



National Diabetes Statistics Report

2020

Estimates of Diabetes and Its Burden in the United States



U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

This document is intended to provide up-to-date scientific data and statistics on diabetes and its burden in the United States. Formerly known as the National Diabetes Fact Sheet, this consensus document is written primarily for a scientific audience.

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INTRODUCTION

The National Diabetes Statistics Report, a periodic publication of the Centers for Disease Control and Prevention (CDC), provides information on the prevalence and incidence of diabetes and prediabetes, risk factors for complications, acute and long-term complications, deaths, and costs. These data can help focus efforts to prevent and control diabetes across the United States. This document is an update of the 2017 National Diabetes Statistics Report and is intended for a scientific audience.

METHODS

New in 2020, this National Diabetes Statistics Report features trends in prevalence and incidence estimates over time.

The estimates in this document (unless otherwise noted) were derived from various data systems of CDC, Indian Health Service (IHS), Agency for Healthcare Research and Quality (AHRQ), and US Census Bureau, and from published research studies. Estimated percentages and total number of people with diabetes and prediabetes were derived from the National Health and Nutrition Examination Survey (NHANES), National Health Interview Survey (NHIS), IHS National Data Warehouse (NDW), Behavioral Risk Factor Surveillance System (BRFSS), United States Diabetes Surveillance System (USDSS), and US resident population estimates.

Diagnosed diabetes status was determined from self-reported information provided by survey respondents; for American Indians and Alaska Natives who accessed IHS or tribal health facilities that submitted medical records data to the IHS NDW, clinical diagnostic codes were also used. Undiagnosed diabetes was determined by measured fasting plasma glucose or A1C levels. Numbers and rates for acute and long-term complications of diabetes were derived from the National Inpatient Sample (NIS) and National Emergency Department Sample (NEDS), as well as NHIS.

For some measures, estimates were not available for certain racial and ethnic subgroups due to small sample sizes.

An alpha level of 0.05 was used when determining statistically significant differences between groups. Age-adjusted estimates were calculated among adults aged 18 years or older by the direct method to the 2000 US Census standard population, using age groups 18–44, 45–64, and 65 years or older. Most estimates of diabetes in this report do not differentiate between type 1 and type 2 diabetes. However, as type 2 diabetes accounts for 90% to 95% of all diabetes cases, the data presented here are more likely to be characteristic of type 2 diabetes, except as noted.

More information about the data sources, methods, and references is available in the [Detailed Methods and Data Sources](#) section.

RESULTS

Prevalence of Diabetes (Diagnosed and Undiagnosed)

(See [Detailed Methods](#))

Among the US population overall, crude estimates for 2018 were:

- 34.2 million people of all ages—or 10.5% of the US population—had diabetes.
- 34.1 million adults aged 18 years or older—or 13.0% of all US adults—had diabetes (Table 1a; Table 1b).
- 7.3 million adults aged 18 years or older who met laboratory criteria for diabetes were not aware of or did not report having diabetes (undiagnosed diabetes, Table 1b). This number represents 2.8% of all US adults (Table 1a) and 21.4% of all US adults with diabetes.
- The percentage of adults with diabetes increased with age, reaching 26.8% among those aged 65 years or older (Table 1a).

Table 1a. Estimated crude prevalence of diagnosed diabetes, undiagnosed diabetes, and total diabetes among adults aged 18 years or older, United States, 2013–2016

Characteristic	Diagnosed diabetes Percentage (95% CI)	Undiagnosed diabetes Percentage (95% CI)	Total diabetes Percentage (95% CI)
Total	10.2 (9.3–11.2)	2.8 (2.4–3.3)	13.0 (12.0–14.1)
Age in years			
18–44	3.0 (2.6–3.6)	1.1 (0.7–1.8)	4.2 (3.4–5.0)
45–64	13.8 (12.2–15.6)	3.6 (2.8–4.8)	17.5 (15.7–19.4)
≥65	21.4 (18.7–24.2)	5.4 (4.1–7.1)	26.8 (23.7–30.1)
Sex			
Men	11.0 (9.7–12.4)	3.1 (2.3–4.2)	14.0 (12.3–15.5)
Women	9.5 (8.5–10.6)	2.5 (2.0–3.2)	12.0 (11.0–13.2)
Race/ethnicity			
White, non-Hispanic	9.4 (8.4–10.5)	2.5 (1.9–3.3)	11.9 (10.9–13.0)
Black, non-Hispanic	13.3 (11.9–14.9)	3.0 (2.0–4.5)	16.4 (14.7–18.2)
Asian, non-Hispanic	11.2 (9.5–13.3)	4.6 (2.8–7.2)	14.9 (12.0–18.2)
Hispanic	10.3 (8.1–13.1)	3.5 (2.5–4.8)	14.7 (12.5–17.3)

Notes: CI = confidence interval. Diagnosed diabetes was based on self-report. Undiagnosed diabetes was based on fasting plasma glucose and A1C levels among people self-reporting no diabetes. Numbers for subgroups may not add up to the total because of rounding. Age-adjusted estimates are presented in [Appendix Table 1](#).

Data source: 2013–2016 National Health and Nutrition Examination Survey.

Table 1b. Estimated number of adults aged 18 years or older with diagnosed diabetes, undiagnosed diabetes, and total diabetes, United States, 2018

Characteristic	Diagnosed diabetes Number in Millions (95% CI)	Undiagnosed diabetes Number in Millions (95% CI)	Total diabetes Number in Millions (95% CI)
Total	26.8 (24.4–29.1)	7.3 (6.3–8.4)	34.1 (31.6–36.6)
Age in years			
18–44	3.6 (3.0–4.1)	1.4 (0.8–1.9)	4.9 (4.0–5.8)
45–64	11.7 (10.3–13.1)	3.1 (2.3–3.9)	14.8 (13.4–16.3)
≥65	11.5 (10.1–12.8)	2.9 (2.1–3.6)	14.3 (12.7–15.9)
Sex			
Men	14.0 (12.4–15.6)	3.9 (2.8–5.0)	17.9 (16.2–19.6)
Women	12.8 (11.4–14.1)	3.4 (2.7–4.1)	16.2 (14.8–17.6)
Race/ethnicity			
White, non-Hispanic	15.4 (13.8–17.0)	4.1 (3.1–5.2)	19.5 (17.9–21.2)
Black, non-Hispanic	4.2 (3.8–4.7)	0.9 (0.6–1.3)	5.2 (4.7–5.7)
Asian, non-Hispanic	1.6 (1.3–2.0)	0.7 (0.4–1.0)	2.3 (1.9–2.8)
Hispanic	4.9 (4.1–5.6)	1.5 (1.0–1.9)	6.4 (5.4–7.3)

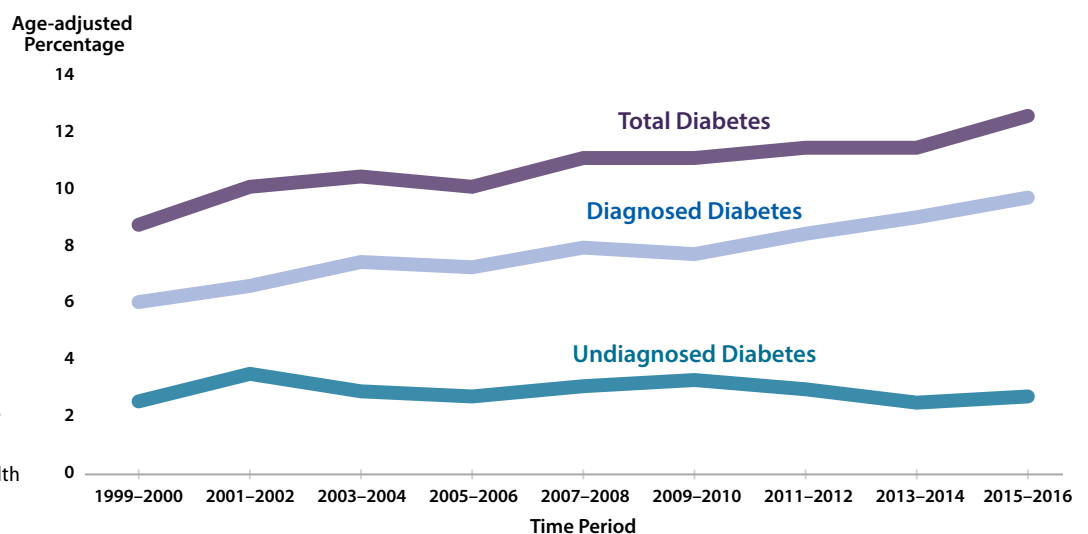
Notes: CI = confidence interval. Estimated numbers for 2018 were derived from percentages for 2013–2016 applied to July 1, 2018 US resident population estimates from the US Census Bureau (See [Detailed Methods](#)). Diagnosed diabetes was based on self-report. Undiagnosed diabetes was based on fasting plasma glucose and A1C levels among people self-reporting no diabetes. Numbers for subgroups may not add up to the total because of rounding.

Data sources: 2013–2016 National Health and Nutrition Examination Survey; 2018 US Census Bureau data.

Trends in Prevalence of Diagnosed Diabetes, Undiagnosed Diabetes, and Total Diabetes

- During 1999–2016, the age-adjusted prevalence of total diabetes significantly increased among adults aged 18 years or older (Figure 1).
- Prevalence estimates were 9.5% in 1999–2002 and 12.0% in 2013–2016 ([Appendix Table 2](#)).
- During this period, the age-adjusted prevalence significantly increased for diagnosed diabetes. No significant change in undiagnosed diabetes prevalence was detected (Figure 1; [Appendix Table 2](#)).

Figure 1. Trends in age-adjusted prevalence of diagnosed diabetes, undiagnosed diabetes, and total diabetes among adults aged 18 years or older, United States, 1999–2016.



Notes: Diagnosed diabetes was based on self-report. Undiagnosed diabetes was based on fasting plasma glucose and A1C levels among people self-reporting no diabetes.

