PREVALENCE AND INCIDENCE OF TYPE 2 DIABETES AND PREDIABETES

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SUMMARY

Diabetes is a common condition in the United States and worldwide, associated with multiple complications and early mortality that result in costly use of health resources and lost productivity. This chapter reviews the prevalence and incidence of type 2 diabetes in terms of diagnosed and undiagnosed diabetes, as well as prediabetes. Variations in estimates are illustrated by age, sex, race/ethnicity, and over time.

Data come primarily from analyses of two national health surveys: the National Health Interview Surveys (NHIS) 2011–2015, which include only an interview; and the National Health and Nutrition Examination Surveys (NHANES) 2011–2014, which include an interview and blood draw to detect undiagnosed diabetes by glycosylated hemoglobin (A1c), fasting plasma glucose (FPG), and/or 2-hour plasma glucose (2-hour PG) from an oral glucose tolerance test. While these data do not distinguish type 1 from type 2 diabetes, an estimated 90%–95% are from persons with type 2 diabetes. Data from the literature are used to describe type 2 diabetes in adolescents, Hispanic and Asian subgroups, and American Indians.

Crude overall prevalence of diagnosed diabetes based on the NHIS 2011–2015 was 9.5% in adults age ≥20 years, translating to 21.8 million in the U.S. civilian noninstitutionalized population. Prevalence increased with age, ranging from 0.5% in youth age 12–19 years to about 20% in those age ≥65 years. Age-standardized prevalence was somewhat higher in adult men than women. Age- and sex-standardized prevalence was highest in non-Hispanic American Indian/Alaska Native adults (19.1%) and lowest in non-Hispanic whites (8.2%), with prevalences between these in non-Hispanic blacks, all Hispanics, and non-Hispanic Asians. Variability in prevalence was found across Hispanic and Asian subgroups. Prevalence of validated type 2 diabetes in adolescents age 10–19 years based on the SEARCH for Diabetes in Youth Study was 0.46 per 1,000 in 2009, which varied by age, sex, and race/ethnicity.

Crude overall prevalence of undiagnosed diabetes in adults ≥20 years based on the NHANES 2011–2014 was 2.9% as detected by A1c/FPG; and when combined with diagnosed diabetes (9.6%), total diabetes prevalence was 12.5% or 28.2 million in the U.S. civilian noninstitutionalized population. Undiagnosed diabetes of 5.0% by A1c/FPG/2-hour PG resulted in total diabetes of 14.6% or 33.0 million. Prevalence of undiagnosed and total diabetes rose with age. The percent of total diabetes that was undiagnosed was highest (33.4%–41.5%) at age 20–44 years. Standardized prevalence of undiagnosed diabetes and total diabetes tended to be higher in men than women, as was the percent of total diabetes that was undiagnosed. Standardized prevalence of undiagnosed diabetes, total diabetes, and the percent of total diabetes that was undiagnosed were highest in non-Hispanic Asians and lowest in non-Hispanic whites, with prevalences for non-Hispanic blacks, all Hispanics, and Mexican Americans in between.

Crude overall incidence of diagnosed diabetes based on the NHIS 2012 was 7.4 per 1,000 adults age 20–79 years. Incidence increased to age 65–74 years and then declined. It was higher in women than men, highest in Hispanics, followed by non-Hispanic blacks, and lowest in non-Hispanic whites.

Over time, crude prevalence of diagnosed diabetes among all ages based on the NHIS has risen from 0.93% in 1958 to 7.40% in 2015. In adults age 20–74 years during 1980–2012, both age-adjusted prevalence and incidence rose particularly fast during 1990–2008, but may be leveling off or decreasing since 2008. Other data sources have corroborated this finding. An analysis of the NHANES during 1988–2012 found standardized prevalence of total diabetes increased across all subgroups of the U.S. population, due to an increase in diagnosed diabetes, while undiagnosed diabetes remained relatively constant. Both prevalence and incidence of type 2 diabetes in adolescents based on SEARCH have continued to increase significantly since the early 2000s across all age, sex, and race/ethnicity groups.

Crude overall prevalence of prediabetes in adults age ≥20 years based on the NHANES 2011–2014 was 34.4% (77.9 million) by A1c/FPG and 36.9% (83.6 million) by A1c/FPG/2-hour PG. Prevalence of prediabetes rose with age. Standardized prevalence was significantly higher in men than women; and prevalences were higher in non-Hispanic blacks, all Hispanics, and Mexican Americans compared to non-Hispanic whites and non-Hispanic Asians. Prediabetes prevalence was fairly constant during 1999–2006, but significantly increased during 2007–2010.

Diabetes remains a very prevalent condition, especially in American Indians, non-Hispanic blacks, and Hispanic groups. The long-term trend showing a persistent rise in occurrence, though a slowing in more recent years, needs continued surveillance. The fact that one-quarter to one-third of diabetes is undiagnosed and that another third of the total population has prediabetes emphasizes the importance of sustained monitoring and improvements in health care delivery.

INTRODUCTION

Diabetes is one of the most common chronic diseases in the United States and worldwide, associated with the myriad complications presented throughout this compendium, resulting in increased disability, physician office visits and hospitalization rates, premature mortality, and costs amounting to $327 billion in 2017 due to health care and lost productivity (1). Understanding the magnitude of diabetes occurrence in the U.S. population, and in subgroups in which there is a particularly high burden, is the foundation for facilitating further research on risk factor and intervention investigations, as well as health care planning.

This chapter reviews the prevalence and incidence of type 2 diabetes in terms of diagnosed, undiagnosed, and total diabetes; prediabetes; and total dysglycemia. Variations in estimates are illustrated by age, sex, and race/ethnicity, with additional focus on certain Hispanic and Asian subgroups. Type 2 diabetes in adolescents is also presented. The different criteria for detecting undiagnosed diabetes (glycosylated hemoglobin [A1c], fasting plasma glucose [FPG], and 2-hour plasma glucose [2-hour PG] from an oral glucose tolerance test [OGTT]) are compared. Prevalence of diagnosed diabetes is also compared across two national health surveys frequently used in its reporting. Trends over time in these estimates are shown by demographic factors and by county.

The national health survey data do not distinguish between type 1 and type 2 diabetes with precision, as antibody and C-peptide data at the time of diabetes diagnosis are not available; data are not validated by physician diagnosis. The vast majority (90%–95%) of diabetes in these surveys, however, is estimated to be type 2 (2). Some data from other sources that are presented from the scientific literature have validated type 2 diabetes based on physician report. For a detailed discussion on classification of diabetes, please refer to Chapter 1 *Classification and Diagnosis of Diabetes*.

DATA SOURCES AND LIMITATIONS

Two national health surveys with publicly accessible data were analyzed for *Diabetes in America, 3rd edition*, and are the main data sources for this chapter. Published studies from the scientific literature are also described to fill in data gaps; details of these studies are described in the main text.

NATIONAL HEALTH INTERVIEW SURVEY
The National Health Interview Survey (NHIS) is a cross-sectional household interview survey of a representative sample of the U.S. civilian, noninstitutionalized population that has been conducted annually since 1957 to obtain data on the health of the nation. Because of the technical and logistical problems, the survey does not include institutionalized persons in long-term care facilities, those

on active duty with the Armed Forces, persons incarcerated in the prison system, and U.S. nationals living in foreign countries. The NHIS sample is drawn from households in each State and the District of Columbia using a stratified, multistage, probability sample design. The NHIS design and methods have been described (3).

The data used for the analyses from the NHIS in this chapter are from 2011–2015. Non-Hispanic blacks, Hispanics, non-Hispanic Asians, and older persons age ≥65 years were oversampled to obtain more precise estimates for these groups. During 2011–2015, approximately 33,000–37,000 individuals age ≥18 years and 12,000–14,000 age <18 years were sampled. Response rates during 2011–2015 ranged from 55.2% to 74.6% and were adjusted for nonresponse (4).

Interview sample weights were applied to provide representative estimates of the U.S. civilian noninstitutionalized population, and variance estimation accounted for the complex survey design.

The NHIS personal household interview includes a core questionnaire that remains largely unchanged over successive years, enabling trends analysis and data pooling to increase sample size, and a supplemental questionnaire about current health topics. In the core questionnaire, persons are asked about the presence or absence of specific chronic conditions. To identify people with diagnosed diabetes, respondents were asked "(Other than during pregnancy for females), Have you ever been told by a doctor or other health professional that you have diabetes or sugar diabetes?" If the response was

"yes," the person was classified as having diagnosed diabetes. All other data were self-reported, including race/ethnicity.

Self-reported physician-diagnosed diabetes may under- or overestimate true prevalence of diagnosed diabetes; several reports, however, have found self-report to have high validity (5,6,7). Since diabetes was only based on interview information, some persons were classified as not having diabetes when in fact they had undiagnosed diabetes; as much as one-quarter to more than one-third of all diabetes may be undiagnosed (8). It is not possible to differentiate type of diabetes with precision in the NHIS based on available data, and there was no attempt to do so in this chapter; however, the vast majority (90%–95%) of diagnosed diabetes is estimated to be type 2 (2).

NATIONAL HEALTH AND NUTRITION EXAMINATION SURVEY

The National Health and Nutrition Examination Survey (NHANES) is an ongoing cross-sectional, stratified, multistage, probability sample of the U.S. civilian, noninstitutionalized population. It is the only national health survey with both interview and physical examination components to ascertain health conditions. Currently, the NHANES samples approximately 5,000 individuals of all ages from households in 15 locations of the United States each year. Certain groups, such as minority, elderly, and adolescent populations are oversampled to provide more precise estimates in these groups. In-home interviews are followed by physical examinations and laboratory tests in mobile examination centers. For 2011–2014, the most recent years available at the time of analysis for *Diabetes in America*, response rates of the screened sample were 71%–73% for the interview and 69%–70% for the examination (9). Nonresponse adjustment is applied to yield representative estimates. Data are released in 2-year cycles. Survey design and methods have been described (10).

The NHANES identifies race/ethnicity based on self-report in the interview.

Diagnosed diabetes is ascertained in the interview based on an affirmative response to "(Other than during pregnancy, if female) . . . Have you ever been told by a doctor or other health professional that you have diabetes or sugar diabetes?" In persons without diagnosed diabetes, undiagnosed diabetes was determined by measurement of A1c ≥6.5% (≥48 mmol/mol) in those with a physical examination, or by FPG ≥126 mg/dL (≥7.0 mmol/L) in those randomly assigned to the morning sample who fasted 8–<24 hours, or by a 2-hour PG ≥200 mg/dL (≥11.1 mmol/L) from an OGTT with a 75 gram oral glucose challenge (Trutol) and a venipuncture 2 hours (±15 minutes) later in those in the morning sample. In persons without diagnosed or undiagnosed diabetes, prediabetes was defined by A1c 5.7%–6.4% (39–46 mmol/mol), FPG 100–125 mg/dL (5.6–6.9 mmol/L), or 2-hour PG 140–199 mg/dL (7.8–11.0 mmol/L). These criteria cutpoints are recommended by the American Diabetes Association (ADA) (11). Pregnant women were included; only one woman was found to have undiagnosed diabetes based on elevated A1c and 2-hour PG, and she may have had gestational diabetes. NHANES-recommended glucose corrections were used (12,13,14,15,16,17). Sample weighted estimates included interview weights for diagnosed diabetes; examination weights for undiagnosed diabetes and prediabetes identified by A1c; and fasting or OGTT weights for undiagnosed diabetes, prediabetes, or no diabetes identified by FPG or 2-hour PG; this procedure maximizes the use of survey information and sample sizes. Variance estimation accounted for the complex survey design.

Undiagnosed diabetes was defined either by two markers of elevated A1c or FPG or by three markers of elevated A1c or FPG or 2-hour PG, in order to provide a comprehensive assessment of diabetes in the U.S. civilian noninstitutionalized population. Both definitions were also used for assessing the magnitude of prediabetes prevalence. The use of any of the three criteria is recommended by the

ADA (11). A1c and FPG are more frequently used in clinical practice to assess diabetes/prediabetes because of ease of measurement and less burden and time/cost for physicians and patients. While less frequently used in clinical practice, 2-hour PG from an OGTT also detects additional undiagnosed diabetes, which adds to overall diabetes prevalence (18).

Diagnosed diabetes and undiagnosed diabetes were combined to estimate total diabetes in the general population. In addition, the proportion of diabetes that was undiagnosed is reported, using the total diabetic population as a denominator.

Estimates of self-reported prediabetes prevalence are not provided in this chapter, although the NHANES queries participants on whether they were ever told they have prediabetes, impaired fasting glucose (IFG), impaired glucose tolerance, borderline diabetes, or higher than normal glucose but not high enough to be called diabetes or sugar diabetes. Only a small proportion of individuals are aware of having prediabetes; among those testing positive for prediabetes by FPG or a 2-hour PG in the NHANES 2005–2006, only 7.3% self-reported having been told (19). Defining prediabetes based on elevated A1c, FPG, or 2-hour PG levels captures the condition as currently defined.

The NHANES is unique for national surveys because of its examination component that allows undiagnosed diabetes to be ascertained, in addition to collecting self-reported physician-diagnosed diabetes. As mentioned for the NHIS in the previous section, although self-reported diagnosed diabetes may not represent true prevalence, literature has shown such reports to have high validity. Detection of undiagnosed diabetes in the NHANES is based on a single blood sample assessment for A1c and plasma glucose and does not include a repeat blood draw and assessment for confirmation, as recommended by the ADA (11), which could lead to overestimation of undiagnosed diabetes prevalence since it is not confirmed (20,21). The NHANES does not distinguish

type 1 from type 2 diabetes; however, as described above, almost all is expected to be type 2.

ANALYTIC CONSIDERATIONS IN USING THE NHIS AND NHANES

Both the NHIS and NHANES use complex survey designs that oversample certain groups of the U.S. population to provide more precise estimates in these groups, requiring sample weighting of prevalence estimates. Absolute numbers of individuals with diabetes were calculated from weighted prevalence estimates applied to the respective NHIS and NHANES samples, to represent millions of the U.S. civilian noninstitutionalized population. Standard errors were estimated using SUDAAN (Release 11.0.0)

(22), which accounts for the clustered sample design.

Relative standard errors (RSEs) are noted in the figures and appendices, if estimates had limited statistical precision due to small sample sizes. Estimates with RSE >30%–50% should be considered with caution, and those with an RSE >50% have been suppressed. Standard errors and 95% confidence intervals (CI) for estimates have also been provided. All comparisons of interest were tested for statistical significance using large sample t-tests based on a level of $p < 0.05$.

Estimated prediabetes prevalence in the NHANES was somewhat lower in some older age groups based on the A1c/

FPG/2-hour PG definition compared to the A1c/FPG definition. This occurred from a combination of two reasons: the first due to some sample persons being classified as having prediabetes by A1c/FPG, but having diabetes by OGTT, making them ineligible to have prediabetes using the three-marker definition, and the second due to comparing two somewhat different subsamples (fasting vs. OGTT subsamples). In addition, estimates of Total Diabetes and Total Dysglycemia may not reflect the sum of their parts due, first, to rounding, and second, to small differences in the fasting and OGTT subsamples used to estimate the various components.

PREVALENCE OF DIAGNOSED DIABETES

OVERALL

Data from the NHIS 2011–2015 were analyzed for *Diabetes in America* to present prevalence of diagnosed diabetes. Crude overall prevalence of diagnosed diabetes was 9.5% for adults age ≥20 years, translating to 21.8 million (95% CI 21.3–22.3 million) adults with diagnosed diabetes in the U.S. civilian noninstitutionalized population (Appendix 3.1).

PREVALENCE BY AGE

Crude prevalence of diagnosed diabetes during 2011–2015 increased significantly with age but plateaued in older age groups. Prevalence was 0.5% in youth age 12–19 years and was 2.6% in adults age 20–44 years, rising to 21.5% in those age 65–74 years, which was similar to prevalence in adults age ≥75 years (19.9%), although the difference was statistically significant (Figure 3.1, Appendix 3.1). Prevalence was 20.8% in all adults age ≥65 years.

Prevalence estimates of diagnosed diabetes in youth based on data from the NHIS contain a mixture of both type 1 and type 2 diabetes. The SEARCH for Diabetes in Youth study aims to describe the magnitude of diabetes, separately for type 1 and type 2, in youth age <20 years. SEARCH data were collected from

four geographic areas (Colorado [from all 64 counties], Ohio [from eight counties], South Carolina [from all 46 counties], and Washington state [from five counties]) and one managed health care plan located in California (Kaiser Permanente Southern California health plan in seven counties), with additional data from selected American Indian reservations in Arizona and New Mexico. Networks of pediatric and adult endocrinologists and other clinicians, hospitals, and health plans in the study areas were used. Data from identified patients were validated by verifying

the diagnosis and type of diabetes with a physician. As reported by Dabelea *et al.* (23), overall prevalence (per 1,000 general population) in 2009 of type 2 diabetes in youth age 10–19 years was 0.46 and was lower in youth age 10–14 years (0.23) than in those age 15–19 years (0.68) (Table 3.1). Prevalence of type 1 diabetes in youth is described in Chapter 2 *Prevalence and Incidence of Type 1 Diabetes Among Children and Adults in the United States and Comparison With Non-U.S. Countries* and also in Chapter 15 *Diabetes in Youth*.

FIGURE 3.1. Crude Prevalence of Diagnosed Diabetes by Age and Sex, U.S., 2011–2015
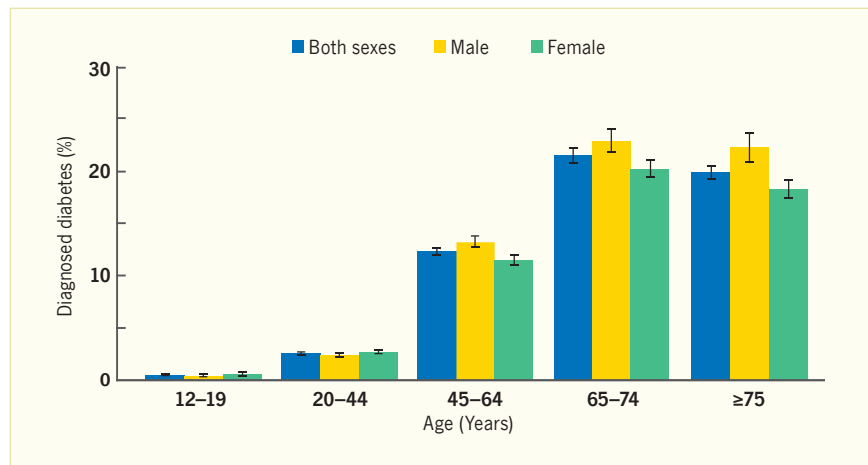
Diagnosed diabetes is based on self-report. Error bars represent 95% confidence intervals. See Appendix 3.1 for further details.

