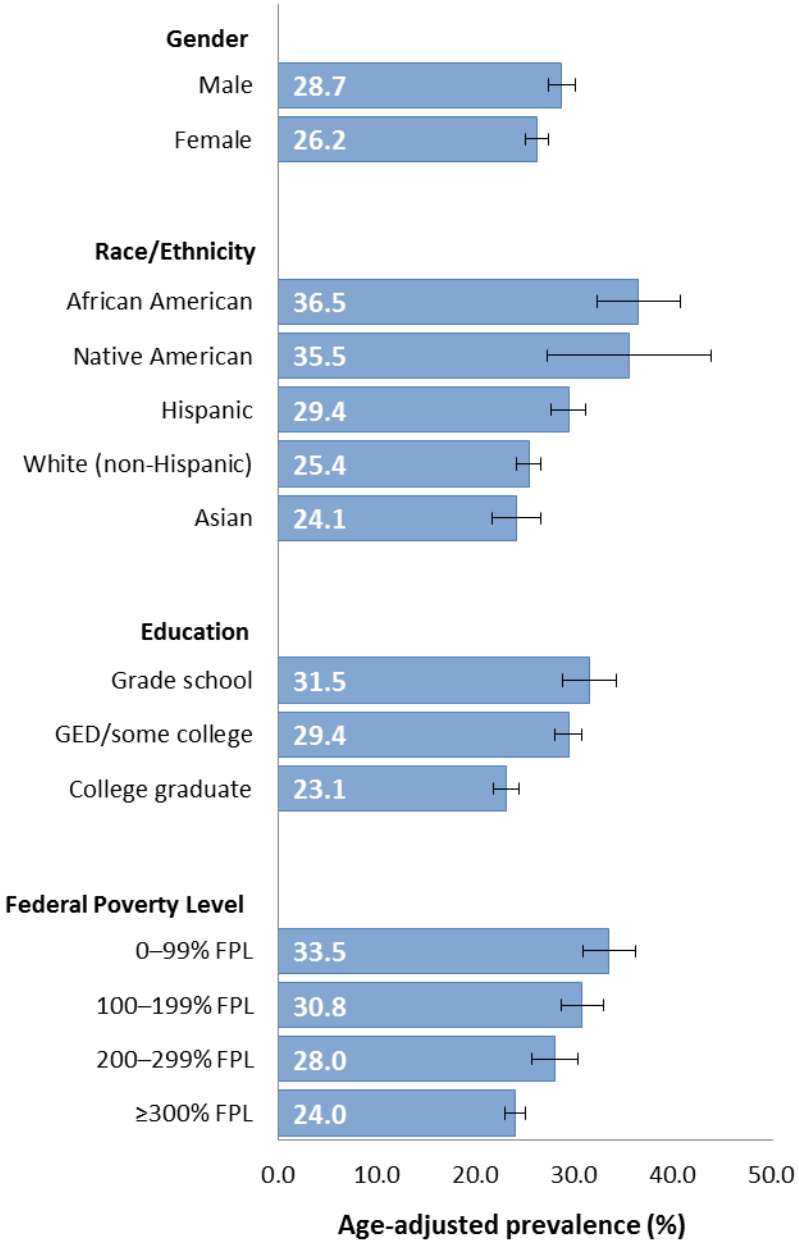
Note: Because survey data are based on self-reported responses, these data will only reflect Californians who are aware they have high blood pressure. National surveys suggest that 17 percent of adults who have HTN are not aware they have it.[16]

Figure 32. Hypertension Prevalence by Age Group, California, 2013-2014



Source: California Health Interview Survey (CHIS) 2013-2014 Adult Survey.
Heart disease prevalence is based on answers to the question "Has a doctor ever told you that you have high blood pressure?"
Vertical lines represent 95% confidence intervals.

Figure 33. Hypertension Prevalence in Adults by Gender, Race/Ethnicity, Education, and Poverty, California 2013-2014



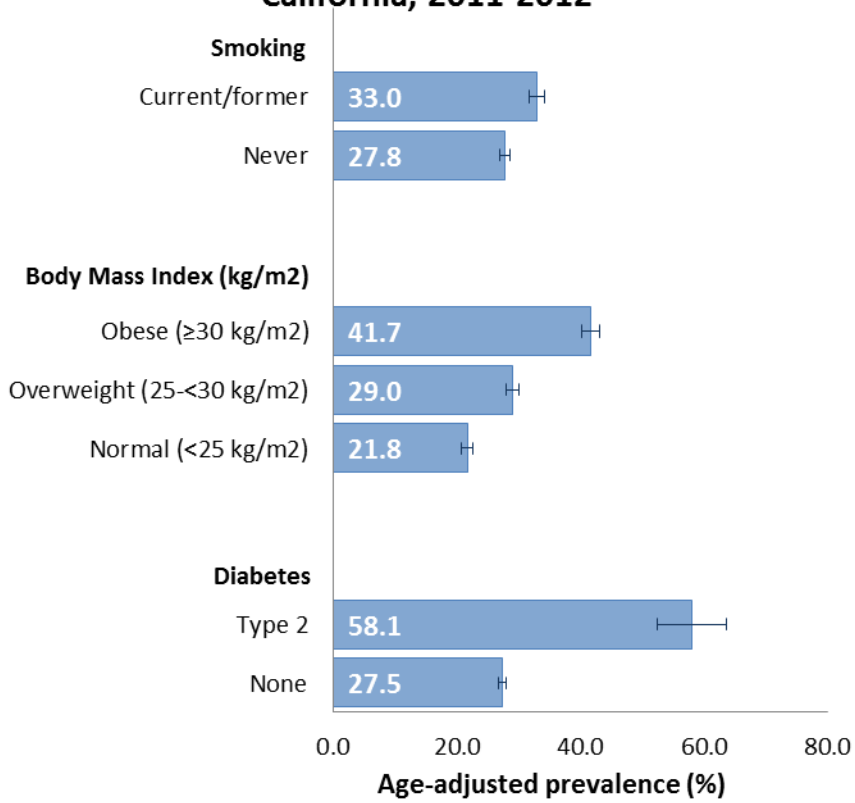
Source: California Health Interview Survey (CHIS) 2013-2014 Adult Survey.
Heart disease prevalence is based on answers to the question: "Has a doctor ever told you that you have high blood pressure?"
Horizontal lines represent 95% confidence intervals.
Abbreviations: PI, Pacific Islander; GED, General Educational Development (High-school equivalency test)

Cardiovascular Disease Risk factors and Cardiovascular Health

As shown, CVD mortality rates have declined dramatically in recent years. This progress is largely attributed to improvement in the management of HTN, cholesterol levels, reduction in tobacco use, and in improved treatments for CVD, particularly CHD.[3] Nonetheless, CVD remains the leading cause of death in the United States. In 2010, the AHA established goals to further reduce CVD deaths and to improve cardiovascular health by encouraging all Americans to meet targets for seven cardiovascular health metrics: not smoking, being physically active, eating a healthy diet, and maintaining a normal blood pressure, blood glucose, cholesterol, and weight. Americans who meet these goals have lower death rates from CVD and from all causes, including CVD, and the greater the number of these CVD health targets that are met, the lower death rates go.[4]

In California, CVD is more prevalent among adults who smoke and who are obese than those without these health risk factors (Figure 34). The prevalence of CVD among type 2 diabetics is more than double that of those without the disease.

Figure 34. Cardiovascular Disease Prevalence in Adults by Smoking, Obesity, and Diabetes, California, 2011-2012



Source: California Health Interview Survey (CHIS) 2011-2012 Adult Survey.
Cardiovascular disease prevalence based on answers to the questions: "Has a doctor ever told you that you had a stroke, have high blood pressure, have any kind of heart disease, or have heart failure or congestive heart failure?" Stroke question not asked in 2013-14.
Horizontal lines represent 95% confidence intervals

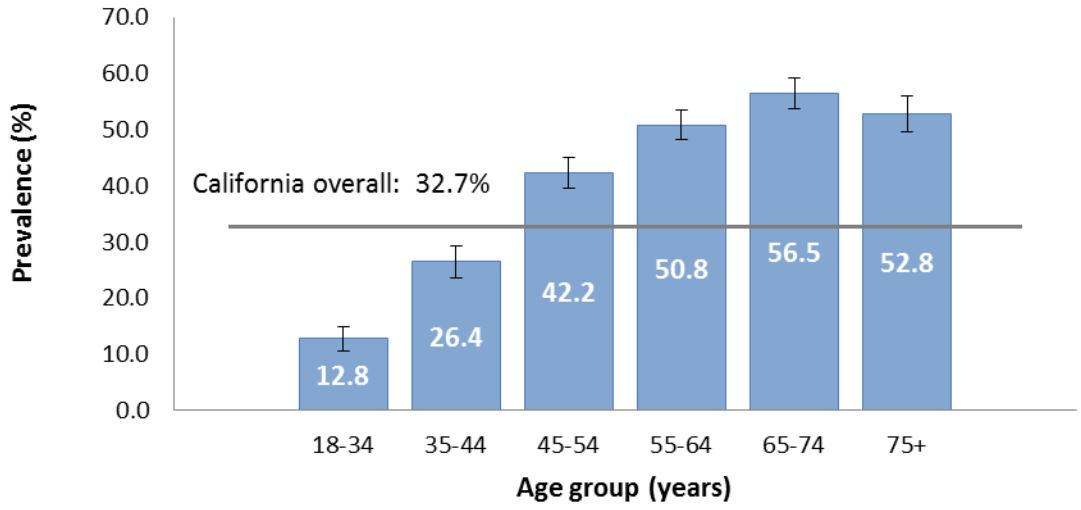
Cholesterol

- Cholesterol screening and high cholesterol prevalence among adults are CDI measures for CVD (CVD indicators 4 and 5).
- Increasing the number of adults screened for high cholesterol and decreasing the prevalence of high cholesterol are objectives of the CWP (CWP objectives 2.6.2I and 2.6.3L).