Data source: 1999–2016 National Health and Nutrition Examination Surveys.

Prevalence of Diagnosed Diabetes

(See [Detailed Methods](#))

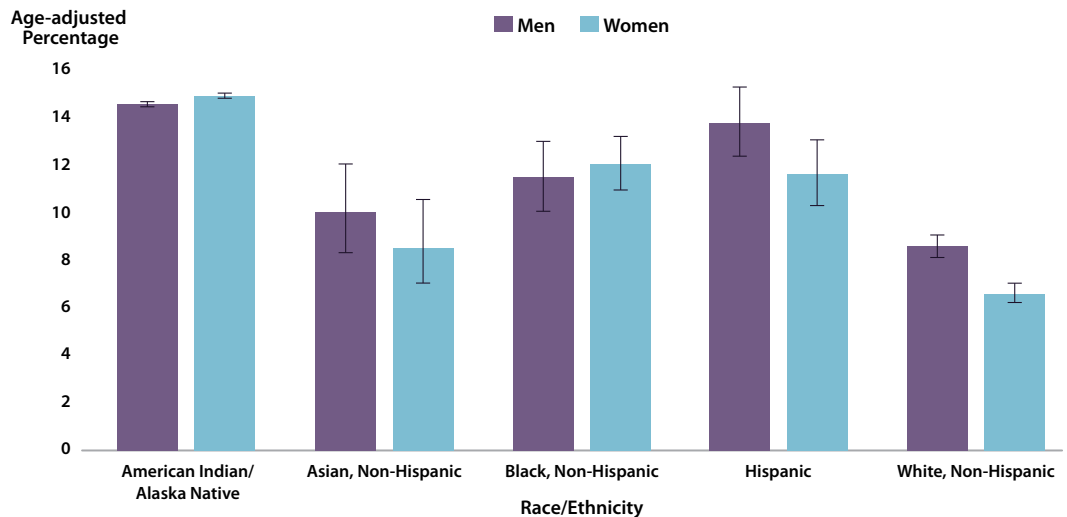
Among the US population overall, crude estimates for 2018 were:

- 26.9 million people of all ages—or 8.2% of the US population—had diagnosed diabetes.
- 210,000 children and adolescents younger than age 20 years—or 25 per 10,000 US youths—had diagnosed diabetes. This includes 187,000 with type 1 diabetes.
- 1.4 million adults aged 20 years or older—or 5.2% of all US adults with diagnosed diabetes—reported both having type 1 diabetes and using insulin.
- 2.9 million adults aged 20 years or older—or 10.9% of all US adults with diagnosed diabetes—started using insulin within a year of their diagnosis.

Among US adults aged 18 years or older, age-adjusted data for 2017–2018 indicated the following:

- Prevalence of diagnosed diabetes was highest among American Indians/Alaska Natives (14.7%), people of Hispanic origin (12.5%), and non-Hispanic blacks (11.7%), followed by non-Hispanic Asians (9.2%) and non-Hispanic whites (7.5%) ([Appendix Table 3](#)).
- American Indians/Alaska Natives had the highest prevalence of diagnosed diabetes for women (14.8%) (Figure 2; [Appendix Table 3](#)).
- American Indian/Alaska Native men had a significantly higher prevalence of diagnosed diabetes (14.5%) than non-Hispanic black (11.4%), non-Hispanic Asian (10.0%), and non-Hispanic white (8.6%) men (Figure 2; [Appendix Table 3](#)).
- Among adults of Hispanic origin, Mexicans (14.4%) and Puerto Ricans (12.4%) had the highest prevalences, followed by Central/South Americans (8.3%) and Cubans (6.5%) ([Appendix Table 3](#)).
- Among non-Hispanic Asians, Asian Indians (12.6%) and Filipinos (10.4%) had the highest prevalences, followed by Chinese (5.6%). Other Asian groups had a prevalence of 9.9% ([Appendix Table 3](#)).
- Among adults, prevalence varied significantly by education level, which is an indicator of socioeconomic status. Specifically, 13.3% of adults with less than a high school education had diagnosed diabetes versus 9.7% of those with a high school education and 7.5% of those with more than a high school education ([Appendix Table 3](#)).

Figure 2. Age-adjusted estimated prevalence of diagnosed diabetes by race/ethnicity group and sex for adults aged 18 years or older, United States, 2017–2018



Note: Error bars represent upper and lower bounds of the 95% confidence interval.

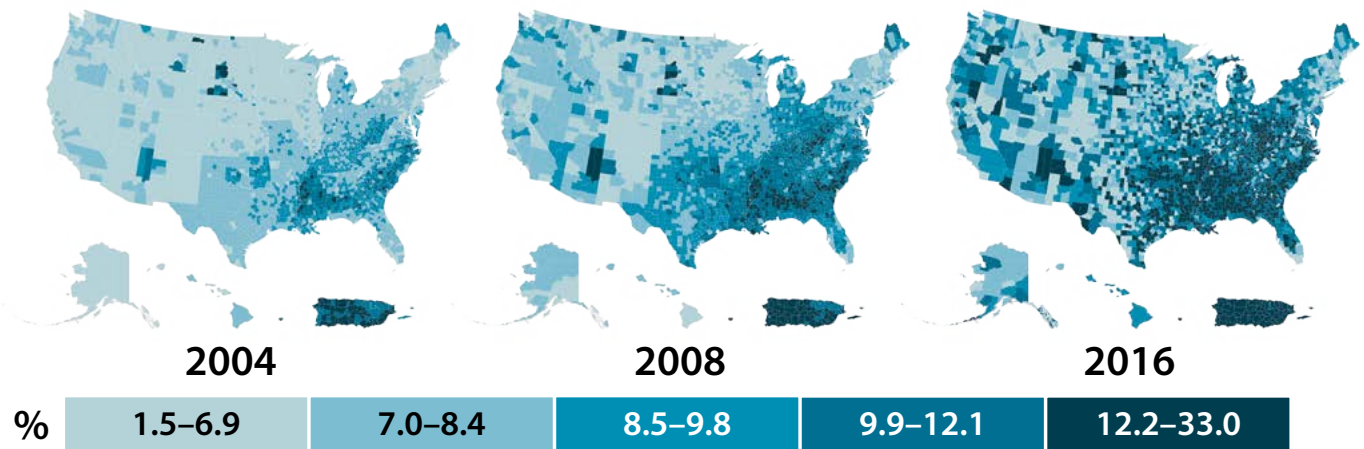
Data sources: 2017–2018 National Health Interview Survey; 2017 Indian Health Service National Data Warehouse (for American Indian/Alaska Native group only).

County-Level Prevalence Among Adults (See [Detailed Methods](#))

Among US adults aged 20 years or older, age-adjusted, county-level data indicated:

- In 2016, estimates of diagnosed diabetes prevalence varied across US counties, ranging from 1.5% to 33.0% (Figure 3).
- Median county-level prevalence of diagnosed diabetes increased from 7.8% in 2004 to 13.1% in 2016.

Figure 3. Age-adjusted, county-level prevalence of diagnosed diabetes among adults aged 20 years or older, United States, 2004, 2008, and 2016



Note: Data were unavailable for some US territories.

Data sources: US Diabetes Surveillance System; Behavioral Risk Factor Surveillance System.

Incidence of Diagnosed Diabetes (Newly Diagnosed Diabetes)

Incidence Among Adults

Among US adults aged 18 years or older, crude estimates for 2018 were:

- 1.5 million new cases of diabetes—or 6.9 per 1,000 persons—were diagnosed (Table 2).
- Compared to adults aged 18 to 44 years, incidence rates of diagnosed diabetes were higher among adults aged 45 to 64 years and those aged 65 years and older (Table 2).

Among US adults aged 18 years or older, age-adjusted data for 2017–2018 indicated:

- Non-Hispanic blacks (8.2 per 1,000 persons) and people of Hispanic origin (9.7 per 1,000 persons) had a higher incidence compared to non-Hispanic whites (5.0 per 1,000 persons) ([Appendix Table 4](#)).

Table 2. Estimated crude incidence of diagnosed diabetes among adults aged 18 years or older, United States, 2017–2018

Characteristic	Population Estimates, 2018 ^a Number in thousands (95% CI)	Incidence Estimates, 2017–2018 Rate per 1,000 (95% CI)
Total	1,483 (1,289–1,677)	6.9 (5.8–8.3)^b
Age in years		
18–44	452 (343–561)	4.3 (3.2–5.9) ^b
45–64	706 (571–840)	9.9 (7.6–12.8) ^b
≥65	326 (253–398)	8.8 (6.5–11.9) ^b
Sex		
Men	745 (614–875)	7.3 (5.8–8.3) ^b
Women	738 (601–876)	6.6 (5.1–8.4) ^b
Race/ethnicity		
White, non-Hispanic	786 (666–906)	5.4 (4.6–6.3)
Black, non-Hispanic	213 (148–279)	7.9 (5.9–10.8)
Asian, non-Hispanic	97 (58–137)	7.2 (4.8–10.8)
Hispanic	334 (204–464)	9.0 (6.1–13.3)

CI = confidence interval.

^a Population estimates for 2018 were derived from rates for 2017–2018 applied to July 1, 2018 US resident population estimates from the US Census Bureau (See [Detailed Methods](#)).