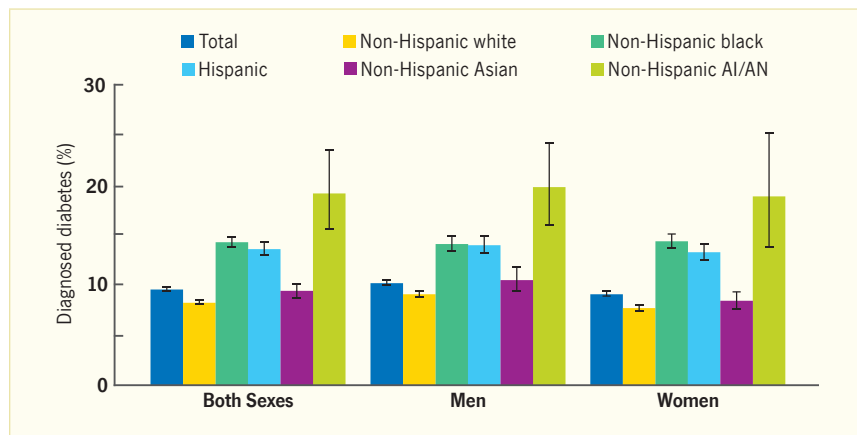SOURCE: National Health Interview Surveys 2011–2015

TABLE 3.1. Prevalence of Type 2 Diabetes Per 1,000 Youth Age 10–19 Years by Demographic Characteristics, 2009

| CHARACTERISTICS | NUMBER OF YOUTH | | PREVALENCE PER 1,000 (95% CI) |
	Cases With Diabetes	General Population	
Total	819	1,781,260	0.46 (0.43–0.49)
Age (years)*			
10–14	198	867,403	0.23 (0.20–0.26)
15–19	621	913,857	0.68 (0.63–0.74)
Sex			
Male	314	909,795	0.35 (0.31–0.39)
Female	505	871,465	0.58 (0.53–0.63)
Race/ethnicity			
White	172	985,818	0.17 (0.15–0.20)
Black	209	196,723	1.06 (0.93–1.22)
Hispanic	317	402,691	0.79 (0.70–0.88)
Asian Pacific Islander	46	133,455	0.34 (0.26–0.46)
American Indian	75	62,573	1.20 (0.96–1.51)

Data were from four U.S. geographic areas (Colorado, Ohio, South Carolina, and Washington state), one managed health care plan in California, and selected American Indian reservations in Arizona and New Mexico. CI, confidence interval.
* Age on December 31, 2009

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FIGURE 3.2. Age- or Age/Sex-Standardized Prevalence of Diagnosed Diabetes in Adults Age ≥20 Years, by Sex and Race/Ethnicity, U.S., 2011–2015

Diagnosed diabetes is based on self-report. For Both Sexes, data are standardized to the NHIS 2011–2015 total population by age and sex using age groups 20–44, 45–64, and ≥65 years. For Men and Women, data are standardized to the NHIS 2011–2015 total population by age using age groups 20–44, 45–64, and ≥65 years. Error bars represent 95% confidence intervals. See Appendix 3.2 for further details. AI/AN, American Indian/Alaska Native.

SOURCE: National Health Interview Surveys 2011–2015

PREVALENCE BY SEX

Overall age-standardized prevalence of diagnosed diabetes based on data from the NHIS during 2011–2015 in adults age ≥20 years was minimally higher in men (10.1%) than in women (9.0%) (Appendix 3.2); the prevalences were statistically different. Prevalences by sex were similar at young ages, but prevalence became higher in men than in women beginning at age 45–64 years (13.2% vs. 11.5%) with differences widening even further at ages 65–74 (22.9% vs. 20.2%) and ≥75 (22.3% vs. 18.3%) years and all were statistically different (Figure 3.1, Appendix 3.1). Prevalence by sex from the NHIS is also described for certain race/ethnicity groups in the section *Prevalence by Race/Ethnicity*.

Based on data from SEARCH for youth age 10–19 years in 2009, the prevalence (per 1,000 general population) of type 2 diabetes was significantly higher in females (0.58) than in males (0.35) (Table 3.1) (23).

PREVALENCE BY RACE/ETHNICITY

Overall age-standardized prevalence of diagnosed diabetes based on data from the NHIS during 2011–2015 was significantly higher in non-Hispanic American Indian/Alaska Native adults age ≥20 years (19.1%) than all other race/ethnicity groups; this was followed by similar prevalences in non-Hispanic blacks (14.2%) and Hispanics (13.5%) which were significantly higher than that in non-Hispanic Asians (9.3%), which was in turn somewhat higher than that in non-Hispanic whites (8.2%) (Figure 3.2, Appendix 3.2). Race/ethnicity patterns were very similar by sex, although there was a statistically higher prevalence in non-Hispanic Asian men (10.4%) than women (8.3%).

Race/ethnicity patterns of crude prevalence across age groups were similar to overall prevalence patterns described in the previous paragraph. In all race/ethnicity groups, prevalence rose with increasing age (Figure 3.3) but generally plateaued in race/ethnicity groups between 65–74 years and ≥75 years. Prevalences reached a high at age 65–74 years of 18.8% for non-Hispanic whites, of 31.5% for non-Hispanic blacks, of 33.2% for Hispanics; at both ages 65–74 and ≥75 years of 22.5% for non-Hispanic Asians; and at age ≥75 years of 45.2% for non-Hispanic American Indians/Alaska Natives (Figure 3.3, Appendix 3.1).

Race/ethnicity patterns of prevalence among youth age 10–19 years in 2009 from SEARCH were similar to those found in the NHIS. American Indians had the highest prevalence (1.20 per 1,000 general population), which was not significantly different than that in blacks (1.06), followed by successive significantly lower prevalences in Hispanics (0.79), Asian Pacific Islanders (0.34), and whites (0.17) (Table 3.1) (23).

Although 5 years of data were used to present NHIS estimates in order to

FIGURE 3.3. Crude Prevalence of Diagnosed Diabetes by Age and Race/Ethnicity, U.S., 2011–2015
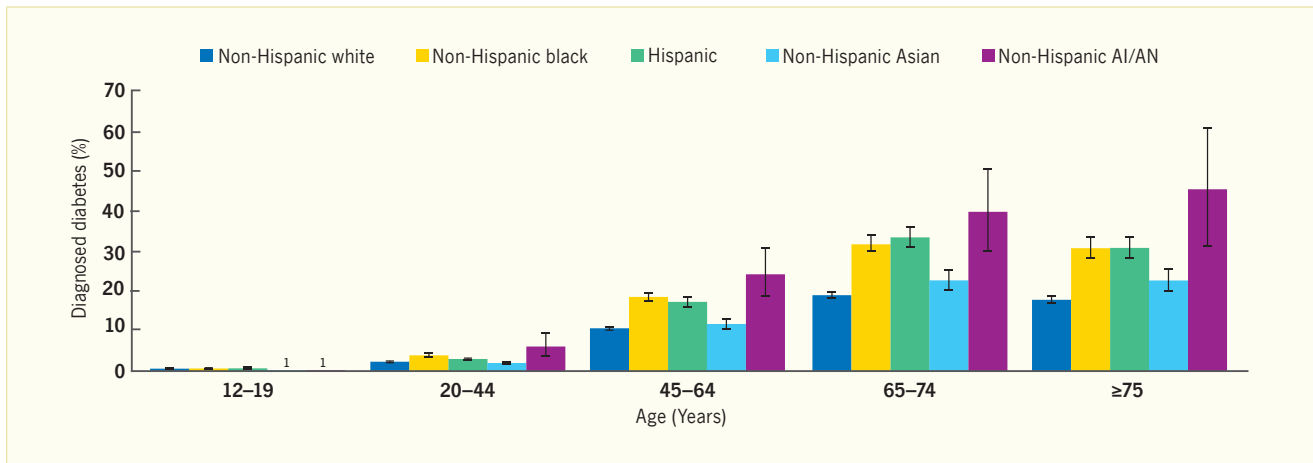
Diagnosed diabetes is based on self-report. Error bars represent 95% confidence intervals. See Appendix 3.1 for further details. AI/AN, American Indian/Alaska Native.
[1] Estimate is too unreliable to present; relative standard error >50%.

SOURCE: National Health Interview Surveys 2011–2015

FIGURE 3.4. Age- or Age/Sex-Standardized Prevalence of Diagnosed Diabetes in Adults Age ≥20 Years, by Sex and Hispanic Ethnicity, U.S., 2011–2015
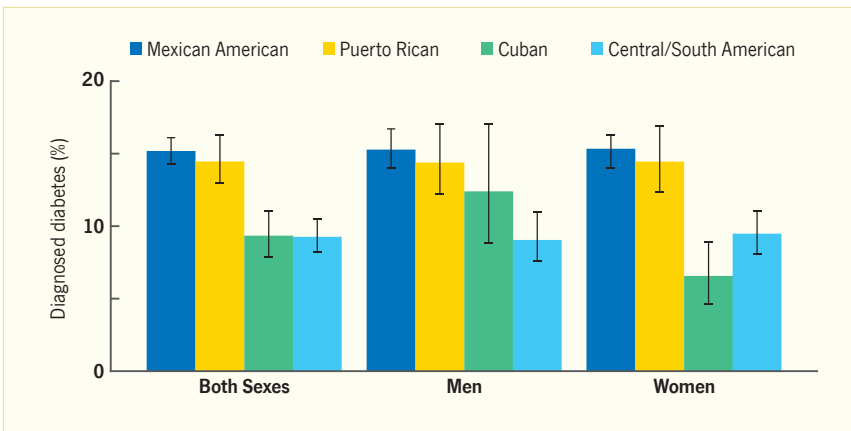
Diagnosed diabetes is based on self-report. For Both Sexes, data are standardized to the NHIS 2011–2015 total population by age and sex using age groups 20–44, 45–64, and ≥65 years. For Men and Women, data are standardized to the NHIS 2011–2015 total population by age using age groups 20–44, 45–64, and ≥65 years. Error bars represent 95% confidence intervals. See Appendix 3.2 for further details.

SOURCE: National Health Interview Surveys 2011–2015

provide larger sample size, the sample size for non-Hispanic American Indians/Alaska Natives is relatively small. This is indicated by the larger standard errors and wider confidence intervals for estimates in this group compared to other race/ethnicity groups in Appendix 3.1. Another source of data is the Indian Health Service National Data Warehouse (IHS NDW), a system that includes patient registration and encounter data that are received from IHS facilities, tribally operated programs, and urban and contract health systems. In 2015, these health care facilities served about 2.2 million American Indian/

Alaska Native people belonging to 567 federally recognized tribes in 36 states. Patients age ≥18 years with diabetes were ascertained by having at least two visits to a health care facilitiy in 2015. The age-standardized prevalence of diagnosed diabetes in American Indians/Alaska Natives was 15.1% (95% CI 15.0%–15.2%) and was slightly lower in men (14.9%, 95% CI 14.8%–15.0%) than in women (15.3%, 95% CI 15.2%–15.3%). The estimates were standardized to the 2000 U.S. Census standard population. Although these estimates are lower than those from the NHIS, it must be emphasized that the

NHIS and IHS NDW employ different methods (2).

Prevalence by Hispanic Ethnicity

Overall age-standardized prevalence of diagnosed diabetes from the NHIS during 2011–2015 among adults age ≥20 years was examined by Hispanic ethnicity subgroup (Figure 3.4, Appendix 3.2). Prevalences were highest among Mexican Americans (15.2%) and Puerto Ricans (14.5%), which were significantly higher than the prevalences among Cubans (9.4%) and Central/South Americans (9.3%). These same Hispanic ethnicity patterns were found separately by sex, except prevalence was significantly higher in Cuban men (12.5%) than women (6.5%).

Prevalence of diagnosed diabetes rose with age in all Hispanic ethnic groups but declined somewhat at age ≥75 years in Mexican Americans and Puerto Ricans, while rising somewhat in this age group in Cubans and Central/South Americans (Figure 3.5, Appendix 3.1). Prevalence reached a high of 37.9% in Mexican Americans and 32.6% in Puerto Ricans at age 65–74 years and a high of 27.2% in Central/South Americans and 22.6% in Cubans at age ≥75 years. The higher prevalences of diagnosed diabetes in Mexican Americans and Puerto Ricans than in Cubans and Central/South Americans were also found across age groups. Although this Hispanic ethnicity

pattern by age was sustained, many of these differences were not statistically significant.

Prevalence of diagnosed diabetes by Hispanic ethnicity is also available from the Hispanic Community Health Study/Study of Latinos (HCHS/SOL), a community-based prospective cohort study of self-identified Hispanic/Latino persons age 18–74 years. Participants were recruited after multistage probability sampling of four communities with some of the largest numbers of Hispanics/Latinos in the United States, including Chicago, Illinois; Miami, Florida; Bronx,

New York; and San Diego, California. Baseline data were collected during 2008–2011 in approximately 16,000 persons age 18–74 years. Diagnosed diabetes was ascertained by answering yes to the question: "Has a doctor ever said that you have diabetes (high sugar in blood or urine)?," with further clarification for women whether this was during pregnancy only. In an analysis by Schneiderman *et al.* (24), an additional criterion was whether respondents self-reported hypoglycemic medications. In the HCHS/SOL, age-standardized prevalence of diagnosed diabetes was similarly highest in Puerto Ricans (14.7%,

95% CI 13.17%–16.48%), Dominicans (14.5%, 95% CI 12.59%–16.54%), and Mexicans (12.8%, 95% CI 11.70%–13.99%); and significantly higher than the lowest prevalences, found in Cubans (8.4%, 95% CI 7.26%–9.76%) and South Americans (6.1%, 95% CI 4.63%–7.89%); prevalence for Central Americans was between these (11.1%, 95% CI 9.09%–13.49%) (Figure 3.6A). Compared to prevalences in the NHIS, the prevalence in the HCHS/SOL was somewhat lower in Mexican Americans; of similar magnitude in Puerto Ricans and Cubans; and the separate prevalences for South Americans and for Central Americans were lower and higher, respectively, than the combined prevalence reported for these two groups in the NHIS.

Prevalence by Asian Subgroups

Overall age-standardized prevalences of diagnosed diabetes from the NHIS during 2011–2015 were more than twofold higher in Asian Indians (12.5%) and Filipinos (11.3%) than in Chinese (4.7%) adults age ≥20 years (Figure 3.7, Appendix 3.2). This pattern was also found in both men and women. Prevalences were lower in women than men for each Asian subgroup, but differences were not consistently statistically significant.

Prevalence of diagnosed diabetes increased with age in all Asian subgroups, except in Filipinos, in whom prevalence

FIGURE 3.5. Crude Prevalence of Diagnosed Diabetes by Age and Hispanic Ethnicity, U.S., 2011–2015
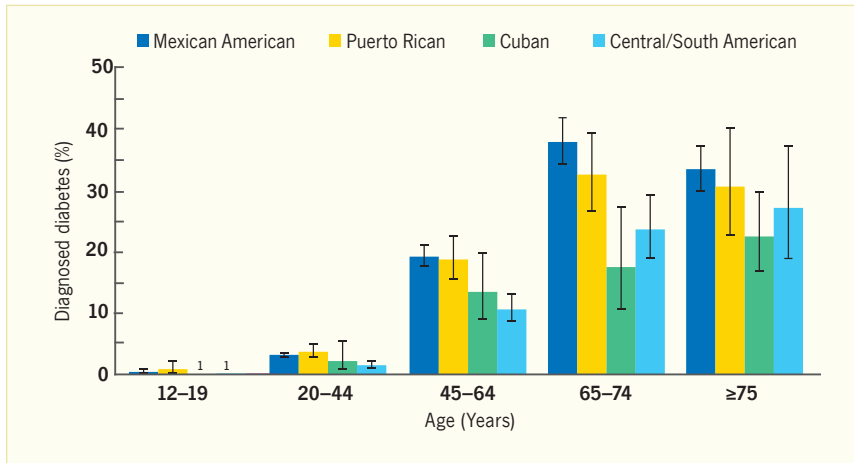
Diagnosed diabetes is based on self-report. Error bars represent 95% confidence intervals. See Appendix 3.1 for further details.
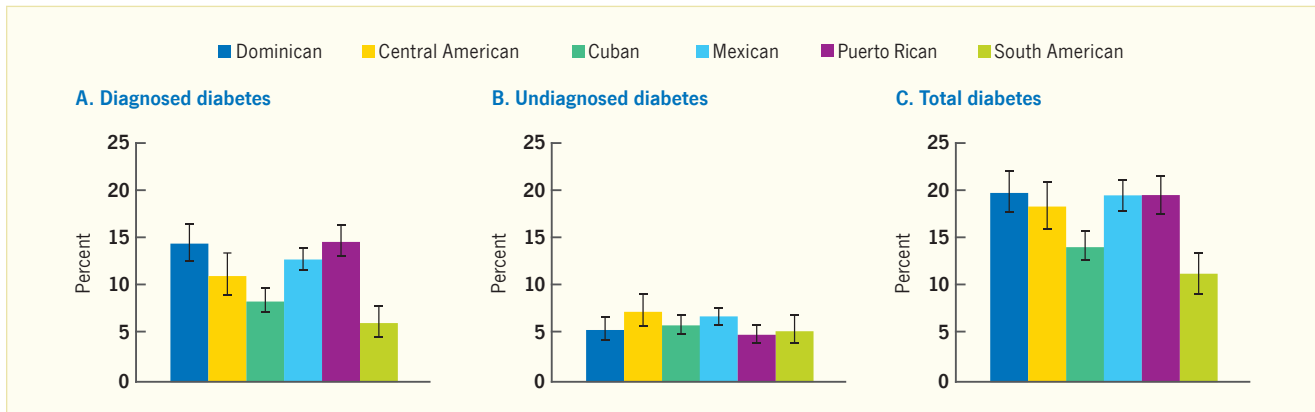[1] Estimate is too unreliable to present; relative standard error >50%.

