Burden of Diabetes in California

California Department of Public Health
Chronic Disease Control Branch

June 2019

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TABLE OF CONTENTS

TABLE OF FIGURES

MESSAGE FROM THE CHRONIC DISEASE CONTROL BRANCH CHIEF

June 1, 2019

The estimated prevalence of prediabetes and diabetes among California adults has significantly increased since 2013, with higher rates among racial and ethnic minorities and older adults. In 2017, nearly 2.6 million California adults reported having type 2 diabetes, with 15.6 percent of adults estimated to have prediabetes; worsening trends include increases in prevalence of gestational diabetes. We also have geographic areas in California that have higher prevalence of diabetes. Finally, on average, medical expenditures for California adults with diabetes are 2.3 times more expensive than for those without diabetes and those who have diabetes are at higher risk of comorbidities and death.

As the California Department of Public Health, Center for Healthy Communities, Chronic Disease Control Branch works to combat chronic disease by addressing determinants of health, this Report illustrates how poverty, limited education, smoking and obesity are associated with higher prevalence of diabetes. Thus, it is vital for patients to have access to regular health care and treatment, including evidence-based lifestyle change programs, in order to limit complications and poor health outcomes. This includes the management and prevention of high blood sugar, high blood pressure and high blood cholesterol to reduce diabetes-related complications.

I invite you to review the Report and utilize the information to further our collaborative efforts to reduce the preventable disability and premature death from diabetes in California.

Sincerely,

Jessica Núñez de Ybarra, MD, MPH, FACPM, Chief
Chronic Disease Control Branch
California Department of Public Health

I. INTRODUCTION

Diabetes is the seventh leading cause of death in California, contributing to 9,592 deaths among adults in 2017.[1] In 2017, it was estimated that 3.1 million California adults were diagnosed with diabetes, representing approximately 1 out of every 9.3 California adults.[2] It was also estimated that 1 out of every 6.4 California adults were diagnosed with prediabetes.[2]

The *National Diabetes Statistics Report, 2017* from the Centers for Disease Control and Prevention (CDC) indicates that 30.3 million people, or 9.4 percent of the United States population, have some form of diabetes[3]—and many with type 2 diabetes do not know they have the disease. Additionally, it is estimated that 84 million people have prediabetes, an indicator of higher than normal blood sugar levels that increases the risk for developing type 2 diabetes, and approximately 90 percent of people do not know that they have prediabetes.[4]

II. DIABETES DEFINITIONS

Diabetes is a complex metabolic disorder in which the body is unable to produce insulin, or has a decreased ability to use insulin, or both. Diabetes is classified into four main types: type 1, type 2, gestational, and secondary or other specific types of diabetes. **Type 1 diabetes** is an autoimmune disease in which the insulin-producing pancreatic beta cells are destroyed by autoimmune attack, meaning the body is no longer able to produce insulin, resulting in severe hyperglycemia. **Type 2 diabetes** is caused by a combination of insulin resistance (largely due to obesity) and relative insulin insufficiency. **Gestational diabetes** is a form of glucose intolerance that occurs during pregnancy among women who have never been diagnosed with diabetes prior to pregnancy. **Other types of diabetes** result from specific genetic conditions (such as maturity-onset diabetes of youth), surgery, medications, infections, pancreatic disease, and other illnesses.[5] **Prediabetes** (also called impaired glucose tolerance) is a condition in which blood sugar levels are higher than normal, but not high enough to be diagnosed as type 2 diabetes. Type 2 diabetes is the most common form of diabetes,[3] accounting for 90 to 95 percent of all diabetes cases. Type 1 diabetes accounts for about 5 percent of all diabetes cases,[6] and other types of diabetes account for less than 5 percent of all diagnosed cases. When the body cannot use or produce insulin properly hyperglycemia, or high blood glucose, occurs.[7] Uncontrolled hyperglycemia can lead to diabetes-related disabilities such as blindness, nerve damage, amputations, and kidney failure.[8]

Type 1 diabetes is most often diagnosed in children and young adults, but it can occur at any age. Insulin resistance typically characteristic of type 2 diabetes can also co-occur with type 1 diabetes.[9] There is no known way to prevent type 1 diabetes, and the only treatment is lifelong use of insulin.

Unlike type 1 diabetes, type 2 diabetes can be prevented. Awareness of risk factors for type 2 diabetes, which include older age, race/ethnicity, personal history of prediabetes or gestational diabetes, a family history of type 2 diabetes, or obesity and physical inactivity is necessary to be able to take action and delay development of the disease.[2][10] Nationally, diabetes rates vary

by race and ethnicity, with American Indian/Alaska Native, African American, Hispanic/Latino, and Asian/Pacific Islander adults about twice as likely as white adults to have type 2 diabetes.[11] Type 2 diabetes can be controlled through healthy food choices, physical activity, and weight loss, but insulin or oral medication may also be necessary.

Gestational diabetes occurs more often in African American, Hispanic/Latino, and American Indian/Alaska Native women, as well as in women who are obese or have a family history of type 2 diabetes.[10] Insulin may be required to bring maternal blood glucose to normal levels and avoid complications in the infant.[12] Evidence suggests that women who experience gestational diabetes, and their children, are more likely to develop type 2 diabetes later in life.[10]

People with prediabetes are at high risk of developing type 2 diabetes, as well as heart disease and stroke.[4] Studies have shown that people with prediabetes who lose weight and increase their physical activity can bring blood sugar levels back to normal and may prevent type 2 diabetes from developing.[4]

Because gestational diabetes can only develop in women during the course of a pregnancy, in order to better estimate the burden of diabetes in California, in this report the term **diabetes** refers to California adults reporting all types of diabetes except gestational diabetes.

III. DATA SOURCES

Several data sources were used in this report to calculate diabetes prevalence and hospitalization estimates. The California Health Interview Survey[13] (CHIS) and the California Behavioral Risk Factor Surveillance System Survey[14] (BRFSS) were used to estimate the prevalence of diabetes and other chronic disease conditions and their associated risk factors. These surveys are both representative population-based, random-dial, cross-sectional surveys of non-institutionalized individuals in California. Because of their cross-sectional nature, results from these surveys cannot be used to assess the directionality of disease and associated risk factors.

The California Office of Statewide Health Planning and Development (OSHPD) dataset of patients discharged from non-federal hospitals in California[15] was used to estimate hospitalizations for gestational diabetes and for diabetes-related complications.

ICD-9-CM (for years through 2015) and ICD-10-CM (for years including and after 2015) codes were used to determine the cause of hospitalizations. California Vital Statistics Death Statistical Master Files[16] were used to estimate trends in diabetes mortality rates; ICD-10 codes were used to define diabetes deaths. For a more detailed description of all data sources, see the Appendix.

IV. BURDEN OF DIABETES AND PREDIABETES IN CALIFORNIA

Prevalence of Diabetes

- The estimated prevalence of diabetes among California adults significantly increased from 8.7 percent in 2013 to 10.7 percent in 2017 ($p < 0.05$).
- In 2017, nearly 2.6 million California adults reported having type 2 diabetes, accounting for 83.0 percent of diabetes cases among California adults.
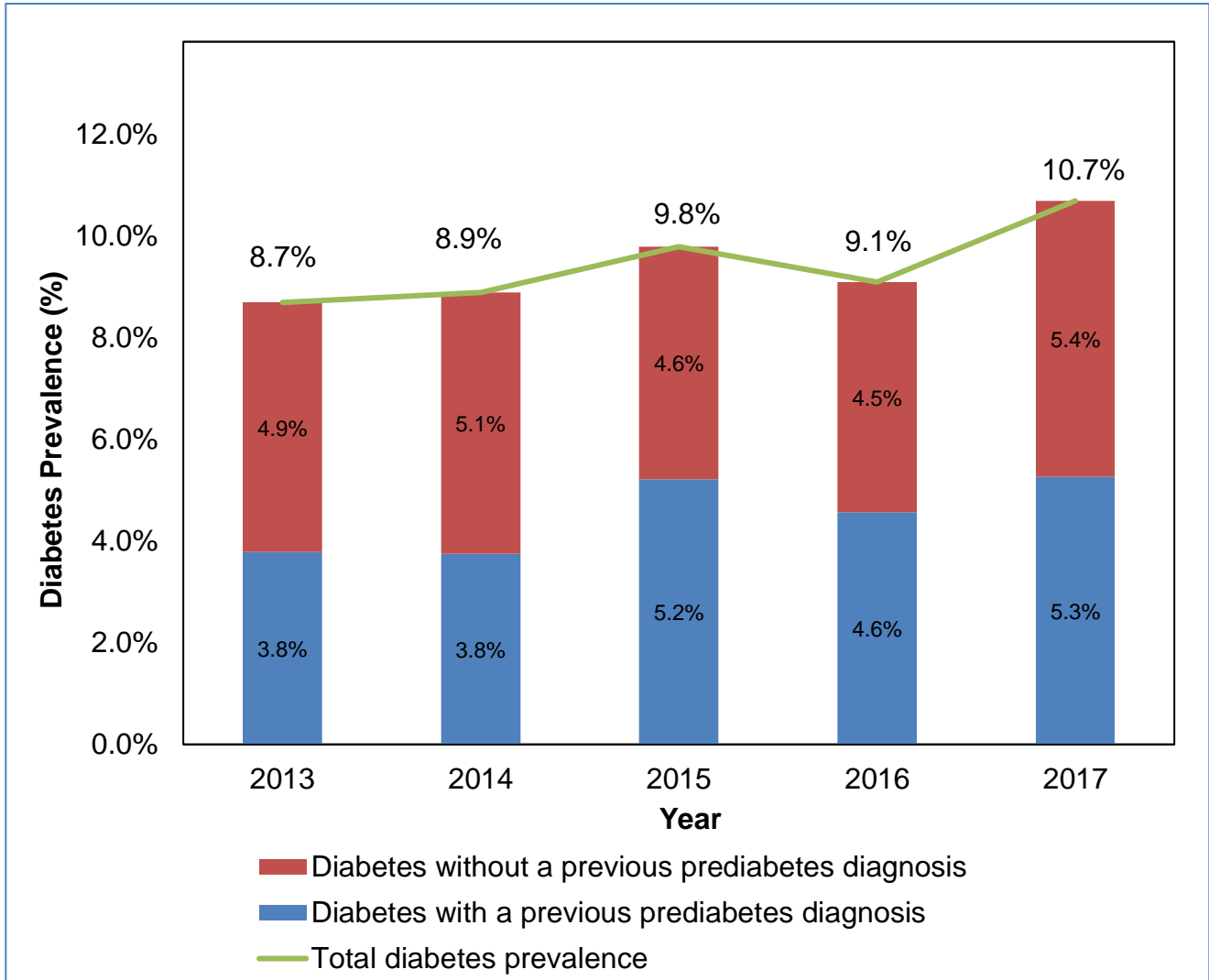
Figure 1. Estimated prevalence of diabetes among those with or without a previous prediabetes diagnosis, 2013-2017

Source: CHIS, 2013-2017 Adult Survey.[13]