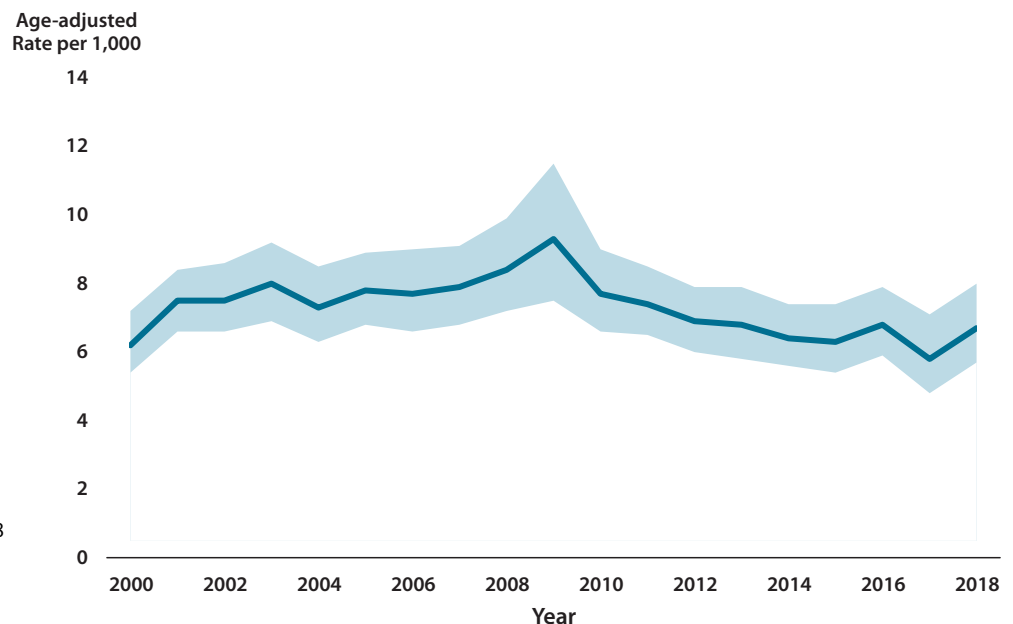
^b Rates were calculated using 2018 data only.

Data sources: 2017–2018 National Health Interview Survey and 2018 US Census Bureau data.

Trends in Incidence Among Adults

- Among adults aged 18 years or older, the age-adjusted incidence of diagnosed diabetes was similar in 2000 (6.2 per 1,000 adults) and 2018 (6.7 per 1,000 adults). A significant decreasing trend in incidence was detected from 2008 (8.4 per 1,000 adults) through 2018. (Figure 4).

Figure 4. Trends in age-adjusted incidence of diagnosed diabetes among adults aged 18 years or older, United States, 2000–2018



Notes: Data shown are estimated incidence rates (solid blue line) and 95% confidence intervals (shaded). Joinpoint identified in 2008 (See [Detailed Methods](#)).

Data source: 2000–2018 National Health Interview Survey.

County-Level Incidence Among Adults

Among US adults aged 20 years or older, age-adjusted, county-level data indicated:

- Estimates of diagnosed diabetes incidence varied across US counties, ranging from 1.2 to 46.2 per 1,000 persons in 2016 (For more detail, see [US Diabetes Surveillance System](#)).
- Median county-level incidence of diagnosed diabetes was 10.1, 11.0 and 10.3 per 1,000 persons in 2004, 2008, and 2016, respectively (For more detail, see [US Diabetes Surveillance System](#)).

Incidence Among Children and Adolescents

Data from the SEARCH for Diabetes in Youth Study indicated that during 2014–2015, the estimated annual number of newly diagnosed cases in the United States included:

- 18,291 children and adolescents younger than age 20 years with type 1 diabetes.
- 5,758 children and adolescents age 10 to 19 years with type 2 diabetes.

Trends in Incidence Among Children and Adolescents

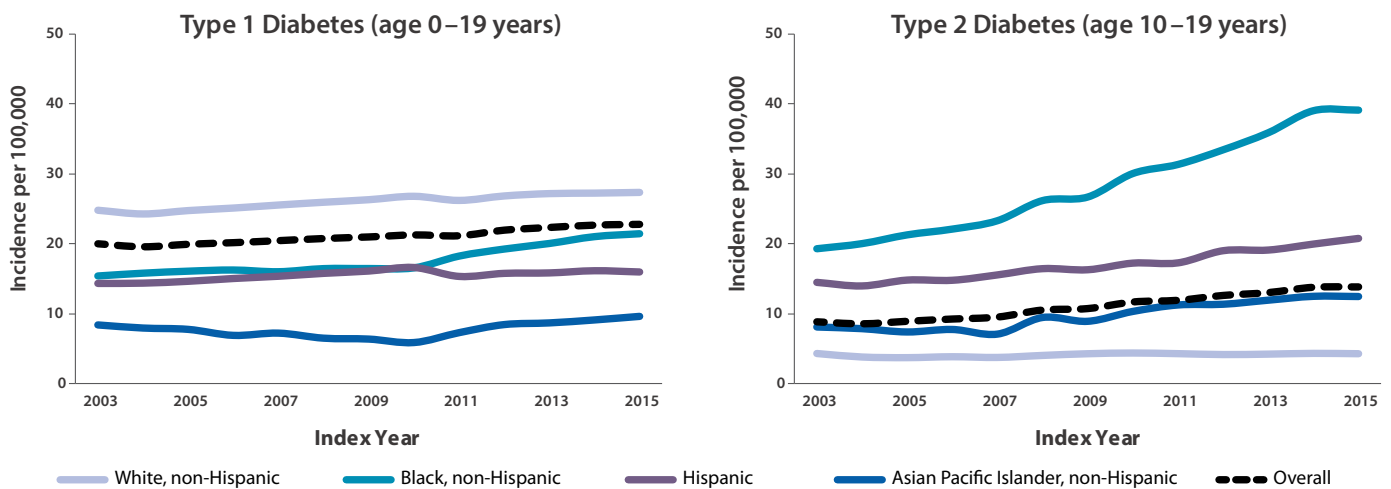
Among US children and adolescents aged less than 20 years, modeled data in Figure 5 showed:

- For the period 2002–2015, overall incidence of type 1 diabetes significantly increased.
- During 2002–2010, Hispanic children and youth had the largest significant increases in incidence of type 1 diabetes.
- During 2011–2015, non-Hispanic Asian and Pacific Islander children and youth had the largest significant increases in incidence of type 1 diabetes.

Among US children and adolescents aged 10 to 19 years, modeled data in Figure 5 showed:

- For the entire period 2002–2015, overall incidence of type 2 diabetes significantly increased.
- During the 2002–2010 and 2011–2015 periods, changes in incidence of type 2 diabetes were consistent across race/ethnic groups. Specifically, incidence of type 2 diabetes remained stable among non-Hispanic whites and significantly increased for all others, especially non-Hispanic blacks.

Figure 5. Trends in incidence of type 1 and type 2 diabetes in youth, overall and by race/ethnicity, 2002–2015



Note: Adapted from Divers et al. (2020).¹ Data are model-adjusted incidence estimates (See [Detailed Methods](#)).

Data source: SEARCH for Diabetes in Youth Study.

Prevalence of Prediabetes Among Adults

- An estimated 88 million adults aged 18 years or older had prediabetes in 2018 (Table 3).
- Among US adults aged 18 years or older, crude estimates for 2013–2016 were:
 - » 34.5% of all US adults had prediabetes, based on their fasting glucose or A1C level (Table 3).
 - » 10.5% of adults had prediabetes based on both elevated fasting plasma glucose and A1C levels ([Appendix Table 5](#)).
 - » 15.3% of adults with prediabetes reported being told by a health professional that they had this condition (Table 3).

Among US adults aged 18 years or older, age-adjusted data for 2013–2016 indicated:

- A higher percentage of men (37.4%) than women (29.2%) had prediabetes ([Appendix Table 6](#)).
- Prevalence of prediabetes was similar among all racial/ethnic groups and education levels ([Appendix Table 6](#)).

Table 3. Estimated number, percentage, and awareness of prediabetes^a among adults aged 18 years or older, United States, 2013–2016 and 2018

Characteristic	Prediabetes, ^a 2018 Estimates Number in millions (95% CI)	Prediabetes, ^a 2013–2016 Estimates Percentage (95% CI)	Prediabetes Awareness, ^b 2013–2016 Estimates Percentage (95% CI)
Total	88.0 (82.2–93.8)	34.5 (32.2–36.9)	15.3 (12.8–18.3)
Age in years			
18–44	28.7 (25.3–32.1)	24.3 (21.4–27.4)	8.8 (5.9–13.0)
45–64	35.1 (33.0–37.3)	41.7 (39.1–44.4)	16.0 (12.8–19.8)
≥65	24.2 (22.0–26.4)	46.6 (42.3–51.0)	22.6 (17.2–29.1)
Sex			
Men	40.9 (37.6–44.3)	38.0 (34.5–41.2)	11.4 (8.5–15.2)
Women	47.1 (42.9–51.3)	31.2 (28.6–34.0)	19.8 (15.9–24.5)
Race/ethnicity			
White, non-Hispanic	54.8 (49.7–59.8)	33.9 (30.7–37.2)	15.8 (12.2–20.1)
Black, non-Hispanic	11.4 (10.4–12.5)	36.9 (33.5–40.1)	16.8 (13.6–20.5)
Asian, non-Hispanic	5.0 (4.5–5.4)	32.8 (29.6–36.2)	9.8 (6.1–15.6)
Hispanic	14.6 (13.5–15.8)	35.4 (32.6–38.3)	10.8 (8.1–14.3)

Note: CI = confidence interval. Data are crude estimates (See [Detailed Methods](#)).

^aPrediabetes was defined as fasting plasma glucose values of 100 to 125 mg/dL or A1C values of 5.7% to 6.4%.

^bPrediabetes awareness was based on self-report and estimated only among adults with prediabetes.

Data sources: 2013–2016 National Health and Nutrition Examination Survey; 2018 US Census Bureau data.

Trends in Prevalence of Prediabetes Among Adults

- There were no significant changes in age-adjusted prevalence of prediabetes from 2005–2008 to 2013–2016 ([Appendix Table 7](#)). About one-third of US adults had prediabetes over the entire period.
- Among adults with prediabetes, the age-adjusted percentage aware that they had this condition doubled from 6.5% to 13.3% between 2005–2008 and 2013–2016 ([Appendix Table 7](#)).

Risk Factors for Diabetes-Related Complications

Among US adults aged 18 years or older with diagnosed diabetes, crude estimates for 2013–2016 shown in [Appendix Table 8](#) were:

Smoking

- 21.6% were tobacco users based on self-report or levels of serum cotinine.
- 15.0% reported current cigarette smoking.
- 36.4% had quit smoking but had a history of smoking at least 100 cigarettes in their lifetime.