SOURCE: National Health Interview Surveys 2011–2015

FIGURE 3.6. Age-Standardized Prevalence of Diagnosed, Undiagnosed, and Total Diabetes in Adults Age 18–74 Years From Four U.S. Communities, by Hispanic Ethnicity, 2008–2011

(A) Diagnosed diabetes is based on self-report and/or use of hypoglycemic medications. (B) Undiagnosed diabetes is based on A1c ≥6.5%, FPG ≥126 mg/dL, 2-hr PG ≥200 mg/dL, or use of hypoglycemic medications. (C) Total diabetes includes diagnosed and undiagnosed diabetes. All data are age-standardized to the 2010 U.S. Census population. Error bars represent 95% confidence intervals. Conversions for A1c and glucose values are provided in *Diabetes in America Appendix 1 Conversions*. 2-hr PG, 2-hour plasma glucose level from an oral glucose tolerance test; A1c, glycosylated hemoglobin; FPG, fasting plasma glucose.

SOURCE: Reference 24. Adapted from data table in reference.

FIGURE 3.7. Age- or Age/Sex-Standardized Prevalence of Diagnosed Diabetes in Adults Age ≥20 Years, by Sex and Asian Subgroup, U.S., 2011–2015
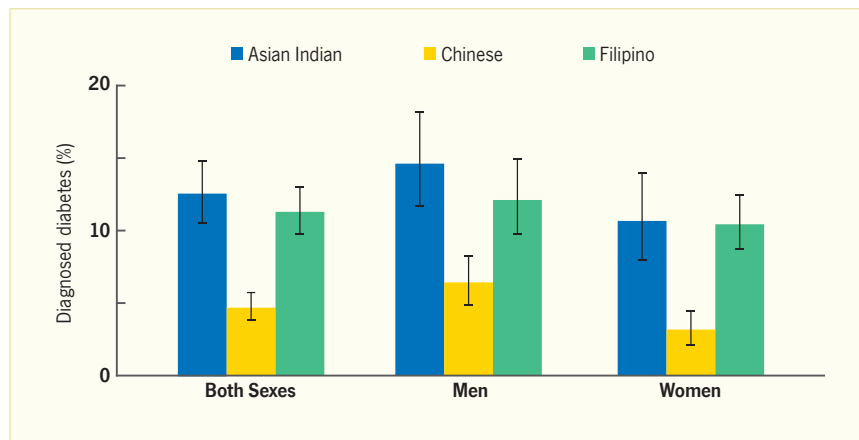
Diagnosed diabetes is based on self-report. For Both Sexes, data are standardized to the NHIS 2011–2015 total population by age and sex using age groups 20–44, 45–64, and ≥65 years. For Men and Women, data are standardized to the NHIS 2011–2015 total population by age using age groups 20–44, 45–64, and ≥65 years. Error bars represent 95% confidence intervals. See Appendix 3.2 for further details.

SOURCE: National Health Interview Surveys 2011–2015

FIGURE 3.8. Crude Prevalence of Diagnosed Diabetes by Age and Asian Subgroup, U.S., 2011–2015
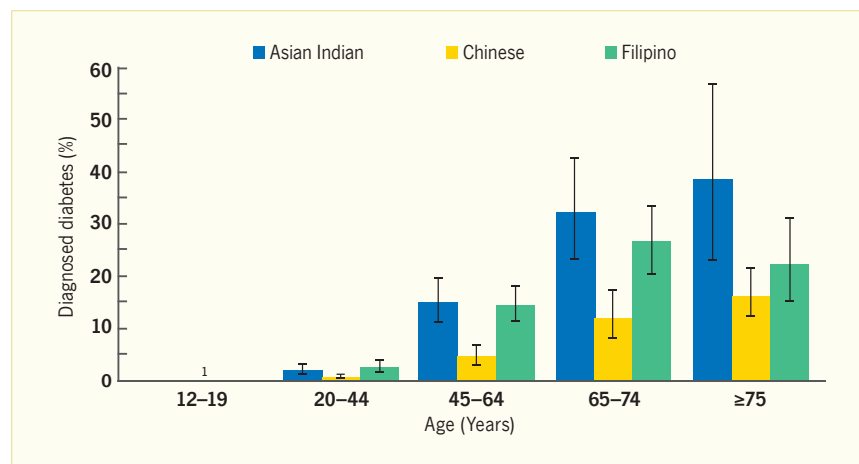
Diagnosed diabetes is based on self-report. Error bars represent 95% confidence intervals. See Appendix 3.1 for further details.
[1] Estimates are too unreliable to present; relative standard error >50%.

SOURCE: National Health Interview Surveys 2011–2015

declined slightly between ages 65–74 years and ≥75 years (Figure 3.8, Appendix 3.1). Greatest prevalence was 38.8% in Asian Indians at age ≥75 years, 26.6% in Filipinos at age 65–74 years, and 16.5% in Chinese adults at age ≥75 years. Prevalences were generally twofold to threefold higher in Asian Indians and Filipinos than Chinese adults in every age group.

The California Health Interview Survey (CHIS) provides prevalence estimates of diagnosed diabetes in additional

Asian subgroups. The CHIS is a biennial population-based telephone interview health survey of individuals residing in California households, drawn from all of the state's 58 counties and designed to be representative of the noninstitutionalized population and to capture the diversity of the population. CHIS oversamples subgroups to obtain more precise estimates and adjusts for nonresponse. In 2009, the survey interviewed 46,091 (projected to 26.6 million) adults age ≥18 years. Race/ethnicity was determined by

participants' self-report. Diabetes was defined by the respondents' answer to the question "Were you told that you had type 1 or type 2 diabetes?," based on a description of the types of diabetes provided as needed. Using data from this survey, and excluding individuals reporting type 1 diabetes, Choi *et al.* (25) reported that, among Asian men, highest age-adjusted prevalences of type 2 diabetes were found among Filipinos (15.8%) and Japanese (11.8%), followed by Koreans (6.7%), South Asians (6.3%), and Chinese (5.0%), with lowest prevalence among Vietnamese (2.5%). The pattern was almost the same among Asian women, with highest age-adjusted prevalences among Filipinos (9.4%) and Japanese (7.6%), followed by Koreans (5.1%), Chinese (3.6%), South Asians (2.7%), and Vietnamese (2.1%).

PREVALENCE BY AGE, SEX, AND RACE/ETHNICITY
A more detailed breakdown based on data from the NHIS during 2011–2015, simultaneously by age, sex, and race/ethnicity, is shown in Appendix 3.1.

PREVALENCE BY COUNTY
County level data have been examined for prevalence of diabetes based on the Behavioral Risk Factor Surveillance System (BRFSS) and U.S. Census data. The BRFSS is a telephone survey that collects data in 3,100 counties or county equivalents from all 50 U.S. States, the District of Columbia, and three U.S. territories. More than 400,000 noninstitutionalized adults age ≥18 years are interviewed each year about chronic health conditions and health-related risk behaviors, including information on diabetes, obesity, and physical activity (26). Data from 2007, which excluded women who reported having diabetes only during pregnancy, first noted disparity by county in diabetes prevalence. A "diabetes belt" was evident that comprised a broad clustering of counties from the Mississippi Valley, across the Deep South, the Carolinas, the Appalachian region, and in American Indian reservations (Figure 3.9) (27,28).

FIGURE 3.9. Estimates of Prevalence of Diagnosed Diabetes, by U.S. County, 2007

2007 percentage of adults with diagnosed diabetes

- 0–6.5
- 6.6–8.0
- 8.1–9.4
- 9.5–11.1
- ≥11.2
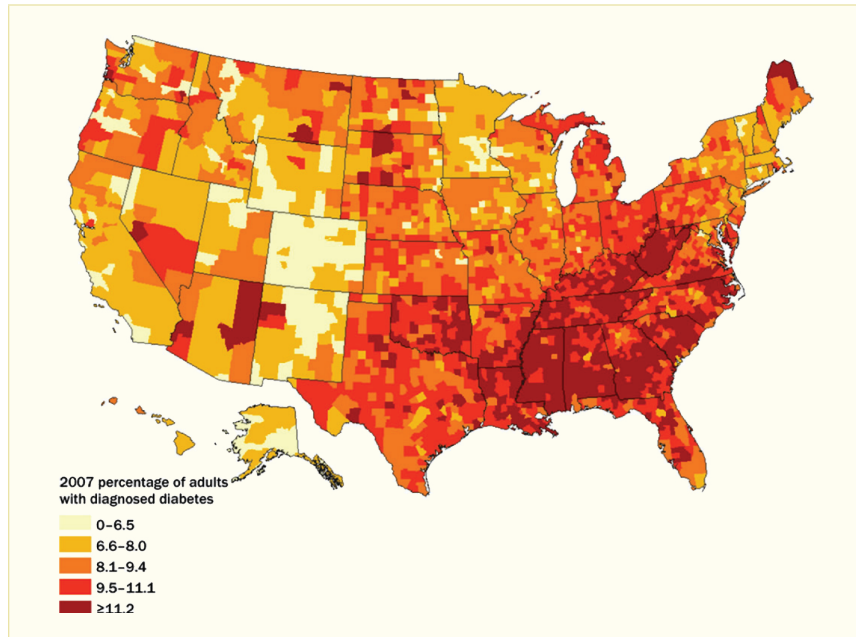
SOURCE: Reference 27, copyright © 2011 Elsevier, reprinted with permission

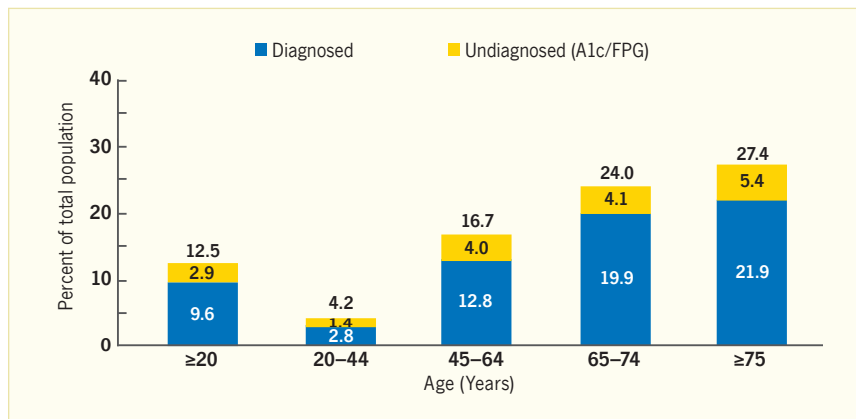## PREVALENCE OF DIAGNOSED, UNDIAGNOSED, AND TOTAL DIABETES

OVERALL

As mentioned above, the NHANES consists of both an interview asking the respondent of physician-diagnosed diabetes and an examination that includes a blood draw for glucose determinations allowing the detection of undiagnosed diabetes, which together assess total diabetes. Data from 2011–2014 were analyzed for *Diabetes in America* to present diagnosed diabetes, undiagnosed diabetes, and total diabetes; data through 2014 were the most recent data available at the time of analyses. Undiagnosed diabetes was defined both by A1c or FPG and by A1c or FPG or 2-hour PG to provide a comprehensive assessment in the U.S. civilian noninstitutionalized population.

For adults age ≥20 years, crude overall prevalence of diagnosed diabetes in the NHANES during 2011–2014 was 9.6%, undiagnosed diabetes by A1c/FPG was 2.9%, and total diabetes was 12.5% (Figure 3.10, Appendices 3.3 and 3.4), with total diabetes translating to 28.2 million (95% CI 25.3–31.1 million) in the U.S. civilian noninstitutionalized population. Crude prevalence of undiagnosed diabetes detected by A1c/FPG/2-hour PG was higher, at 5.0%, as was total diabetes at 14.6% or 33.0 million (95% CI 29.3–36.7 million) (Figure 3.11, Appendices 3.3 and 3.4).

When undiagnosed diabetes was expressed as a percentage of total diabetes among adults age ≥20 years, almost one-quarter of the total diabetic population during 2011–2014 was undiagnosed based on A1c/FPG (23.3%) and about one-third of the total diabetic population was undiagnosed based on A1c/FPG/2-hour PG (34.5%) (Figure 3.12 for both sexes, Appendix 3.3).

PREVALENCE BY AGE

Similar to that found in the NHIS, crude prevalence of diagnosed diabetes in the NHANES during 2011–2014 rose significantly with increasing age, although

FIGURE 3.10. Prevalence of Diagnosed, Undiagnosed (A1c/FPG), and Total Diabetes by Age, U.S., 2011–2014

Diagnosed diabetes is based on self-report. Undiagnosed diabetes is defined by A1c ≥6.5% or FPG ≥126 mg/dL. Total diabetes includes diagnosed and undiagnosed diabetes. Numbers above the bars indicate total diabetes. See Appendix 3.3 for further details. Conversions for A1c and glucose values are provided in *Diabetes in America Appendix 1 Conversions*. A1c, glycosylated hemoglobin; FPG, fasting plasma glucose.
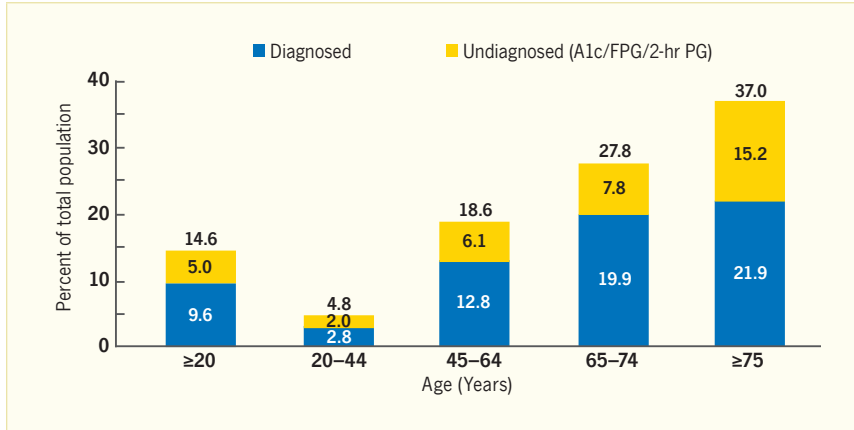
SOURCE: National Health and Nutrition Examination Surveys 2011–2014

FIGURE 3.11. Prevalence of Diagnosed and Undiagnosed (A1c/FPG/2-hr PG) Diabetes by Age, U.S., 2011–2014

Diagnosed diabetes is based on self-report. Undiagnosed diabetes is based on A1c ≥6.5%, FPG ≥126 mg/dL, or 2-hr PG ≥200 mg/dL. Total diabetes includes diagnosed and undiagnosed diabetes. Numbers above the bars indicate total diabetes. See Appendix 3.3 and the section *Data Sources and Limitations*, for the National Health and Nutrition Examination Survey, for further details. Conversions for A1c and glucose values are provided in *Diabetes in America Appendix 1 Conversions*. 2-hr PG, 2-hour plasma glucose level from an oral glucose tolerance test; A1c, glycosylated hemoglobin; FPG, fasting plasma glucose.

SOURCE: National Health and Nutrition Examination Surveys 2011–2014

FIGURE 3.12. Percent of Total Diabetic Population With Undiagnosed Diabetes in Adults Age ≥20 Years, by Sex, U.S., 2011–2014
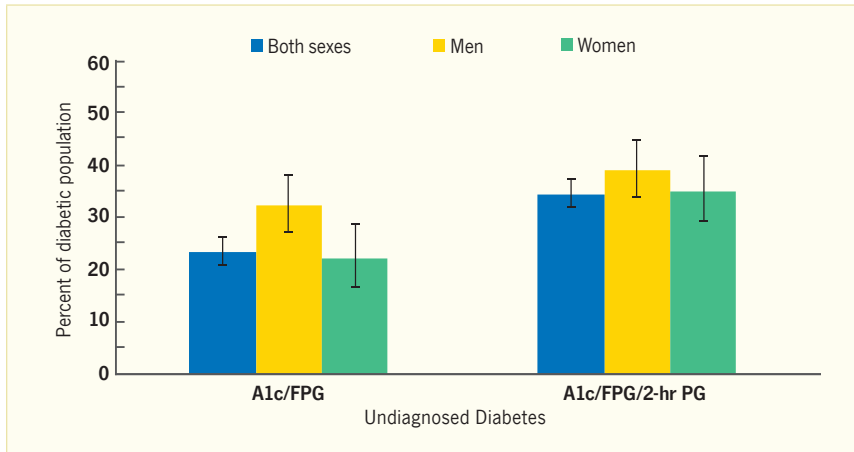
Total diabetes includes diagnosed diabetes (based on self-report) and undiagnosed diabetes (as specified on the x-axis, A1c ≥6.5%, FPG ≥126 mg/dL, or 2-hr PG ≥200 mg/dL). Except for Both Sexes, data are standardized to the NHANES 2011–2014 total population by age using age groups 20–44, 45–64 and ≥65 years. Error bars represent 95% confidence intervals. See Appendix 3.3 for Both Sexes and Appendix 3.4 for Men and Women, which provide further details. Conversions for A1c and glucose values are provided in *Diabetes in America Appendix 1 Conversions*. 2-hr PG, 2-hour plasma glucose level from an oral glucose tolerance test; A1c, glycosylated hemoglobin; FPG, fasting plasma glucose.

SOURCE: National Health and Nutrition Examination Surveys 2011–2014

there was a plateauing between age 65–74 and ≥75 years (Figure 3.10, Appendix 3.3). Undiagnosed diabetes by A1c/FPG also increased with age, significantly between ages 20–44 years and 45–64 years, but less rapidly between ages 45–74 and ≥75 years, reaching highest prevalence at 5.4% at age ≥75 years. Resultant total diabetes rose significantly with age up to 65–74 years, and increased less rapidly thereafter, reaching a high of 27.4% at age ≥75 years.