High cholesterol is a major risk factor for heart disease and stroke, and like HTN, causes damage to the inside walls of arteries. Over time, high levels of cholesterol in the blood result in atherosclerosis, a condition in which plaque builds up on the insides of the artery walls. This plaque contains cholesterol and other substances, and may lead to a heart attack or stroke if a blood clot forms in the area of the plaque and blocks blood flow, or if a piece of plaque breaks off and becomes lodged in a smaller blood vessel.[17] Cholesterol levels are affected by a person's genetics, age, and diet, and can be controlled with dietary changes and by appropriate medications. The AHA has identified untreated total cholesterol of less than 200 mg/dl as one of the seven components of ideal cardiovascular health for adults.[3]

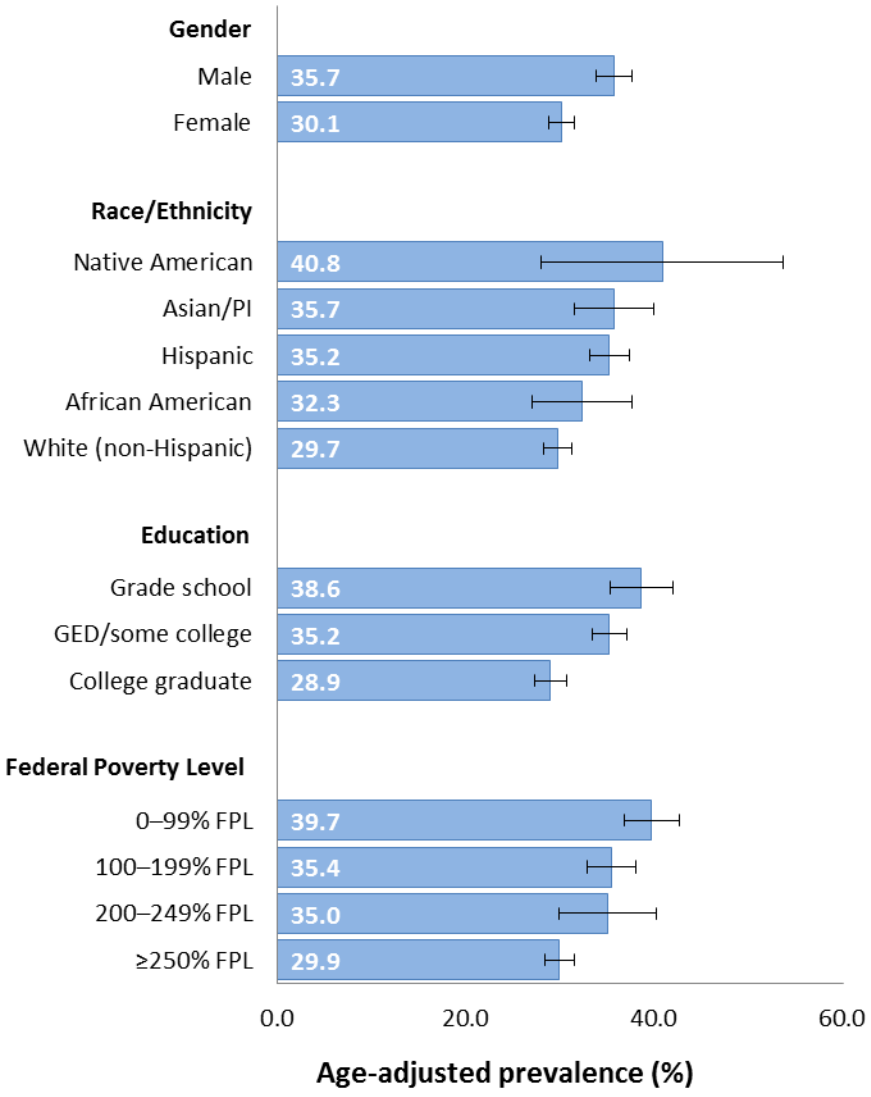
According to the 2013 California BRFSS survey, 79.4 percent of adults reported having their cholesterol levels checked. One in three of those adults report being told their level is high. By age 55–64 years, half of adults report having high cholesterol (Figure 35). The prevalence is higher among men than women, and higher among Native Americans and Asian/Pacific Islanders and lowest among non-Hispanic whites (Figure 36). As with other CVD risk factors, high cholesterol is found more frequently among those with lower levels of education and income.

Figure 35. High Cholesterol Prevalence by Age Group, California, 2013



Source: California Behavioral Risk Factor Surveillance System (BRFSS) 2013.
High cholesterol prevalence based on answers to the questions "Have you had your cholesterol checked?" and "Have you ever been told by a doctor/health professional that your blood cholesterol is high?" Cholesterol question not asked in 2014.
Vertical lines represent 95% confidence intervals.

Figure 36. High Cholesterol Prevalence in Adults by Gender, Race/Ethnicity, Education, and Poverty, California, 2013



Source: California Behavioral Risk Factor Surveillance System (BRFSS) 2013.
High cholesterol prevalence based on answers to the questions "Have you had your cholesterol checked?" and "Have you ever been told by a doctor/health professional that your blood cholesterol was high?" Cholesterol question not asked in 2014.
Horizontal lines represent 95% confidence intervals.
Abbreviations: PI, Pacific Islander; GED, General Educational Development (High-school equivalency test)

Diabetes

- The prevalence of diagnosed diabetes among adults is a CDI measure (Diabetes Indicator 2.1).
- Decreasing the prevalence of diagnosed diabetes is an objective of LGHC and the CWP (CWP objective 2.5.5L).

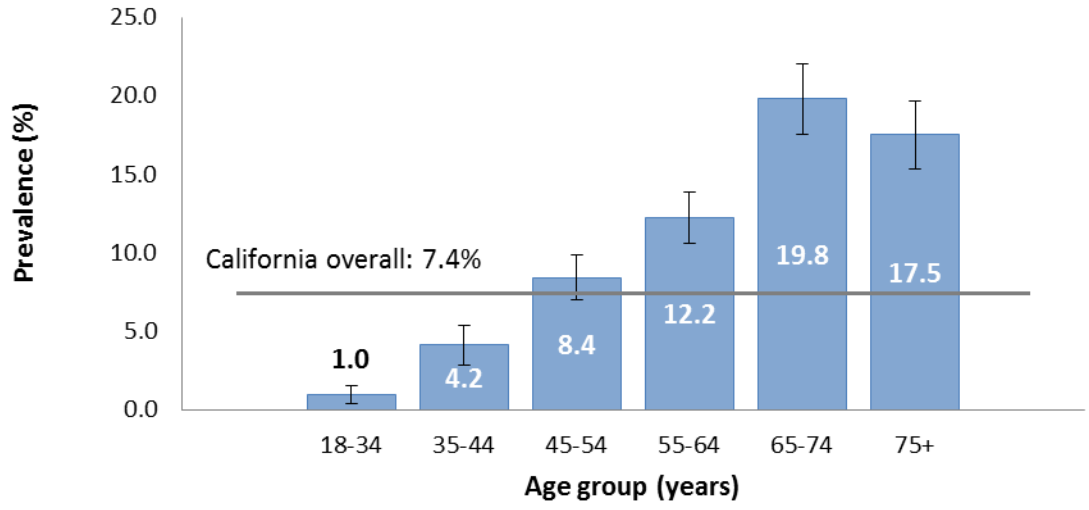
Diabetes is a disease characterized by high levels of sugar in the blood and is a major risk factor for heart disease and stroke. Diabetes occurs when insulin, the main hormone that regulates blood sugar levels, is either too low (type 1 diabetes) or the body is unable to use available insulin effectively (type 2 diabetes). Diabetes is diagnosed when a fasting plasma glucose (FPG) level is elevated above 126 mg/dl.[18] Patients with FPG levels of 100–125 mg/dl are classified as having impaired fasting glucose or prediabetes. The AHA has defined untreated fasting blood glucose levels of <100 mg/dl as one of the seven components of ideal cardiovascular health.[3]

According to CHIS (2013–2014), 8.6 percent of California adults report having been diagnosed with diabetes, representing almost 2.5 million people. The majority have type 2 diabetes (7.4 percent or 2.1 million people). One percent of California adults 18-34 years old reported having type 2 diabetes (Figure 37). The prevalence increases with age and peaks among Californians 65-74 years old at almost 20 percent.

Men were more likely than women to report having type 2 diabetes (Figure 38). The highest prevalence was reported by Hispanics at 11.7 percent, well above the lowest prevalence reported by non-Hispanic whites (4.8 percent). As with CVD and HTN, diabetes is more prevalent among those with lower levels of education and income.