Estimated Prevalence of Type 2 Diabetes by County in California

- In 2017, the age-adjusted prevalence of type 2 diabetes among California adults was 8.3 percent.
- The prevalence of type 2 diabetes ranged from 3.8 percent to 13.6 percent across California's counties, with the highest age-adjusted prevalence of type 2 diabetes in San Bernardino County.
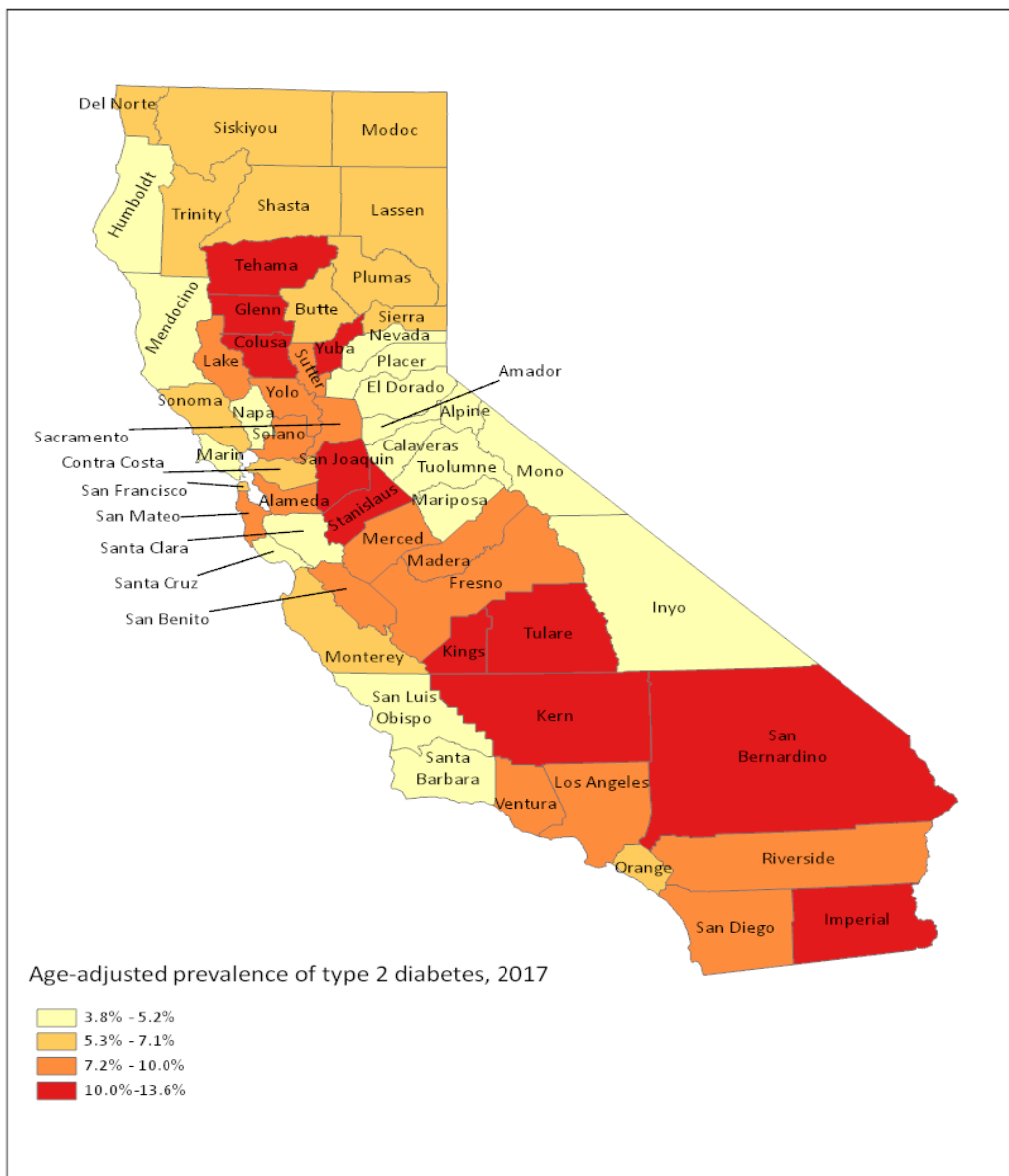
Figure 2. Estimated age-adjusted prevalence of type 2 diabetes in California by county, 2017

Source: CHIS, 2017 Adult Survey.2 See Appendix Table 4 for the estimated prevalence of type 2 diabetes by county in 2017.

Prevalence of Prediabetes

- The estimated prevalence of prediabetes among all California adults significantly increased from 10.1 percent in 2013 to 15.6 percent in 2017 ($p < 0.05$).
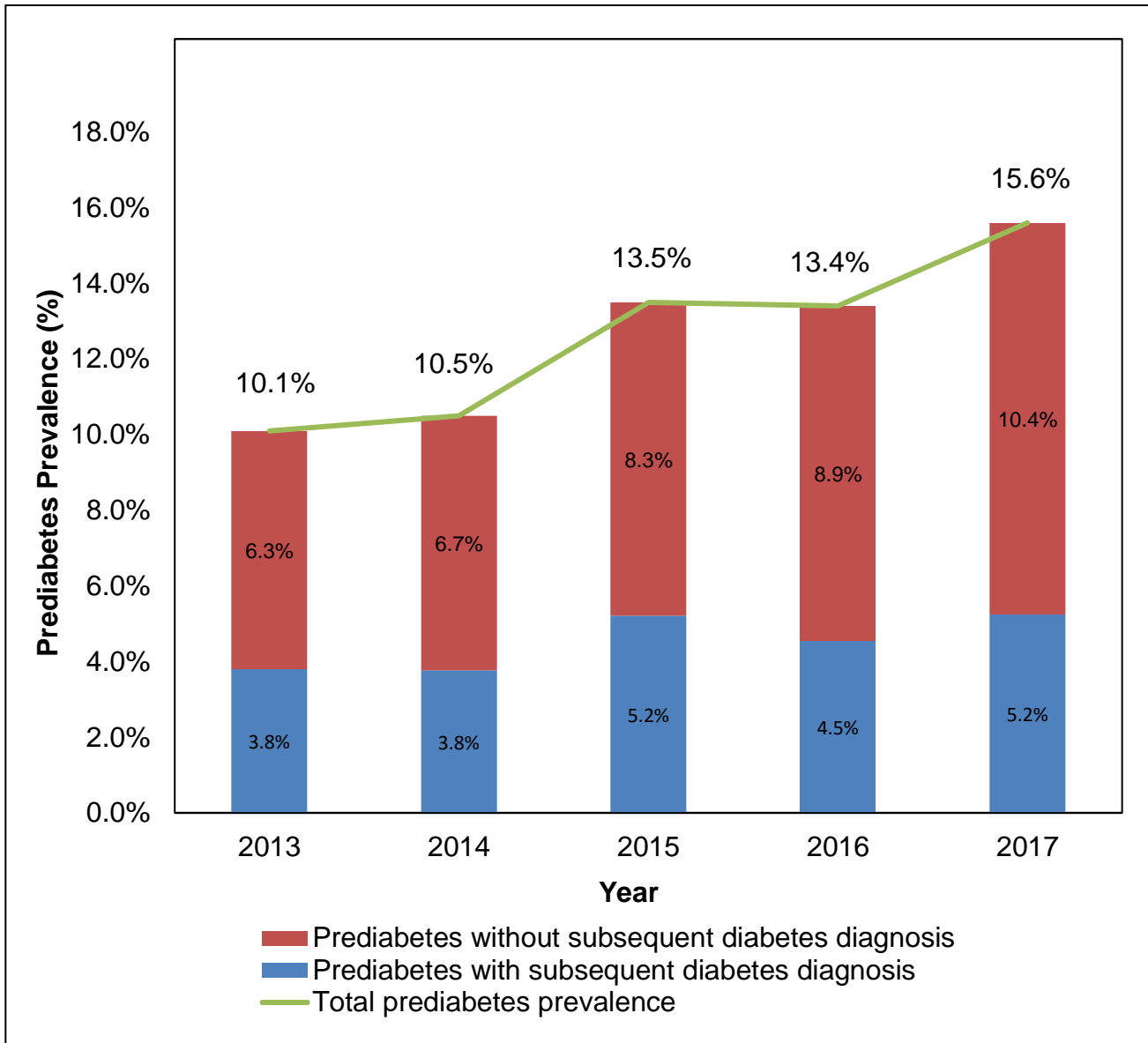
Figure 3. Estimated prevalence of prediabetes among those with and without a subsequent diabetes diagnosis, 2013-2017

Source: CHIS, 2013-2017 Adult Survey.[13]

Estimated Prevalence of Prediabetes by County in California

- In 2017, the age-adjusted prevalence of prediabetes among California's adults was 14.9 percent.
- The prevalence of prediabetes ranged from 3.9 percent to 24.6 percent, with the highest age-adjusted prevalence of prediabetes in Imperial County.
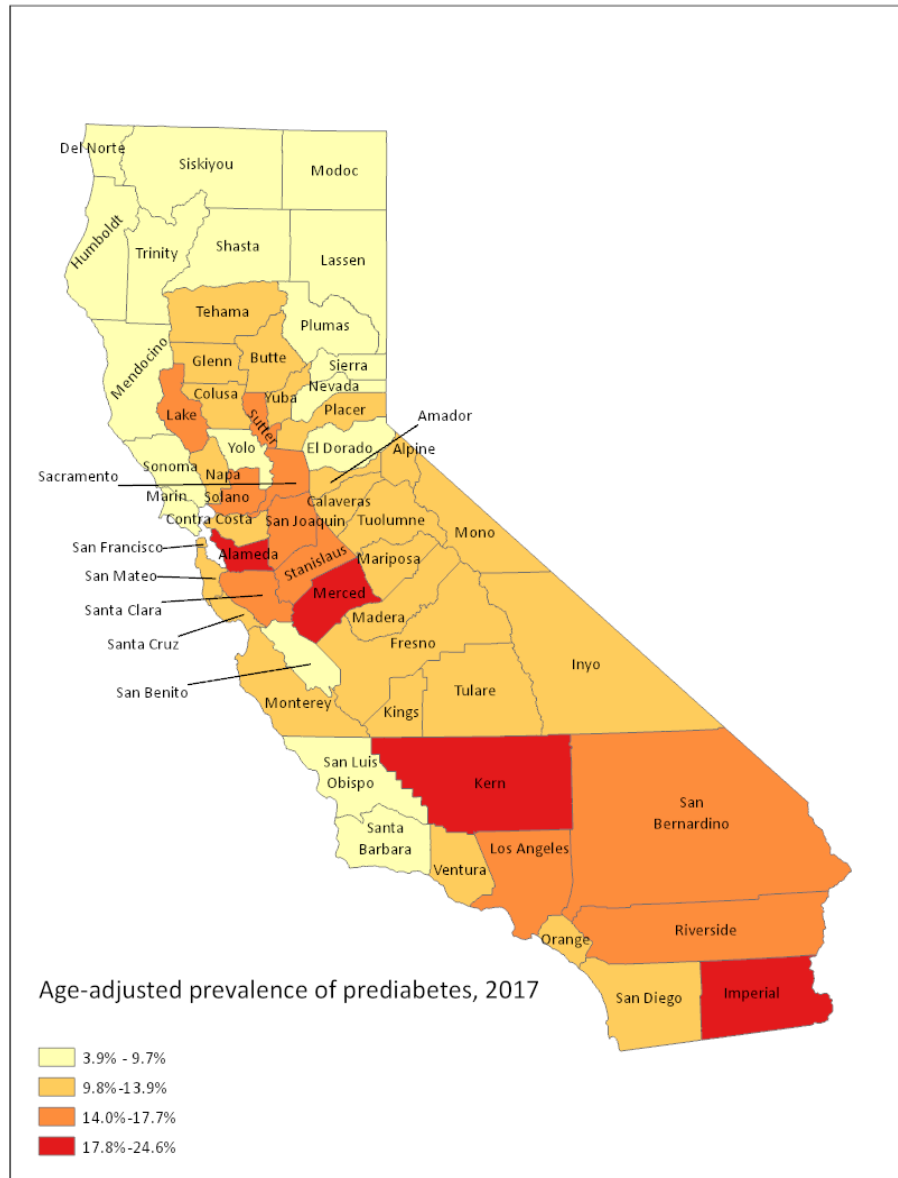
Figure 4. Estimated age-adjusted prevalence of prediabetes in California by county, 2017

Source: CHIS, 2017 Adult Survey.[2] See Appendix Table 4 for prediabetes prevalence estimates among all California adults by county in 2017.