Prevalence of undiagnosed diabetes by A1c/FPG/2-hour PG rose significantly at youngest and oldest age groups, reaching a high of 15.2% at age ≥75 years (Figure 3.11, Appendix 3.3). Resultant total diabetes rose significantly across all age groups, with prevalence highest at 37.6% at age ≥75 years.

Figure 3.13 shows the percent of total diabetes that was undiagnosed by age group. Based on A1c/FPG, about a third (33.4%) of diabetes was undiagnosed in those age 20–44 years, but the percentage decreased significantly at age 45–64 years (23.8%) and leveled off at 17.0%–19.9% at older age groups. Based on A1c/FPG/2-hour PG, the percent was much higher, with 41.5% of total diabetes that was undiagnosed at age 20–44 years, which decreased to 28.0%–32.7% at age 45–74 years, but then increased to 40.4% at age ≥75 years. Detailed data are shown in Appendix 3.3.

PREVALENCE BY SEX

The age-standardized prevalence of diagnosed diabetes from the NHANES 2011–2014 was similar in men and women age ≥20 years at 10.1% and 9.3%, respectively (Figure 3.14, Appendix 3.4); the slight difference was not statistically significant. Undiagnosed diabetes based on A1c/FPG was somewhat higher in men (3.6%) than women (2.3%), as was total diabetes at 13.8% and 11.6%, respectively; both of these differences by sex were statistically significant. Undiagnosed diabetes based on A1c/FPG/2-hour PG was not significantly different by sex, though the difference in resultant total diabetes was statistically significant.

The percent of total diabetes that was undiagnosed based on A1c/FPG was significantly higher in men (32.4%) than women (22.1%), while that based on A1c/FPG/2-hour PG was not significantly different by sex (Figure 3.12, Appendix 3.4).

Further examination of age-specific prevalences shows a predominance of higher prevalences in men than in women of undiagnosed diabetes and the percent of total diabetes that was undiagnosed in the age groups of 45–64 and 65–74 years (Appendix 3.3).

FIGURE 3.13. Percent of Total Diabetic Population With Undiagnosed Diabetes in Adults Age ≥20 Years, by Age, U.S., 2011–2014
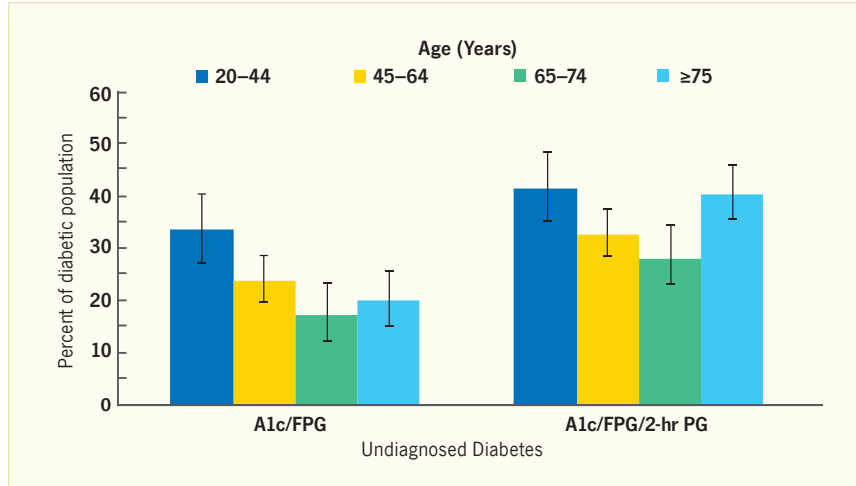
Total diabetes includes diagnosed diabetes (based on self-report) and undiagnosed diabetes (as specified on the x-axis, A1c ≥6.5%, FPG ≥126 mg/dL, or 2-hr PG ≥200 mg/dL). Error bars represent 95% confidence intervals. See Appendix 3.3 for further details. Conversions for A1c and glucose values are provided in *Diabetes in America Appendix 1 Conversions*. 2-hr PG, 2-hour plasma glucose level from an oral glucose tolerance test; A1c, glycosylated hemoglobin; FPG, fasting plasma glucose.

SOURCE: National Health and Nutrition Examination Surveys 2011–2014

FIGURE 3.14. Age-Standardized Prevalence of Diagnosed, Undiagnosed, and Total Diabetes in Adults Age ≥20 Years, by Sex, U.S., 2011–2014
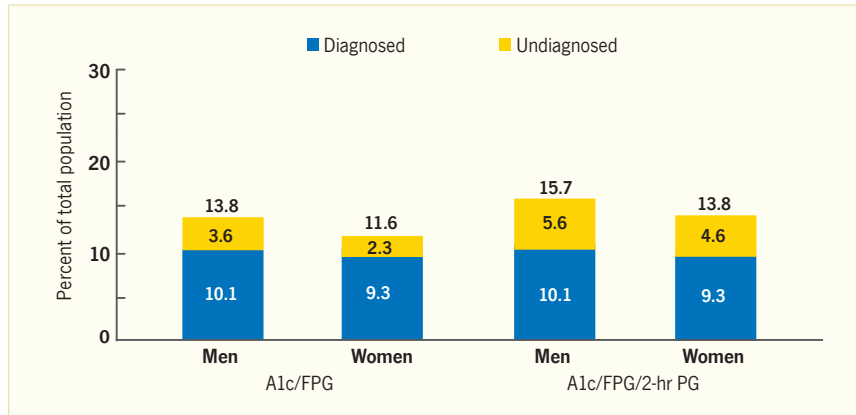
Diagnosed diabetes is based on self-report. Undiagnosed diabetes, as specified on the x-axis, is based on A1c ≥6.5%, FPG ≥126 mg/dL, or 2-hr PG ≥200 mg/dL. Total diabetes includes diagnosed and undiagnosed diabetes. Numbers above the bars indicate total diabetes. Data are standardized to the NHANES 2011–2014 total population by age using age groups 20–44, 45–64, and ≥65 years. See Appendix 3.4 and the section *Data Sources and Limitations*, for the National Health and Nutrition Examination Survey, for further details. Conversions for A1c and glucose values are provided in *Diabetes in America Appendix 1 Conversions*. 2-hr PG, 2-hour plasma glucose level from an oral glucose tolerance test; A1c, glycosylated hemoglobin; FPG, fasting plasma glucose.

SOURCE: National Health and Nutrition Examination Surveys 2011–2014

FIGURE 3.15. Age- and Sex-Standardized Prevalence of Diagnosed, Undiagnosed (A1c/FPG), and Total Diabetes in Adults Age ≥20 Years, by Race/Ethnicity, U.S., 2011–2014
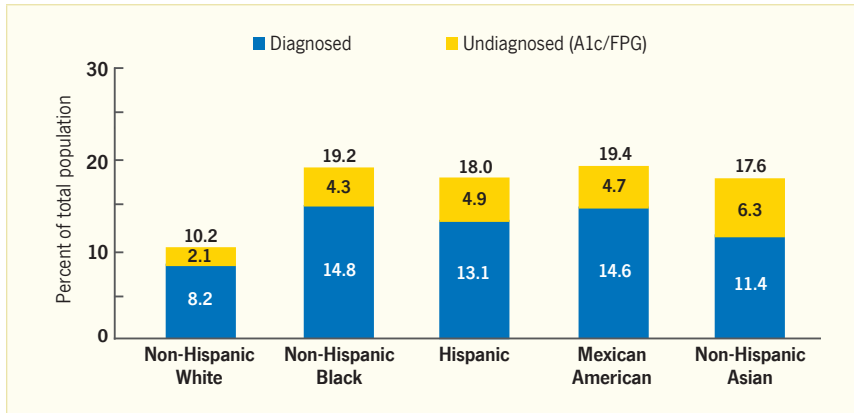
Diagnosed diabetes is based on self-report. Undiagnosed diabetes is defined by A1c ≥6.5% or FPG ≥126 mg/dL. Total diabetes includes diagnosed and undiagnosed diabetes. Numbers above the bars indicate total diabetes. Data are standardized to the NHANES 2011–2014 total population by sex and age using age groups 20–44, 45–64, and ≥65 years. See Appendix 3.4 for further details. Conversions for A1c and glucose values are provided in *Diabetes in America Appendix 1 Conversions*. A1c, glycosylated hemoglobin; FPG, fasting plasma glucose.

SOURCE: National Health and Nutrition Examination Surveys 2011–2014

FIGURE 3.16. Age- and Sex-Standardized Prevalence of Diagnosed, Undiagnosed (A1c/FPG/2-hr PG), and Total Diabetes in Adults Age ≥20 Years, by Race/Ethnicity, U.S., 2011–2014

Diagnosed diabetes is based on self-report. Undiagnosed diabetes is based on A1c ≥6.5%, FPG ≥126 mg/dL, or 2-hr PG ≥200 mg/dL. Total diabetes includes diagnosed and undiagnosed diabetes. Numbers above the bars indicate total diabetes. Data are standardized to the NHANES 2011–2014 total population by sex and age using age groups 20–44, 45–64, and ≥65 years. See Appendix 3.4 and the section *Data Sources and Limitations*, for the National Health and Nutrition Examination Survey, for further details. Conversions for A1c and glucose values are provided in *Diabetes in America Appendix 1 Conversions*. 2-hr PG, 2-hour plasma glucose level from an oral glucose tolerance test; A1c, glycosylated hemoglobin; FPG, fasting plasma glucose.

SOURCE: National Health and Nutrition Examination Surveys 2011–2014

PREVALENCE BY RACE/ETHNICITY

As in the NHIS, age- and sex-adjusted prevalence of diagnosed diabetes based on NHANES 2011–2014 in persons age ≥20 years was highest in non-Hispanic blacks, all Hispanics, and Mexican Americans, somewhat lower in non-Hispanic Asians, and significantly lower in non-Hispanic whites (Figure 3.15, Appendix 3.4). In contrast, prevalence of undiagnosed diabetes based on A1c/FPG was higher, though not statistically significantly, in non-Hispanic Asians

(6.3%) compared to non-Hispanic blacks (4.3%), all Hispanics (4.9%), and Mexican Americans (4.7%); the lower prevalence in non-Hispanic whites (2.1%) was significantly lower than all other race/ethnicity groups. Resultant total diabetes was significantly lower in non-Hispanic whites (10.2%) than all other race/ethnicity groups (prevalences 17.6%–19.4%).

Prevalence of undiagnosed diabetes based on A1c/FPG/2-hour PG was higher, though not statistically significantly, in

non-Hispanic Asians (9.3%), followed by all Hispanics, Mexican Americans, and non-Hispanic blacks (prevalences 6.0%–8.4%), and significantly lower than all other race/ethnicity groups in non-Hispanic whites (4.0%) (Figure 3.16, Appendix 3.4). Resultant total diabetes was significantly lower in non-Hispanic whites (12.1%) than all other race/ethnicity groups (prevalences 20.5%–22.2%).

Based on undiagnosed diabetes detected by A1c/FPG, the percent of total diabetes that was undiagnosed was highest in non-Hispanic Asians at 40.4%, and lowest in non-Hispanic whites at 21.6%, with the percentages between these and similar in non-Hispanic blacks (29.8%), all Hispanics (29.6%), and Mexican Americans (26.9%) (Figure 3.17, Appendix 3.4). A similar pattern was found based on undiagnosed diabetes by A1c/FPG/2-hour PG, with highest prevalence of 47.9% in non-Hispanic Asians and lowest prevalence of 30.5% in non-Hispanic whites.

The sample size of the NHANES does not allow assessment of diabetes prevalence or any health characteristics by detailed Hispanic ethnicity or Asian subgroup. Baseline data from the HCHS/SOL are available, however, to provide prevalences of undiagnosed diabetes by Hispanic ethnicity using similar glucose measurement methods to those in the NHANES, based on A1c/FPG/2-hour PG. Prevalence of undiagnosed diabetes in 2008–2011 from the four sampled U.S. communities among Mexicans age 18–74 years was 6.7% (Figure 3.6B), statistically significantly lower than the 7.8% in this group from the NHANES (Figure 3.14, Appendix 3.4); however, the sampling frame of the two surveys and the ages differed. The prevalence of undiagnosed diabetes was highest in Central Americans (7.2%), followed by Mexicans (6.7%), Cubans (5.8%), Dominicans (5.3%) and South Americans (5.2%), and Puerto Ricans (4.8%) (Figure 3.6B). Resultant total diabetes was similar in Dominicans (19.8%), Mexicans and Puerto Ricans (both 19.5%), and Central Americans (18.3%); total diabetes was significantly
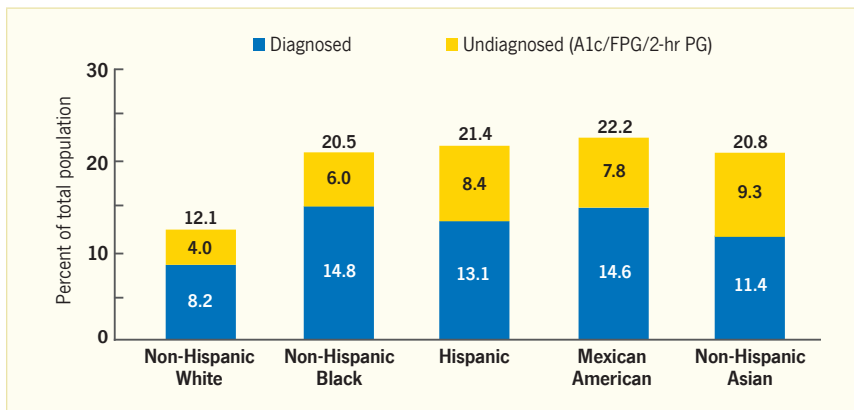
FIGURE 3.17. Percent of Total Diabetic Population With Undiagnosed Diabetes in Adults Age ≥20 Years, by Race/Ethnicity, U.S., 2011–2014
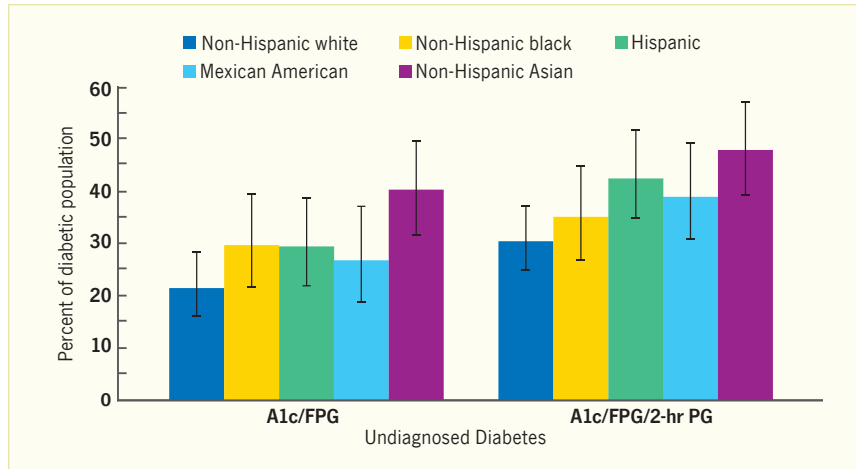
Total diabetes includes diagnosed diabetes (based on self-report) and undiagnosed diabetes (as specified on the x-axis, A1c ≥6.5%, FPG ≥126 mg/dL, or 2-hr PG ≥200 mg/dL). Data are standardized to the NHANES 2011–2014 total population by sex and age using age groups 20–44, 45–64, and ≥65 years. Error bars represent 95% confidence intervals. See Appendix 3.4 for further details. Conversions for A1c and glucose values are provided in *Diabetes in America Appendix 1 Conversions*. 2-hr PG, 2-hour plasma glucose level from an oral glucose tolerance test; A1c, glycosylated hemoglobin; FPG, fasting plasma glucose.

SOURCE: National Health and Nutrition Examination Surveys 2011–2014

lower than these groups in Cubans (14.2%) and lowest in South Americans (11.3%) (Figure 3.6C) (24).

PREVALENCE BY AGE, SEX, AND RACE/ETHNICITY

Further detailed estimates based on the NHANES 2011–2014 are shown in the Appendices. Appendix 3.3 provides age-specific prevalence estimates by sex, age-specific estimates by race/ethnicity, and sex-specific estimates by race/ethnicity. Appendix 3.4 provides age-standardized sex-specific estimates by race/ethnicity. Clear patterns were not evident.

PREVALENCE OF PREDIABETES

OVERALL

Based on data from the NHANES 2011–2014, overall prevalence of prediabetes in adults age ≥20 years was 34.4% as defined by A1c/FPG, or 77.9 million (95% CI 69.5–86.2 million), and was 36.9% as defined by A1c/FPG/2-hour PG, or 83.6 million (95% CI 74.5–92.7 million) (Appendix 3.3).

PREVALENCE BY AGE

Prevalence of prediabetes based on A1c/FPG in 2011–2014 rose steadily with age from 13.5% at age 12–19 years to a high of 48.6% at age 65–74 years and similar prevalence at age ≥75 years (Figure 3.18, Appendix 3.3). Patterns were similar for prediabetes prevalence based on A1c/FPG/2-hour PG (Appendix 3.3).

PREVALENCE BY SEX

Overall age-standardized prevalence of prediabetes defined by A1c/FPG in 2011–2014 was significantly higher in men (38.1%) than women (31.1%) (Appendix 3.4). By age, prevalence was significantly higher in males than females at ages 12–19 and 20–44 years but became more similar at older ages (Figure 3.18, Appendix 3.3). A similar pattern was found for prediabetes defined by A1c/FPG/2-hour PG (Appendix 3.3).

PREVALENCE BY RACE/ETHNICITY

Age- and sex-standardized prevalences of prediabetes based on A1c/FPG in 2011–2014 were higher, though not statistically significant, in non-Hispanic blacks, all Hispanics, and Mexican Americans (36.8%–37.5%) compared to non-Hispanic whites (33.3%) and non-Hispanic Asians (33.5%) (Figure 3.19, Appendix 3.4). A similar race/ethnicity pattern was found in both men and women. A similar race/ethnicity pattern was also found within age groups through 45–64 years; at older ages, non-Hispanic whites had highest prevalences, but estimates were more unstable (Appendix 3.3). Similar race/

FIGURE 3.18. Crude Prevalence of Prediabetes by Age and Sex, U.S., 2011–2014

Prediabetes is defined by A1c 5.7%–6.4% or FPG 110–125 mg/dL. Error bars represent 95% confidence intervals. See Appendix 3.3 for further details. Conversions for A1c and glucose values are provided in *Diabetes in America Appendix 1 Conversions*. A1c, glycosylated hemoglobin; FPG, fasting plasma glucose.