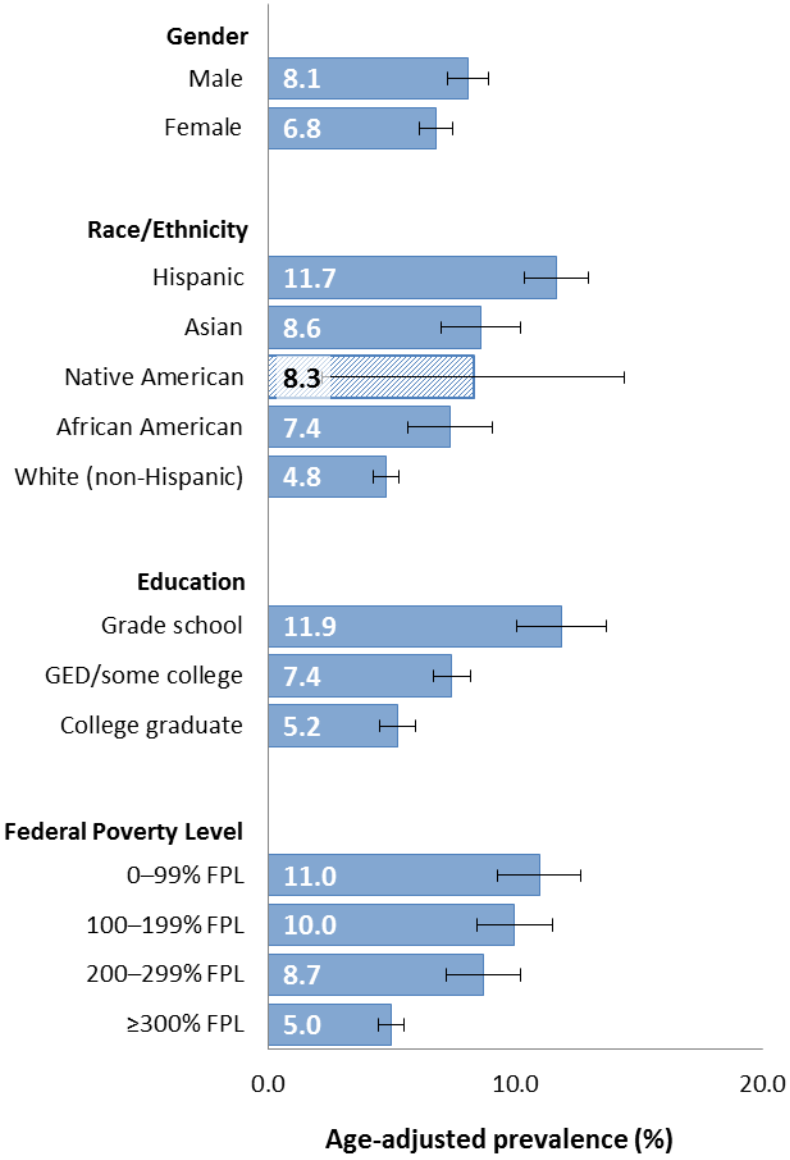
Additional detailed information on diabetes in California can be found in the 2014 CDPH report "The Burden of Diabetes in California," available at: http://www.cdph.ca.gov/programs/cdcb/Documents/FINAL%20Rpt%20(1877)%20DM%20burden%202014_9-04-14MNR3.pdf.

Figure 37. Type 2 Diabetes Prevalence by Age Group, California, 2013-2014



Source: California Health Interview Survey (CHIS) 2013-2014 Adult Survey.
Diabetes prevalence is based on answers to the question "Other than during pregnancy, has/had a doctor ever told you that you have diabetes or sugar diabetes?" and "Were you told that you had Type 1 or Type 2 diabetes?"
Vertical lines represent 95% confidence intervals.

Figure 38. Diabetes Prevalence in Adults by Gender, Race/Ethnicity, Education, and Poverty, California 2013-2014



Source: California Health Interview Survey (CHIS) 2013-2014 Adult Survey.
Diabetes prevalence is based on answers to the question "Other than during pregnancy, has/had a doctor ever told you that you have diabetes or sugar diabetes?" and "Were you told that you had Type 1 or Type 2 diabetes?"
Horizontal lines represent 95% confidence intervals.
Native American estimate is unstable due to small sample size.
Abbreviations: GED, General Educational Development (High-school equivalency test)

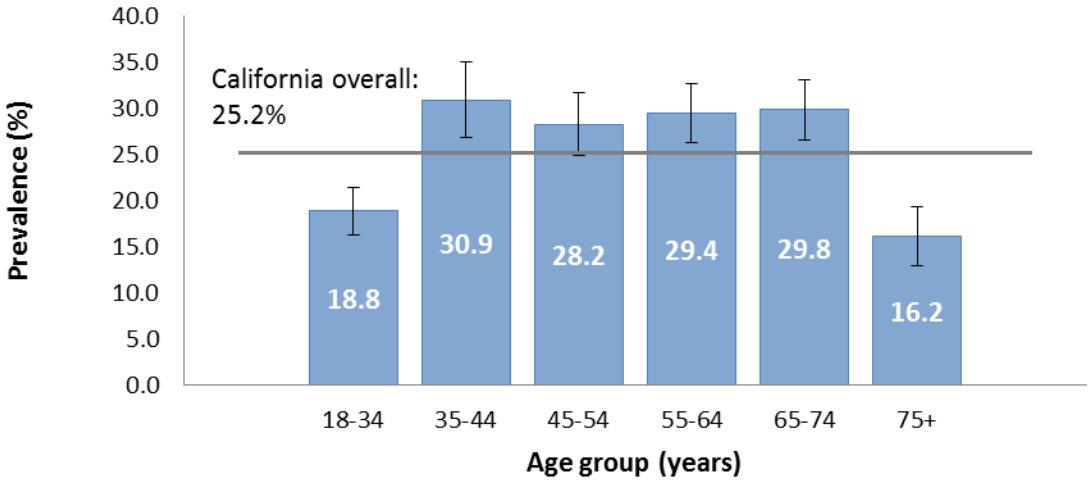
Obesity

- Obesity among adults is a CDI measure (Nutrition, physical activity, and weight status indicator 1.1).
- Decreasing the percentage of adults who are obese is an objective of LGHC and the CWP (Objective 2.5.2L).

Obesity is a major risk factor for CVD, including CHD, stroke, atrial fibrillation, and HF.[1] Obesity among adults is typically defined as a body mass index (BMI) of 30 kg/m^2 or greater, and overweight is defined as BMI ranging from 25 to <30. The AHA has identified having a BMI < 25 as one of the seven ideal components of cardiovascular health.[3]

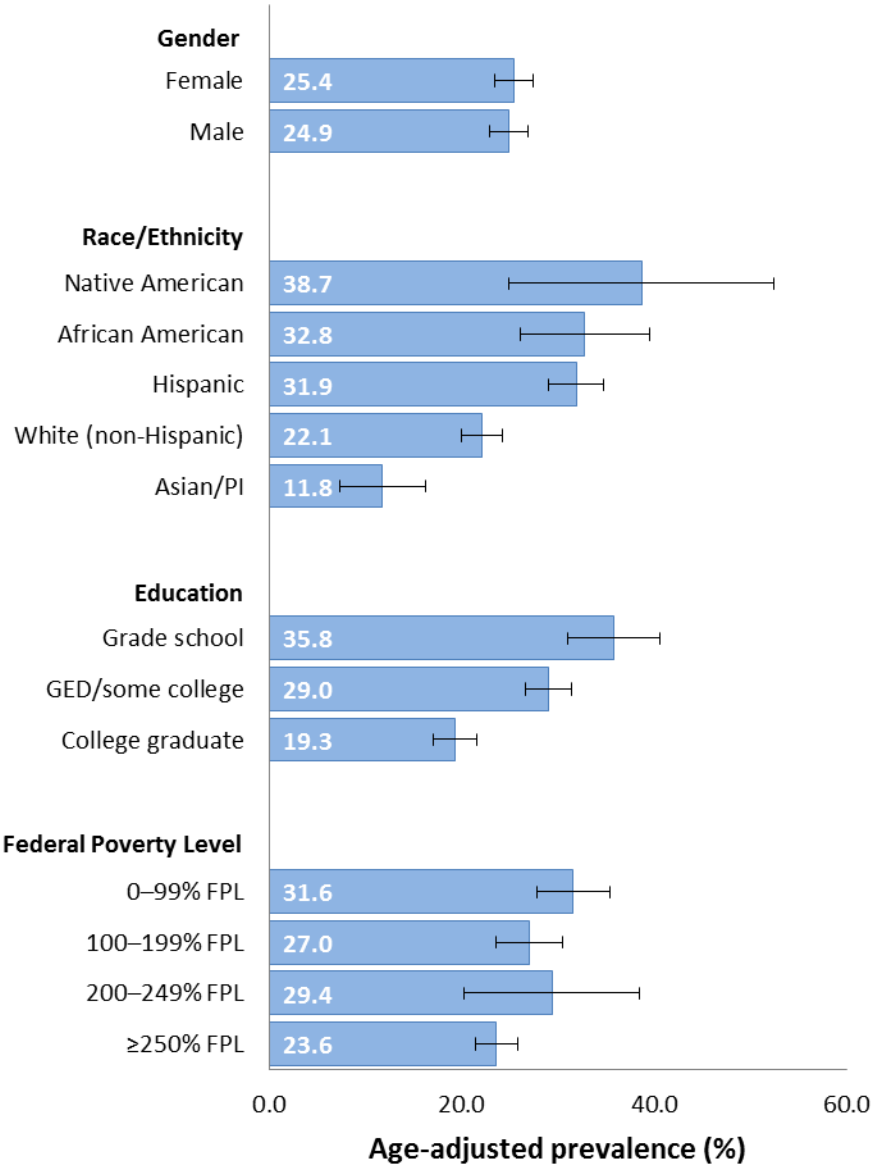
In California, one out of four adults is obese according the results of the 2014 BRFSS. The prevalence increases with age until it peaks at age 55-64 years, then declines with advancing age (Figure 39). The prevalence is slightly greater among men than women, and varies greatly by race/ethnicity (Figure 40). Native Americans and African Americans report the highest levels of obesity in the state (38.7 percent and 32.8 percent, respectively), and Asian/Pacific Islanders the lowest (11.8 percent). Californians with the lowest levels of education and income are more often obese than those in upper education and income brackets. According to the 2014 BRFSS, 38 percent of California adults report weights that are in the normal range (BMI 18.5-24.9).