Overweight and Obesity

- 89.0% were overweight or had obesity, defined as a body mass index (BMI) of 25 kg/m² or higher. Specifically:
 - » 27.6% were overweight (BMI of 25.0 to 29.9 kg/m²).
 - » 45.8% had obesity (BMI of 30.0 to 39.9 kg/m²).
 - » 15.5% had extreme obesity (BMI of 40.0 kg/m² or higher).

Physical Inactivity

- 38.0% were physically inactive, defined as getting less than 10 minutes a week of moderate or vigorous activity in each physical activity category of work, leisure time, and transportation.

A1C

- 50.0% had an A1C value of 7.0% or higher. Specifically:
 - » 22.3% had an A1C value of 7.0% to 7.9%.
 - » 13.2% had an A1C value of 8.0% to 9.0%.
 - » 14.6% had an A1C value higher than 9.0%.
- 16.3% of adults aged 18–44 years had A1C levels of 10% or higher, compared to 12.7% of those aged 45–64 years and 4.3% of those aged 65 years or older ([Appendix Table 9](#)).

High Blood Pressure

- 68.4% had a systolic blood pressure of 140 mmHg or higher or diastolic blood pressure of 90 mmHg or higher or were on prescription medication for their high blood pressure ([Appendix Table 8](#)).

High Cholesterol*

- 43.5% had a non-HDL level of 130 mg/dL or higher. Specifically:
 - » 22.4% had a non-HDL level of 130 to 159 mg/dL.
 - » 11.2% had a non-HDL level of 160 to 189 mg/dL.
 - » 9.9% had a non-HDL level of 190 mg/dL or higher.

* Non-high-density lipoprotein cholesterol (non-HDL) contains all the atherogenic lipoproteins, including low-density lipoprotein cholesterol (LDL), very-low-density lipoprotein, lipoprotein(a), and others. Growing evidence supports non-HDL as a better predictor of cardiovascular disease risk than LDL.²

Preventing Diabetes-Related Complications

Among US adults aged 18 years or older with diagnosed diabetes, crude data for 2013–2016 shown in [Appendix Table 10](#) indicated:

Usual Source for Diabetes Care

- 77.8% reported having at least one usual source of diabetes care, such as a doctor or other health care professional.

Physical Activity

- 24.2% met the recommended goal of at least 150 minutes per week of leisure-time physical activity.

Weight Management

- 77.1% reported managing or losing weight to lower their risk for developing certain diseases.

Statin Treatment

- 58.4% of adults aged 40–75 years were on statin therapy.

A1C, Blood Pressure, Cholesterol, and Smoking (ABCs)

- 19.2% met all of these criteria: A1C value <7.0%, blood pressure <140/90 mmHg, non-HDL cholesterol <130 mg/dL, and being a nonsmoker (Table 4).
- 36.4% met all of these criteria: A1C value <8.0%, blood pressure <140/90 mmHg, non-HDL cholesterol <160 mg/dL, and being a nonsmoker (Table 4).

Table 4. Crude percentage of adults aged 18 years or older with diagnosed diabetes meeting all ABCs goals, United States, 2013–2016

Risk Factor	ABCs Goals for Many Adults	Less Stringent ABCs Goals
A1C	<7.0%	<8.0%
Blood Pressure	<140/90 mmHg	<140/90 mmHg
Cholesterol, non-HDL	<130 mg/dL	<160 mg/dL
Smoking, current	Nonsmoker	Nonsmoker
Percentage meeting all ABCs goals	19.2 (15.3–23.9)	36.4 (15.3–23.9)

Notes: ABCs = A1C, blood pressure, cholesterol, and smoking. CI = confidence interval. Estimates are crude percentages and 95% confidence intervals. See 2019 Standards of Medical Care in Diabetes for more information on ABCs goals.³

Data source: 2013–2016 National Health and Nutrition Examination Survey.

Coexisting Conditions and Complications

Emergency Department Visits

In 2016, a total of 16 million emergency department (ED) visits were reported with diabetes as any listed diagnosis among adults aged 18 years or older (Table 5), including:

- 224,000 for hyperglycemic crisis (9.7 per 1,000 adults with diabetes).
- 235,000 for hypoglycemia (10.2 per 1,000 adults with diabetes).

Table 5. Number and rate of emergency department visits per 1,000 adults aged 18 years or older with diabetes for selected causes, United States, 2016

Risk Factor	Number in thousands	Crude rate per 1,000 (95% CI)
Diabetes as any listed diagnosis	15,965	69.1 (63.3–74.9)
Hyperglycemic crisis	224	9.7 (8.9–10.5)
Diabetic ketoacidosis	203	8.8 (8.0–9.5)
Hyperosmolar hyperglycemic syndrome	21	0.9 (0.85–1.0)
Hypoglycemia	235	10.2 (9.4–11.0)

Note: CI = confidence interval.

Data sources: 2016 National Emergency Department Sample; 2016 National Health Interview Survey.

In 2016, of the ED visits with diabetes as any listed diagnosis among US adults aged 18 years or older, disposition data (See [Detailed Methods](#)) indicated:

- 59.0% were treated and released; 35.1% were admitted to the hospital; 2.3% were transferred to another hospital; 2.2% were transferred to a skilled nursing facility, intermediate care facility, or home with home health care; 1.1% left against medical advice; 0.2% died; and 0.2% had unknown disposition but were not admitted to a hospital.
- Of those ED visits involving hypoglycemia, 71.0% were treated and released, 22.3% were admitted to the hospital, and <0.1% died.
- Of the ED visits involving hyperglycemic crisis, 8.1% were treated and released, 85.6% were admitted to the hospital, and <0.1% died.

Hospitalizations

In 2016, a total of 7.8 million hospital discharges were reported with diabetes as any listed diagnosis among US adults aged 18 years or older (339.0 per 1,000 adults with diabetes) (Table 6). These discharges included:

- 1.7 million for major cardiovascular diseases (75.3 per 1,000 adults with diabetes), including:
 - » 438,000 for ischemic heart disease (18.9 per 1,000 adults with diabetes).
 - » 313,000 for stroke (13.6 per 1,000 adults with diabetes).
- 130,000 for a lower-extremity amputation (5.6 per 1,000 adults with diabetes).
- 209,000 for hyperglycemic crisis (9.1 per 1,000 adults with diabetes).
- 57,000 for hypoglycemia (2.5 per 1,000 adults with diabetes).

Table 6. Number and rate of hospitalizations per 1,000 adults aged 18 years or older with diabetes for selected causes, United States, 2016

Risk Factor	Number in thousands	Crude rate per 1,000 (95% CI)
Diabetes as any listed diagnosis	7,833	339.0 (317.6–360.4)
Major cardiovascular disease	1,740	75.3 (70.4–80.2)
Ischemic heart disease	438	18.9 (17.6–20.2)
Stroke	313	13.6 (12.7–14.5)
Lower-extremity amputation	130	5.6 (5.3–6.0)
Hyperglycemic crisis	209	9.1 (8.5–9.6)
Diabetic ketoacidosis	188	8.1 (7.6–8.7)
Hyperosmolar hyperglycemic syndrome	21	0.9 (0.85–1.0)
Hypoglycemia	57	2.5 (2.3–2.6)

Note: CI = confidence interval.

Data sources: 2016 National Inpatient Sample; 2016 National Health Interview Survey.

Kidney Disease (See Detailed Methods)

Among US adults aged 18 years or older with diagnosed diabetes, crude estimates for 2013–2016 were:

- 37.0% (95% CI, 33.0%–41.2%) had chronic kidney disease (stages 1–4), of which over half (52.5%) had moderate to severe chronic kidney disease (stage 3 or 4).
- 24.9% (95% CI, 19.4%–31.4%) with moderate to severe chronic kidney disease (stage 3 or 4) were aware of their kidney disease.

In 2017:

- Crude prevalence of end-stage kidney disease with diabetes listed as the primary cause was 38.6% (288,451 out of 746,557 people). Consequently, diabetes was the leading cause of end-stage kidney disease, followed by high blood pressure (25.9%), and glomerulonephritis (15.5%).
- Crude incidence of end-stage kidney disease with diabetes as the primary cause was 180.3 per 1 million population (58,372 new cases).

Vision Disability (See Detailed Methods)

- Diabetes is the leading cause of new cases of blindness among adults aged 18–64 years.
- Among US adults aged 18 years or older with diagnosed diabetes, crude data for 2018 indicated:
 - » 11.7% (95% CI, 11.0%–12.5%) reported vision disability, including blindness.

Deaths⁴

- In 2017, diabetes was the seventh leading cause of death in the United States. This finding is based on 83,564 death certificates in which diabetes was listed as the underlying cause of death (crude rate, 25.7 per 100,000 persons).
- In 2017, there were 270,702 death certificates with diabetes listed as the underlying or contributing cause of death (crude rate, 83.1 per 100,000 persons).

Costs⁵

- The total direct and indirect estimated costs of diagnosed diabetes in the United States in 2017 was \$327 billion.
- Total direct estimated costs of diagnosed diabetes increased from \$188 billion in 2012 to \$237 billion in 2017 (2017 dollars); total indirect costs increased from \$73 billion to \$90 billion in the same period (2017 dollars).
- Between 2012 and 2017, excess medical costs per person associated with diabetes increased from \$8,417 to \$9,601 (2017 dollars).

ACKNOWLEDGMENTS

The following organizations collaborated on the content of this report:

- Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Division of Diabetes Translation
- Indian Health Service, Division of Diabetes Treatment and Prevention
- American Diabetes Association
- National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases
- Centers for Disease Control and Prevention, National Center for Health Statistics
- JDRF

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SUGGESTED CITATION

Centers for Disease Control and Prevention. National Diabetes Statistics Report, 2020. Atlanta, GA: Centers for Disease Control and Prevention, U.S. Dept of Health and Human Services; 2020.