Prevalence of Gestational Diabetes

- The estimated prevalence of gestational diabetes among resident California women hospitalized for labor and delivery increased from 5.7 percent in 2004 to 9.4 percent in 2015.
- Women who experience gestational diabetes are at increased risk of developing type 2 diabetes later in life.[10]
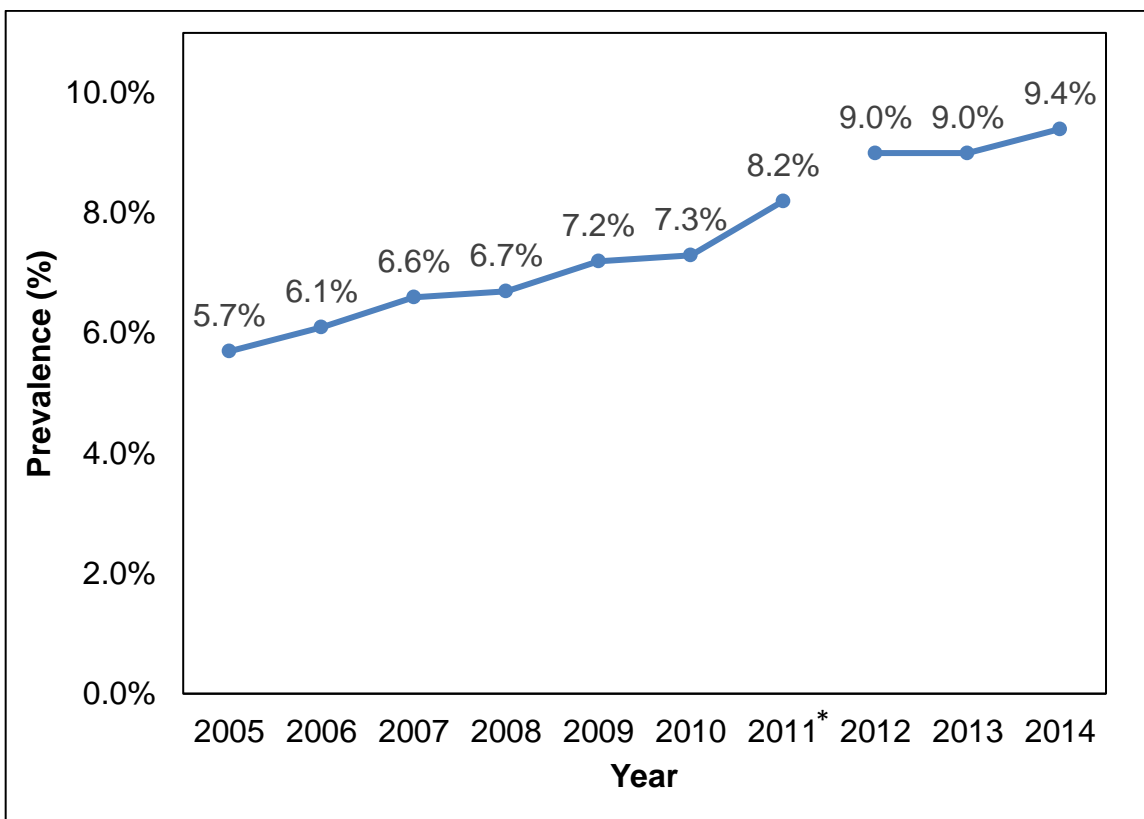
Figure 5. Estimated prevalence of resident California women hospitalized for labor and delivery with gestational diabetes mellitus, 2005-2014

* The recommendations for diagnosing gestational diabetes were revised starting January 2011.
Source: California Office of Statewide Health Planning and Development, 2005-2014 Patient Discharge Data.[15]
Numerator: Gestational diabetes defined by ICD-9 CM code 648.8
Denominator: Number of women with a labor/delivery diagnosis
Analysis prepared by: Center for Family Health/Maternal, Child and Adolescent Health Program/Epidemiology, Surveillance and Federal Reporting.

Prevalence of Diabetes, Prediabetes, and Type 2 Diabetes Among California Adults by Selected Socio-Demographic Characteristics

- The estimated prevalence of diabetes, prediabetes, and type 2 diabetes increased with age. Adults 65 years and older self-reported the highest prevalence of diabetes.
- The estimated prevalence of diabetes, prediabetes, and type 2 diabetes was higher among racial/ethnic minorities compared to non-Hispanic Whites.
- The prevalence of diabetes, prediabetes, and type 2 diabetes was slightly higher among males than females.
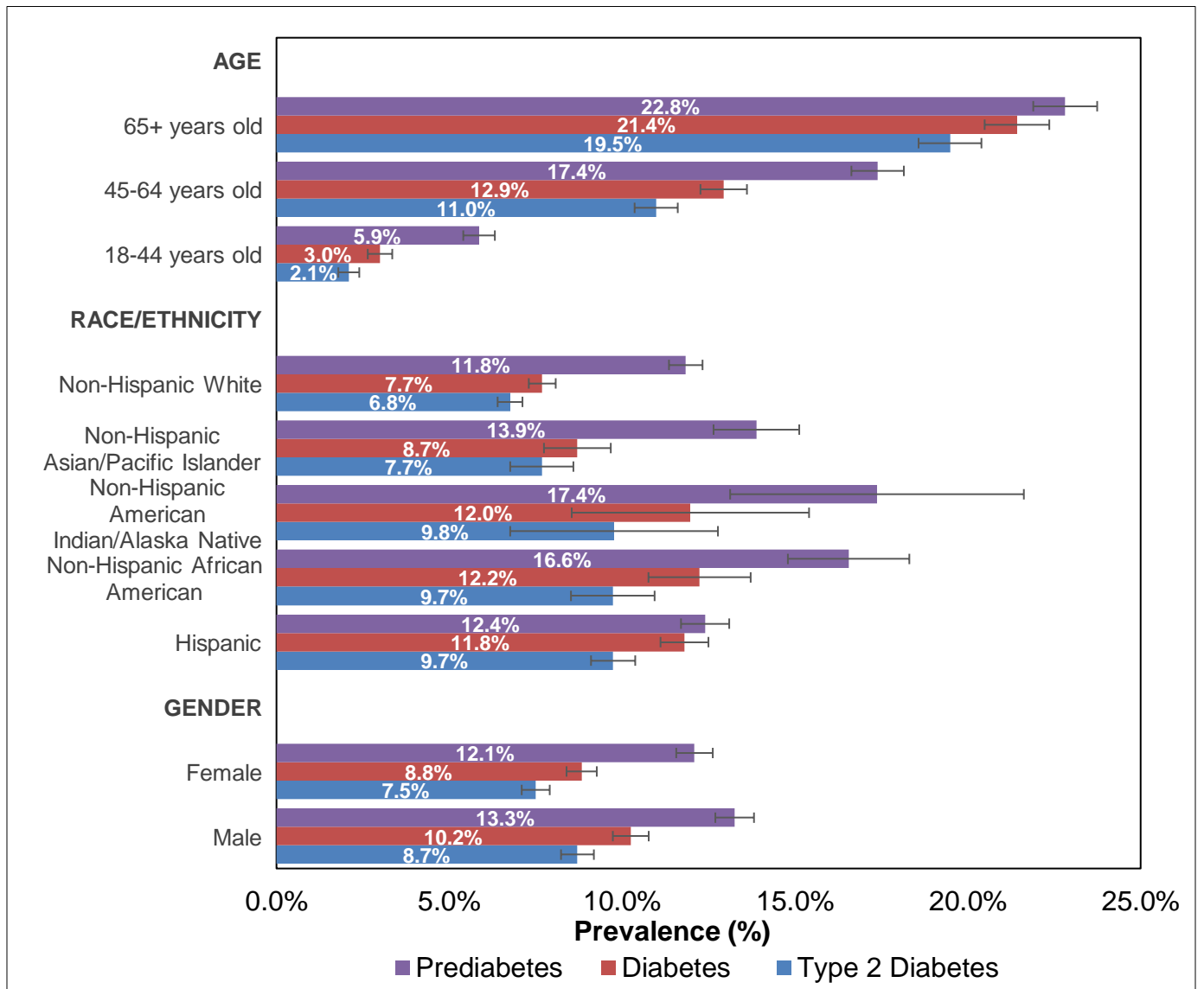
Figure 6. Estimated prevalence of diabetes, prediabetes, and type 2 diabetes among California adults by age, race/ethnicity, and gender, 2013-2017

Source: CHIS, 2013-2017 Adult Survey.[13]

- The estimated prevalence of type 2 diabetes among California adults with a family income below 200 percent of the federal poverty level was 21.7 percent compared to 6.0 percent among California adults with an income of 300 percent or more above the federal poverty level.
- The prevalence of type 2 diabetes was 14.2 percent among those with less than a high school diploma, compared to 5.7 percent among those with a college degree or higher.
- In contrast, the prevalence of prediabetes was comparable across income and education levels.
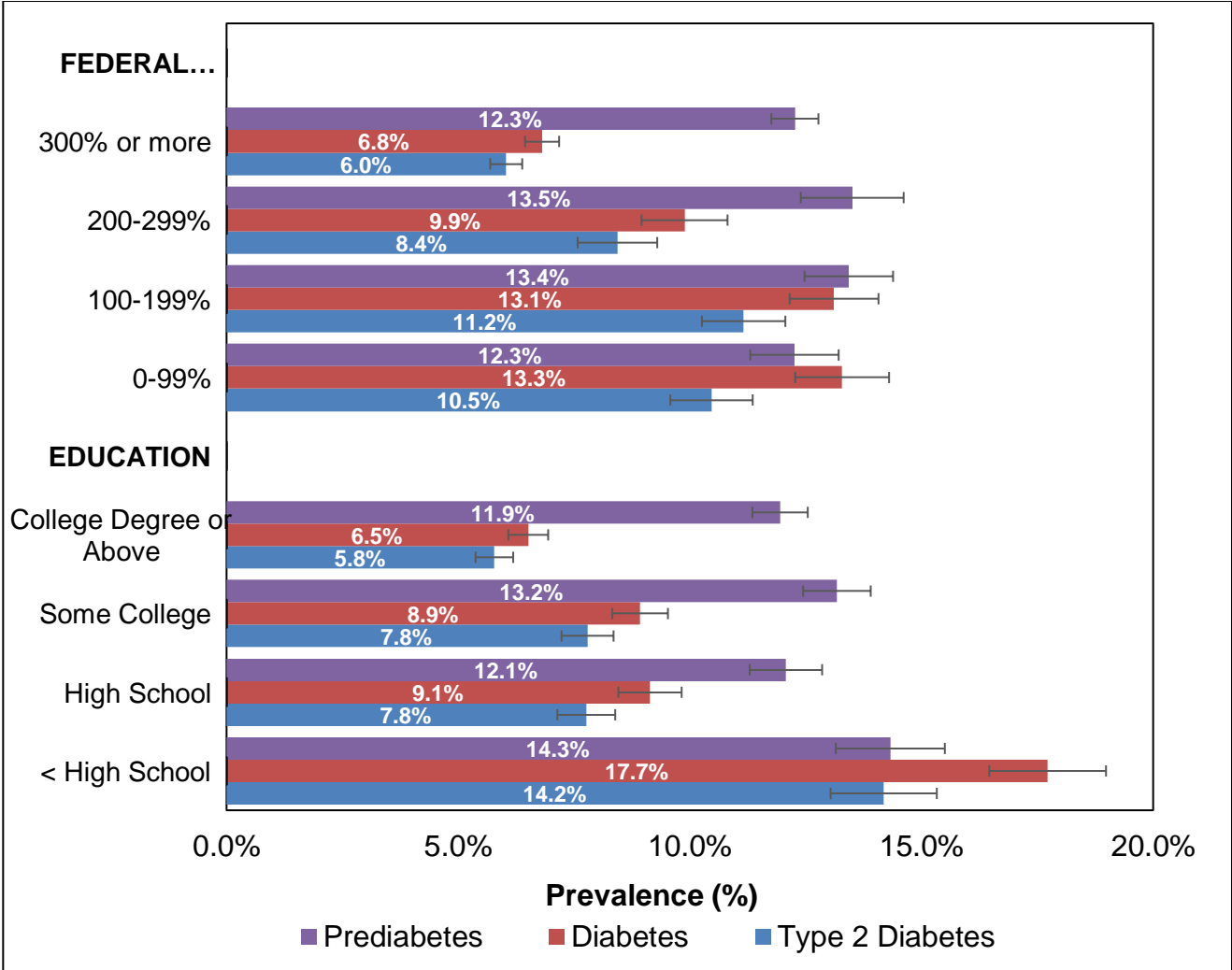
Figure 7. Estimated prevalence of diabetes, prediabetes, and type 2 diabetes among California adults by education and federal poverty levels, 2013-2017