Figure 39. Obesity Prevalence by Age Group, California, 2014



Source: California Behavioral Risk Factor Surveillance System (BRFSS) 2014.
Obesity prevalence based on reported height and weight of respondants. People with 30 kilograms (weight) / meters squared (height) were considered obese.
Vertical lines represent 95% confidence intervals.

Figure 40. Obesity Prevalence in Adults by Gender, Race/Ethnicity, Education, and Poverty, California, 2014



Source: California Behavioral Risk Factor Surveillance System (BRFSS) 2014.
Obesity prevalence based on reported height and weight of respondents. People with 30 kilograms (weight) / meters squared (height) were considered obese.
Horizontal lines represent 95% confidence intervals.
Abbreviations: PI, Pacific Islander; GED, General Educational Development (High-school equivalency test)

Tobacco Use

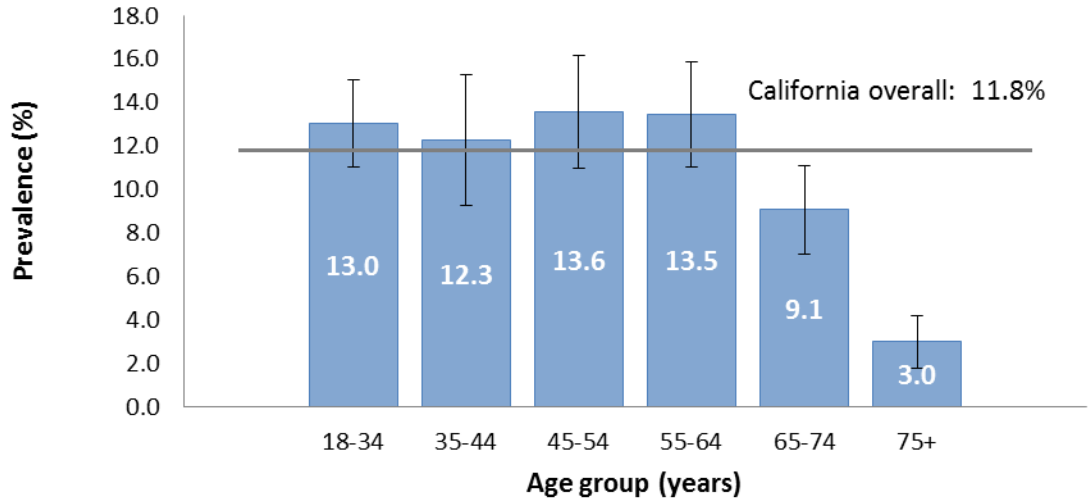
- Current smoking among adults is a CDI measure (Tobacco indicator 1.1).
- Decreasing the percentage of adults who are current smokers is an objective of LGHC and the CWP (Objective 1.2.2L).

Smoking is a major risk factor for CVD. Clear and conclusive evidence of the health risks of smoking have been accumulated for over 50 years, from the landmark 1964 Surgeon General's report "Smoking and Health," to the most recent 2014 update from the Surgeon General that summarizes the health consequences of smoking.[19] The AHA has identified "never smoking" as one of the seven components of ideal cardiovascular health for adults.[3]

Since the initiation of the California Tobacco Control Program (CTCP) in 1988, smoking rates in California have declined by over 50 percent.[20] In the 2014 BRFSS, 11.8 percent of California adults reported current smoking. Smoking prevalence was highest among younger adults ages 18–34 years and middle-aged adults ages 45–64 years, then declined with advancing age (Figure 41). Smoking rates are higher among men than women (Figure 42), and higher among Native Americans and African Americans. Smoking rates are lowest among Californians with the highest levels of education and income, approximately half of those of other groups.

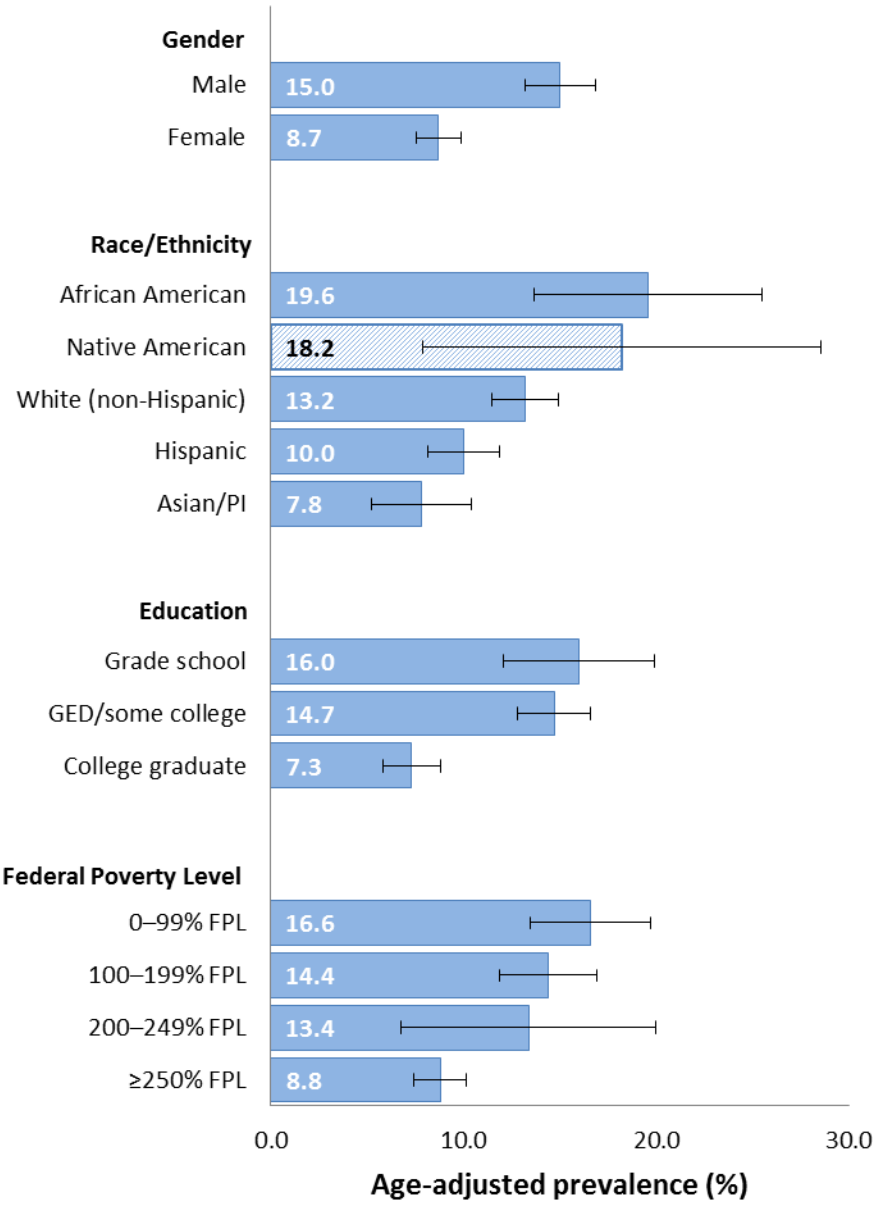
Additional detailed information on tobacco use in California is available from the CTCP in "California Tobacco Facts and Figures, 2016" available at: http://www.cdph.ca.gov/programs/tobacco/Documents/CDPH%20CTCP%20Refresh/Research%20and%20Evaluation/Facts%20and%20Figures/FactsFigures2016-PrePrintEdition.pdf.

Figure 41. Smoking Prevalence by Age Group, California, 2014



Source: California Behavioral Risk Factor Surveillance System (BRFSS) 2014.
Current smoking prevalence based on answers to the question "Have you smoked at least 100 cigarettes in your entire life?" and "Do you currently smoke cigarettes?"
Vertical lines represent 95% confidence intervals.