APPENDIX A: Detailed Tables

Appendix Table 1. Age-adjusted prevalence of diagnosed, undiagnosed, and total diabetes among adults aged 18 years or older, United States, 2013–2016.

Characteristic	Diagnosed diabetes Percentage (95% CI)	Undiagnosed diabetes Percentage (95% CI)	Total diabetes Percentage (95% CI)
Total	9.4 (8.6–10.2)	2.6 (2.2–3.1)	12.0 (11.1–12.9)
Sex			
Men	10.4 (9.2–11.7)	3.0 (2.2–4.0)	13.3 (12.0–14.8)
Women	8.6 (7.7–9.5)	2.2 (1.8–2.8)	10.8 (9.9–11.8)
Race/ethnicity			
White, Non-Hispanic	7.9 (7.2–8.7)	2.2 (1.6–2.9)	10.0 (9.2–11.0)
Black, Non-Hispanic	13.7 (12.5–15.1)	3.0 (2.0–4.5)	16.8 (15.4–18.1)
Asian, Non-Hispanic	11.3 (9.2–13.7)	4.7 (3.0–7.3)	16.0 (13.7–18.5)
Hispanic	13.7 (12.1–15.6)	4.1 (3.1–5.4)	17.9 (16.0–19.9)
Education			
Less than high school	12.7 (11.4–14.2)	3.9 (2.5–5.8)	16.6 (14.8–18.6)
High school	9.7 (8.5–11.1)	3.0 (2.1–4.4)	12.8 (11.1–14.7)
More than high school	8.3 (7.3–9.5)	2.2 (1.6–2.8)	10.5 (9.4–11.8)

Note: CI = confidence interval.

Data source: 2013–2016 National Health and Nutrition Examination Survey.

Appendix Table 2. Trends in age-adjusted prevalence of diagnosed, undiagnosed, and total diabetes among adults aged 18 years or older, United States, 1999–2016.

Time Period	Diagnosed diabetes ^a Percentage (95% CI)	Undiagnosed diabetes Percentage (95% CI)	Total diabetes ^a Percentage (95% CI)
1999–2002	6.4 (5.8–7.0)	3.1 (2.6–3.7)	9.5 (8.7–10.4)
2001–2004	7.1 (6.5–7.8)	3.2 (2.7–3.8)	10.3 (9.4–11.3)
2003–2006	7.4 (6.7–8.1)	2.8 (2.2–3.6)	10.2 (9.3–11.2)
2005–2008	7.7 (6.9–8.5)	2.9 (2.4–3.6)	10.6 (9.6–11.6)
2007–2010	7.9 (7.1–8.7)	3.2 (2.7–3.7)	11.1 (10.1–12.2)
2009–2012	8.1 (7.4–8.9)	3.2 (2.6–3.8)	11.3 (10.3–12.3)
2011–2014	8.7 (8.1–9.4)	2.7 (2.3–3.3)	11.5 (10.7–12.3)
2013–2016	9.4 (8.6–10.2)	2.6 (2.2–3.1)	12.0 (11.1–12.9)

^ap-value for linear trend <0.05.

Note: CI = confidence interval.

Data source: 1999–2016 National Health and Nutrition Examination Survey.

Appendix Table 3. Age-adjusted prevalence of diagnosed diabetes by detailed race/ethnicity, education level, and sex among adults aged 18 years or older, United States, 2017–2018.

Characteristic	Total Percentage (95% CI)	Men Percentage (95% CI)	Women Percentage (95% CI)
Race/ethnicity			
American Indian/Alaska Native	14.7 (14.6–14.7)	14.5 (14.4–14.6)	14.8 (14.7–14.9)
Asian, non-Hispanic, overall	9.2 (8.0–10.5)	10.0 (8.3–12.0)	8.5 (7.0–10.5)
Asian Indian	12.6 (9.3–16.7)	13.9 (10.3–18.6)	11.1 (6.6–18.0)
Chinese	5.6 (3.9–8.1)	5.9 (3.5–9.8)	5.3 (3.2–8.8)
Filipino	10.4 (8.1–13.4)	10.9 (7.6–15.4)	10.0 (6.8–14.6)
Other Asian	9.9 (8.1–12.2)	11.5 (8.5–15.3)	8.7 (6.2–11.9)
Black, non-Hispanic	11.7 (10.8–12.7)	11.4 (10.0–12.9)	12.0 (10.9–13.1)
Hispanic, overall	12.5 (11.5–13.5)	13.7 (12.3–15.2)	11.6 (10.2–13.0)
Central/South American	8.3 (8.0–8.6)	9.2 (8.8–9.6)	7.6 (7.2–8.0)
Cuban	6.5 (4.6–9.2)	7.3 (4.2–12.5)	6.0 (3.6–9.8)
Mexican	14.4 (13.1–15.8)	16.2 (14.2–18.3)	12.8 (11.1–14.8)
Puerto Rican	12.4 (10.1–15.1)	13.0 (9.5–17.6)	11.9 (9.0–15.5)
White, non-Hispanic	7.5 (7.2–7.8)	8.6 (8.1–9.0)	6.6 (6.2–7.0)
Education			
Less than high school	13.3 (12.4–14.2)	13.0 (11.8–14.4)	13.6 (12.3–15.1)
High school	9.7 (9.1–10.4)	11.2 (10.4–12.1)	8.6 (7.9–9.4)
More than high school	7.5 (7.2–7.9)	8.3 (7.8–8.8)	6.8 (6.4–7.3)

Note: CI = confidence interval.

Data sources: 2017–2018 National Health Interview Survey, except American Indian/Alaska Native data, which were from the Indian Health Service National Data Warehouse (2017 data only).

Appendix Table 4. Age-adjusted incidence of diagnosed diabetes among adults aged 18 years or older, United States, 2017–2018.

Characteristic	Rate per 1,000 (95% CI)
Total	6.7 (5.7–8.0)^a
Sex	
Men	7.2 (5.7–9.0) ^a
Women	6.3 (4.9–8.0) ^a
Race/ethnicity	
White, non-Hispanic	5.0 (4.3–5.8)
Black, non-Hispanic	8.2 (6.0–11.0)
Asian, non-Hispanic	7.4 (4.9–10.9)
Hispanic	9.7 (6.7–14.0)
Education	
Less than high school	11.5 (8.3–15.9)
High school	6.0 (4.8–7.5)
More than high school	5.6 (4.7–6.7)

^a Rate calculated using 2018 data only.

Note: CI = confidence interval.

Data source: 2017–2018 National Health Interview Survey.

Appendix Table 5. Age-adjusted prevalence of prediabetes according to various definitions of hyperglycemia among adults aged 18 years or older, United States, 2013–2016.

Characteristic	Definition 1 Percentage (95% CI)	Definition 2 Percentage (95% CI)	Definition 3 Percentage (95% CI)	Definition 4 Percentage (95% CI)
Total	33.3 (31.1–35.7)	38.0 (35.2–40.8)	22.0 (20.4–23.6)	10.5 (9.4–11.7)
Age, years^a				
18–44	24.3 (21.4–27.4)	29.1 (25.2–33.3)	12.9 (11.0–15.2)	5.3 (4.1–6.7)
45–64	41.7 (39.1–44.4)	46.3 (43.5–49.1)	30.1 (27.8–32.5)	13.7 (11.5–16.2)
≥65	46.6 (42.3–51.0)	51.0 (46.5–55.5)	35.9 (31.6–40.3)	21.3 (18.0–25.0)
Sex				
Men	37.4 (33.9–40.9)	42.3 (38.1–46.5)	22.2 (20.0–23.3)	11.8 (9.9–13.9)
Women	29.2 (26.7–31.8)	33.7 (30.7–36.8)	21.6 (20.0–23.3)	9.3 (8.1–10.7)
Race/ethnicity				
White, non-Hispanic	31.0 (27.8–34.4)	35.5 (31.7–39.5)	18.9 (16.9–21.0)	9.2 (7.9–10.7)
Black, non-Hispanic	36.6 (33.7–39.6)	38.6 (35.3–42.1)	31.9 (29.7–34.3)	11.5 (9.6–13.7)
Asian, non-Hispanic	33.0 (29.6–36.7)	39.9 (35.7–44.3)	21.7 (19.0–24.6)	10.2 (8.2–12.7)
Hispanic	36.1 (33.5–38.9)	42.3 (39.1–45.6)	23.8 (21.3–26.5)	12.9 (11.2–15.0)

continued on next page →

Characteristic	Definition 1 Percentage (95% CI)	Definition 2 Percentage (95% CI)	Definition 3 Percentage (95% CI)	Definition 4 Percentage (95% CI)
Education				
Less than high school	37.2 (32.7–42.1)	42.5 (37.6–47.5)	24.4 (20.8–28.5)	12.0 (9.6–14.9)
High school	35.7 (32.5–39.1)	41.2 (37.5–45.1)	25.2 (22.2–28.4)	11.4 (9.3–14.0)
More than high school	31.3 (28.9–33.9)	35.5 (32.7–38.4)	20.1 (18.1–22.2)	9.8 (8.7–11.0)

^aEstimates are crude.

Definition 1: Any of: A1C 5.7–6.4% or fasting plasma glucose 100–125 mg/dL.

Definition 2: Any of: A1C 5.7–6.4%, fasting plasma glucose 100–125 mg/dL, or 2-hour plasma glucose from oral glucose tolerance test 140–199 mg/dL.

Definition 3: Any of: A1C 5.7–6.4% or fasting plasma glucose 110–125 mg/dL.

Definition 4: Both A1C 5.7–6.4% and fasting plasma glucose 100–125 mg/dL.

Note: CI = confidence interval.

Data source: 2013–2016 National Health and Nutrition Examination Survey.

Appendix Table 6. Age-adjusted prevalence and awareness of prediabetes among adults aged 18 years or older, United States, 2013–2016.