Source: CHIS, 2013-2017 Adult Survey.[13]

Prevalence of Diabetes, Prediabetes, and Type 2 Diabetes by Selected Risk Factors

- The estimated prevalence of type 2 diabetes was higher among overweight and obese California adults compared to adults with a normal body mass index, with the highest prevalence was among obese adults (14.9 percent).
- Prior smoking is a risk factor for developing type 2 diabetes.[17] The estimated prevalence of type 2 diabetes was highest among former smokers (12.6 percent) followed by current smokers (7.2 percent).
- The estimated prevalence of prediabetes was highest among obese adults (21.8 percent) and among former smokers (17.9 percent).
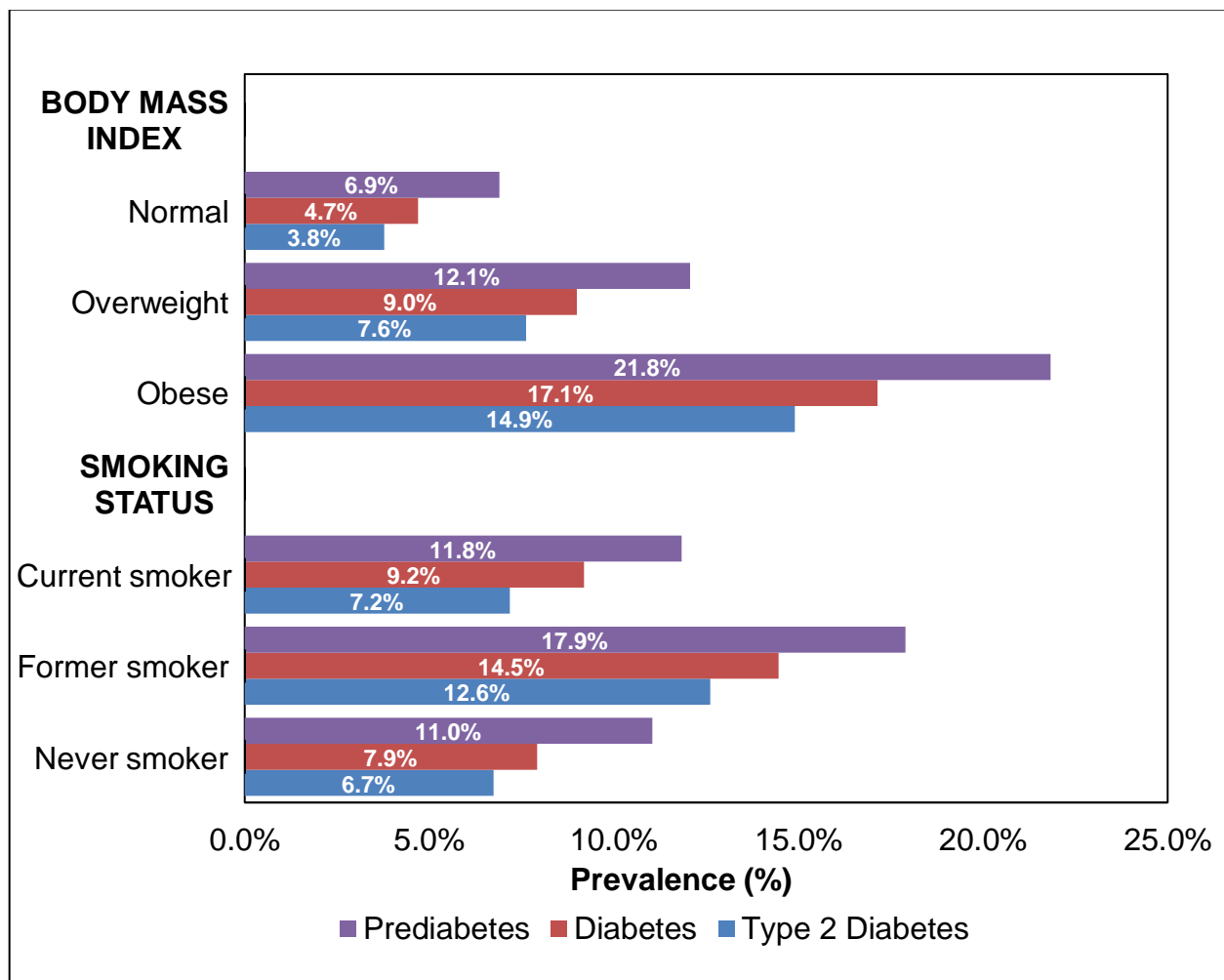
Figure 8. Estimated prevalence of diabetes, prediabetes, and type 2 diabetes by body mass index and cigarette smoking status, 2013-2017

Source: CHIS 2013-2017 Adult Survey.[13] Smoking status refers to California adults reporting that they currently (at time of interview) smoke cigarettes, were former cigarette smokers, or never smoked cigarettes.

Summary of Diabetes Burden in California

The estimated burden of diabetes, prediabetes, and gestational diabetes among California adults has continued to increase from 2012 through 2017. This burden varies by county, racial/ethnic groups, age, and gender, which is consistent with the national burden of diabetes.[3] The percentage of California adults reporting they were ever told they had prediabetes and also reporting that they had diabetes increased from 43.6 percent in 2013 to 49.2 percent in 2017.[18]

V. DIABETES COMORBIDITIES

- Individuals diagnosed with diabetes or prediabetes are at risk of comorbidities such as cardiovascular disease, hypertension, high blood cholesterol, and arthritis. Therefore, management of diabetes is also important for the prevention of cardiovascular disease.[19]
- Although diabetes and hypertension can be managed by incorporating lifestyle interventions (e.g., physical activity, weight control, and healthy food choices) into daily routines, arthritis may make these activities more challenging.
- The estimated prevalence of heart disease, hypertension, high cholesterol, and arthritis were significantly higher among California adults with diabetes compared to those without diabetes ($p < 0.05$).
- Similarly, the estimated prevalence of heart disease, hypertension, high cholesterol, and arthritis were significantly higher among California adults with prediabetes compared to those without diabetes ($p < 0.05$).
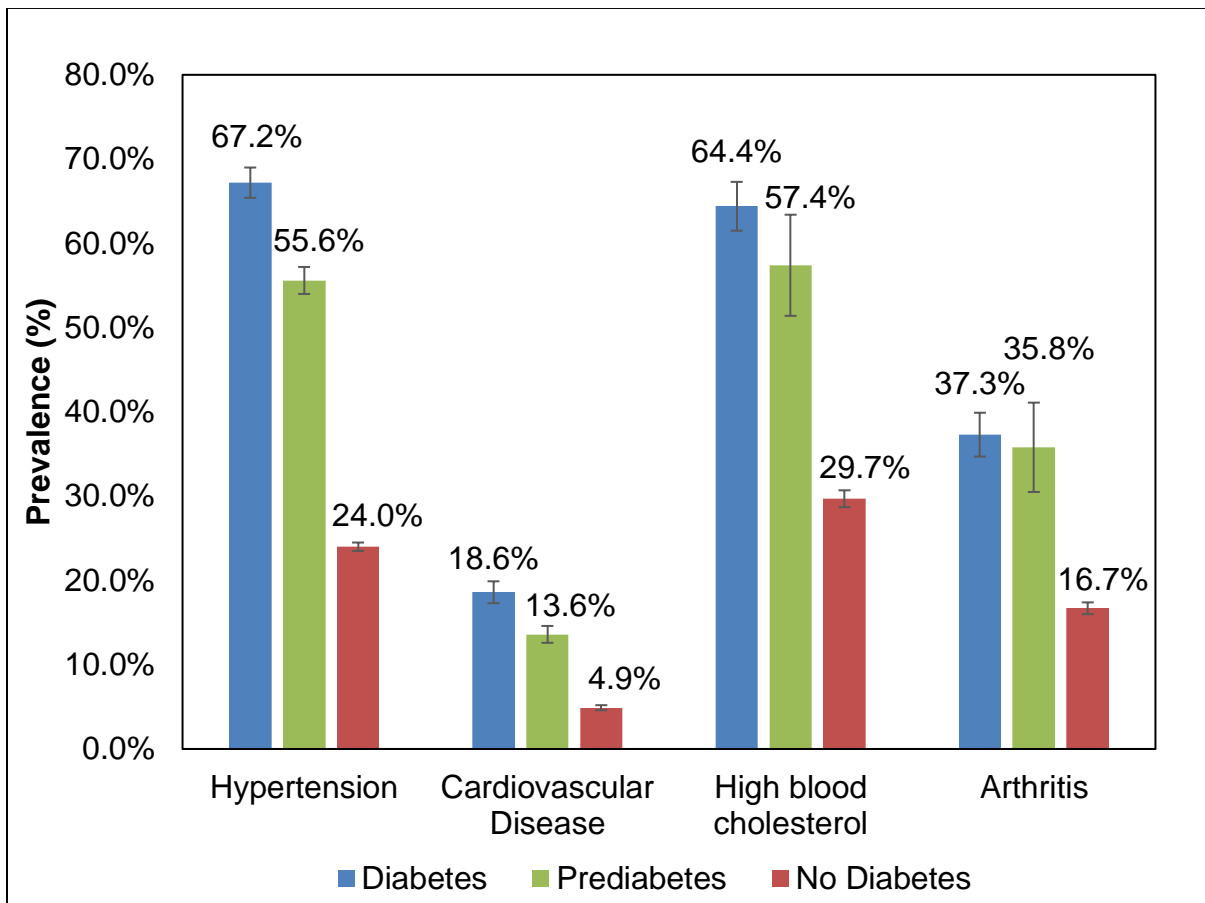
Figure 9. Estimated prevalence of hypertension, cardiovascular disease, high cholesterol, and arthritis among California adults with diabetes, prediabetes, and without diabetes, 2013-2017

Source: CHIS, 2013-2017 Adult Survey[13] (hypertension and cardiovascular disease data) and CA BRFSS, 2015 Adult Survey[14] (high blood cholesterol and arthritis data).

- Across all age, gender or racial/ethnic categories, California adults with diabetes had a higher prevalence of hypertension, cardiovascular disease, high blood cholesterol, and arthritis than California adults with prediabetes or without diabetes (see Table 1).
- Males had a higher prevalence of hypertension, cardiovascular disease, high blood cholesterol and arthritis compared to females, regardless of whether they were diabetic, prediabetic or had no diabetes (see Table 1).
- Among those with diabetes, the prevalence of hypertension was highest among Non-Hispanic African Americans and the prevalence of cardiovascular disease was highest among Non-Hispanic Native Americans/Alaska Natives in 2017 (see Table 1).
- Across all ages, gender, and racial/ethnic groups, California adults without diabetes were more likely to be uninsured or not have a source of medical care than California adults with diabetes or prediabetes (see Table 2).

Table 1. Estimated prevalence of other chronic conditions among California adult population with diabetes, prediabetes, and without diabetes, by age, gender, and race/ethnicity, 2013-2017

Other Chronic Disease	Total CA (%)	Age 18-44 (%)	Age 45-64 (%)	Age 65+ (%)	Male (%)	Female (%)	Hispanic (%)	Non-Hispanic White (%)	Non-Hispanic African American (%)	Non-Hispanic Asian/Pacific Islander (%)	Non-Hispanic Native American/Alaska Native (%)
Hypertension[13]											
Diabetes	67.2	52.2	63.9	77.0	69.3	64.9	64.1	69.0	80.4	64.8	72.9
Prediabetes	55.6	35.3	55.6	70.4	59.1	52.0	52.3	59.6	67.0	48.0	57.5
No Diabetes	24.0	11.5	31.1	54.8	25.3	23.5	20.3	28.0	34.2	19.2	31.3
Cardiovascular Disease[13]											
Diabetes	18.6	8.0	14.6	27.4	19.8	17.2	14.0	25.0	18.0	16.9	34.5
Prediabetes	13.6	4.6	10.8	24.3	15.3	11.9	9.7	18.1	12.2	11.7	20.0
No Diabetes	4.9	1.3	4.9	17.2	5.5	4.4	2.9	7.1	4.3	3.2	9.0
High Blood Cholesterol[14]											
Diabetes	64.4	47.5	70.6	62.6	63.7	65.2	63.0	67.0	66.1	61.2	59.1
Prediabetes	57.4	37.4	60.8	65.1	57.9	57.0	47.3	56.6	60.2	74.0	94.2
No Diabetes	29.7	17.7	36.5	48.7	31.5	27.9	26.8	32.6	28.9	26.0	19.5
Arthritis[14]											
Diabetes	37.3	14.7	36.3	49.5	32.0	42.7	27.2	48.3	44.7	27.0	50.0
Prediabetes	35.8	8.8	37.8	52.6	31.8	38.7	25.3	48.6	38.7	20.3	91.3
No Diabetes	16.7	5.3	23.9	47.9	12.9	20.6	10.8	22.9	19.9	7.4	28.2

Source: CHIS 2013-2017 Adult Survey[13] and CA BRFSS, 2015 Adult Survey [14] ** indicates unstable estimates due to small sample size.