Figure 42. Smoking Prevalence in Adults by Gender, Race/Ethnicity, Education, and Poverty, California, 2014



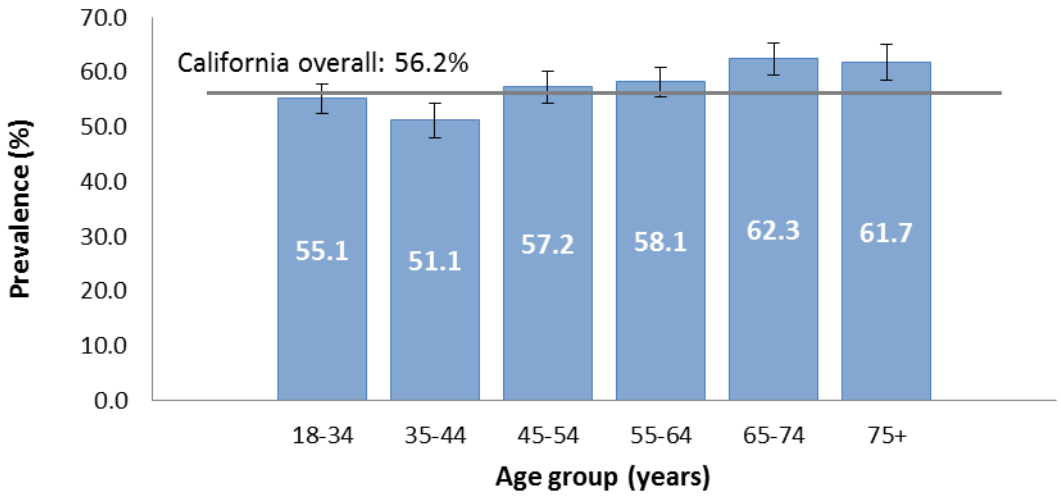
Source: California Behavioral Risk Factor Surveillance System (BRFSS) 2014.
Current smoking prevalence based on answers to the question "Have you smoked at least 100 cigarettes in your entire life?" and "Do you currently smoke cigarettes?"
Horizontal lines represent 95% confidence intervals.
Native American rate is statistically unstable.
Abbreviations: PI, Pacific Islander; GED, General Educational Development (High-school equivalency test)

Physical Activity

- Meeting aerobic physical activity guidelines for adults is a CDI measure (Nutrition, physical activity, and weight status indicator 11.1).
- Increasing the percentage of adults who meet physical activity guidelines for aerobic activity is an objective of LGHC and the CWP (CWP Objective 1.3.3L).

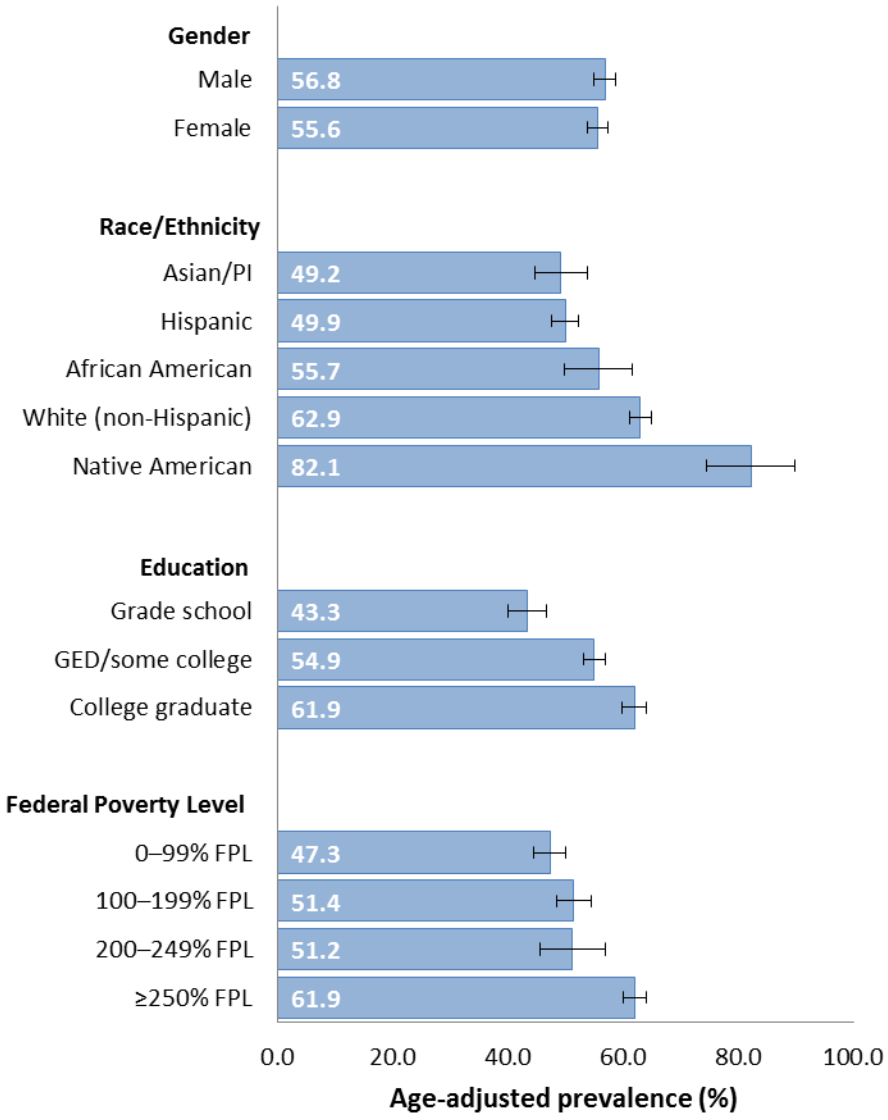
Physical inactivity is a major risk factor for CVD and stroke. The U.S. Department of Health and Human Services (HHS) reports strong evidence of the benefits of physical activity for adults, including reduced risk of CHD, stroke, high blood pressure, high cholesterol, and diabetes.[21] HHS Guidelines for physical activity in adults recommend at least 150 minutes of moderate-intensity activity or 75 minutes of vigorous-intensity activity per week or an equivalent combination.[21] In 2013, 56.2 percent of Californians reported they were meeting this minimum activity level (Figure 43). Older adults reported meeting this level of activity more often than younger adults. There was little difference in activity level between men and women (Figure 44). The prevalence of meeting physical activity recommendations was greatest among Native Americans and non-Hispanic whites and among Californians with higher levels of education and income. The AHA has included meeting physical activity guidelines as one of the seven components of ideal cardiovascular health.[3]

Figure 43. Physical Activity Prevalence by Age Group, California, 2013



Source: California Behavioral Risk Factor Surveillance System (BRFSS) 2013.
Physical activity prevalence based on answers to questions asking how many minutes of moderate physical activity respondents do in an average week. People with 150 minutes of moderate physical activity per week or the equivalent vigorous physical activity were considered physically active. Physical activity questions were not asked in 2014.
Vertical lines represent 95% confidence intervals.

Figure 44. Physical Activity Prevalence in Adults by Gender, Race/Ethnicity, Education, and Poverty, California, 2013



Source: California Behavioral Risk Factor Surveillance System (BRFSS) 2013.
Physical activity prevalence based on questions asking how many minutes of moderate physical activity respondents do in an average week. People with 150 minutes of moderate physical activity per week or the equivalent vigorous physical activity were considered physically active. Physical activity questions were not asked in 2014.
Horizontal lines represent 95% confidence intervals.
Abbreviations: PI, Pacific Islander; GED, General Educational Development (High-school equivalency test).

Healthy Diet

- Median frequency of fruit consumption and of vegetable consumption among adults are CDI measures (Nutrition, physical activity, and weight status indicators 4.2 and 5.2).
- Increasing the percentage of adults who consume fruits and vegetables five or more times per day is an objective of LGHC and the CWP (CWP Objective 1.3.10).

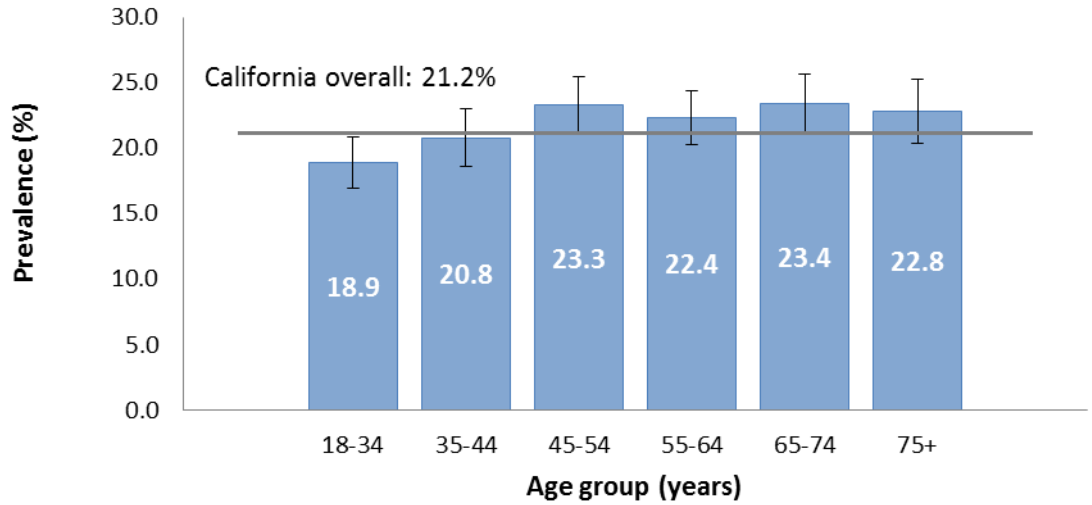
The AHA has identified eating a healthy diet as one of its seven components of ideal cardiovascular health,[3] based on current nutritional guidelines and recommendations that include these five components to create a healthy diet score:

- Fruits and vegetables: at least 4.5 cups per day
- Fish: at least two servings per week
- Fiber-rich whole grains: at least three one-ounce-equivalent servings per day
- Sodium: less than 1,500 mg per day
- Sugar-sweetened beverages: limit to 450 calories or less (36 ounces) per week

For ideal cardiovascular health, the AHA has set a metric of meeting at least four of these five dietary recommendations. Data from the 2005–2010 National Health and Nutrition Examination Survey (NHANES) indicate that of the seven cardiovascular health components outlined by the AHA (normal blood pressure, cholesterol, glucose, and weight, and no tobacco use, meet physical activity guidelines and meet four of five dietary guidelines) the healthy diet index was the least likely to be met by Americans, with only 22 percent of Americans meeting two or more of the five guidelines.[4] People who live with food insecurity are also less likely to have a healthy diet, and are more likely to be a racial/ethnic minority and low income.[22]

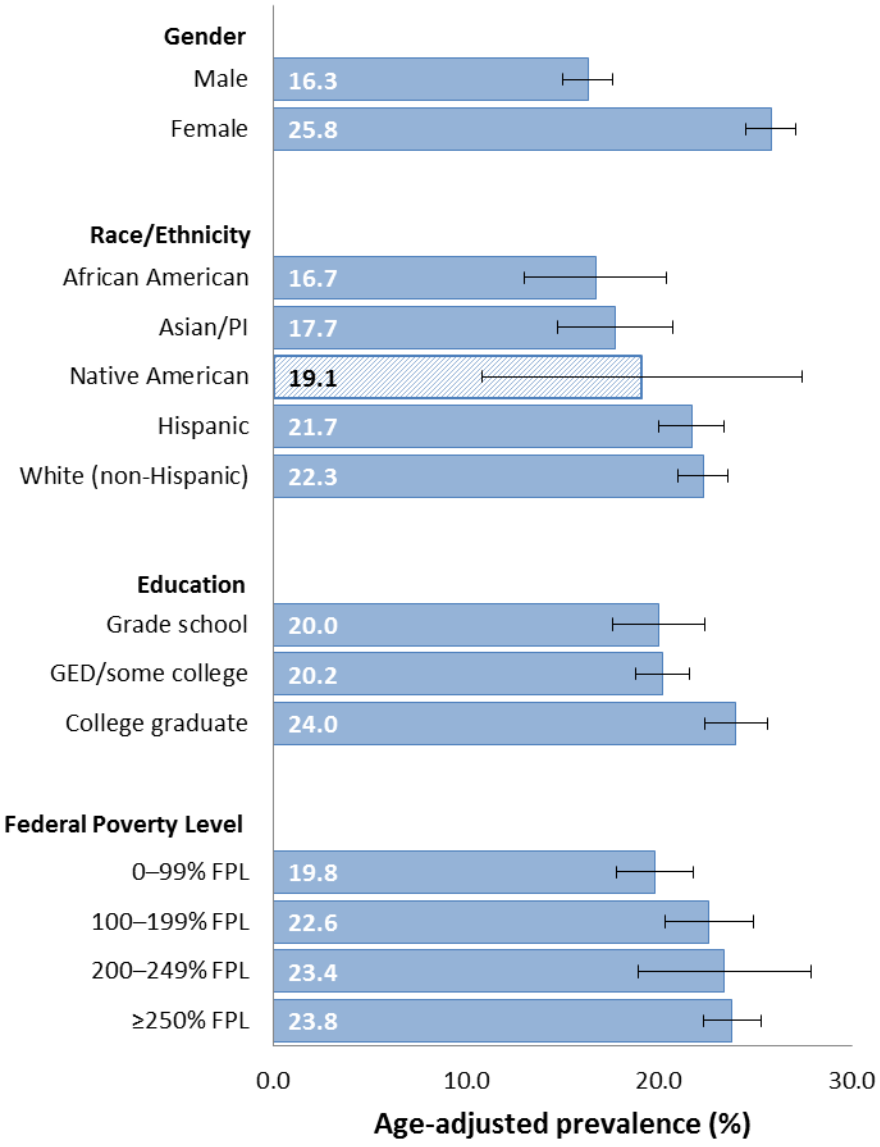
Fruit and vegetable consumption has been proposed as a proxy for estimating an overall healthy diet using surveillance data such as BRFSS.[23] In California, 21 percent of adults report eating at least five servings of fruits and vegetables daily (Figure 45). Consumption is greater among women than men (Figure 46) and among non-Hispanic whites and Hispanics than other groups. Californians with higher levels of education and income report higher intakes of fruits and vegetables than other groups.

Figure 45. Prevalence of Eating Five or More Servings of Fruits and Vegetables by Age Group, California, 2013



Source: California Behavioral Risk Factor Surveillance System (BRFSS) 2013.
Prevalence of consuming 5+ fruits/vegetables per day based on answers to questions asking how often respondent typically eats different types of fruits and vegetables. These diet questions were not asked in 2014.
Vertical lines represent 95% confidence intervals.

Figure 46. Prevalence of Eating Five or More Servings of Fruits and Vegetables in Adults by Gender, Race/Ethnicity, Education, and Poverty, California, 2013



Source: California Behavioral Risk Factor Surveillance System (BRFSS) 2013.
Prevalence of consuming 5+ fruits/vegetables per day based on answers to questions asking how often respondent typically eats different types of fruits and vegetables. These diet questions were not asked in 2014.
Horizontal lines represent 95% confidence intervals.
Native American rate is statistically unstable.
Abbreviations: PI, Pacific Islander; GED, General Educational Development (High-school equivalency test)

Cardiovascular Disease Prevention and Control Activities and Collaborations at CDPH

Heart Disease and Diabetes Prevention

The Heart Disease and Diabetes Prevention programs of CDCB are funded by the CDC and focus on CVD prevention and control:

Prevention First

In July 2013, CDPH was awarded funding from CDC for "State Public Health Actions to Prevent and Control Diabetes, Heart Disease, Obesity, and Associated Risk Factors and Promote School Health." This initiative is referenced in California as "Prevention First" and supports statewide implementation of cross-cutting approaches to promote health, prevent and control chronic diseases and their risk factors, and maintain coordination and collaboration across state and local programs, including four local health departments that receive funds under this grant. The objectives of this grant align with those of Million Hearts® (please see later description).

Lifetime of Wellness

In September 2014, CDPH was awarded a four-year grant from CDC for "State and Local Public Health Actions to Prevent Obesity, Diabetes, Heart Disease, and Stroke." The California initiative, known as "Lifetime of Wellness: Communities in Action," provides grant funding to six local health departments to promote health and address obesity, diabetes, and heart disease and stroke prevention and control in high-risk populations using evidence-based strategies. The objectives of this grant align with those of Prevention First and Million Hearts®.

Cardiovascular Disease Prevention Program

The Cardiovascular Disease Prevention Program (CDPP) is a component of the Preventive Health and Health Services Block Grant. CDPP interventions directly address health objectives for heart disease prevention, with an emphasis on HTN. Current efforts are focused on lowering sodium consumption to reduce the risk of HTN and CVD through public education to increase awareness of the health risks of excessive sodium intake, led by the state-level Sodium Awareness Leadership Team (SALT). Additional activities include implementing quality-improvement processes through promotion of evidence-based, team-based care models and conducting CVD surveillance activities. The objectives of this grant align with those of Prevention First, Lifetime of Wellness, and Million Hearts®.

Well-Integrated Screening and Evaluation for Women Across the Nation (WISEWOMAN™)

WISEWOMAN focuses on reducing CVD risk factors among low-income, underinsured, or uninsured 40- to 64-year-old women. This is accomplished through providing women with the knowledge, skills, and opportunities to improve their diet, physical activity, and other life habits

to prevent, delay, or control cardiovascular and other chronic diseases. Addressing risk factors such as high blood pressure, elevated cholesterol, obesity, inactivity, diabetes, and smoking greatly reduces a woman's risk of heart disease- and stroke-related illness and death. Women must be enrolled in the California Breast and Cervical Cancer Early Detection Program (BCCEDP) to be eligible for WISEWOMAN services.

The goals of the WISEWOMAN program are: (1) assuring that cardiovascular screening is provided; (2) working with community-based organizations to provide evidence-based prevention services to those women in need through agreements with organizations such as the Expanded Food and Nutrition Education Program and providers of the National Diabetes Prevention Program; (3) improving the management and control of HTN by integrating innovative health system-based approaches and strengthening community-clinical linkages (such as team-based care); and (4) gathering and reporting program-related evaluation data, including impact measures.

California Stroke Registry/California Coverdell Program

The California Stroke Registry (CSR) was initiated in 2007 with CDC funding to reduce the rate of premature death and disability from acute stroke, increase public awareness of stroke treatment and prevention, and reduce disparities in acute stroke care. In 2012, the CSR was funded by CDC to participate in the Paul Coverdell National Acute Stroke Program (PCNASP). The PCNASP is a national effort to ensure that all Americans receive the highest quality of acute stroke care available to reduce untimely deaths, prevent disability, and avoid recurrent strokes. As directed by the U.S. Congress, CDC funds state-based registries to measure and track acute stroke care with the overall goal of decreasing the rate of premature death and disability from stroke. California is currently one of nine states participating in the Paul Coverdell National Acute Stroke Registry. More than 50 California hospitals have voluntarily committed to participate in the state stroke registry.