Characteristic	Prediabetes ^a Percentage (95% CI)	Prediabetes Awareness ^b Percentage (95% CI)
Total	33.3 (31.1–35.7)	13.3 (11.0–16.0)
Sex		
Men	37.4 (33.9–40.9)	10.3 (7.7–13.6)
Women	29.2 (26.7–31.8)	17.5 (13.0–23.1)
Race/ethnicity		
White, non-Hispanic	31.0 (27.8–34.4)	13.6 (9.9–18.4)
Black, non-Hispanic	36.6 (33.7–39.6)	15.1 (12.0–18.8)
Asian, non-Hispanic	33.0 (29.6–36.7)	8.3 (5.1–13.4)
Hispanic	36.1 (33.5–38.9)	11.5 (8.8–14.9)
Education		
Less than high school	37.2 (32.7–42.1)	8.7 (5.9–12.6)
High school	35.7 (32.5–39.1)	13.1 (8.4–19.6)
More than high school	31.3 (28.9–33.9)	15.0 (11.4–19.5)

^aPrediabetes was defined as fasting plasma glucose values of 100 to 125 mg/dL or A1C values of 5.7% to 6.4%.

^bPrediabetes awareness was based on self-report and estimated only among adults with prediabetes.

Note: CI = confidence interval.

Data source: 2013–2016 National Health and Nutrition Examination Survey.

Appendix Table 7. Trends in age-adjusted prevalence and awareness of prediabetes among adults aged 18 years or older, United States, 2005–2016.

Time Period	Prediabetes ^a Percentage (95% CI)	Prediabetes Awareness ^{b,c} Percentage (95% CI)
2005–2008	33.6 (31.9–35.2)	6.5 (5.3–7.9)
2007–2010	36.3 (34.6–38.1)	8.2 (6.7–9.9)
2009–2012	35.2 (33.2–37.3)	10.0 (8.3–11.9)
2011–2014	33.0 (30.7–35.4)	10.7 (9.0–12.5)
2013–2016	33.3 (31.1–35.6)	13.3 (11.0–16.0)

Note: CI = confidence interval.

^a Prediabetes was defined as fasting plasma glucose values of 100 to 125 mg/dL or A1C values of 5.7% to 6.4%.

^b Prediabetes awareness was based on self-report and estimated only among adults with prediabetes.

^c p-value for linear trend <0.05.

Data source: 2005–2016 National Health and Nutrition Examination Survey.

Appendix Table 8. Crude percentage of factors associated with diabetes-related complications among adults aged 18 years or older with diagnosed diabetes, United States, 2013–2016.

Risk Factors for Diabetes-Related Complications	Percentage (95% CI)
Smoking	
Current tobacco user based on self-report or serum cotinine >10 ng/mL	21.6 (18.5–25.0)
Current cigarette smoker based on self-report	15.0 (12.6–17.7)
Former cigarette smoker	36.4 (33.4–39.5)
Overweight and obesity, according to body mass index (BMI)	
BMI ≥25.0 kg/m ²	89.0 (86.6–91.1)
BMI 25.0–29.9 kg/m ²	27.6 (24.8–30.6)
BMI 30.0–39.9 kg/m ²	45.8 (42.1–49.5)
BMI ≥40.0 kg/m ²	15.5 (13.0–18.3)
Physical inactivity	38.0 (34.1–42.0)
A1C	
A1C ≥7.0%	50.0 (46.2–53.8)
A1C 7.0–7.9%	22.3 (19.5–25.4)
A1C 8.0–9.0%	13.2 (10.7–16.2)
A1C >9.0%	14.6 (12.1–17.4)
High blood pressure	
Blood pressure ≥140/90 mmHg or taking antihypertensive medication	68.4 (64.6–72.0)
High cholesterol, according to non-HDL cholesterol	
Non-HDL ≥130 mg/dL	43.5 (39.6–47.5)
Non-HDL 130–159 mg/dL	22.4 (18.9–26.3)
Non-HDL 160–189 mg/dL	11.2 (8.5–14.6)
Non-HDL ≥190 mg/dL	9.9 (7.2–13.4)

Notes: CI = confidence interval. Former cigarette smoker was based on serum cotinine levels ≤10 ng/mL, a history of smoking at least 100 cigarettes in their lifetime, and a self-report of no current cigarette smoking. Physical inactivity was based on self-report of less than 10 minutes per week of moderate or vigorous activity in each of the physical activity categories of work, leisure time, and transportation.

Data source: 2013–2016 National Health and Nutrition Examination.

Appendix Table 9. Distribution of A1C levels among adults with diagnosed diabetes aged 18 years or older, overall and by age group, United States, 2013–2016.

A1C	Total	18–44 years	45–64 years	≥65 years
<6.5%	34.2 (30.4–38.1)	38.7 (30.5–47.6)	30.5 (25.9–35.5)	36.9 (31.9–42.3)
6.5%–6.9%	15.8 (13.2–18.8)	14.7 (9.3–22.4)	14.8 (11.5–18.9)	17.4 (13.1–22.9)
7.0%–7.9%	22.3 (19.5–25.4)	12.9 (8.8–18.5)	22.3 (19.0–26.0)	25.6 (20.8–31.0)
8.0%–8.9%	13.2 (10.7–16.2)	12.9 (7.6–21.1)	13.7 (10.0–18.5)	12.6 (9.8–16.1)
9.0%–9.9%	4.6 (3.3–6.5)	4.5 (2.4–8.4)	5.9 (3.9–8.9)	3.1 (1.8–5.3)
≥10.0%	9.9 (8.1–12.1)	16.3 (10.8–23.9)	12.7 (9.5–16.9)	4.3 (2.9–6.5)

Note: Estimates are crude percentages and 95% confidence intervals.

Data source: 2013–2016 National Health and Nutrition Examination Survey.

Appendix Table 10. Crude percentage of factors associated with prevention of diabetes-related complications among adults aged 18 years or older with diagnosed diabetes, United States, 2013–2016.

Preventive Factors	Percentage (95% CI)
At least one usual source of diabetes care	34.2 (30.4–38.1)
At least 150 minutes per week of leisure-time physical activity	15.8 (13.2–18.8)
Managing or losing weight to lower their risk for developing certain diseases	22.3 (19.5–25.4)
Among adults aged 40–75 years, % on statin therapy	13.2 (10.7–16.2)

Note: CI = confidence interval.

Data source: 2013–2016 National Health and Nutrition Examination.

APPENDIX B: Detailed Methods and Data Sources

This section provides additional information about data sources and methods used in the National Diabetes Statistics Report, 2020.

Prevalence of Diabetes (Diagnosed and Undiagnosed) Among People of All Ages, United States, 2018

Data Sources

- 2013–2016 National Health and Nutrition Examination Survey (NHANES), National Center for Health Statistics, Centers for Disease Control and Prevention.
- 2017–2018 National Health Interview Survey (NHIS), National Center for Health Statistics, Centers for Disease Control and Prevention.
- Annual Estimates of the Resident Population by Sex, Single Year of Age, Race, and Hispanic Origin for the United States: April 1, 2010 to July 1, 2018, Population Division, US Census Bureau.

Methods

The total number of people with diabetes is the sum of the number of those aged 18 years or older with diagnosed or undiagnosed diabetes and the number of those younger than age 18 years with diagnosed diabetes. Undiagnosed diabetes for children and adolescents younger than age 18 years was not assessed due to insufficient sample size for reliable estimates. The 2013–2016 NHANES was used to calculate the percentage of adults aged 18 years or older with diagnosed and undiagnosed diabetes (see next section for detail). The 2017–2018 NHIS was used to calculate the percentage of children and adolescents younger than 18 years with diagnosed diabetes. These percentages were then applied to the corresponding July 1, 2018 US resident population estimates from the US Census Bureau to derive the total number of people with diabetes.

Applying 2013–2016 NHANES estimates to the 2018 US resident population estimates has limitations. This methodology assumes that the prevalence of diabetes in 2018 was the same as it was in earlier periods (2013–2016) and that the prevalence of diabetes in the resident population was identical to those in the civilian, noninstitutionalized population (from NHANES). Deviations from these assumptions may result in overestimated or underestimated numbers and rates.

Prevalence of Diabetes (Diagnosed and Undiagnosed) Among Adults Aged 18 Years or Older, United States, 2013–2016 and 2018

Data Sources

- 2013–2016 National Health and Nutrition Examination Survey (NHANES), National Center for Health Statistics (NCHS), Centers for Disease Control and Prevention.
- Annual Estimates of the Resident Population by Sex, Single Year of Age, Race, and Hispanic Origin for the United States: April 1, 2010 to July 1, 2018, Population Division, US Census Bureau.

Methods

The percentage of adults aged 18 years or older with diabetes (diagnosed or undiagnosed) was estimated using 2013–2016 NHANES data. People who self-reported being told by a doctor or health professional that they had diabetes (other than during pregnancy) were classified as having diagnosed diabetes. Those not reporting a history of diagnosed diabetes but who had either a fasting plasma

glucose greater than or equal to 126 mg/dl or an A1C level greater than or equal to 6.5% were classified as having undiagnosed diabetes. For consistency with earlier estimates, fasting glucose values were adjusted using backward regression equations provided by NCHS. People with missing values for either fasting glucose or A1C and pregnant women were excluded. People with diagnosed diabetes from the interviewed sample were combined with people with undiagnosed diabetes from the fasting plasma glucose subsample. Appropriate sampling weights were used so that estimates were representative of the total US adult population.

To estimate the number of adults with diagnosed and undiagnosed diabetes, the age-, sex-, race/ethnicity-specific percentages from three-way cross-tabulations were applied to the corresponding July 1, 2018 US resident population estimates from the US Census Bureau. These subgroup-specific numbers of adults were summed to obtain the estimated number of adults with diagnosed and undiagnosed diabetes for the following: total population; age groups 18–44, 45–64, and 65 years or older; men, women; non-Hispanic white, non-Hispanic black, non-Hispanic Asian, and Hispanic adults. Age-adjusted percentages of diagnosed and undiagnosed diabetes were calculated among adults aged 18 years or older by sex, race/ethnicity, and education level by the direct method to the 2000 US Census standard population, using age groups 18–44, 45–64, and 65 years or older.