Table 2. Estimated prevalence of insurance coverage among California adult population with diabetes, prediabetes, and without diabetes, by age, gender, and race/ethnicity, 2013-2017

Insurance Status	Total CA (%)	Age 18-44 (%)	Age 45-64 (%)	Age 65+ (%)	Male (%)	Female (%)	Hispanic (%)	Non-Hispanic White (%)	Non-Hispanic African American (%)	Non-Hispanic Asian/Pacific Islander (%)	Non-Hispanic Native American/ Alaska Native (%)
Private											
Diabetes	28.6	38.1	47.2	3.3	30.4	26.6	26.3	28.7	23.2	38.5	21.5
Prediabetes	41.2	50.3	62.6	3.5	43.2	39.1	37.8	39.7	32.9	58.1	32.9
No Diabetes	52.4	56.6	68.1	4.3	54.0	50.9	40.4	58.4	46.8	64.8	43.8
Medicare only											
Diabetes	3.6	0.4**	2.0	6.8	4.3	2.9	2.7	4.7	2.9	4.2	7.3
Prediabetes	2.6	0.1**	1.5	6.1	3.1	2.1	1.8	3.7	2.7	1.6**	3.7**
No Diabetes	1.6	0.1	1.2	7.5	1.5	1.7	0.8	2.4	1.4	0.9	1.5
Medicaid only											
Diabetes	20.1	38.9	29.5	1.9	17.1	23.5	28.0	11.2	20.2	16.6	18.4
Prediabetes	17.5	34.2	20.5	1.0	13.9	21.2	26.4	9.7	24.2	12.9	21.4
No Diabetes	17.7	24.4	14.8	0.9	15.2	20.1	28.6	9.4	24.0	14.1	21.9
Uninsured											
Diabetes	7.6	18.7	9.8	0.7	8.5	6.6	12.3	3.3	5.8	4.9	5.3
Prediabetes	5.8	10.8	7.2	0.2**	6.0	5.6	10.5	3.2	4.9	2.6	6.1**
No Diabetes	12.4	16.2	11.6	0.9	15.2	9.8	21.8	6.5	9.6	9.1	11.6
No Usual Source of Care											
Diabetes	8.9	17.0	8.8	5.9	10.6	7.0	14.9	3.4	4.0	6.2	4.5**
Prediabetes	7.0	13.0	6.0	4.1	7.7	6.2	11.5	3.3	5.5	6.8	6.9**
No Diabetes	16.0	22.1	11.0	5.4	20.5	11.8	23.1	10.0	13.9	18.0	13.8

Source: CHIS, 2013-2017 Adult Survey.[13] ** indicates unstable estimates due to small sample size.

Summary of Diabetes Comorbidities

Currently, cardiovascular disease and diabetes are among the top ten leading causes of death in California and nationally, and the risk of developing these diseases is disproportionately shared among certain racial/ethnic groups and among various sociodemographic factors. The figures and tables on the proceeding pages show that, compared to California adults without diabetes, California adults with diabetes self-reported a higher prevalence of hypertension, cardiovascular disease, high blood cholesterol, and arthritis during 2013-2017. This trend was consistent by age, gender, and racial/ethnic groups. Because these conditions often arise as comorbidities of diabetes, the California Department of Public Health (CDPH) recommends prevention and management of hypertension, cardiovascular health, high blood cholesterol, and arthritis in an effort to improve and reduce diabetes-related complications.

VI. DIABETES COMPLICATIONS AND HEALTHCARE USE

End Stage Renal Disease (ESRD)

- ESRD is the most advanced stage of chronic kidney disease, in which the kidneys permanently fail to work. The only treatment options for ESRD are dialysis or kidney transplant. In the United States, one-third of adults with diabetes also have chronic kidney disease.[20]
- ESRD can be prevented through management of diabetes and hypertension, including lifestyle modifications and appropriate medications.[20]
- The estimated prevalence of ESRD in California fluctuated between 2006 and 2016, with an estimated 1,909 per million in 2016.[21]
- Figure 10 shows that in 2016, the prevalence of ESRD-related hospitalizations was 241 per 100,000 diabetes hospitalizations.
- Figure 10 shows that diabetes-related ESRD hospitalizations declined by more than 55 percent, from 539 cases in 2006 to 241 cases in 2016 per 100,000 diabetes-related hospitalizations.
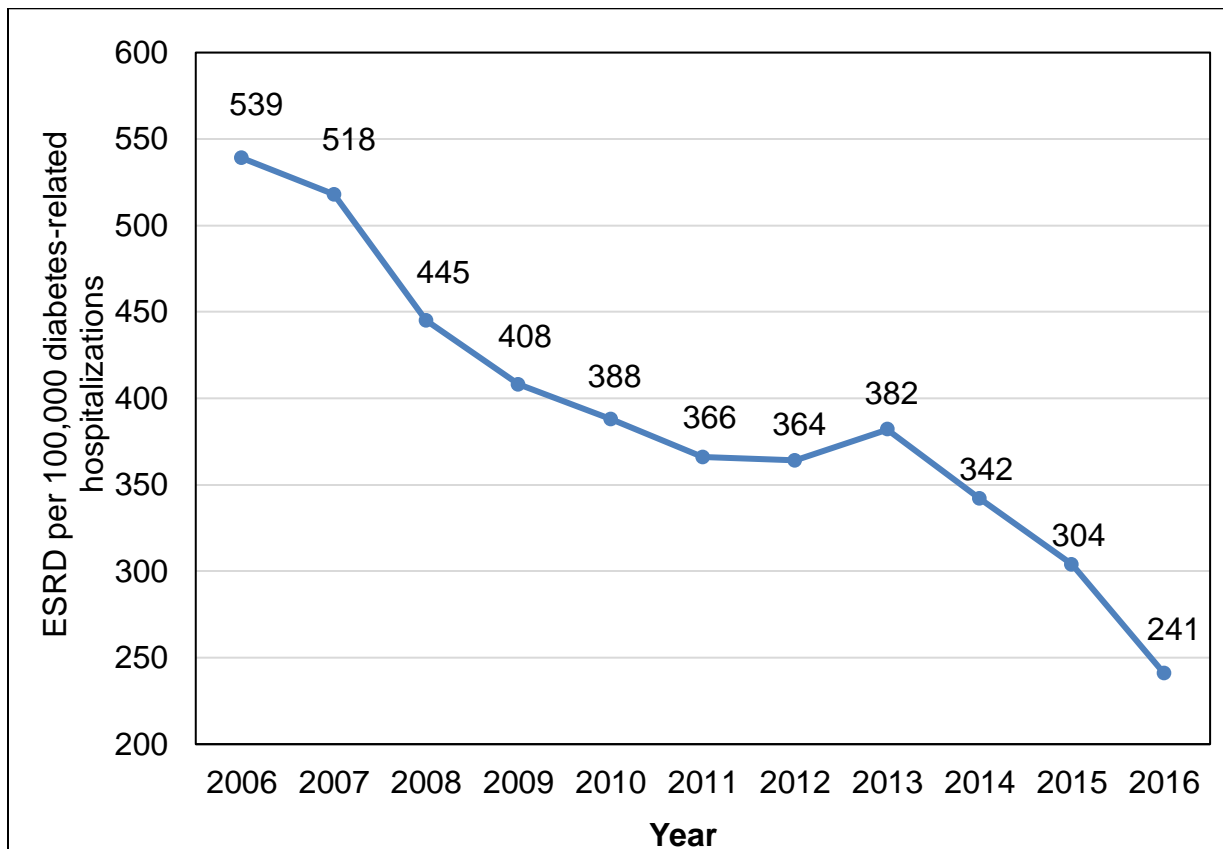
Figure 10. Estimated prevalence of diabetes-related ESRD per 100,000 adult diabetes hospitalizations, 2006-2016

Source: OSHPD, 2006-2016 Patient Discharge Data.[15]

Ophthalmic Complications

- Individuals with diabetes are at risk of ophthalmic (eye) complications, such as diabetic retinopathy and blindness. Comorbidities such as hypertension are also linked to developing retinopathy.[22]
- In the United States, an estimated 40-45 percent of people with diabetes have some stage of diabetic retinopathy.[23]
- However, early detection can occur through routine eye exam screenings. In 2010, 62.8 percent of adults with diabetes indicated that they had their eyes dilated and examined in the past year.[24]
- Treatment of diabetic retinopathy can include careful management of blood glucose and blood pressure levels, medication, and sometimes surgery.[25]
- Figure 11 shows that the rate of diabetes-related ophthalmic hospitalizations in California decreased to less than a third from 32 cases in 2006 to 10 cases in 2016 per 100,000 diabetes-related hospitalizations.
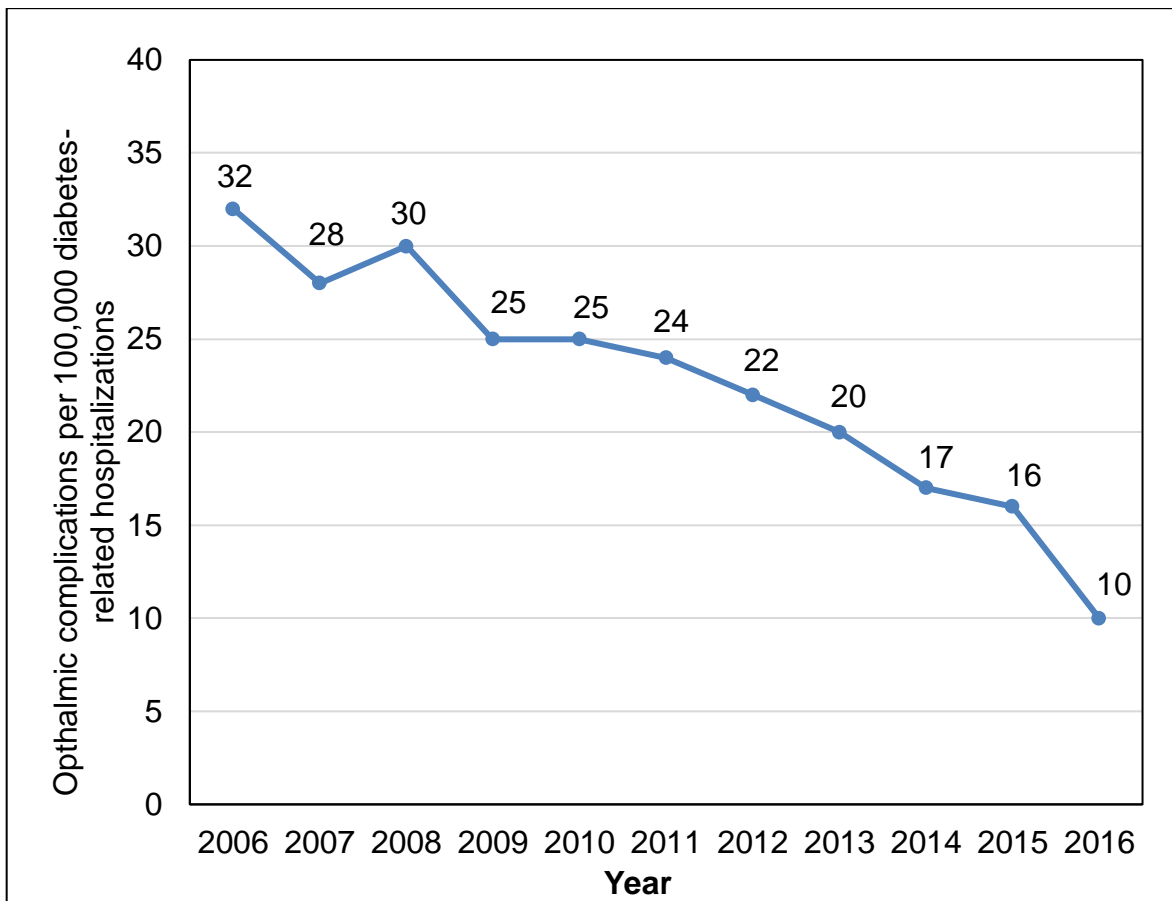
Figure 11. Estimated prevalence of diabetes-related ophthalmic hospitalizations per 100,000 adult diabetes hospitalizations, 2006-2016