Nutrition Education and Obesity Prevention Branch

The Nutrition Education and Obesity Prevention Branch (NEOPB) is a statewide movement of local, state, and national partners collectively working toward improving the health status of low-income Californians through increased fruit and vegetable consumption and daily physical activity. Multiple venues are used to facilitate behavior change in the homes, schools, worksites, and communities of low-income Californians to create environments that support fruit and vegetable consumption and physical activity.

California Tobacco Control Program

The California Tobacco Control Program (CTCP) is a program of CDPH. Since 1990, CTCP has been a leader in the fight to keep tobacco out of the hands of youth, to help tobacco users quit,

and to ensure that all Californians can live, work, play, and learn in tobacco-free environments. CTCP funds and coordinates the efforts of local communities in California to create smoke-free environments, prevent illegal sales of tobacco products to youth and young adults, counter the aggressive marketing practices of the tobacco industry, and help smokers to quit—for good. CTCP has helped save over one million lives and over $86 billion in health care costs for California.[24]

The California Wellness Plan

The California Wellness Plan[7] (CWP) aligns with LGHC priorities and expands upon them to create a detailed road map for CDPH and its partners to promote health and eliminate preventable chronic disease in California. CWP, published in 2014, includes short-, intermediate-, and long-term objectives and performance measures that are developed from evidence-based strategies to prevent chronic disease and promote equity. The CWP contains multiple objectives specific to cardiovascular health and disease, including objectives to reduce hospitalizations and mortality from heart disease and stroke, to reduce the prevalence of CVD risk factors, and improve cardiovascular health through better nutrition and increased physical activity. The CWP may be found on the CDPH, Chronic Disease Control Branch (CDCB) website at http://www.cdph.ca.gov/programs/cdcb/.

The Office of Health Equity

The Office of Health Equity (OHE) is charged with achieving the highest level of health and mental health for all people with special focus on those with socioeconomic disadvantages and historical injustices. OHE advises and assists other state departments in their mission to increase access to culturally and linguistically competent health services. It strives to improve the health status of all populations and places with a priority on eliminating health disparities and inequities.

Let's Get Healthy California

In 2012, Governor Jerry Brown issued an Executive Order establishing the Let's Get Healthy California Task Force (LGHC) to "develop a 10-year plan for improving the health of Californians, controlling health care costs, promoting personal responsibility for individual health, and advancing health equity."[6] The Task Force established priorities for preventing and managing chronic disease, which include the seven metrics identified by the AHA and described earlier in this report that support cardiovascular health: (1) meeting physical activity guidelines, (2) consuming a healthy diet (including fruit and vegetable consumption), (3) reducing tobacco use, (4) improving control of HTN, (5) improving control of high cholesterol, (6) reducing the prevalence of obesity, and (7) reducing the prevalence of diabetes.

Million Hearts®

Million Hearts® is a national, public–private initiative with the goal of preventing one million heart attacks and strokes in the United States by 2017.[25] The initiative aligns prevention and control efforts to improve health across communities by empowering Americans to make healthy choices and improving quality of care focused on the "ABCs" strategies: Aspirin for people at risk, Blood pressure control, Cholesterol management, and Smoking cessation.

In support of the Million Hearts® goal to prevent one million heart attacks and strokes by 2017, CDPH is committed to the following activities to increase the percentage of adults who can control their HTN and high cholesterol:

- Collaborate with state and local programs to promote healthy policies and environments that support healthful choices; access to quality, coordinated health systems; and equity in health and wellness through promotion, convening stakeholders, and providing education.
- Promote use of electronic health records with registry function, decision supports, and electronic reminders.
- Encourage appropriate use of aspirin and blood pressure control by promoting (1) team-based care and (2) the use of comprehensive medication management (CMM) between pharmacists and physicians to increase coordination between providers such as nurses, pharmacists, and community health workers for management of high blood pressure.
- Promote cholesterol management through nutrition education at the CDPH worksite and at the *Changing the Menu: Strategies for Healthy Eating and Sodium Reduction in California* statewide meeting.
- Increase smoking cessation by (1) promoting routine screening and treatment for nicotine dependence including referral to the California Smokers' Helpline (CSH) and (2) increasing health care provider referral rates to 50 percent of all callers who complete the CSH intake process.

Appendix: Methodology

Data Sources

California Health Interview Survey (CHIS)

The CHIS is a representative population-based, random-dial, cross-sectional health survey of non-institutionalized individuals in California and covers a wide range of health topics. The survey provides statewide information on the health and health needs of the overall population in California including many racial and ethnic groups. For the 2013-2014 CHIS, a total of 40,240 adults were surveyed. CHIS is designed to meet two sampling objectives: (1) provide estimates for 41 large and medium-size counties in California, and for groups of counties with the smallest populations; and (2) provide estimates for California's overall population, major racial and ethnic groups, and for several smaller ethnic subgroups. Sampling weights are applied to the data files and are based on the State of California's Department of Finance population estimates and projections with adjustment for populations not eligible to participate in CHIS (e.g., nursing homes, prisons). The resulting weighted estimates represent one year of California's residential population.[26]

Trends over time or comparisons with previous CHIS data (2001, 2003, 2005, 2007, or 2009) are not presented in this report. There are a number of cycle-specific methodological changes implemented in the 2011-2012 CHIS cycle that may impact the validity in comparing estimates over time.[27] Briefly, CHIS data collection was biennial from 2001-2009, with data collected during a 7-9 month period every other year. In 2011, CHIS changed to a continuous data collection cycle across a two-year period. The CHIS 2013-2014 data were collected between February 2013 and January 2015. Approximately half of the interviews were conducted during the 2013 calendar year and half during the 2014 calendar year. CHIS also updated their weighting based on the 2010 Census while previous CHIS cycles were based on projections based on the 2000 Census. Furthermore, a larger percentage of adult interviews (19 percent) were collected via cell phone, more than in years prior to 2011. Further information on the design and methodology of CHIS may be found on their website (http://healthpolicy.ucla.edu/chis/).

Behavioral Risk Factor Surveillance System (BRFSS)

BRFSS was established in 1984 by the CDC and is currently conducted in all 50 states and multiple territories. The California BRFSS has been conducted continuously since 1984 and provides an abundant source of information regarding health risk behaviors, attitudes, knowledge and beliefs, preventive health practices, and disease prevalence. The California BRFSS and its annual questionnaire development is a collaborative effort between the CDC, CDPH, the California Department of Social Services, and the California Department of Health Care Services.

The BRFSS is a random-digit dial telephone survey where data are collected yearly from non-institutionalized adults (18+ years of age) living in households with land line telephones. Once a household is identified, respondents are selected randomly from among all eligible adults. In 2014, interviews were conducted in English and Spanish. The age, race, and sex distribution of the sample does not completely match that of the California population because minorities are over-sampled to ensure they are represented in the survey. Therefore, the sample was weighted to the 2010 California Department of Finance population estimates to improve the representativeness of the sample. The final sample size of the 2014 California BRFSS was 8,832 adults.[28]

Due to changes in the methodology of BRFSS over the years, no trends using these data were presented. Prevalence rates from this report should not be compared to BRFSS rates from before 2012 due to changes in the weighted methodology.

California Death Statistical Master File

The California Death Statistical Master File was used for the leading causes of death analysis. The Center for Health Statistics and Informatics in CDPH compiles the Death Statistical Master File annually from death certificates of California residents. The death certificates contain the cause of death, coded using the International Classification of Diseases version 10 (ICD-10). The table below details the ICD-10 codes used to define each cause of death.

Cause of Death	ICD-10 codes
Cardiovascular Disease	I00-I99
Heart Disease	I00-I09, I11, I13, I20-I51
Coronary Heart Disease	I20-I25
Congestive Heart Failure	I50
Cancer	C00-C97
Injuries (Accidents, Suicide, Homicide)	U01-03, V01-Y09, Y85-Y86, Y87.0, Y87.1
Stroke	I60-I69
Chronic Lower Respiratory Disease	J40-J47
Alzheimer's Disease	G30
Diabetes	E10-E14
Influenza and Pneumonia	J09-J18
Chronic Liver Disease	K70, K73-K74
Essential Hypertension/Renal Disease	I10, I12, I15

California Office of Statewide Health Planning and Development Patient Discharge Data

The California Office of Statewide Health Planning and Development compiles administrative data on all patients discharged from non-Federal hospitals in California (Patient Discharge Data) annually. Only California residents were included in the calculation of hospitalization rates.

Patient Discharge Data contain the primary cause of hospitalization using the International Classification of Diseases version 9 (ICD-9). The table below details the ICD-9 codes used.