SOURCE: National Health and Nutrition Examination Surveys 2011–2014

FIGURE 3.19. Age- or Age/Sex-Standardized Prevalence of Prediabetes in Adults Age ≥20 Years, by Sex and Race/Ethnicity, U.S., 2011–2014
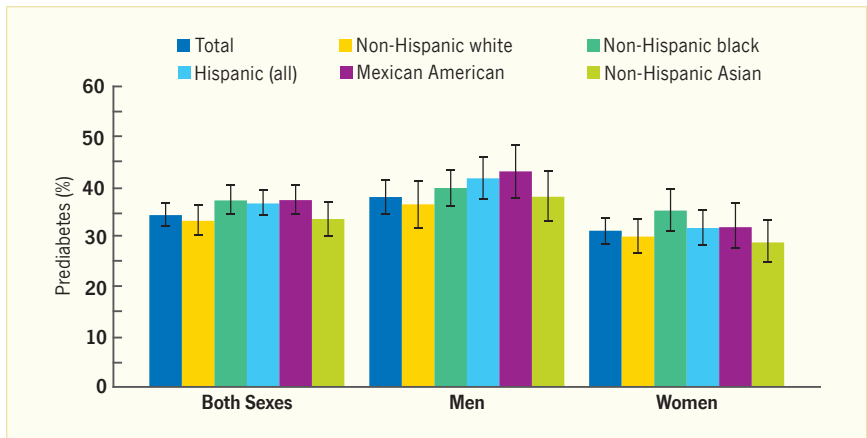
Prediabetes is defined by A1c 5.7%–6.4% or FPG 110–125 mg/dL. For Both Sexes, data are standardized to the NHANES 2011–2014 total population by age and sex using age groups 20–44, 45–64, and ≥65 years. For Men and Women, data are standardized to the NHANES 2011–2014 total population by age using age groups 20–44, 45–64, and ≥65 years. Error bars represent 95% confidence intervals. See Appendix 3.4 for further details. Conversions for A1c and glucose values are provided in *Diabetes in America Appendix 1 Conversions*. A1c, glycosylated hemoglobin; FPG, fasting plasma glucose.

SOURCE: National Health and Nutrition Examination Surveys 2011–2014

FIGURE 3.20. Age- or Age/Sex-Standardized Prevalence of Prediabetes in Adults Age 18–74 Years From Four U.S. Communities, by Sex and Hispanic Ethnicity, 2008–2011

Prediabetes is based on A1c 5.7%–6.4%, FPG 100–125 mg/dL, or 2-hr PG 140–199 mg/dL. Prevalence estimates for Both Sexes are age- and sex-standardized, and those for Men and Women are age-standardized, to the 2010 U.S. Census population. Error bars represent 95% confidence intervals. Conversions for A1c and glucose values are provided in *Diabetes in America Appendix 1 Conversions*. 2-hr PG, 2-hour plasma glucose level from an oral glucose tolerance test; A1c, glycosylated hemoglobin; FPG, fasting plasma glucose.

SOURCE: Reference 29. Adapted from data table in reference.

ethnicity prevalence patterns were found when prediabetes was based on A1c/FPG/2-hour PG.

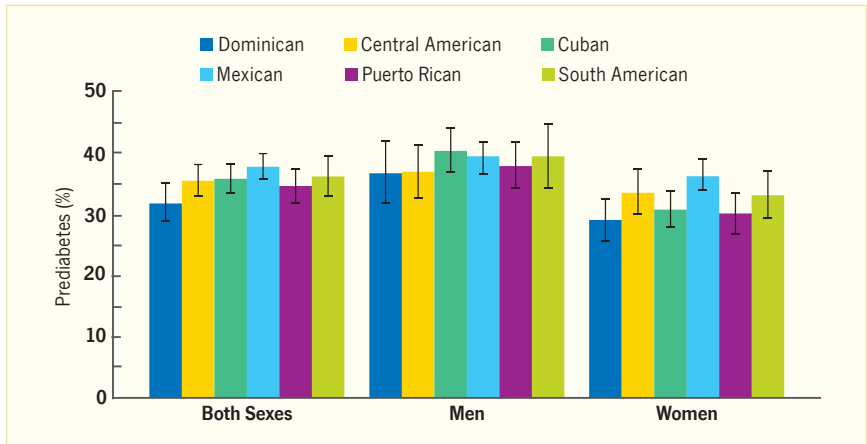Age-standardized prevalences of prediabetes based on A1c/FPG/2-hour PG were also available by Hispanic ethnicity from the HCHS/SOL during 2008–2011 (Figure 3.20) (29). About one-third of Hispanic groups had prediabetes, with prevalence being highest in Mexicans (37.8%, 95% CI 35.9%–40.0%) and lowest in Dominicans (31.8%, 95% CI 28.9%–34.9%). Prevalences were between these groups and similar for South Americans (36.2%, 95% CI 32.9%–39.5%), Cubans (35.9%, 95% CI 33.5%–38.3%), Central Americans (35.4%, 95% CI 32.8%–38.1%), and Puerto Ricans (34.6%, 95% CI 31.9%–37.4%). Similar patterns by race were found for men and women. Prevalences of prediabetes were higher in men than women of all Hispanic groups, particularly among Cubans and Puerto Ricans.

PREVALENCE OF TOTAL DYSGLYCEMIA

Combining estimates from the NHANES on diagnosed diabetes, undiagnosed diabetes, and prediabetes in adults age ≥20 years in the 2011–2014 U.S. population, overall crude prevalence of dysglycemia based on A1c/FPG was 46.9%, or 106.1 million (95% CI 96.1–116.0 million) (Appendix 3.3). Prevalence continually increased from 14.2% at age 12–19 years to 75.1% at age ≥75 years. Prevalence was significantly greater in men (51.8%) than women

(42.7%) (Appendix 3.4). By race/ethnicity, prevalence was similarly highest in non-Hispanic blacks (56.7%) and Mexican Americans (56.8%), followed by somewhat lower prevalence in non-Hispanic Asians (51.2%), and significantly lowest prevalence in non-Hispanic whites (43.5%). Overall prevalence of dysglycemia in adults age ≥20 years based on A1c/FPG/2-hour PG was 51.4% or 116.6 million (95% CI 105.5–127.8 million) (Appendix 3.3). Patterns by

age, sex, and race/ethnicity were similar to those based on A1c/FPG (Appendix 3.4). Prevalences were highest in adults age ≥75 years (82.7%) (Appendix 3.3), in men (55.5%), and in Mexican Americans (61.7%) (Appendix 3.4).

More detailed assessments by age, sex, and race/ethnicity are found in Appendices 3.3 and 3.4.

COMPARISON OF NHIS AND NHANES ESTIMATES OF DIAGNOSED DIABETES

Two different surveys were analyzed for this chapter to present prevalences of diagnosed diabetes. The NHIS is a much larger survey of the noninstitutionalized civilian U.S. population, and data are based on self-report of a wide range of health conditions. By comparison, the NHANES is much smaller but includes an examination and laboratory component along with self-reported conditions. Crude prevalences of diagnosed diabetes during 2011–2014 in adults age ≥20 years in the two surveys are shown in Appendix 3.5. Overall prevalences and prevalences by age, sex, and race/ethnicity were similar, with no statistically significant differences between the surveys.

COMPARISON OF PREVALENCES OF UNDIAGNOSED DIABETES AND PREDIABETES BASED ON INDIVIDUAL A1C, FPG, AND 2-HOUR PG CRITERIA

An analysis of NHANES 2003–2006 data compared A1c, FPG, and 2-hour PG in their ability to detect undiagnosed diabetes in adults age ≥20 years (18). Among all adults classified as having undiagnosed diabetes based on at least one of these criteria, all three criteria simultaneously classified 23% as having undiagnosed diabetes. The A1c criteria diagnosed the smallest percent (30%) of the undiagnosed diabetic group. In contrast, the 2-hour PG diagnosed 90% of those with undiagnosed diabetes. A substantial proportion, 47% of undiagnosed diabetes, was detected only by the 2-hour PG, but not by the A1c or FPG. In addition, 19% of undiagnosed diabetes was diagnosed by both FPG and 2-hour PG, but not by A1c. Most people who were diagnosed by A1c were also diagnosed by FPG or 2-hour PG (Figure 3.21) (18).

Table 3.2 likewise shows that prevalences of undiagnosed diabetes by age differed according to whether diabetes was detected by A1c, FPG, or 2-hour PG (18). Prevalences of undiagnosed diabetes rose with age for all methods of detection. However, both FPG and 2-hour PG detected more undiagnosed diabetes in older age groups than A1c, particularly 2-hour PG. For prediabetes, both FPG and 2-hour PG detected more prediabetes. A 2-hour PG was particularly sensitive at detecting prediabetes at oldest ages (age ≥75 years) compared to younger ages.

Prevalences of undiagnosed diabetes were higher but not statistically significantly in men than women for each of the three different criteria (Table 3.2) (18). FPG detected a somewhat higher relative proportion of undiagnosed diabetes in men compared to women than the other methods. Prevalences of prediabetes followed the same trends by sex, except that prevalence of IFG was significantly higher in men than women.

Compared to non-Hispanic whites, A1c detected about twice as much undiagnosed diabetes in non-Hispanic blacks and almost three times as much undiagnosed diabetes in Mexican Americans (Table 3.2) (18). For the other glycemic measures, the relative differences by race/ethnicity were much less. For prediabetes, prevalence by A1c was at least twice as high in non-Hispanic blacks compared to non-Hispanic whites and Mexican Americans; prevalences were similar by race/ethnicity for the other measures. Studies have shown that A1c levels may vary with race/ethnicity independently of glycemia. Even at similar FPG and 2-hour PG levels, it has been shown that African Americans and Hispanic/Latino heritage groups may have higher A1c levels than non-Hispanic whites (30,31). Some other studies have also shown that African Americans may have a greater glycemic burden (e.g., higher levels of fructosamine and glycated albumin) than non-Hispanic whites, although the association of A1c with complication risk is similar (11). In addition, the interpretation of A1c levels can be difficult in the presence of hemoglobinopathies (11).

FIGURE 3.21. Undiagnosed Diabetes in Adults Age ≥20 Years by Three Diagnostic Criteria, U.S., 2005–2006
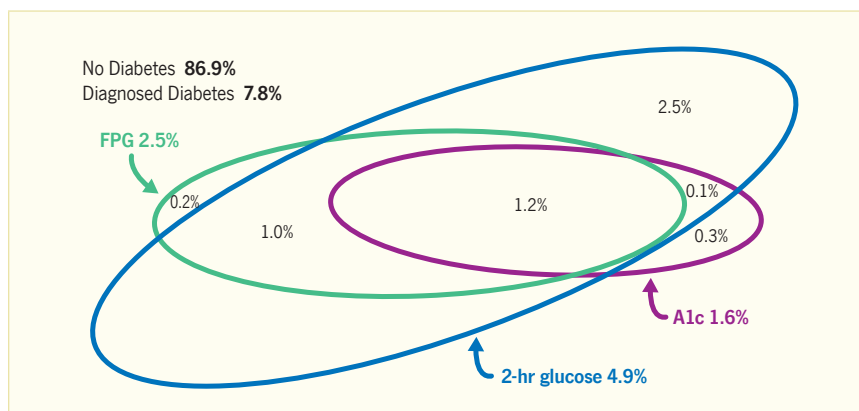
Comparisons were calculated among individuals in the OGTT subsample of the National Health and Nutrition Examination Surveys 2005–2006 (n=2,017). The thresholds of diagnostic criteria for diabetes were A1c ≥6.5%, FPG ≥7.0 mmol/L, and 2-hr glucose ≥11.1 mmol/L. Point estimates (%) and 95% confidence intervals for the categories are: A1c alone, 0.3 (0.0–0.7); FPG alone, 0.2 (0.0–0.5); 2-hr glucose alone, 2.5 (1.9–3.2); A1c and FPG, not 2-hr glucose, 0.0; A1c and 2-hr glucose, not FPG, 0.1 (0.0–0.3); FPG and 2-hr glucose, not A1c, 1.0 (0.3–1.8); A1c, FPG, and 2-hr glucose, 1.2 (0.5–2.0); total A1c, 1.6 (0.7–2.5); total FPG, 2.5 (1.2–3.8); total 2-hr glucose, 4.9 (3.4–6.4); diagnosed diabetes, 7.8 (6.7–8.8); no diabetes, 86.9 (84.6–89.1). Conversions for A1c and glucose values are provided in *Diabetes in America Appendix 1 Conversions*. A1c, glycosylated hemoglobin; FPG, fasting plasma glucose, OGTT, oral glucose tolerance test.

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TABLE 3.2. Standardized Prevalence of Undiagnosed Diabetes and High Risk/Prediabetes Using Three Different Criteria (A1c, FPG, and 2-hr PG From an OGTT) in Adults Age ≥20 Years, By Age, Sex, and Race/Ethnicity, U.S., 2003–2006

	PERCENT (95% CONFIDENCE INTERVAL)					
	Undiagnosed Diabetes			High Risk/Prediabetes		
CHARACTERISTICS	A1c	FPG	2-hr PG	A1c	FPG	2-hr PG
Age (years)						
≥20	1.8 (1.4–2.2)	2.4 (1.4–3.5)	4.8 (3.5–6.1)	3.4 (3.0–3.8)	25.2 (22.4–28.1)	13.6 (11.5–15.8)
20–39	0.6 (0.3–0.9)	0.7 (0.2–1.3)	0.9 (0.4–1.4)	0.7 (0.4–1.0)	12.9 (10.1–15.7)	7.4 (4.6–10.1)
40–59	2.0 (1.3–2.7)	1.9 (0.4–3.4)	4.2 (1.8–6.5)	3.7 (3.1–4.4)	31.2 (24.3–38.2)	13.3 (9.1–17.5)
60–74	3.5 (2.1–4.9)	6.8 (2.0–11.5)	12.4 (6.6–18.3)	7.1 (5.5–8.8)	38.2 (32.0–44.4)	21.8 (15.8–27.7)
≥75	3.6 (2.4–4.8)	5.7 (1.4–10.0)	13.2 (9.3–17.2)	8.7 (7.2–10.2)	35.6 (31.0–40.2)	34.7 (25.6–43.8)
Sex						
Men	2.1 (1.5–2.7)	3.4 (1.5–5.3)	5.0 (3.0–6.9)	3.6 (3.1–4.1)	31.9 (27.3–36.5)	14.7 (12.0–17.4)
Women	1.5 (1.2–1.8)	1.6 (0.5–2.6)	4.6 (3.1–6.0)	3.2 (2.6–3.9)	19.0 (16.9–21.0)	12.8 (9.8–15.8)
Race/ethnicity						
Non-Hispanic white	1.3 (0.9–1.8)	2.3 (0.9–3.7)	4.9 (3.1–6.6)	2.7 (2.3–3.2)	24.0 (20.6–27.4)	13.5 (10.9–16.2)
Non-Hispanic black	2.7 (2.2–3.3)	3.5 (2.3–4.7)	4.1 (2.9–5.3)	7.2 (6.2–8.2)	20.9 (17.3–24.5)	10.1 (7.1–13.1)
Mexican American	3.6 (2.3–4.9)	3.7 (1.9–5.5)	7.0 (4.7–9.3)	3.6 (2.5–4.6)	27.8 (20.3–35.4)	14.4 (10.6–18.1)

Undiagnosed diabetes is based on A1c ≥6.5%, FPG ≥126 mg/dL, or 2-hr PG ≥200 mg/dL. High risk/prediabetes is based on A1c 5.7%–<6.5%, FPG 100–<126 mg/dL, or 2-hr PG 140–<200 mg/dL. Values by age alone and sex include those of race/ethnicity groups not listed separately. Estimates for the total population age ≥20 years and for race/ethnicity groups were age- and sex-standardized using age groups 20–39, 40–59, and ≥60 years, estimates for age-specific groups were sex-standardized, and estimates for sex groups were age-standardized, all using the 2000 U.S. Census population. A1c is based on the NHANES 2003–2006; FPG and 2-hr PG are based on the NHANES 2005–2006. Conversions for A1c and glucose values are provided in *Diabetes in America Appendix 1 Conversions*. 2-hr PG, 2-hour plasma glucose level from an OGTT; A1c, glycosylated hemoglobin; FPG, fasting plasma glucose; OGTT, oral glucose tolerance test.

SOURCE: National Health and Nutrition Examination Surveys 2003–2006. Adapted from Reference 18, copyright © 2010 American Diabetes Association, reprinted with permission from The American Diabetes Association

INCIDENCE OF DIAGNOSED DIABETES

There are few reports in the scientific literature that present incidence of diabetes based on nationally representative data. Most national health survey data are cross-sectional and do not follow individuals initially free of disease for onset of diabetes. The large sample size of the NHIS, however, allows estimation of diabetes incidence based on self-report of diagnosis and duration of diabetes for less than a year to yield the rate of new cases in the past year (32). In the United States in 2012, overall crude incidence per 1,000 adults age 20–79 years was 7.4 (95% CI 6.3–8.5). Incidence rose from 3.7 (95% CI 2.7–4.7) at age 20–44 years, peaked at 12.1 (95% CI 9.7–14.5) at age 45–64 years, and decreased to 8.7 (95% CI 5.7–11.7) at age 65–79 years. Age-standardized incidence was higher in women (8.2, 95% CI 6.7–9.8) than men (5.9, 95% CI 4.6–7.2); it was highest in Hispanics (12.5, 95% CI 8.8–16.2), followed by non-Hispanic blacks (9.9, 95% CI 6.8–13.0), and lowest in non-Hispanic whites (5.7, 95% CI 4.5–6.8).