Source: OSHPD, 2006-2016 Patient Discharge Data.[15]

Lower Extremity Amputations

- Chronic hyperglycemia (high blood glucose) causes changes in cell function, which can eventually progress to nerve damage known as diabetic neuropathy. This cellular damage can also contribute to the development of foot ulcers or infections that may require lower extremity amputations.[26] Nationally, diabetes is the leading cause of lower extremity amputations, with an estimated 60 percent of all non-traumatic lower-limb amputations occurring among people with diabetes.[27]
- Diabetes-related amputations can be prevented by managing and controlling glucose and cholesterol levels, blood pressure, and receiving routine screening and treatment for feet.[28]
- Figure 12 shows the rate of diabetes-related lower limb amputations in California increased more than 40 percent from 1,081 cases in 2009 to 1,552 cases in 2016 per 100,000 diabetes-related hospitalizations.
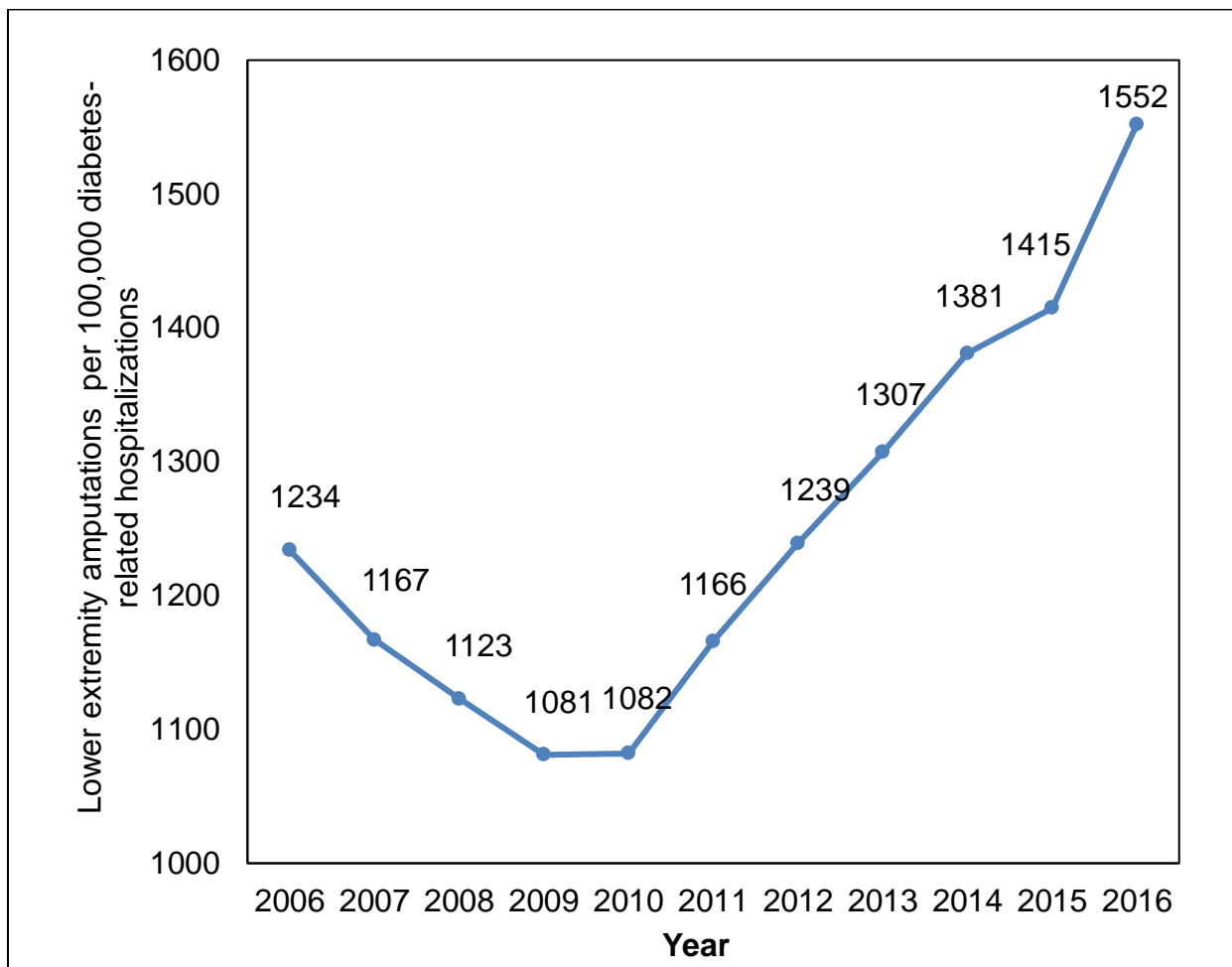
Figure 12. Estimated prevalence of diabetes-related lower extremity amputations per 100,000 diabetes hospitalizations, 2006-2016

Source: OSHPD, 2006-2016 Patient Discharge Data.[15]

Healthcare Use

- Diabetes management, including regular health care visits to monitor blood control, eye health, and lower extremities, is necessary to prevent diabetes complications and the development of other comorbidities.[28]
- Persons with diabetes should see their doctors regularly to have their hemoglobin A1c, an indicator of average blood glucose levels over the previous 3 months, monitored.[29] Hispanics had the lowest rate of A1c test in the past year compared to non-Hispanics in California (see Table 3). Hispanics and non-Hispanic Native American/Alaska Natives also had a lower diabetes management screening rate for both an eye and foot exam in the past year than the state average.
- Across age, gender, and race and ethnicity, over 70 percent of California adults with diabetes had a diabetes management plan; however, Hispanics and   non-Hispanic Native American/Alaska Natives had the lowest proportion among California adults with diabetes (see Table 3).
- Over 90 percent of all those with a plan were confident in their abilities to manage their diabetes (see Table 3). In contrast, confidence in the ability to manage diabetes was slightly lower amongst those without a diabetes management plan (see Table 3).

Table 3. Estimated prevalence of diabetes and related care among California adult population with diabetes, by age, gender, and race/ethnicity, 2013-2016

Diabetes and Related Care	Total CA (%)	Age 18-44 (%)	Age 45-64 (%)	Age 65+ (%)	Male (%)	Female (%)	Hispanic (%)	Non-Hispanic White (%)	Non-Hispanic African American (%)	Non-Hispanic Asian/Pacific Islander (%)	Non-Hispanic Native American/Alaska Native (%)
Diabetes Management Screening											
At least one A1C test in past year	80.8	72.7	82.4	82.1	80.6	81.0	70.7	90.2	83.9	87.8	84.2
Eye exam within past year	70.7	52.5	67.3	81.5	70.7	70.7	66.4	74.9	71.3	73.9	62.9
At least one foot exam in past year	72.1	59.0	72.6	76.7	73.3	70.9	70.0	74.0	79.4	70.7	60.4
Diabetes Medication Management											
Take pills or insulin for diabetes	82.9	76.2	84.2	84.1	83.8	82.0	82.9	80.5	84.0	88.2	81.1
Diabetes Management Plan											
Have a diabetes management plan	78.0	72.0	81.5	76.3	78.5	77.5	72.1	86.0	85.3	73.4	71.4
Confidence in Ability to Control Diabetes											
Percentage of those with a plan who are confident in abilities to manage diabetes	93.4	92.7	91.8	95.7	94.5	92.2	91.3	95.6	94.8	93.0	97.7

Table 3. Estimated prevalence of diabetes and related care among California adult population with diabetes, by age, gender, and race/ethnicity, 2013-2016 (cont.)

Diabetes and Related Care	Total CA (%)	Age 18-44 (%)	Age 45-64 (%)	Age 65+ (%)	Male (%)	Female (%)	Hispanic (%)	Non-Hispanic White (%)	Non-Hispanic African American (%)	Non-Hispanic Asian/Pacific Islander (%)	Non-Hispanic Native American/Alaska Native (%)
Percentage of those *without* a diabetes management plan who are confident in abilities to manage diabetes	85.0	84.9	82.9	87.0	87.5	82.5	84.0	89.4	93.3	81.5	92.0

Source: CHIS, 2013-2016 Adult Survey.[13] * A1c test refers to a hemoglobin A1c test, which measures the percent of hemoglobin with attached glucose and reflects average blood glucose levels over the previous 3 months. A hemoglobin A1c test can be used alone or in combination with other tests to diagnosis diabetes, and after a diabetes diagnosis, is used to monitor long term blood glucose management.[29]

Financial Cost of Diabetes and its Complications

According to a 2016 Health Policy Brief, the current trends in diabetes and prediabetes are alarming because of the associated health, human, and financial costs.[30] Diabetes increases the risk of serious medical complications and is extremely costly to families, businesses, health care plans, states, and the nation. In 2017, the national estimated cost of diabetes was $327 billion, with $237 billion in direct medical costs and $90 billion in lost productivity.[31] Given that the prevalence of diabetes and prediabetes continues to increase over time, it is expected that the costs associated with diabetes and its complications will continue to rise.

In California, the medical expenditures to treat diabetes total approximately $1.9 billion, with an additional $800 million in lost productivity each year.[32-34] Diabetes-related ESRD adds an additional $2,693 million/year, lower limb amputations add an additional $195 million/year, and blindness adds an additional $36 million/year in total medical expenditures.[32] On average, medical expenditures for California adults with diabetes are 2.3 times more than those without diabetes.[35]