Cause of Hospitalization	ICD-9 codes
Myocardial Infarction (heart attack)	410
Congestive Heart Failure	428
Stroke	430-434, 436-438

California Department of Finance Population Data

Population data are from the California Department of Finance's Demographic Research Unit. The data files are: "Total Population Only by Age and Race/Ethnicity" that provides intercensal population estimates of single years in California for the years 2000-2009;[4] and "Total Population Only by Race/Hispanic and Age" that provides the 2010 Census population for year 2010 and population projections in California for year 2011 and beyond.[29]

Statistical Methods

Age adjustment

In this report, we age-adjusted using the direct method and the 2000 US Standard Population.[30] Age adjustment is a calculation that allows different populations to be directly compared. Age adjustment is necessary because diabetes prevalence and mortality rates increase with age. Without age adjustment, if a population with mostly young people is compared to a population with mostly old people, the diabetes rates would be much higher in the population with mostly old people. However, it would be impossible to tell if the diabetes rate was higher because of the age of the population or due to another factor. Age adjustment essentially *adjusts* the rates so that both populations have the same distribution of old and young people, making it easier to tell if there is another factor affecting the diabetes rates aside from age.

Confidence intervals

Data sources for this report include survey data (CHIS and BRFSS), death data, and hospital discharge data. Survey data are subject to sampling variation due to estimating a rate for an entire population.

Confidence intervals represent the precision of an estimate. Wide confidence intervals indicate that the true rate could fall anywhere in a wide range, and the measured value is subject to a large degree of random error. In contrast, narrow confidence intervals tell us that the true estimate falls inside a small range, and random error is less-likely to have affected the measured value. The number of individuals with the condition used to calculate the estimate directly correlates with the precision. If the estimate is based on a small number of individuals, the confidence interval will be wide. This report uses the 95 percent confidence interval

indicating our level of certainty. We are 95 percent confident that the true estimate falls within the given range.

Trend Analysis

To calculate annual percent change over time for morbidity and mortality rates, Joinpoint regression analysis was used.[31] This estimate provides a direction of the morbidity and mortality rate over the years of data in the analysis. Annual percent change is calculated using Joinpoint Trend Analysis Software, a program offered through the National Cancer Institute. Tests of significance use a Monte Carlo permutation method. Trends were considered statistically significant if the p-value for the difference from a trend of zero percent change was ≤0.05.

Unstable estimates

Estimates with a coefficient of variation ([standard error of the estimate/estimate]*100) ≥ 30 percent are considered unstable and should be interpreted as unreliable. An estimate is unstable if only a few respondents are represented with the specific characteristics and/or disease and (small numerator), thus, represented by a large standard error relative to the estimate.

References

1. Mozaffarian D, Benjamin EJ, Go AS, et. al. Heart disease and stroke statistics: 2016 update: a report from the American Heart Association. Circulation 2016; 133: e38–e360.
2. Centers for Disease Control and Prevention, National Center for Health Statistics. Underlying Cause of Death 1999-2014 on CDC WONDER Online Database, released 2015. Data are from the Multiple Cause of Death Files, 1999-2014, as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Accessed at http://wonder.cdc.gov/ucd-icd10.html on April 26, 2016.
3. Lloyd-Jones DM, Hong Y, Labarthe D, et. al. Defining and setting national goals for cardiovascular health promotion and disease reduction: the American Heart Association's strategic impact goal through 2020 and beyond. Circulation 2010; 121:586–613.
4. Yang Q, Cogswell ME, Flanders WD, et. al. Trends in cardiovascular health metrics and associations with all-cause mortality and CVD mortality among US adults. JAMA 2012; 307 (12): 1273–1283.
5. Brown PM, Gonzalez ME, Sandhu R, Conroy SM, Peck C, Nuñez de Ybarra JM. Economic Burden of Chronic Disease in California 2015. California Department of Public Health, 2014. Sacramento, California. Available at: http://www.cdph.ca.gov/programs/cdcb/Documents/CDPHEconomicBurdenCD2015California.pdf.
6. California Department of Health and Human Services Let's Get Healthy California Task Force. http://www.chhs.ca.gov/pages/LGHCTF.aspx. Accessed on October 15, 2015.
7. Nuñez de Ybarra JM, Weiss R, Pendleton J, Wittenberg R, Rousseve M, Van Court J, Logan J, Lewis M, Lee A, Conroy S, Maizlish N, Peck C. The California Wellness Plan, 2014. Sacramento, CA: California Department of Public Health, 2014. Available at: http://www.cdph.ca.gov/programs/cdcb/Documents/CDPH-CAWellnessPlan2014%20(Agency%20Approved).FINAL.2-27-14(Protected).pdf.
8. Holt JB, Huston SL, Heidari K, et. al. Indicators for chronic disease surveillance – United States, 2013. MMWR 2015; 64 (No. RR01): 1–15.
9. Centers for Disease Control and Prevention, Behavioral Risk Factor Surveillance System, http://www.cdc.gov/brfss/brfssprevalence/
10. Rhoads DA. Racial misclassification and disparities in cardiovascular disease among American Indians and Alaska Natives. Circulation 2005; 111:1250–1256.
11. Hall MJ, Levant S, DeFrances CJ. Hospitalization for congestive heart failure: United States, 2000-2010. NCHS Data Brief no. 108. Hyattsville, MD; National Center for Health Statistics. 2012.
12. Lackland DT, Roccella EJ, Deutsch AF, et.al. Factors influencing the decline in stroke mortality – a statement from the American Heart Association/American Stroke Association. Stroke 2014;45:315–353.

13. Centers for Disease Control and Prevention, National Center for Health Statistics, National Vital Statistics System. Deaths, percent of total deaths, and death rates for the 15 leading causes of death: United States and each state. LCWK_2013. Accessed online on October 20, 2015, at: http://www.cdc.gov/nchs/data/dvs/LCWK9_2013.pdf.
14. James PA, Oparil S, Carter BL, et. al. 2014 Evidence-based guideline for the management of high blood pressure in adults—report from the panel members appointed to the Eighth Joint National Committee (JNC8). JAMA 2014; 311(5):507–520.
15. The SPRINT Research Group. A Randomized Trial of Intensive versus Standard Blood-Pressure Control. NEJM 2015; 373:2103–16.
16. Nwankwo T, Yoon SS, Burt V, Gu Q. Hypertension among adults in the United States: National Health and Nutrition Examination Survey, 2011-2012. NCHS Data Brief No. 133. Hyattsville, MD: National Center for Health Statistics. 2013.
17. American Heart Association. Atherosclerosis. Accessed online on October 20, 2015, at: http://www.heart.org/HEARTORG/Conditions/Cholesterol/WhyCholesterolMatters/Atherosclerosis_UCM_305564_Article.jsp#.ViaBW43luUk.
18. American Diabetes Association. Position Statement: Diagnosis and Classification of Diabetes Mellitus. Diabetes Care 2004; 27 no. suppl; 1 s5–s10. Available at: http://care.diabetesjournals.org/content/27/suppl_1/s5.full.pdf+html.
19. US Department of Health and Human Services. The Health Consequences of Smoking: 50 years of Progress. A Report of the Surgeon General. Atlanta, GA: US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, 2014.
20. California Department of Public Health, Tobacco Control Program, California Tobacco Facts and Figures 2016, Sacramento, CA, 2015. Available at: http://www.cdph.ca.gov/programs/tobacco/Documents/CDPH%20CTCP%20Refresh/Research%20and%20Evaluation/Facts%20and%20Figures/FactsFigures2016-PrePrintEdition.pdf. Accessed on September 16, 2016.
21. US Department of Health and Human Services. 2008 Physical Activity Guidelines for Americans. Accessed online on October 20, 2015, at: http://health.gov/PAGuidelines/pdf/paguide.pdf.
22. http://www.cdph.ca.gov/programs/Documents/Accessible-CDPH_OHE_Disparity_Report_Final.pdf. Accessed online on October 14, 2016.
23. Gebreab SY, Davis SK, Symanzik S, et. al. Geographic Variations in Cardiovascular Health in the United States: Contributions of State and Individual-level Factors. J Am Heart Assoc 2015; 4(6):e001–673. Available at: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4599527/pdf/jah30004-e001673.pdf

24. http://www.cdph.ca.gov/programs/tobacco/Documents/Archived%20Files/Making%20a%20Difference%20012012.pdf. Accessed online on September 16, 2016.
25. http://millionhearts.hhs.gov/. Accessed online on November 30, 2015.
26. California Health Interview Survey. CHIS 2011–2012 Methodology Series: Report 1 - Sample Design. Los Angeles, CA: UCLA Center for Health Policy Research, 2014.
27. http://healthpolicy.ucla.edu/chis/design/Documents/whats-new-chis-2013-2014.pdf. Accessed online on April 25, 2016.
28. Bryant, S. M., Miguelino-Keasling, V., & Tomassilli, J. C. California Behavioral Risk Factor Surveillance System (BRFSS) SAS Dataset Documentation and Technical Report: 1984–2014. Public Health Survey Research Program, California State University, Sacramento, 2014.
29. State of California, Department of Finance, State and County Population Projections by Race/Ethnicity, Sex, and Age 2010-2060, Sacramento, California, December 2014. Available at: http://www.dof.ca.gov/research/demographic/projections/documents/Projections_Methodology_2014.pdf.
30. Klein RJ, Schoenborn CA. Age adjustment using the 2000 projected U.S. population. Healthy People Statistical Notes, no. 20. Hyattsville, Maryland: National Center for Health Statistics. January 2001.
31. Joinpoint Regression Program, Version 4.2.0 - April 2015; Statistical Methodology and Applications Branch, Surveillance Research Program, National Cancer Institute. Available at: http://surveillance.cancer.gov/joinpoint/.