SEARCH, a longitudinal study, has provided incidence of type 2 diabetes per 100,000 youths age 10–19 years. In 2011–2012, based on the number at risk in the previous and current year (2-year moving average), overall crude 1-year incidence was 12.5 (95% CI 11.2–13.9); was similar by ages 10–14 (12.1, 95% CI 10.3–14.1) and 15–19 years (12.9, 95% CI 11.1–15.0); significantly higher in girls (16.2, 95% CI 14.1–18.5) than boys (9.0, 95% CI 7.5–10.7); and highest in Native Americans (46.5, 95% CI 32.4–66.9), followed by non-Hispanic blacks (32.6, 95% CI 27.2–39.0), significantly lower in Hispanics (18.2, 95% CI 15.0–22.2) and Asian/Pacific Islanders (12.2, 95% CI 7.8–19.1), and significantly lower than all other race/ethnicity groups in non-Hispanic whites (3.9, 95% CI 3.0–5.0) (33).

TRENDS OVER TIME IN THE PREVALENCE AND INCIDENCE OF DIABETES

DIAGNOSED DIABETES

Figure 3.22 shows the crude prevalence and number of persons with diagnosed diabetes over all ages in the United States from 1958 to 2015, based on data from the NHIS. The percentage rose from 0.93% in 1958, to 2.29% in 1975, 2.62% in 1985, 3.30% in 1995, 5.61% in 2005, and to 7.40% or 23.4 million in 2015 (34).

Analysis of data from the NHIS during 1980–2012 found that prevalence in adults age 20–79 years did not change significantly during the 1980s. However, the overall age-adjusted annual percentage change rose dramatically during 1990–2008 (4.5%, 95% CI 4.1%–4.9%, p<0.001), but then leveled off during 2008–2012 (32). Prevalence was 3.5% in 1990, more than doubled to 7.9% in 2008, and was 8.3% in 2012. Subgroup analysis revealed that absolute changes in prevalence over the entire period from 1990 to 2012 were greatest for adults at oldest ages, while relative increases were greatest for young adults age 20–44 years compared to older adults (Figure 3.23). The rate of increase in prevalence was also higher for adults who had a high school education or less compared to

adults with more education. In addition, the rate of increase was significantly greater for Hispanics compared to non-Hispanic blacks, and both greater than that for non-Hispanic whites.

Likewise, trends in overall age-adjusted incidence for adults age 20–79 years based on NHIS data during 1980–2012 did not change significantly during the 1980s, but increased rapidly during 1990–2008 (overall age-adjusted annual percentage change 4.7%, 95% CI 3.8%–5.6%, p<0.001); in contrast to prevalence which leveled off, incidence then decreased during 2008–2012. Incidence per 1,000 persons was 3.2 in 1990, more than doubled to 8.8 in 2008, and decreased to 7.1 in 2012. It was particularly evident that incidence continued to increase for non-Hispanic blacks and Hispanics during 2008–2012 compared to non-Hispanic whites (Figure 3.23).

The plateauing of prevalence and decrease in incidence of diabetes noted above in the NHIS was corroborated by data from the BRFSS during 2004–2012. County-level disparities

in diabetes prevalence in adults age ≥18 years widened, while disparities in diabetes incidence narrowed (35). A further analysis of the county data found a concomitant decrease between 2004–2008 and 2008–2012 in diabetes prevalence, obesity, and leisure-time physical inactivity (Figure 3.24) (36). The reader is referred to Chapter 13 *Risk Factors for Type 2 Diabetes* for a comprehensive review of risk factors for type 2 diabetes.

Trends in prevalence of type 2 diabetes in adolescents age 10–19 years come from SEARCH (23). Prevalence of type 2 diabetes per 1,000 of the general population was 0.34 (95% CI 0.31–0.37) in 2001, which rose to 0.46 (95% CI 0.43–0.49) in 2009, a significant increase of 35% (95% CI 21.4%–50.0%). After adjusting for completeness of ascertainment, the increase during this time period was 30.5% (95% CI 17.3%–45.1%). There were significant increases in prevalence across the two periods in both those age 10–14 years and those age 15–19 years (larger increase in the older age group); and in both sexes (larger increase in females). There were also significant increases in non-Hispanic whites, non-Hispanic blacks, and Hispanics, but no significant changes in Asian Pacific Islander or American Indian youth (23).

Incidence of type 2 diabetes among adolescents age 10–19 years based on SEARCH rose from an unadjusted 9.0 cases per 100,000 per year in 2002–2003 (95% CI 7.9–10.2) to 12.5 cases per 100,000 per year in 2011–2012 (95% CI 11.2–13.9), an annual increase of 7.1%, p<0.0001; significant increases were found across all age, sex, race/ethnicity groups (except non-Hispanic whites) in both unadjusted and adjusted statistical models (33).

FIGURE 3.22. Number and Percentage of the U.S. Population With Diagnosed Diabetes, 1958–2015
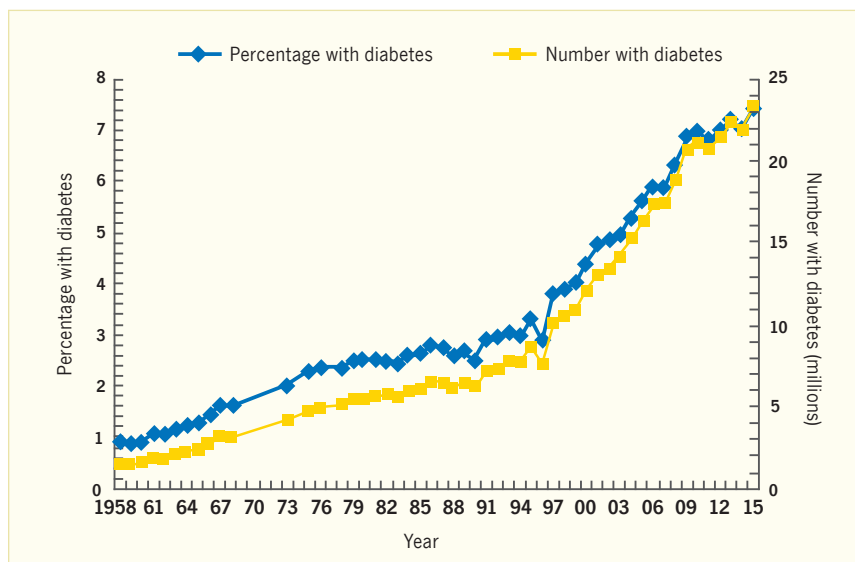
SOURCE: Reference 34

FIGURE 3.23. Prevalence and Incidence of Diagnosed Diabetes Among Adults Age 20–79 Years, by Demographic Variables, 1980–2012
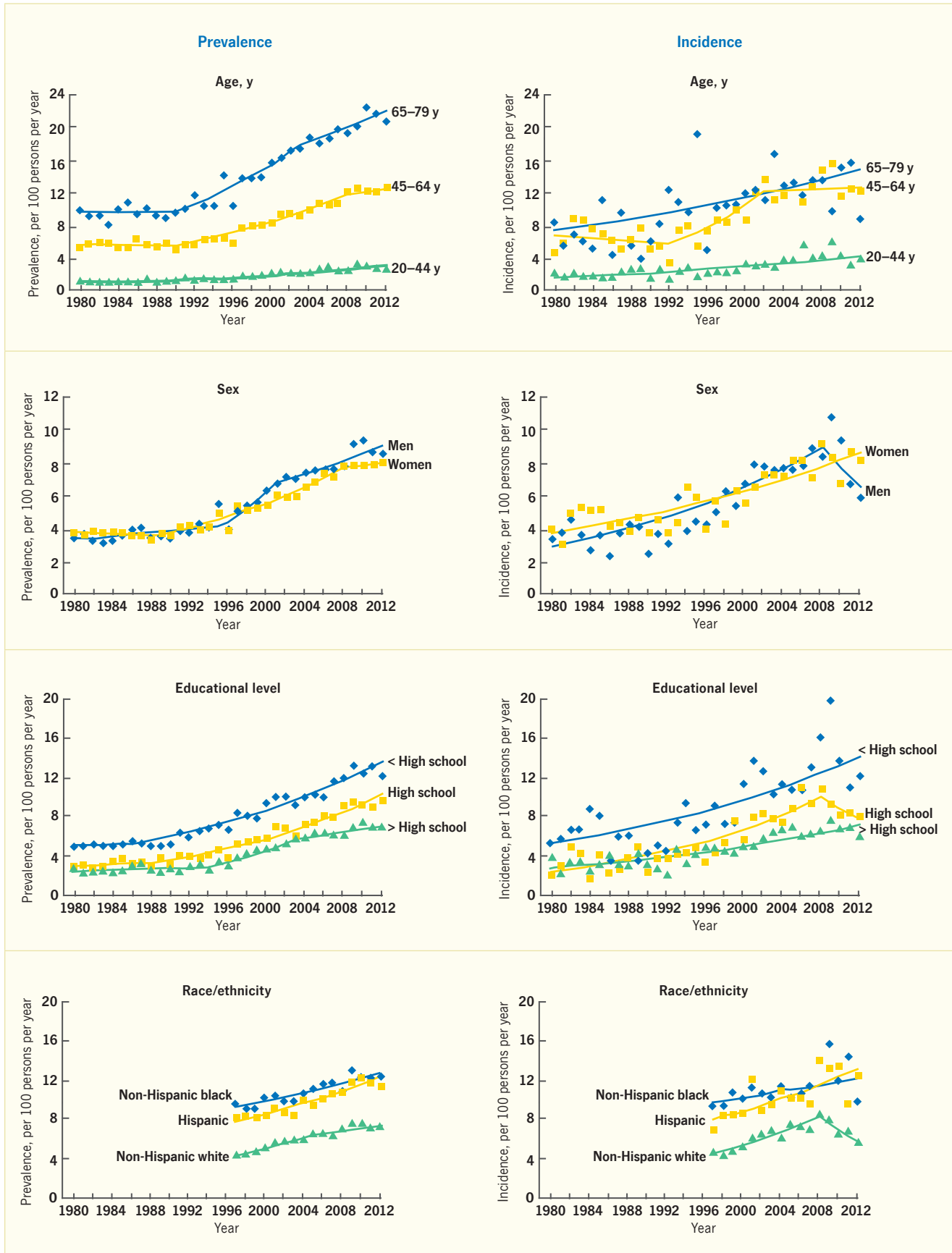
Data are from National Health Interview Surveys. Race/ethnicity analyses were restricted to 1997–2012 due to sample size for some race/ethnicity groups. Y, years.

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FIGURE 3.24. Average Annual Percentage Point Change in Diagnosed Diabetes, Obesity, and Physical Inactivity Prevalence, U.S. Counties, 2004–2008 and 2008–2012

SOURCE: Reference 36

(95% CI 25.2%–37.4%) in 2011–2012 (p<0.001), and significant decreases were also found in all subgroups, except for the youngest age group, 20–44 years, and in Mexican Americans. Note, however, that concern has been raised in examining trends in the ratio of undiagnosed diabetes to total diabetes over time; if prevalence of total diabetes is not constant over time, the percentage undiagnosed is not necessarily a reliable indicator of trends in the level of case detection (38).

Trends in prevalence of total diabetes were also examined based on defining undiagnosed diabetes by A1c/FPG/2-hour PG; however, this was restricted to those age 40–74 years, because the OGTT was performed only in these ages across all of 1988–2012. Prevalence increased significantly during this period overall, in people age 65–74 years, and in men, but increases were not significant in younger ages, women, or in specific race/ethnicity groups. Clear patterns of change in prevalence of undiagnosed diabetes using the three criteria were not evident during this time period.

An earlier analysis of NHANES data from 1976–1980, 1988–1994, and the continuous NHANES 1999–2010 examined what population factors explained the increase in prevalence of diabetes over time (39), specifically investigating whether the changing race/ethnicity distribution, the aging population, and/or rising obesity prevalence were responsible. Diabetes was defined by self-report or FPG (consistently available over all surveys). Explanatory population factors differed in men and women. After adjustment for age, race/ethnicity, and BMI, diabetes prevalence increased significantly in men during this time period; however, the increase in prevalence was halved by accounting for these factors. In women, however, prevalence of diabetes no longer increased over time after adjustment for these factors. BMI was the greatest contributor among the three population factors to the change in prevalence
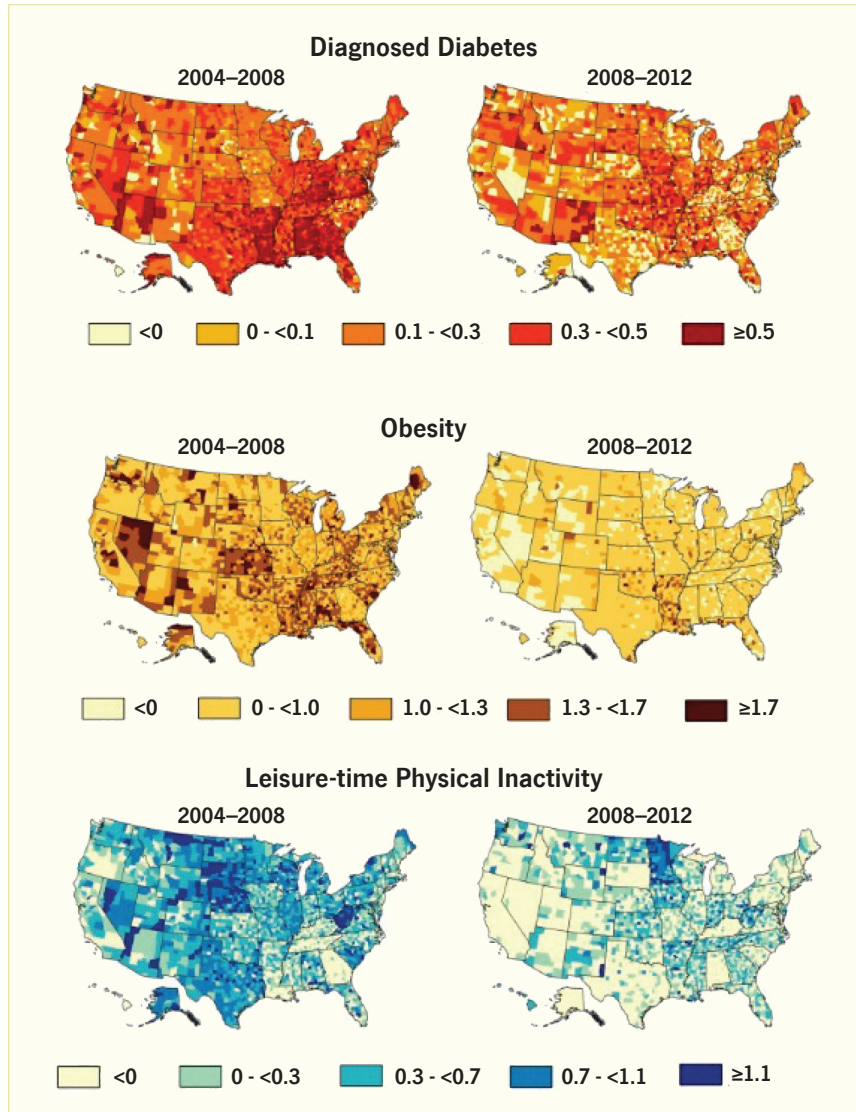
DIAGNOSED AND UNDIAGNOSED DIABETES

Trends in prevalence of diabetes that included both diagnosed and previously undiagnosed have been examined using data from the NHANES during 1988–2012 in adults age ≥20 years (37). The age-standardized prevalence of total diabetes based on A1c/FPG increased significantly from 9.8% (95% CI 8.9%–10.6%) in 1988–1994 to 12.4% (95% CI 10.8%–14.2%) in 2011–2012 (p<0.001); however, the prevalence was similar during 2007–2008 (12.5%, 95% CI 10.9%–14.2%) to 2011–2012 (12.4%, 95% CI 10.8%–14.2%) (Figure 3.25). The

prevalence of total diabetes also rose significantly during 1988–2012 by every subgroup of age, sex, race/ethnicity, education level, and poverty income ratio. When stratified by body mass index (BMI), however, total diabetes prevalence rose significantly only in those adults with BMI ≥30 kg/m^2 compared to lower levels of BMI. The overall increase in total diabetes prevalence was due to the increase in diagnosed diabetes (Figure 3.25); overall undiagnosed diabetes based on A1c/FPG remained relatively constant. The percent of total diabetes that was undiagnosed decreased significantly from 40.3% (95% CI 34.9%–45.7%) in 1988–1994 to 31.0%

FIGURE 3.25. Trends in Diabetes Prevalence Per 100 Adults Age ≥20 Years, U.S., 1988–2012
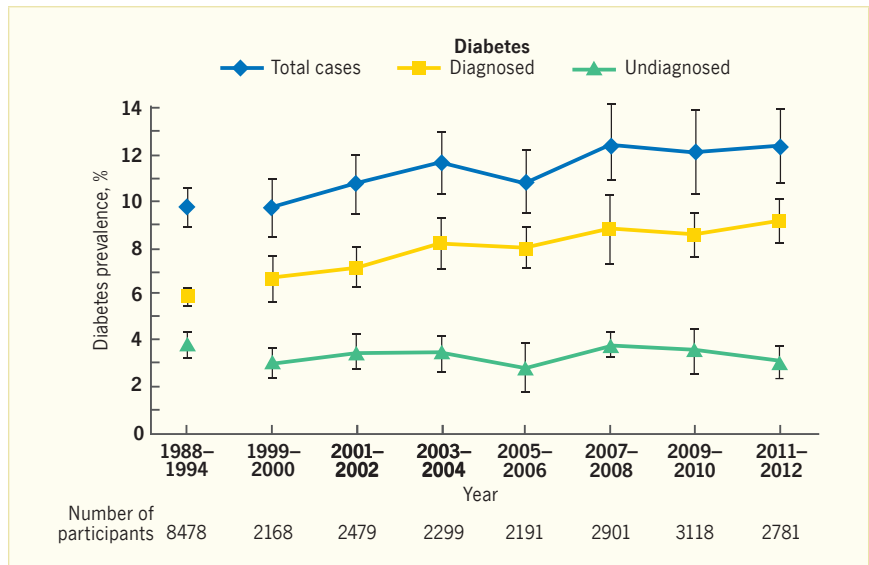
Both diagnosed and undiagnosed cases of diabetes are included in the total cases. Diagnosed diabetes is based on self-report of a previous diagnosis by a physician or other health professional. Undiagnosed diabetes is based on A1c ≥6.5% or FPG ≥126 mg/dL. All estimates were age standardized to the overall National Health and Nutrition Examination Surveys 2011–2012 interview population using the age groups 20–44, 45–64, and ≥65 years. Error bars indicate 95% confidence intervals. Conversions for A1c and glucose values are provided in *Diabetes in America Appendix 1 Conversions*. A1c, glycosylated hemoglobin; FPG, fasting plasma glucose.

estimates in both men and women. The analysis was unable to examine the effects of other possible risk factors for the increase in diabetes prevalence over time, such as decreasing physical activity, increasing central adiposity, and lower mortality, as these data were not available for all survey years. A more thorough description of risk factors for type 2 diabetes is found in Chapter 13.