VII. DIABETES MORTALITY

- In 2017, diabetes was the seventh leading cause of death among adults (18 years and older) in California, with 9,592 deaths attributed to diabetes as the underlying cause. Moreover, diabetes was listed as a contributing cause of death in 32,871 deaths in California in 2017.[36]
- Additionally, adults with diabetes are almost twice as likely to die from heart disease or stroke as adults without diabetes.[19]
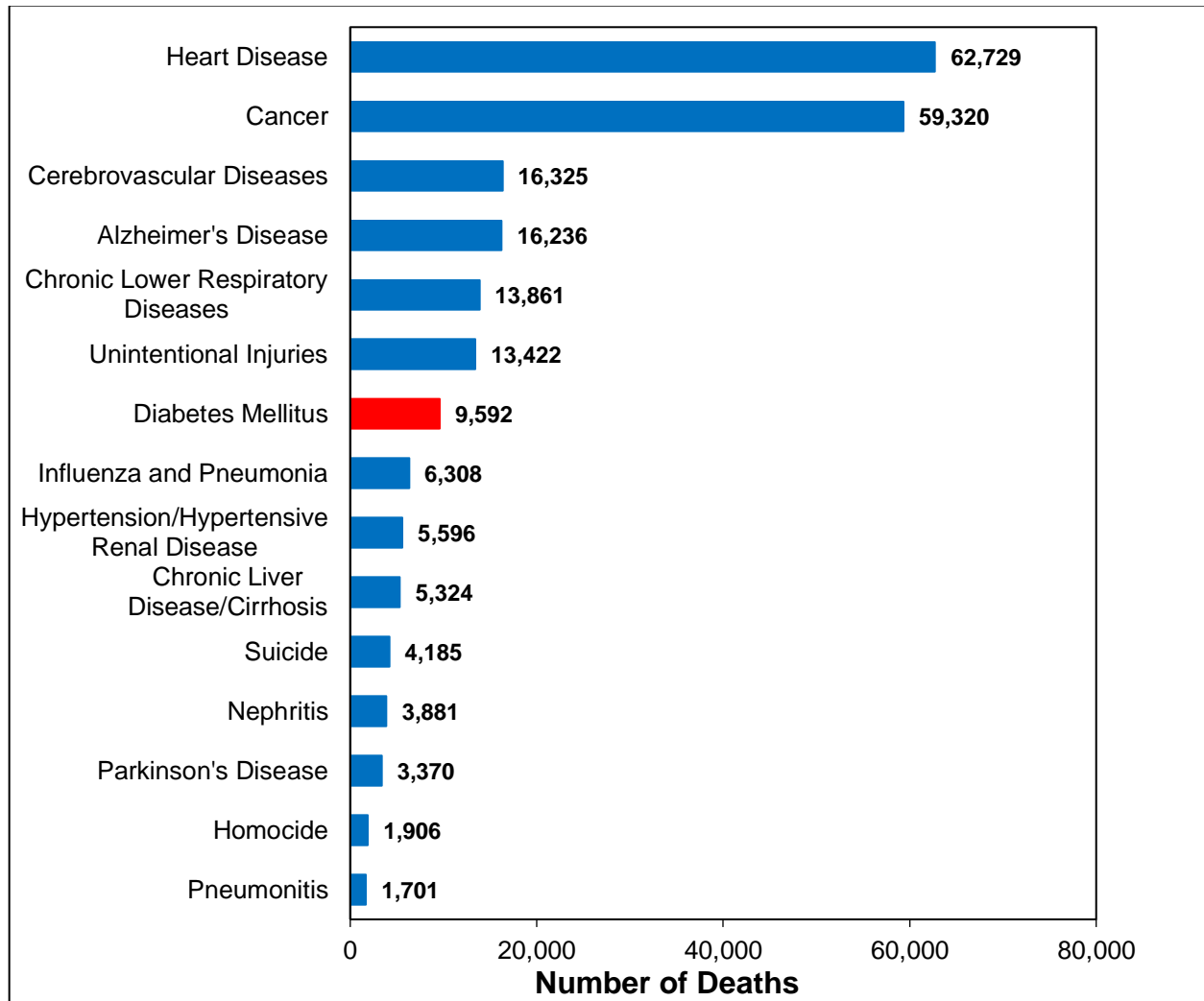
Figure 13. Leading causes of death in California, 2017

Source: CDC WONDER Database, 2017.[1] Deaths are amongst people ages 18 and older.

Diabetes Mortality by Race/Ethnicity

- There are disparities in diabetes mortality rates across race and ethnic groups in California.
- African Americans experienced the highest rates of diabetes mortality between 2007 and 2016 while Whites and Asian/Pacific Islanders experienced the lowest rates.

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Hispanic	43.6	42.1	35.5	36.8	37.6	37.9	38.3	36.2	36.9	37.9
Non-Hispanic White	24.9	24.4	22.5	22.6	23.8	23.8	22.8	22.7	23.5	23.4
Non-Hispanic African American	63.4	58.0	53.2	50.5	55.0	53.1	50.8	55.7	58.6	57.9
Non-Hispanic Native American/Alaskan Native	53.3	44.2	34.8	40.5	44.0	50.2	44.7	33.3	51.8	51.8
Non-Hispanic Asian/Pacific Islander	24.7	25.3	22.0	22.0	23.8	23.5	23.9	23.7	24.6	23.8

Y-axis: Age-adjusted mortality rates (per 100,000 people)

Figure 14. Age-adjusted diabetes mortality rates per 100,000 by race and ethnicity in California, 2007-2016

Source: California Vital Statistics Death Data, 2007-2016.[16] 2007-2010 population data from the California Department of Finance,[37] 2011-2016 population data from the United States Census Bureau.[38] Diabetes deaths defined by ICD10 codes E10x-E14x for the underlying cause of death. Deaths are of people ages 18 and above.

VIII. DIABETES PREVENTION AND CONTROL ACTIVITIES

CDPH

To equitably address the burden of diabetes and prediabetes, the CDC suggests promotion of evidence-based lifestyle change programs. The CDC recommends several training programs including but not limited to: the National Diabetes Prevention Program (National DPP), Diabetes Self-Management Education and Support (DSMES), the Expanded Food and Nutrition Education Program (EFNEP), smoking cessation, and physical activity to prevent and manage type 2 diabetes. Participation in lifestyle change programs can increase awareness about lifestyle choices that reduce the risk of type 2 diabetes. Additionally, incorporating support from a care team that includes non-physician team members such as pharmacists[39] and community health workers,[40] can help individuals with type 2 diabetes or at risk of type 2 diabetes adopt and sustain lifestyle changes as they navigate through diabetes prevention resources.

CDPH is involved in several diabetes prevention and control activities to reduce the burden and prevalence of type 2 diabetes in California. In 2018, CDPH received the Improving the Health of Americans Through Prevention and Management of Diabetes and Heart Disease and Stroke five year (2018-2023) federal grant from the CDC (CDC-RFA-DP18-1815PPHF18), referred to at CDPH as Prevention Forward. This grant funds efforts to work with traditional and nontraditional partners to prevent and manage chronic conditions such as diabetes, increase monitoring of and reporting on chronic disease, and increase referrals to and participation in lifestyle change programs. Under Prevention Forward, CDPH focuses on communities with a high burden of chronic disease in its efforts to reduce diabetes-related disparities and costs; to promote awareness and reporting of type 2 diabetes, prediabetes, cardiovascular disease, and high blood pressure among at risk populations; and to educate and train health care professionals (including physicians and non-physician team members) in medical/academic institutions about the importance of diabetes interventions, routine screening and glucose testing to identify and educate patients with prediabetes and diabetes.

Prevention Forward builds upon the work CDPH mobilized under the State Public Health Actions to Prevent and Control Diabetes, Heart Disease, Obesity and Associated Risk Factors and Promote School Health (CDC-RFA-DP13-1305) (funded between 2013-2018) and the Heart Disease and Stroke Prevention Program and Diabetes Prevention – State and Local Public Health Actions to Prevent Obesity, Diabetes, and Heart Disease and Stroke (CDC-RFA-DP14-1422PPHF14) (funded between 2014 and 2018) grants. Those grants provided Prevention Forward with a strong foundation in the use of evidence-based strategies to prevent and manage diabetes. Prevention Forward staff continue the partnerships and discussions about the use of electronic health records to increase diabetes and prediabetes screening, testing, and referrals to lifestyle change programs, to develop health system interventions to improve the quality of health care delivered to high burden populations, and to use team-based models to address diabetes prevention and management.

Under the 2013-2018 CDC grants, CDPH collaborated with the CDC, the American Medical Association (AMA), and the National Association of Chronic Disease Directors (NACDD) to establish the California Prevent Diabetes: Screen, Test, Act, Today™ (CA PDSTAT) network. CA PDSTAT continues under Prevention Forward, with the goal of increasing the availability of and support for National DPPs and DSMES programs in California, increasing awareness of diabetes and prediabetes among Californians, encouraging employers and insurers to offer National DPP as a covered benefit, and increasing referrals of individuals to National DPP and DSMES programs. The CA PDSTAT network consists of representatives from health care organizations, the community at large, volunteer organizations, health insurance organizations, government (state, county, and city) employees, and others interested in type 2 diabetes prevention and management. Through this collaboration, CA PDSTAT developed policy recommendations for the prevention and management of type 2 diabetes, which resulted in the *Diabetes Prevention Through Lifestyle Change Programs: 2018 Action Plan (https://www.cdph.ca.gov/Programs/CCDPHP/DCDIC/CDCB/CDPH%20Document%20Library/ DiabetesPrevActionPlan_FinalADA-07%2003%2018%20v2.pdf).* This Action Plan focuses on interventions for individuals with prediabetes to prevent progression to type 2 diabetes, namely increased awareness, availability, coverage, and utilization of evidence-based National DPPs.

In July 2018, CDPH received funding from the California Budget Act 2018 to develop and implement a Diabetes Awareness and Outreach Campaign. The goal of this media campaign is to engage Californians at risk for type 2 diabetes about their risk factors, increase awareness of the link between type 2 diabetes and cardiovascular disease, and promote resources and National DPPs. Implementation of this campaign will include traditional media, advertising, and social media under the guidance of an advisory committee, and will continue through June 30, 2020.

CDPH's Chronic Disease Control Branch (CDCB) collaborates with the California Department of Health Care Services (DHCS) on the 6|18 Initiative. The 6|18 Initiative connects health care purchasers, payers, and providers with CDC researchers, economists, and policy analysts to find ways to improve health and control costs of six common health conditions through the use of 18 proven interventions.[41] DHCS and CDPH are focusing on type 2 diabetes prevention through the expansion of access to the National DPP, which became a Medi-Cal covered benefit on January 1, 2019.

The CDPH's Maternal, Child, and Adolescent Health Division (MCAH) implements the California Diabetes and Pregnancy Program (CDAPP) and Sweet Success program, funded by the Maternal and Child Health Services Title V BIChock Grant. CDAPP's Sweet Success program provides technical support and education to medical personnel and community liaisons to promote improved pregnancy outcomes for high-risk pregnant women with pre-existing diabetes and women who develop gestational diabetes while pregnant. Medical providers who complete a CDAPP Sweet Success application, undergo standardized CDAPP Sweet Success training, and provide direct patient care to pregnant women with diabetes become CDAPP Sweet Success Affiliates. The MCAH Division contracts with the CDAPP Sweet Success Resource Center to develop and record training and education to medical personnel to promote improved pregnancy outcomes for high-risk pregnant women with preexisting and gestational diabetes. The Resource Center trained about 2,000 program

affiliates in 2017-2018 through online trainings that covered a range of subjects, including gestational diabetes. In addition to training, the Sweet Success Resource Center provided educational resources for both providers and pregnant women with diabetes. For more information on available resources, visit the CDAPP Sweet Success program website at www.cdappsweetsuccess.org/resources.

Community-Related Diabetes Activities

Diabetes prevention and management efforts also take place at the local level throughout California. For example, Monterey County, with Prevention First funding, created an educational pathway for students to serve as community health workers (CHWs) for diabetes prevention in the county's Latino community.[42] Additionally, culturally-adapted national Prediabetes Awareness Campaign public service announcement advertisements ran for two years in the Central Valley, Los Angeles, and San Diego. Furthermore, in 2018, the CDC awarded funds via the Innovative State and Local Public Health Strategies to Prevent and Manage Diabetes and Heart Disease and Stroke grant (CDC-RFA-DP18-1817) to the Fresno, Los Angeles, and San Diego local health departments to design, test, and evaluate innovative approaches to address diabetes, heart disease, and stroke, which align with and support the goal of Prevention Forward.[43] The Los Angeles County Public Health Department received funding to address diabetes as well as heart disease and stroke.[43]

Diabetes-Related Policies in California

Several efforts have been undertaken by the state legislature, local health departments, and health insurance companies to address the burden of diabetes. In 2017, the California Public Employees Retirement System (CalPERS) began offering the National DPP as a covered benefit to its more than 1.4 million adult members.[44] Additionally, in 2019, Medi-Cal began to offer the National DPP as a covered benefit.[45] CDPH's CDCB will continue to work with health plans to cover and promote enrollment in National DPPs and DSMES programs.

IX. CONCLUSIONS

Type 2 diabetes and prediabetes rates are increasing in California. There are geographic and sociodemographic disparities in the prevalence of diabetes and prediabetes in California, as well as in diabetes management and mortality rates. CDPH, local health departments, and community partners are involved in a number of efforts to address these disparities in California. With support from CDC grants, CDPH is working to target communities with a high burden of chronic disease in its efforts to reduce diabetes-related disparities and costs; to promote awareness and reporting of type 2 diabetes, prediabetes, cardiovascular disease, and high blood pressure among at risk populations; and to educate and train health care professionals about the importance of diabetes interventions. Additionally, Medi-Cal coverage of the National DPP will increase access to diabetes prevention programs for low-income and vulnerable populations. Through these efforts, California aims to improve diabetes prevention and management throughout the state, and therefore improve the health of all Californians.