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National Health and Nutrition Examination Survey. 2015–2016 Data Documentation, Codebook, and Frequencies https://wwwn.cdc.gov/Nchs/Nhanes/2015-2016/GLU_I.htm.

Trends in Prevalence of Diagnosed Diabetes, Undiagnosed Diabetes, and Total Diabetes Among Adults Aged 18 Years or Older, United States, 1999–2016

Data Source

- 1999–2016 National Health and Nutrition Examination Survey (NHANES), National Center for Health Statistics, Centers for Disease Control and Prevention.

Methods

Percentages of diagnosed, undiagnosed, and total diabetes using overlapping 4-year survey periods during 1999–2016 were calculated among adults aged 18 years or older and age-adjusted by the direct method to the 2000 US Census standard population, using age groups 18–44, 45–64, and 65 years or older. Joinpoint regression was used to analyze varying trends in non-overlapping 2-year estimates. This analysis used the age-adjusted estimates and permutation tests to identify a maximum of three points where linear trends in prevalence changed significantly in either direction or magnitude.

Reference

National Cancer Institute. Joinpoint Trend Analysis Software <https://surveillance.cancer.gov/joinpoint/>

Prevalence of Diagnosed Diabetes, United States, 2013–2016 and 2018

Data Sources

- 2013–2016 National Health and Nutrition Examination Survey (NHANES), National Center for Health Statistics, Centers for Disease Control and Prevention.
- 2017–2018 National Health Interview Survey (NHIS), National Center for Health Statistics, Centers for Disease Control and Prevention.
- Annual Estimates of the Resident Population by Sex, Single Year of Age, Race, and Hispanic Origin for the United States: April 1, 2010 to July 1, 2018, Population Division, US Census Bureau.

Methods

The percentage of people with diagnosed diabetes was obtained from 2017–2018 NHIS data and 2013–2016 NHANES data. The percentage of people aged <20 years with diagnosed diabetes was obtained from NHIS based on information reported by a knowledgeable adult family member residing in the household. The percentage of people aged 20 years or older with diagnosed diabetes was obtained from self-reported data in the 2013–2016 NHANES. The combined estimate of diagnosed diabetes for all ages was applied to the July 1, 2018 US resident population from the US Census Bureau to derive the number of people with diagnosed diabetes for all ages and for children and adolescents younger than age 20 years.

Validated methods to distinguish between types of diabetes in surveys are not available. The percentage of adults aged 20 years or older with diagnosed diabetes who self-reported type 1 diabetes plus current insulin use and the percentage of adults aged 20 years or older with diagnosed diabetes who started using insulin within a year of their diagnosis were estimated from 2017 NHIS data. To estimate the number of adults aged 20 years or older with type 1 diabetes, these percentages were then applied to the derived number of adults aged 20 years or older with diagnosed diabetes. To estimate the number of youths with type 1 diabetes, the percentage of youth aged less than 20 years with type 1 diabetes (88.9%) calculated using prevalence data from the SEARCH for Diabetes in Youth Study was applied to the derived number of youth aged less than 20 years with diagnosed diabetes.

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Prevalence of Diagnosed Diabetes by Race/Ethnicity Among Adults Aged 18 Years or Older, United States, 2017–2018

Data Sources

- 2017–2018 National Health Interview Survey (NHIS), National Center for Health Statistics, Centers for Disease Control and Prevention.
- National Data Warehouse (NDW), Indian Health Service (IHS).

Methods

With the exception of American Indian/Alaska Native (AI/AN) people, who are not well-represented in national surveys because of small population size, race/ethnicity-specific estimates of diagnosed diabetes overall and by sex were calculated using 2017–2018 NHIS self-reported data. Two years of data

were averaged to provide more statistically reliable estimates. Adults aged 18 years or older who self-reported being told by a doctor or health professional that they had diabetes were classified as having diagnosed diabetes. Estimates of diagnosed diabetes for Native Hawaiians and Other Pacific Islanders were not included because of small sample size.

Prevalence of diagnosed diabetes among AI/AN people was calculated using fiscal year 2017 data from the IHS NDW. This data system includes patient registration and encounter data that are received from IHS facilities, tribally operated programs, and urban and contract health systems. These health care facilities serve about 2.56 million AI/AN people who belong to 573 federally recognized tribes in 37 states. Data for active patients (i.e., those with at least one encounter during the preceding 3 years) aged 18 years or older were used to calculate these estimates. Diabetes cases among these patients were identified based on patient encounter data using International Classification of Diseases and Related Health Problems, Ninth Revision, Clinical Modification (ICD-9-CM) diagnosis codes starting with 250 and ICD-10-CM (Tenth Revision) diagnosis codes starting with E10, E11, or E13. Patients were considered to have diagnosed diabetes if they had at least two encounters with one of these diagnosis codes reported during fiscal year 2017. Estimates calculated from NHIS and IHS NDW data may not be comparable because of differences in the datasets and the methods used to define diabetes.

Percentages for all US racial and ethnic groups estimated using NHIS and IHS NDW data were age-adjusted, using age groups 18–44, 45–64, and 65 years or older, by the direct method to the 2000 US Census standard population.

County-Level Prevalence and Incidence of Diagnosed Diabetes Among Adults Aged 20 Years or Older, United States, 2004, 2008, and 2016

Data Sources

- 2003–2017 Behavioral Risk Factor Surveillance System (BRFSS), National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention.
- Annual Estimates of the Resident Population for Selected Age Groups by Sex for the United States, States, Counties, and Puerto Rico Commonwealth and Municipios: April 1, 2010 to July 1, 2017, Population Division, US Census Bureau.
- United States Diabetes Surveillance System (USDSS), National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention.

Methods

Year-specific, county-level estimates and maps of prevalence and incidence of diagnosed diabetes are available from the USDSS website (<https://gis.cdc.gov/grasp/diabetes/DiabetesAtlas.html>). Data from the BRFSS and the US Census Bureau's Population Estimates Program were used to estimate county-level prevalence and incidence of diagnosed diabetes among adults aged 20 years or older. Three years of data were used to improve the precision of the year-specific estimates. For example, 2004 estimates used BRFSS survey data for 2003, 2004, and 2005. County-level estimates for over 3,100 counties or county equivalents (e.g., parish, borough, municipality) in the 50 US states, Puerto Rico, and the District of Columbia were based on indirect model-dependent estimates using Bayesian multilevel modeling techniques. This model-dependent approach uses a statistical model that “borrows strength” in making an estimate for one county from BRFSS data collected in other counties. Multilevel binomial regression models with random effects of demographic variables (age groups 20–44, 45–64, and 65 years or older; race/ethnicity; and sex) at the county level were developed. Rates were age-adjusted to the 2000 US Census standard population using age groups 20–44, 45–64, and 65 years or older.

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Incidence of Diagnosed Diabetes Among Adults Aged 18 Years or Older, United States, 2018

Data Sources

- 2017–2018 National Health Interview Survey (NHIS), National Center for Health Statistics, Centers for Disease Control and Prevention.
- 2013–2016 National Health and Nutrition Examination Survey (NHANES), National Center for Health Statistics, Centers for Disease Control and Prevention.
- Annual Estimates of the Resident Population by Sex, Single Year of Age, Race, and Hispanic Origin for the United States: April 1, 2010 to July 1, 2018, Population Division, US Census Bureau.

Methods

The rate of new cases of diabetes was calculated using 2018 NHIS data on respondents' age at diagnosis and age at interview. Two-year averages of 2017–2018 NHIS were used to improve the precision of race/ethnicity- and education level-specific estimates. Adults who reported being diagnosed with diabetes were asked at what age they were diagnosed. The number of years since diagnosis was calculated by subtracting the person's age at diagnosis from the person's current age. Adults who had a value of zero were identified as having been diagnosed with diabetes within the last year. In addition, half of the adults who had a value of one were classified as having been diagnosed within the last year. To calculate the rate, the numerator included the number of adults who were diagnosed with diabetes within the last year. The denominator was the estimate of the adult population, excluding those who had been diagnosed for more than 1 year and those who were categorized on the NHIS as "refused" or "don't know" or who had missing values on the diabetes status question.

To estimate the number of new cases of diabetes for adults in 2018, the age-, sex-, race/ethnicity-specific rates of new cases from three-way cross-tabulations of 2017–2018 NHIS data were applied to the corresponding July 1, 2018 US resident population estimates from the US Census Bureau after excluding the number of adults who had been diagnosed with diabetes for more than 1 year, estimated from NHANES. These subgroup-specific numbers of adults were summed to obtain the estimated number of adults with newly diagnosed diabetes for the following groups: total population; age groups 18–44, 45–64, and 65 years or older; men, women; non-Hispanic white, non-Hispanic black, non-Hispanic Asian, and Hispanic adults. Age-adjusted incidence of diagnosed diabetes was calculated among adults aged 18 years or older by sex, race/ethnicity and education level by the direct method to the 2000 US Census standard population, using age groups 18–44, 45–64, and 65 years or older.

Trends in Age-adjusted Incidence of Diagnosed Diabetes Among Adults Aged 18 Years or Older, United States, 2000–2018

Data Source

- 2000–2018 National Health Interview Survey (NHIS), National Center for Health Statistics, Centers for Disease Control and Prevention.

Methods

The same method used to calculate 2018 incidence was also applied to 2000–2017 NHIS data. For every year from 2000 to 2018, age-adjusted incidence of diagnosed diabetes was calculated among adults aged 18 years or older by the direct method to the 2000 US Census standard population, using age groups 18–44, 45–64, and 65 years or older. Joinpoint regression was used to analyze varying trends in annual age-adjusted incidence estimates. This analysis used the age-adjusted estimates and permutation tests to identify a maximum of three points where linear trends in incidence changed significantly in either direction or magnitude.

Reference

National Cancer Institute. Joinpoint Trend Analysis Software <https://surveillance.cancer.gov/joinpoint/>

Incidence of Diagnosed Diabetes Among Children and Adolescents Aged <20 Years, United States, 2002–2015

Data Source

- 2002–2015 SEARCH for Diabetes in Youth Study, SEARCH Study Group.