TRENDS OVER TIME IN THE PREVALENCE OF PREDIABETES

Trends over time in prediabetes prevalence have been best described based on A1c/FPG from the NHANES during 1999–2010 in adults age ≥18 years (Table 3.3) (40). Age-standardized prevalence of prediabetes based on A1c/FPG combined was similar during 1999–2002 and 2003–2006 at 29.2% and 29.3%, respectively, but rose significantly in 2007–2010 to 36.2%. The change over time in prevalence of prediabetes occurred because of a significant change in elevated A1c, whereas prevalence based on elevated FPG was similar over this time period. Changes over time for prediabetes based on A1c/FPG rose most significantly in those age 18–64 years versus those age ≥65 years, in women versus men, in non-Hispanic whites and non-Hispanic blacks versus Mexican Americans, in those with lower versus higher income levels, and in those with lower versus higher BMI levels.

TABLE 3.3. Age-Standardized Prevalence of Prediabetes in Adults Age ≥18 Years, U.S., 1999–2010

	PERCENT (95% CI) BY SURVEY PERIOD			ABSOLUTE PREVALENCE CHANGE		
	T1 (1999–2002)	T2 (2003–2006)	T3 (2007–2010)	T2 - T1	T3 - T2	T3 - T1
Prediabetes	29.2 (26.8–31.8)	29.3 (27.0–34.5)	36.2 (34.5–38.0)	0.1	6.9*	7.0*
A1c 5.7	10.3 (9.1–11.7)	11.6 (10.7–12.5)	19.3 (18.1–20.7)	1.2	7.8*	9.0*
IFG	25.4 (23.1–27.8)	24.6 (22.2–27.2)	27.5 (25.5–29.5)	-0.8	2.8	2.0

Prediabetes includes persons with A1c 5.7%–<6.5% or FPG 100–<126 mg/dL. A1c5.7 includes persons with A1c 5.7%–<6.5% alone. IFG includes persons with FPG 100–<126 mg/dL alone. Estimates were age-standardized to the 2000 U.S. Census standard population using age groups of 18–44, 45–64, and ≥65 years. Due to rounding, net prevalence changes (T3 - T1) may not equal the sum of changes between the first two time periods and second two time periods [e.g., (T2 - T1) + (T3 - T2)]. P values were calculated from a t test. Conversions for A1c and glucose values are provided in *Diabetes in America Appendix 1 Conversions*. A1c, glycosylated hemoglobin; CI, confidence interval; FPG, fasting plasma glucose; IFG, impaired fasting glucose.
* p<0.001

LIST OF ABBREVIATIONS

2-hour PG . . . . 2-hour plasma glucose from an OGTT
A1c . . . . glycosylated hemoglobin
ADA . . . . American Diabetes Association
BMI . . . . body mass index
BRFSS . . . . Behavioral Risk Factor Surveillance System
CHIS . . . . California Health Interview Survey
CI . . . . confidence interval
FPG . . . . fasting plasma glucose
HCHS/SOL . . . Hispanic Community Health Study/Study of Latinos

IFG . . . . impaired fasting glucose
IHS NDW . . . . . Indian Health Service National Data Warehouse
NHANES . . . . . National Health and Nutrition Examination Survey
NHIS . . . . National Health Interview Survey
OGTT . . . . oral glucose tolerance test
RSE . . . . relative standard error
SEARCH . . . . . SEARCH for Diabetes in Youth Study
SUDAAN . . . . . Survey Data Analysis

CONVERSIONS

Conversions for A1c and glucose values are provided in *Diabetes in America Appendix 1 Conversions*.

DUALITY OF INTEREST

Drs. Cowie and Casagrande and Ms. Geiss reported no conflicts of interest.

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APPENDICES

APPENDIX 3.1. Crude Prevalence of Diagnosed Diabetes in Persons Age ≥12 Years, by Age, Sex, and Race/Ethnicity, U.S., 2011–2015

CHARACTERISTICS	PERCENT (STANDARD ERROR) (95% CONFIDENCE INTERVAL)						
	Age (Years)						
	12–19 (n=26,603)	≥20 (n=168,681)	20–44 (n=71,587)	45–64 (n=58,105)	65–74 (n=21,572)	≥65 (n=38,989)	≥75 (n=17,417)
Total	0.5 (0.05) (0.4–0.6)	9.5 (0.10) (9.3–9.7)	2.6 (0.08) (2.4–2.7)	12.3 (0.19) (12.0–12.7)	21.5 (0.37) (20.8–22.2)	20.8 (0.27) (20.3–21.3)	19.9 (0.39) (19.2–20.7)
Sex							
Male	0.4 (0.07) (0.3–0.6)	9.9 (0.13) (9.6–10.1)	2.4 (0.10) (2.2–2.6)	13.2 (0.27) (12.7–13.8)	22.9 (0.56) (21.8–24.0)	22.6 (0.46) (21.8–23.5)	22.3 (0.73) (20.9–23.7)
Female	0.6 (0.09) (0.4–0.8)	9.2 (0.13) (9.0–9.5)	2.7 (0.11) (2.5–2.9)	11.5 (0.25) (11.0–12.0)	20.2 (0.44) (19.4–21.1)	19.4 (0.33) (18.7–20.0)	18.3 (0.45) (17.4–19.2)
Race/ethnicity							
Non-Hispanic white	0.5 (0.08) (0.3–0.7)	8.9 (0.11) (8.7–9.2)	2.2 (0.09) (2.0–2.4)	10.5 (0.22) (10.1–10.9)	18.8 (0.40) (18.1–19.6)	18.3 (0.30) (17.8–18.9)	17.7 (0.44) (16.8–18.6)
Non-Hispanic black	0.5 (0.13) (0.3–0.8)	12.8 (0.29) (12.2–13.3)	3.8 (0.23) (3.4–4.3)	18.3 (0.49) (17.4–19.3)	31.5 (1.05) (29.5–33.6)	31.1 (0.79) (29.6–32.7)	30.6 (1.27) (28.1–33.1)
Hispanic (all)	0.5 (0.12) (0.3–0.8)	9.9 (0.24) (9.4–10.4)	2.9 (0.14) (2.6–3.2)	17.1 (0.60) (15.9–18.3)	33.2 (1.29) (30.7–35.8)	32.2 (0.99) (30.3–34.2)	30.5 (1.39) (27.8–33.3)
Mexican American	0.5 (0.14) (0.3–0.9)	10.3 (0.32) (9.7–10.9)	3.3 (0.19) (2.9–3.6)	19.2 (0.86) (17.6–21.0)	37.9 (1.93) (34.2–41.8)	36.3 (1.46) (33.5–39.2)	33.4 (1.84) (29.9–37.1)
Puerto Rican	1.0 (0.43) (0.4–2.3)[2]	12.8 (0.81) (11.2–14.4)	3.8 (0.57) (2.9–5.1)	18.8 (1.73) (15.6–22.5)	32.6 (3.22) (26.6–39.2)	31.9 (2.49) (27.2–37.0)	30.7 (4.50) (22.7–40.2)
Cuban	[3]	10.4 (0.98) (8.6–12.5)	2.3 (1.04) (0.9–5.5)[2]	13.6 (2.75) (9.0–19.9)	17.5 (4.20) (10.7–27.3)	20.1 (1.69) (16.9–23.6)	22.6 (3.28) (16.8–29.7)
Central/ South American	[3]	6.3 (0.42) (5.5–7.1)	1.6 (0.29) (1.1–2.3)	10.7 (1.10) (8.8–13.1)	23.7 (2.66) (18.9–29.3)	25.0 (2.58) (20.2–30.4)	27.2 (4.65) (19.0–37.2)
Hispanic NOC	[3]	10.5 (0.76) (9.1–12.1)	1.8 (0.41) (1.2–2.8)	15.5 (1.78) (12.3–19.3)	36.8 (3.80) (29.7–44.6)	34.8 (3.28) (28.6–41.5)	31.9 (5.59) (22.0–43.7)
Non-Hispanic Asian (all)	[3]	7.9 (0.33) (7.3–8.6)	1.9 (0.24) (1.5–2.4)	11.6 (0.72) (10.2–13.1)	22.5 (1.56) (19.6–25.7)	22.5 (1.07) (20.5–24.7)	22.5 (1.82) (19.1–26.3)
Asian Indian	[3]	8.2 (0.79) (6.8–9.9)	2.0 (0.48) (1.3–3.2)	15.1 (2.10) (11.4–19.7)	32.3 (5.00) (23.4–42.8)	33.8 (4.19) (26.1–42.5)	38.8 (8.89) (23.3–57.0)
Chinese	[3]	3.9 (0.41) (3.2–4.8)	0.7 (0.21) (0.4–1.2)[1]	4.6 (0.94) (3.1–6.9)	12.2 (2.36) (8.2–17.6)	14.3 (1.73) (11.2–18.0)	16.5 (2.30) (12.5–21.6)
Filipino	[3]	10.9 (0.84) (9.4–12.7)	2.5 (0.57) (1.6–3.9)	14.5 (1.66) (11.6–18.1)	26.6 (3.30) (20.6–33.5)	25.1 (2.30) (20.9–29.9)	22.4 (3.98) (15.5–31.1)
Other Asian/NHOPI	[3]	8.4 (0.56) (7.4–9.6)	2.3 (0.51) (1.5–3.5)	12.0 (1.29) (9.7–14.7)	19.5 (2.26) (15.4–24.3)	21.2 (1.77) (17.9–24.9)	23.7 (3.72) (17.2–31.8)
Non-Hispanic American Indian/Alaska Native	[3]	18.1 (2.06) (14.4–22.5)	6.0 (1.40) (3.7–9.4)	24.0 (3.02) (18.6–30.4)	39.6 (5.28) (29.8–50.3)	41.8 (4.65) (33.1–51.2)	45.2 (7.66) (31.0–60.2)
Sex and race/ethnicity							
Male							
Non-Hispanic white	0.4 (0.09) (0.3–0.6)	9.5 (0.16) (9.2–9.8)	2.0 (0.12) (1.8–2.3)	11.5 (0.30) (10.9–12.1)	20.9 (0.63) (19.7–22.2)	20.7 (0.51) (19.7–21.7)	20.3 (0.80) (18.8–21.9)
Non-Hispanic black	[3]	12.3 (0.39) (11.6–13.1)	3.5 (0.34) (2.9–4.3)	19.0 (0.82) (17.4–20.7)	28.4 (1.57) (25.4–31.6)	29.7 (1.20) (27.4–32.1)	32.2 (2.28) (27.9–36.8)
Hispanic (all)	0.5 (0.17) (0.3–1.0)[1]	9.6 (0.35) (9.0–10.3)	2.8 (0.21) (2.4–3.2)	17.8 (0.93) (16.0–19.7)	35.0 (1.87) (31.4–38.7)	33.3 (1.59) (30.3–36.5)	30.4 (2.40) (25.9–35.3)
Mexican American	0.4 (0.17) (0.2–0.9)[2]	9.9 (0.47) (9.1–10.9)	3.0 (0.29) (2.5–3.6)	19.6 (1.32) (17.1–22.3)	40.2 (2.84) (34.8–45.9)	36.8 (2.39) (32.2–41.6)	30.1 (3.36) (23.9–37.1)
Puerto Rican	[3]	12.4 (1.11) (10.3–14.7)	4.3 (0.98) (2.8–6.7)	18.1 (2.52) (13.7–23.6)	35.2 (4.74) (26.5–44.9)	32.2 (3.61) (25.5–39.6)	26.8 (6.86) (15.5–42.1)
Cuban	[3]	12.8 (2.15) (9.2–17.7)	[3]	18.0 (4.87) (10.3–29.6)	19.9 (7.69) (8.8–39.1)[1]	22.3 (4.89) (14.1–33.3)	24.7 (4.84) (16.4–35.4)
Central/South American	[3]	5.5 (0.58) (4.5–6.7)	1.4 (0.38) (0.8–2.4)	10.5 (1.56) (7.8–13.9)	21.9 (3.71) (15.5–30.1)	25.0 (3.86) (18.2–33.3)	32.7 (8.89) (18.0–51.8)
Hispanic NOC	[3]	11.2 (1.29) (8.9–14.0)	1.5 (0.38) (0.9–2.5)	19.4 (3.30) (13.7–26.7)	38.2 (5.55) (28.1–49.6)	39.9 (5.20) (30.3–50.5)	42.3 (9.45) (25.5–61.1)

Appendix 3.1 continues on the next page.

APPENDIX 3.1. (continued)

CHARACTERISTICS	PERCENT (STANDARD ERROR) (95% CONFIDENCE INTERVAL)						
	Age (Years)						
	12–19 (n=26,603)	≥20 (n=168,681)	20–44 (n=71,587)	45–64 (n=58,105)	65–74 (n=21,572)	≥65 (n=38,989)	≥75 (n=17,417)
Non-Hispanic Asian (all)	3	8.7 (0.52) (7.7–9.8)	2.1 (0.32) (1.6–2.8)	13.5 (1.25) (11.2–16.1)	23.5 (2.16) (19.5–28.0)	24.6 (1.73) (21.3–28.1)	26.4 (2.96) (21.0–32.6)
Asian Indian	3	9.6 (1.17) (7.5–12.1)	2.2 (0.64) (1.2–3.9)	18.6 (3.36) (12.9–26.1)	32.6 (6.68) (21.0–46.8)	36.7 (6.19) (25.5–49.5)	55.1 (14.70) (27.6–79.8)
Chinese	3	5.6 (0.72) (4.3–7.2)	1.2 (0.37) (0.7–2.2)[1]	6.3 (1.60) (3.8–10.3)	17.2 (4.42) (10.1–27.7)	18.7 (3.51) (12.8–26.6)	20.3 (3.82) (13.8–28.8)
Filipino	3	11.8 (1.34) (9.4–14.7)	3.6 (1.13) (1.9–6.6)[1]	16.8 (2.94) (11.7–23.4)	23.5 (4.72) (15.5–34.0)	23.7 (3.63) (17.3–31.6)	24.3 (7.40) (12.7–41.5)[1]
Other Asian/NHOPI	3	8.3 (0.88) (6.7–10.2)	1.8 (0.58) (0.9–3.4)[1]	12.5 (2.07) (9.0–17.2)	21.3 (3.70) (14.9–29.5)	23.7 (3.04) (18.2–30.2)	27.5 (5.74) (17.7–40.1)
Non-Hispanic American Indian/ Alaska Native	3	18.5 (2.23) (14.5–23.3)	5.4 (1.53) (3.0–9.3)	23.8 (3.71) (17.3–31.8)	40.6 (7.65) (26.8–56.1)	46.2 (7.09) (32.9–60.1)	55.0 (12.31) (31.4–76.4)
Female							
Non-Hispanic white	0.6 (0.14) (0.3–0.9)	8.4 (0.16) (8.1–8.7)	2.4 (0.14) (2.1–2.6)	9.5 (0.29) (9.0–10.1)	16.9 (0.50) (16.0–17.9)	16.4 (0.36) (15.7–17.2)	15.8 (0.50) (14.9–16.8)
Non-Hispanic black	0.6 (0.20) (0.3–1.2)[1]	13.1 (0.36) (12.5–13.9)	4.1 (0.29) (3.6–4.7)	17.8 (0.63) (16.5–19.0)	33.8 (1.34) (31.2–36.5)	32.1 (1.02) (30.1–34.1)	29.7 (1.53) (26.7–32.8)
Hispanic (all)	0.6 (0.15) (0.3–0.9)	10.1 (0.33) (9.5–10.8)	3.0 (0.21) (2.7–3.5)	16.4 (0.74) (15.0–17.9)	31.8 (1.67) (28.6–35.2)	31.3 (1.32) (28.8–34.0)	30.6 (1.88) (27.0–34.4)
Mexican American	0.6 (0.20) (0.3–1.2)[1]	10.7 (0.41) (9.9–11.5)	3.5 (0.28) (3.0–4.1)	18.9 (1.00) (17.0–20.9)	36.0 (2.52) (31.2–41.1)	36.0 (1.81) (32.5–39.6)	35.9 (2.27) (31.5–40.4)
Puerto Rican	3	13.1 (1.10) (11.1–15.4)	3.4 (0.74) (2.2–5.2)	19.4 (2.29) (15.3–24.3)	30.5 (4.02) (23.2–38.9)	31.7 (3.48) (25.3–38.9)	34.0 (5.59) (24.0–45.7)
Cuban	3	7.7 (1.31) (5.5–10.7)	3	8.0 (2.02) (4.9–13.0)	15.4 (2.56) (11.0–21.1)	18.3 (2.89) (13.3–24.7)	21.0 (6.04) (11.5–35.2)
Central/South American	3	7.1 (0.57) (6.0–8.3)	1.8 (0.39) (1.2–2.8)	11.0 (1.37) (8.6–14.0)	25.0 (3.26) (19.2–31.9)	24.9 (3.12) (19.3–31.6)	24.9 (5.63) (15.5–37.4)
Hispanic NOC	3	9.9 (0.99) (8.1–12.0)	2.2 (0.69) (1.2–4.0)[1]	12.3 (2.05) (8.8–16.9)	36.0 (4.91) (27.0–46.1)	31.5 (4.00) (24.2–39.8)	25.0 (5.99) (15.1–38.5)
Non-Hispanic Asian (all)	3	7.2 (0.40) (6.5–8.0)	1.7 (0.31) (1.2–2.4)	9.9 (0.88) (8.3–11.8)	21.6 (2.15) (17.7–26.2)	20.9 (1.47) (18.2–23.9)	19.8 (2.30) (15.7–24.7)
Asian Indian	3	6.7 (1.02) (5.0–9.0)	1.8 (0.65) (0.9–3.7)[1]	11.0 (2.51) (6.9–16.9)	32.0 (7.67) (19.1–48.5)	30.9 (6.04) (20.4–43.8)	28.0 (9.43) (13.4–49.4)[1]
Chinese	3	2.6 (0.47) (1.8–3.7)	3	3.3 (0.97) (1.8–5.8)	7.5 (2.31) (4.1–13.5)[1]	10.0 (2.28) (6.3–15.4)	12.7 (3.37) (7.4–20.9)
Filipino	3	10.3 (1.02) (8.5–12.5)	1.8 (0.53) (1.0–3.2)[1]	13.0 (2.06) (9.5–17.6)	28.9 (3.97) (21.8–37.3)	26.1 (3.08) (20.6–32.6)	21.1 (4.77) (13.2–32.0)
Other Asian/NHOPI	3	8.5 (0.72) (7.2–10.0)	2.7 (0.75) (1.6–4.6)	11.5 (1.69) (8.5–15.2)	18.2 (2.84) (13.3–24.5)	19.6 (2.02) (15.9–23.9)	21.5 (3.76) (15.0–29.8)
Non-Hispanic American Indian/ Alaska Native	3	17.9 (2.94) (12.8–24.4)	6.5 (2.27) (3.2–12.7)[1]	24.2 (3.98) (17.2–32.8)	38.7 (8.01) (24.5–55.0)	37.8 (6.36) (26.3–50.8)	36.5 (8.90) (21.3–55.0)

Diagnosed diabetes is based on self-report. Hispanic NOC (not otherwise classified) includes: multiple Hispanic, Dominican Republic, Other Latin American, Other Spanish, Hispanic/Latino/Spanish, type not specified. Other Asian/NHOPI: Japanese, Korean, Vietnamese, Native Hawaiian, or Non-Hispanic Other Pacific Islander (NHOPI). For further details on methods, refer to descriptions in the chapter text in the section *Data Sources and Limitations*, for the National Health Interview Survey.