APPENDIX

Data Sources

<u>CHIS</u>

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. CHIS is designed to meet two sampling objectives: (1) provide estimates for 44 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.[46] For this report, CHIS survey data from 2013, 2014, 2015, 2016, and 2017 were pooled and weights were adjusted accordingly.[46,47] Further information on the design and methodology of CHIS is available on the UCLA Center for Health Policy Research website (http://healthpolicy.ucla.edu/chis/).

The table below outlines the CHIS questions used to define each variable:

Appendix Table 1. Variable definitions and associated CHIS questions

Variable Definition	Associated CHIS Question
Diabetes	Calculated based on a response of "yes" to the question: *"Other than during pregnancy, has a doctor ever told you that you have diabetes or sugar diabetes?"*
Prediabetes	Calculated based on a response of "yes" to the question: *"Other than during pregnancy, has a doctor ever told you that you have diabetes or sugar diabetes?"* AND a response of "prediabetes" to the question: *"Were you told that you had Type 1 or Type 2 Diabetes?"* (2015-2017) OR a response of "yes" to the question: *"Other than during pregnancy, has a doctor ever told you that you have pre or borderline diabetes?"* (2013-2017)
Type 2 Diabetes	Calculated based on a response of "yes" to the question: *"Other than during pregnancy, has a doctor ever told you that you have diabetes or sugar diabetes?"* AND a response of "type 2 diabetes" to the question: *"Were you told that you had type 1 or type 2 diabetes?"*
Hypertension	Calculated based on a response of "yes" to the question: *"Has a doctor ever told you that you have high blood pressure?"*
Cardiovascular disease	Calculated based on a response of "yes" to the question: *"Has a doctor ever told you that you have any kind of heart disease?"*
Smoking Status	Defined by CHIS based on several questions about smoking habits and categorized as *"Currently Smokes," "Quit Smoking,"* and *"Never Smoked Regularly."*
Body Mass Index	Defined by CHIS based on self-reported height and weight estimates, and categorized as: *"Underweight 0-18.49," "Normal 18.5-24.99," "Overweight 25.0-29.99,"* and *"Obese 30.0+"*
Federal Poverty Level	Defined by CHIS based on several questions on self-reported income level and categorized as: *"0-99% FPL," "100-199% FPL," "200-299% FPL,"* and *"300% FPL and above"*
Education Level	Defined by CHIS based on the question: *"What is the highest grade of education you have completed and received credit for?"* and categorized as *"< High School Education," "High School Education," "Some College,"* and *"College Degree or Above"*
Age	Self-reported age at the time of the interview, as reported by CHIS to the question: *"What is your age, please?"*
Race/Ethnicity	Defined by CHIS based on several questions about self-reported race/ethnicity, and categorized as the Office of Management and Budget and Census Bureau race/ethnicity categories: *1 = Hispanic, 2 = White, Non-Hispanic, 3 = African American Only, Not Hispanic, 4 = American Indian/Alaska Native only, Non-Hispanic, 5 = Asian Only, Non-Hispanic, 6 = Native Hawaiian/Pacific Islander, Non-Hispanic, 7 = Two or More Races, Non-Hispanic)*
Gender	Self-reported gender based on the response to the question: *"Are you male or female?"*

California BRFSS

BRFSS was established in 1984 by the CDC and is currently conducted in all 50 states and multiple United States 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, DHCS, and the California Department of Social Services. The BRFSS is a random-digit dial telephone survey that collects data yearly from non-institutionalized adults (18+ years of age), and includes both cell phone (since 2013) and landline random-digit dial components.[48] Once a household is identified, respondents are randomly selected from among all eligible adults. 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.[48] Therefore, the sample was weighted to California population estimates to improve the representativeness of the sample. For this report, BRFSS survey data from 2013 and 2015 were pooled and weights were adjusted accordingly. Prevalence estimates from this report should not be compared to estimates from before 2012 due to changes in the weighting methodology. Further information on the design and methodology of the California BRFSS is available on the CSUS Public Health Survey Research Program website (https://www.csus.edu/research/phsrp/brfss.html).

The table below outlines the BRFSS questions used to define each variable:

Appendix Table 2. Variable definitions and associated BRFSS questions

Variable Definition	Associated BRFSS Question
Diabetes	Calculated based on a "yes" response to the question: *"Has a doctor, or nurse or other health professional ever told you that you have diabetes?"* (excludes the response: "Yes, but female told only during pregnancy")
High blood cholesterol	Calculated based on a "yes" response to the question: *"Have you ever been told by a doctor, nurse or other health professional that your blood cholesterol is high?"*
Arthritis	Calculated based on a "yes" response to the question: *"Has a doctor, nurse, or other health professional EVER told you that you have some form of arthritis, rheumatoid arthritis, gout, lupus, or fibromyalgia?"*
Age	Self-reported age at the time of the interview, as reported by BRFSS based on the response to the question: *"What is your age?"*
Race/ethnicity	Calculated based on multiple questions about self-reported race and Hispanic status (White, Black or African American, American Indian/Alaska Native, Asian, Pacific Islander, other; Hispanic)
Gender	Self-reported gender, as reported by BRFSS based on the response to the question: *"Are you male or female?"*

CDC WONDER Database

The CDC's Wide-ranging ONline Data for Epidemiologic Research (CDC WONDER) system was used to generate the leading causes of death in California.[1] CDC WONDER's mortality data was published by the National Center for Health Statistics and the CDC from the Multiple Cause of Death Files, 1999-2017, as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Accessed at https://wonder.cdc.gov/ucd-icd10.html on April 22, 2019.

California Vital Statistics Data

The California Vital Statistics Data was used for calculating age-adjusted mortality rates in California.[16] The death certificates contain the cause of death, coded using the International Classification of Diseases (ICD-10). Diabetes deaths were defined by ICD10 codes E10x-E14x.

OSHPD 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.[15] This discharge data was used to calculate rates of hospitalizations for diabetes-related complications, including end-stage renal disease, ophthalmic complications, and lower extremity amputations. Diabetes was defined when a diabetes-related ICD code was present for any of the primary or 24 other diagnosis codes, whereas diabetes-related complications were defined based on primary diagnosis or primary procedure codes only.

Appendix Table 3. Diabetes complications definitions and ICD-9-CM and ICD-10-CM codes

Conditions and Procedures	ICD Codes
Gestational diabetes	*ICD-9-CM diagnosis codes:* 648.80-648.84
Diabetes (any diagnosis)	*ICD-9-CM diagnosis codes:* 250.0-250.93 *ICD-10-CM diagnosis codes:* E10x-E13x
Diabetes-related ESRD (primary diagnosis)	*ICD-9-CM diagnosis codes:* 250.40-250.43 *ICD-10-CM diagnosis codes:* E10.22, E11.22, E12.22, E13.22
Diabetes-related ophthalmic complications (primary diagnosis)	*ICD-9-CM diagnosis codes:* 250.50-250.53 *ICD-10-CM diagnosis codes:* E10.3-E10.39, E11.3-E11.39, E12.3-E12.39, E13.3-E13.39
Diabetes-related lower extremity amputation (primary procedure)	*ICD-9-CM procedure codes:* 84.1-84.19 AND Diabetes ICD9 CM diagnosis codes *ICD-10-CM procedure codes:* 0Y620ZZ-0Y6Y0Z3 AND Diabetes ICD-10-CM diagnosis codes

For diabetes-related complications, ICD-9-CM codes were used to define conditions for years 2006-2015, and ICD-10-CM codes were used to define conditions for years 2015-2016 (the transition from ICD-9-CM to ICD-10-CM coding occurred over the course of 2015, so both coding schemes are present in hospitalization records in 2015).

California Department of Finance Population Data

California county population data are published by the California Department of Finance's Demographic Research Unit. County population estimates were from "E-2. California County Population Estimates and Components of Change by Year—July 1, 2010-2017" (released December 2017).[37] California population data by race and age between 2007 and 2010 (for calculating age-adjusted diabetes mortality rates in Figure 14) are from "California and Counties by Age and Race/Ethnicity – Total Only: 2000-2010" (released March 2013).[49]

United States Census Bureau California Population Data

Population data by race and age in California between 2011 and 2016 (for calculating age-adjusted diabetes mortality rates in Figure 14) are from the United States Census Bureau.[38]

Statistical Methods
Age Adjustment

In this report, age-adjustment was performed using the direct method and the 2000 United States Standard Population.[50] 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. Therefore, without age adjustment, if a population with mostly young people were compared to a population with mostly old people, the diabetes rate would be higher in the older population, but 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 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

Confidence intervals represent the precision of an estimate where the true parameter falls. Wide confidence intervals indicate that the true parameter 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 indicate that the true parameter 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% confidence interval indicating our level of certainty.

Unstable Estimates

Estimates with a coefficient of variation ((standard error of the estimate/estimate)*100) ≥ 30% 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 (small numerator) and, thus, represented by a large standard error relative to the estimate. All estimates in this report were evaluated for instability, and if unstable, were marked as such.

Supplementary Data

Appendix Table 4. Estimated age-adjusted prevalence of diabetes, type 2 diabetes, and prediabetes among adults (≥ 18 years old) by counties in California in 2017

County	Estimated Population Size (2017)	Diabetes Age-adjusted Prevalence (%)	Type 2 Diabetes Age-adjusted Prevalence (%)	Prediabetes Age-adjusted Prevalence (%)
California	39,500,973	10.1	8.3	14.9
Alameda	1,646,405	9.2	8.2	19.9
Butte	226,403	8.8	7.1	12.4
Contra Costa	1,139,313	8.9	6.2	12.9
El Dorado	186,223	6.0	5.0	7.3
Fresno	995,233	12.1	9.2	12.7
Humboldt	136,430	5.6	4.7	8.9
Imperial	187,921	18.7	12.6	24.6
Kern	896,101	14.4	10.8	19.1
Kings	149,559	14.8	13.1	12.9
Lake	64,740	9.9	7.8	14.4
Los Angeles	10,231,271	11.4	9.5	16.7
Madera	156,963	9.4	9.3	13.8
Marin	263,262	3.9	3.9	6.8
Mendocino	89,092	9.5	5.1	8.4
Merced	275,104	10.7	8.2	19.7
Monterey	442,149	9.0	6.9	10.6
Napa	141,784	6.1	4.5	13.9
Nevada	98,613	5.3	4.9	3.9
Orange	3,198,968	8.5	7.0	13.3
Placer	383,173	4.8	3.8	11.0
Riverside	2,382,640	10.0	7.8	14.8
Sacramento	1,513,415	9.7	7.3	16.5
San Benito	56,879	9.5	7.7	8.7
San Bernardino	2,155,590	14.7	13.6	17.7
San Diego	3,309,509	9.3	8.0	12.6
San Francisco	874,008	6.8	5.8	11.4
San Joaquin	747,263	15.2	12.9	14.5
San Luis Obispo	279,210	5.9	3.9	8.2
San Mateo	770,256	9.5	7.7	13.1
Santa Barbara	450,025	4.4	3.9	8.9
Santa Clara	1,937,473	6.9	5.2	16.1
Santa Cruz	276,504	5.3	4.5	10.9

County	Estimated Population Size (2017)	Diabetes Age-adjusted Prevalence (%)	Type 2 Diabetes Age-adjusted Prevalence (%)	Prediabetes Age-adjusted Prevalence (%)
Shasta	178,148	9.5	5.7	7.7
Solano	436,640	10.4	10.0	17.6
Sonoma	504,613	9.2	6.2	8.1
Stanislaus	549,976	12.8	11.0	15.0
Sutter	96,919	10.0	9.0	15.7
Tulare	470,716	13.8	12.4	12.1
Ventura	855,910	9.5	7.8	12.7
Yolo	218,673	8.5	8.4	9.7
Yuba	74,645	16.0	10.8	13.3
Tuolumne, Calaveras, Amador, Inyo, Mariposa, Mono, Alpine	189,932	5.5	5.1	13.5
Del Norte, Siskiyou, Lassen, Trinity, Modoc, Plumas, Sierra	148,593	6.9	5.7	8.8
Colusa, Glenn, Tehama	114,729	10.8	10.7	13.0

Source: CHIS 2017 Adult Survey,[2] population estimates from the California Department of Finance 2017 county population estimates.[37]

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