Methods

We reported data from the SEARCH for Diabetes in Youth Study, a population-based registry of incident diabetes among youth less than age 20 years from five clinical sites in the United States. Diabetes type was based on physician diagnosis. Estimates of incidence for type 1 diabetes were included for all patients less than 20 years. Estimates for incidence of type 2 diabetes were only included for youth age 10 to 19 years since there are too few cases among patients less than 10 years for reliable estimates. Patients with all other types of diabetes were excluded. Race/ethnicity was based on self-report, from medical records, or from geocoding for youth with missing data. Annual denominators included civilian youths who were younger than 20 years of age on December 31 of the index year and who were civilian residents of the geographic study areas and summed across all five centers. Annual incidence rates, by type, were calculated as the number of valid, registered patients divided by the number of persons in the surveillance networks over the same period across the five centers. Rates for each index year were presented as two-year moving averages and were expressed per 100,000 youths, overall, and according to race/ethnicity for 2003 (2002–2003) through 2015 (2014–2015). The 95% confidence intervals for the annual unadjusted rates were calculated with the use of the skew-corrected inverted-score test, assuming a binomial distribution. To estimate the number of youths in the United States with type 1 or type 2 diabetes, the incidence rates from the SEARCH study were applied to the total US population for the four racial and ethnic groups for the years of interest. Data for American Indian (AI) youth who participated in the SEARCH study were not shown, since rates cannot be generalized to all AI youth in the United States. Trends in incidence were modeled separately for type 1 and type 2 diabetes with the number of diagnosed cases in each year as the outcome, the corresponding denominator as an offset, and the incidence year as the main predictor. The models were assumed to have a negative binomial distribution with a logarithmic link and used a generalized autoregressive moving average to account for serial correlation. To determine whether incidence trends were constant over the 2002–2015 period, a knot in

index year 2011 was selected based on the minimum Akaike information criteria to allow for comparison of incidence trends between the 2002–2010 and 2011–2015 periods.

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Prevalence of Prediabetes Among People Aged 18 Years or Older, United States, 2013–2016 and 2018

Data Sources

- 2013–2016 National Health and Nutrition Examination Survey (NHANES), National Center for Health Statistics (NCHS), Centers for Disease Control and Prevention.
- Annual Estimates of the Resident Population by Single Year of Age and Sex for the United States: April 1, 2010 to July 1, 2018, Population Division, US Census Bureau.

The percentage of adults aged 18 years or older with prediabetes was estimated using 2013–2016 NHANES data. People without diabetes were classified as having prediabetes if they had fasting plasma glucose values of 100 to 125 mg/dL or A1C values of 5.7% to 6.4%. In addition to this definition, prediabetes estimates according to other definitions were calculated, using 2-hour fasting glucose from an oral glucose tolerance test or more stringent glycemic criteria.

For consistency with earlier estimates, fasting glucose values were adjusted using backward regression equations provided by NCHS. People with missing values for either fasting glucose or A1C and pregnant women were excluded. To estimate the number of adults with prediabetes, the age-, sex-, race/ethnicity-specific percentages from three-way cross-tabulations were applied to the corresponding July 1, 2018 US resident population estimates from the US Census Bureau. These subgroup-specific numbers of adults were summed to obtain the estimated number of adults with prediabetes for the following: total population; age groups 18–44, 45–64, and 65 years or older; men, women; non-Hispanic white, non-Hispanic black, non-Hispanic Asian, and Hispanic adults.

Among those who tested positive for prediabetes, awareness was defined as (1) answered “yes” to the question, “Have you ever been told by a doctor or other health professional that you have any of the following: prediabetes, impaired fasting glucose, impaired glucose tolerance, borderline diabetes or that your blood sugar is higher than normal but not high enough to be called diabetes or sugar diabetes?” or (2) reported having prediabetes or borderline diabetes when asked whether they had diabetes.

Age-adjusted prevalence of prediabetes was calculated among adults aged 18 years or older by sex, race/ethnicity and education level by the direct method to the 2000 US Census standard population, using age groups 18–44, 45–64, and 65 years or older. Joinpoint regression was used to analyze varying trends in annual age-adjusted prevalence estimates. This analysis used the age-adjusted estimates and permutation tests to identify a maximum of three points where linear trends in prediabetes prevalence changed significantly in either direction or magnitude.

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National Cancer Institute. Joinpoint Trend Analysis Software <https://surveillance.cancer.gov/joinpoint/>.

Risk Factors for Diabetes-Related Complications

Data Source

- 2013–2016 National Health and Nutrition Examination Survey (NHANES), National Center for Health Statistics, Centers for Disease Control and Prevention.

Methods

The percentages of adults aged 18 years or older with diagnosed diabetes who had selected risk factors were estimated using the following definitions:

Smoking

Current cigarette smoking status was based on self-report. Tobacco use was based on self-reported current cigarette smoking or serum cotinine level >10 ng/mL. Former cigarette smoker was based on both 1) no current tobacco use and 2) a history of smoking at least 100 cigarettes in a lifetime.

Overweight and Obesity

Overweight and obesity were classified according to body mass index of 25.0–29.9 kg/m² (overweight), 30.0–39.9 kg/m² (obesity), or 40.0 kg/m² or higher (extreme obesity) calculated from measured values of height and weight.

Physical Inactivity

Physical inactivity was based on self-report of less than 10 minutes per week of moderate or vigorous activity in each of the physical activity categories of work, leisure time, and transportation.

High Blood Pressure

High blood pressure was based on average measured systolic blood pressure of 140 mmHg or higher or the average diastolic blood pressure of 90 mmHg or higher or self-reported current use of prescription medication for high blood pressure.

High Cholesterol

High cholesterol was calculated as measured total cholesterol level minus HDL cholesterol level. A non-HDL cholesterol value of 130 mg/dL is roughly equivalent to an LDL level of 100 mg/dL, which indicates an increased risk of diabetes-related complications and eligibility for statin therapy.

A1C

A1C was classified based on measured glycated hemoglobin, with values higher than 9% indicating poor glycemic control.

Preventing Diabetes-Related Complications

Data Source

- 2013–2016 National Health and Nutrition Examination Survey (NHANES), National Center for Health Statistics, Centers for Disease Control and Prevention.

Methods

The percentages of adults aged 18 years or older with diagnosed diabetes who had selected protective factors were estimated using the following definitions:

Usual Source for Diabetes Care

Self-report of having at least one usual source of diabetes care, such as a doctor or other health care professional. Other health professionals did not include specialists, such as diabetes educators, dietitians, eye doctors, or foot doctors.

Physical Activity

Meeting the recommended physical activity goal was based on having at least 150 minutes per week of leisure-time physical activity.

Weight Management

Self-report of managing or losing weight to lower risk for developing certain diseases.

Statin Treatment

Statin therapy among adults aged 40–75 years with diagnosed diabetes was based on prescription information from a medication inventory.

A1C, Blood Pressure, Cholesterol, and Smoking (ABCs)

The ABCs definition was based on meeting all of the following criteria: A1C value <7.0%, blood pressure <140/90 mmHg, non-HDL cholesterol <130 mg/dL, and being a nonsmoker. A less stringent ABCs definition was based on meeting all of the following criteria: A1C value <8.0%, blood pressure <140/90 mmHg, non-HDL cholesterol <160 mg/dL, and being a nonsmoker.

Reference

American Diabetes Association. Standards of Medical Care in Diabetes—2019. *Diabetes Care*. 2019 Jan 1; 42 (Supplement 1).

Coexisting Conditions and Complications Among Adults Aged 18 Years or Older with Diabetes

Data Sources

- 2016 National Inpatient Sample (NIS), Agency for Healthcare Research and Quality.
- 2016 Nationwide Emergency Department Sample (NEDS), Agency for Healthcare Research and Quality.
- 2016 National Health Interview Survey (NHIS), National Center for Health Statistics, Centers for Disease Control and Prevention.
- 2013–2016 National Health and Nutrition Examination Survey (NHANES), National Center for Health Statistics, Centers for Disease Control and Prevention.

- 2019 United States Renal Data System (USRDS) Annual Report.
- 2018 Behavioral Risk Factor Surveillance System (BRFSS), National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention.

Methods

The number of emergency department (ED) visits for hypoglycemia (blood glucose <70 mg/dL) and hyperglycemic crisis in 2016 were calculated using NEDS. Hyperglycemic crisis includes diabetic ketoacidosis (DKA) and hyperglycemic hyperosmolar syndrome (HHS). DKA is characterized by hyperglycemia (blood glucose >250 mg/dL), metabolic acidosis, and increased blood ketone concentration. HHS is characterized by severe hyperglycemia (blood glucose >600 mg/dL), hyperosmolarity, and dehydration, without ketoacidosis. Discharge disposition was classified as the proportion of ED visits that were: treated and released; admitted to a hospital; transferred to another hospital; transferred to skilled nursing facility, intermediate care facility, or home with home healthcare; left against medical advice; died; unknown disposition but not admitted to a hospital. The number of hospitalizations for major cardiovascular diseases, lower-extremity amputation, hyperglycemic crisis and hypoglycemia in 2016 were calculated using NIS. Crude rates were calculated using the proportion of the population with diabetes from NHIS.

Prevalence of chronic kidney disease (CKD) stages 1–4 among US adults aged 18 years or older was calculated using laboratory data from the 2013–2016 National Health and Nutrition Examination Survey and the CKD Epidemiology Collaboration (CKD-EPI) equation for estimated glomerular filtration rate (eGFR). CKD awareness was based on self-report among adults with eGFR levels 15–<60 mL/min/1.73 m² (i.e., moderate to severe CKD stages 3–4). Data on the numbers of people with end-stage kidney disease by primary cause (diabetes, high blood pressure, and glomerulonephritis) were obtained from the USRDS Annual Report Reference Tables. Prevalence of vision disability was calculated using self-reported data from the 2018 BRFSS.

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