[1] Relative standard error >30%–40%
[2] Relative standard error >40%–50%
[3] Estimate is too unreliable to present; relative standard error >50%.

SOURCE: National Health Interview Surveys 2011–2015

APPENDIX 3.2. Age- or Age/Sex-Standardized Prevalence of Diagnosed Diabetes in Adults Age ≥20 Years, by Sex and Race/Ethnicity, U.S., 2011–2015

RACE/ETHNICITY	PERCENT (STANDARD ERROR) (95% CONFIDENCE INTERVAL)		
	Both Sexes (n=168,681)	Men (n=75,138)	Women (n=93,543)
Total	9.5 (0.10) (9.3–9.7)	10.1 (0.13) (9.9–10.4)	9.0 (0.13) (8.8–9.3)
Non-Hispanic white	8.2 (0.10) (8.0–8.4)	9.0 (0.15) (8.7–9.3)	7.6 (0.14) (7.3–7.9)
Non-Hispanic black	14.2 (0.26) (13.7–14.7)	14.0 (0.39) (13.3–14.8)	14.3 (0.35) (13.6–15.0)
Hispanic (all)	13.5 (0.31) (12.9–14.2)	13.9 (0.46) (13.1–14.8)	13.2 (0.40) (12.4–14.0)
Mexican American	15.2 (0.44) (14.4–16.1)	15.3 (0.65) (14.1–16.7)	15.2 (0.54) (14.1–16.3)
Puerto Rican	14.5 (0.86) (12.9–16.3)	14.5 (1.20) (12.3–17.1)	14.5 (1.15) (12.4–16.9)
Cuban	9.4 (0.82) (7.9–11.1)	12.5 (2.07) (8.9–17.1)	6.5 (1.09) (4.7–9.0)
Central/South American	9.3 (0.59) (8.2–10.5)	9.1 (0.86) (7.6–11.0)	9.5 (0.75) (8.1–11.1)
Hispanic NOC	13.2 (0.88) (11.5–15.0)	15.2 (1.52) (12.4–18.4)	11.4 (1.08) (9.4–13.6)
Non-Hispanic Asian (all)	9.3 (0.36) (8.6–10.0)	10.4 (0.60) (9.3–11.7)	8.3 (0.42) (7.5–9.2)
Asian Indian	12.5 (1.09) (10.5–14.8)	14.6 (1.62) (11.7–18.1)	10.6 (1.50) (8.0–13.9)
Chinese	4.7 (0.47) (3.8–5.7)	6.4 (0.83) (4.9–8.2)	3.2 (0.56) (2.2–4.5)
Filipino	11.3 (0.83) (9.7–13.0)	12.1 (1.30) (9.8–14.9)	10.4 (0.92) (8.7–12.4)
Other Asian/NHOPI	9.4 (0.61) (8.2–10.7)	9.8 (0.97) (8.0–11.9)	9.1 (0.74) (7.7–10.6)
Non-Hispanic American Indian/Alaska Native	19.1 (2.00) (15.5–23.4)	19.7 (2.08) (15.9–24.1)	18.8 (2.93) (13.7–25.2)

Diagnosed diabetes is based on self-report. Hispanic NOC (not otherwise classified) includes: multiple Hispanic, Dominican Republic, Other Latin American, Other Spanish, Hispanic/Latino/Spanish, type not specified. Other Asian/NHOPI includes: Japanese, Korean, Vietnamese, Native Hawaiian, or Non-Hispanic Other Pacific Islander (NHOPI). Except for Total, estimates for both sexes are standardized to the NHIS 2011–2015 total population by age and sex using age groups 20–44, 45–64, and ≥65 years. Estimates for men and women are standardized to the NHIS 2011–2015 total population by age using age groups 20–44, 45–64, and ≥65 years. For further details on methods, refer to descriptions in the chapter text in the section *Data Sources and Limitations*, for the National Health Interview Survey.

SOURCE: National Health Interview Surveys 2011–2015

APPENDIX 3.3. Crude Prevalence of Diagnosed and Undiagnosed Diabetes, Total Diabetes, Prediabetes, and Total Dysglycemia in Persons Age ≥12 Years, by Age, Sex, and Race/Ethnicity, U.S., 2011–2014

CHARACTERISTICS	PERCENT (STANDARD ERROR) (95% CONFIDENCE INTERVAL)											
	Diagnosed Diabetes	Undiagnosed Diabetes	Total Diabetes*	Percent of Total Diabetes Undiagnosed	Undiagnosed Diabetes	Total Diabetes*	Percent of Total Diabetes Undiagnosed	Prediabetes	Prediabetes	Total Dysglycemia*	Total Dysglycemia*	Normal Glucose Levels
	A1c or FPG	A1c or FPG	A1c or FPG	A1c or FPG	A1c, FPG, or 2-hr PG	A1c, FPG, or 2-hr PG	A1c, FPG, or 2-hr PG	A1c or FPG	A1c, FPG, or 2-hr PG	A1c, FPG, or 2-hr PG	A1c, FPG, or 2-hr PG	A1c, FPG, or 2-hr PG
Total, Age ≥12 years (n=6,794)	8.4 (0.34) (7.7–9.1)	2.5 (0.16) (2.2–2.9)	10.9 (0.37) (10.2–11.7)	23.2 (1.34) (20.6–26.0)	4.4 (0.33) (3.8–5.1)	12.8 (0.52) (11.8–13.9)	34.4 (1.79) (30.9–38.2)	31.7 (1.15) (29.4–34.1)	34.4 (1.15) (32.1–36.7)	42.7 (1.17) (40.3–45.1)	47.1 (1.18) (44.8–49.6)	52.9 (1.18) (50.4–55.2)
Total, Age ≥20 years (n=5,719)	9.6 (0.41) (8.8–10.4)	2.9 (0.19) (2.5–3.3)	12.5 (0.46) (11.6–13.4)	23.3 (1.34) (20.7–26.1)	5.0 (0.39) (4.3–5.9)	14.6 (0.64) (13.3–15.9)	34.5 (1.79) (30.9–38.2)	34.4 (1.18) (32.1–36.9)	36.9 (1.13) (34.6–39.2)	46.9 (1.21) (44.4–49.4)	51.4 (1.18) (49.0–53.8)	48.6 (1.18) (46.2–51.0)
Age (years)												
12–19	0.6 (0.21) (0.3–1.2)[1]	[3]	0.7 (0.22) (0.4–1.3)[1]	[3]	0.3 (0.11) (0.1–0.6)[1]	0.8 (0.24) (0.5–1.5)	30.2 (11.48) (12.5–56.7)[1]	13.5 (1.39) (10.9–16.6)	17.5 (1.70) (14.3–21.3)	14.2 (1.46) (11.5–17.4)	18.4 (1.78) (15.0–22.3)	81.6 (1.78) (77.7–85.0)
20–44	2.8 (0.22) (2.4–3.3)	1.4 (0.19) (1.1–1.9)	4.2 (0.30) (3.7–4.9)	33.4 (3.30) (27.1–40.4)	2.0 (0.28) (1.5–2.7)	4.8 (0.41) (4.1–5.7)	41.5 (3.42) (34.7–48.6)	24.0 (1.31) (21.5–26.8)	27.8 (1.36) (25.1–30.7)	28.3 (1.39) (25.5–31.2)	32.6 (1.53) (29.6–35.8)	67.4 (1.53) (64.2–70.4)
45–64	12.8 (0.83) (11.1–14.5)	4.0 (0.43) (3.2–5.0)	16.7 (0.97) (14.8–18.8)	23.8 (2.20) (19.6–28.6)	6.1 (0.65) (4.9–7.6)	18.6 (1.05) (16.6–20.9)	32.7 (2.83) (27.2–38.7)	41.0 (1.64) (37.7–44.4)	44.0 (1.99) (40.0–48.1)	57.7 (1.75) (54.1–61.2)	62.7 (2.04) (58.4–66.7)	37.3 (2.04) (33.3–41.6)
65–74	19.9 (1.63) (16.8–23.5)	4.1 (0.66) (2.9–5.6)	24.0 (1.65) (20.8–27.5)	17.0 (2.72) (12.2–23.3)	7.8 (1.23) (5.6–10.7)	27.8 (1.83) (24.3–31.7)	28.0 (4.09) (20.5–37.1)	48.6 (2.77) (43.0–54.2)	46.3 (2.84) (40.6–52.1)	72.6 (3.08) (65.9–78.4)	74.1 (3.05) (67.5–79.9)	25.9 (3.05) (20.1–32.5)
≥65	20.7 (1.06) (18.7–23.0)	4.6 (0.52) (3.7–5.8)	25.4 (1.21) (23.0–27.9)	18.2 (1.80) (14.8–22.2)	10.7 (1.11) (8.7–13.2)	31.7 (1.68) (28.3–35.2)	33.8 (2.39) (29.1–38.9)	48.2 (1.98) (44.2–52.3)	45.8 (2.18) (41.5–50.3)	73.6 (2.04) (69.2–77.5)	77.5 (2.29) (72.5–81.8)	22.5 (2.29) (18.2–27.5)
≥75	21.9 (1.69) (18.7–25.6)	5.4 (0.73) (4.1–7.1)	27.4 (1.76) (24.0–31.1)	19.9 (2.57) (15.1–25.6)	15.2 (2.23) (11.2–20.3)	37.6 (2.84) (32.0–43.5)	40.4 (3.85) (32.9–48.4)	47.7 (2.71) (42.2–53.2)	45.1 (2.52) (40.1–50.3)	75.1 (2.37) (69.9–79.6)	82.7 (2.65) (76.6–87.5)	17.3 (2.65) (12.5–23.4)
Sex												
Male	8.5 (0.40) (7.7–9.3)	3.1 (0.33) (2.5–3.8)	11.6 (0.53) (10.5–12.7)	26.6 (2.23) (22.3–31.4)	4.7 (0.50) (3.8–5.9)	13.2 (0.67) (11.9–14.6)	35.8 (2.60) (30.7–41.3)	35.1 (1.56) (32.0–38.3)	36.8 (1.65) (33.6–40.3)	46.7 (1.53) (43.6–49.8)	50.0 (1.50) (47.0–53.1)	50.0 (1.50) (46.9–53.0)
Female	8.3 (0.43) (7.5–9.2)	2.0 (0.23) (1.6–2.6)	10.4 (0.45) (9.5–11.3)	19.6 (2.13) (15.7–24.3)	4.1 (0.42) (3.3–5.0)	12.4 (0.63) (11.2–13.7)	33.0 (2.57) (28.0–38.5)	28.5 (1.33) (25.9–31.3)	32.0 (1.37) (29.3–34.9)	38.9 (1.41) (36.1–41.8)	44.4 (1.52) (41.4–47.5)	55.6 (1.52) (52.5–58.6)
Race/ethnicity												
Non-Hispanic white	7.9 (0.41) (7.1–8.7)	2.0 (0.22) (1.6–2.5)	9.8 (0.45) (9.0–10.8)	20.0 (2.04) (16.2–24.5)	3.8 (0.49) (2.9–5.0)	11.7 (0.67) (10.4–13.1)	32.8 (3.03) (26.9–39.2)	31.8 (1.60) (28.6–35.2)	34.6 (1.65) (31.3–38.0)	41.6 (1.62) (38.4–45.0)	46.3 (1.60) (43.0–49.5)	53.7 (1.60) (50.5–57.0)
Non-Hispanic black	11.1 (0.48) (10.1–12.1)	3.4 (0.58) (2.4–4.8)	14.5 (0.90) (12.8–16.4)	23.6 (2.81) (18.4–29.8)	4.7 (0.71) (3.4–6.3)	15.7 (1.06) (13.6–18.0)	29.8 (2.78) (24.5–35.8)	33.8 (1.49) (30.8–36.9)	35.6 (1.58) (32.5–38.9)	48.3 (1.69) (44.9–51.7)	51.3 (1.78) (47.7–54.9)	48.7 (1.78) (45.1–52.3)
Hispanic (all)	8.0 (0.70) (6.7–9.6)	3.2 (0.39) (2.5–4.1)	11.3 (0.85) (9.6–13.1)	28.5 (2.80) (23.1–34.5)	5.5 (0.61) (4.4–6.9)	13.5 (1.12) (11.4–16.0)	40.7 (2.56) (35.6–46.0)	31.2 (1.24) (28.7–33.8)	33.2 (1.36) (30.5–36.1)	42.5 (1.50) (39.4–45.6)	46.8 (1.49) (43.7–49.8)	53.2 (1.49) (50.2–56.3)
Mexican American	8.3 (0.88) (6.7–10.3)	3.0 (0.39) (2.3–3.9)	11.3 (1.01) (9.4–13.5)	26.4 (3.05) (20.6–33.0)	5.0 (0.67) (3.8–6.5)	13.1 (1.32) (10.7–16.0)	38.0 (2.94) (32.2–44.1)	31.7 (1.73) (28.3–35.3)	34.2 (2.30) (29.7–39.0)	43.0 (2.02) (38.9–47.1)	47.3 (2.21) (42.9–51.8)	52.7 (2.21) (48.2–57.1)
Non–Hispanic Asian	8.5 (0.95) (6.7–10.6)	5.0 (0.66) (3.8–6.5)	13.5 (1.17) (11.2–16.0)	36.9 (3.98) (29.3–45.4)	7.5 (1.05) (5.7–10.0)	16.0 (1.57) (13.0–19.5)	47.1 (4.02) (39.1–55.3)	29.5 (1.80) (26.0–33.3)	33.4 (1.67) (30.1–36.9)	42.9 (2.44) (38.1–48.0)	49.4 (2.21) (44.9–53.9)	50.6 (2.21) (46.1–55.1)

Appendix 3.3 continues on the next page.

CHARACTERISTICS	Diagnosed Diabetes A1c or FPG	Undiagnosed Diabetes A1c or FPG	Total Diabetes* A1c or FPG	Percent of Total Diabetes Undiagnosed A1c or FPG	Undiagnosed Diabetes A1c, FPG, or 2-hr PG	Total Diabetes* A1c, FPG, or 2-hr PG	Percent of Total Diabetes Undiagnosed A1c, FPG, or 2-hr PG	Prediabetes A1c or FPG	Prediabetes A1c, FPG, or 2-hr PG	Total Dysglycemia* A1c or FPG	Total Dysglycemia* A1c, FPG, or 2-hr PG	Normal Glucose Levels A1c, FPG, or 2-hr PG
Sex and age (years)												
Male												
12–19	0.6 (0.27) (0.2–1.5)[2]	3	0.7 (0.31) (0.3–1.7)[2]	3	0.4 (0.18) (0.1–1.0)[2]	0.9 (0.35) (0.4–2.0)[1]	39.6 (15.19) (15.2–70.5)[1]	18.3 (2.23) (14.2–23.3)	19.9 (2.47) (15.4–25.4)	19.0 (2.26) (14.8–24.0)	20.8 (2.56) (16.1–26.5)	79.2 (2.56) (73.5–83.9)
≥20	9.7 (0.46) (8.8–10.7)	3.5 (0.39) (2.8–4.4)	13.3 (0.63) (12.0–14.6)	26.6 (2.24) (22.3–31.4)	5.4 (0.59) (4.3–6.8)	15.1 (0.79) (13.6–16.8)	35.8 (2.64) (30.6–41.3)	37.8 (1.66) (34.4–41.2)	39.5 (1.71) (36.1–43.1)	51.0 (1.62) (47.7–54.3)	54.7 (1.53) (51.5–57.8)	45.3 (1.53) (42.2–48.5)
20–44	2.3 (0.28) (1.8–3.0)	1.6 (0.32) (1.1–2.4)	4.0 (0.48) (3.1–5.1)	41.2 (4.78) (31.9–51.2)	1.8 (0.36) (1.2–2.7)	4.1 (0.53) (3.2–5.4)	43.9 (4.71) (34.7–53.6)	31.3 (1.75) (27.9–35.0)	34.1 (1.71) (30.7–37.7)	35.3 (1.77) (31.7–38.9)	38.3 (1.73) (34.8–41.9)	61.7 (1.73) (58.1–65.2)
45–64	13.6 (1.20) (11.4–16.3)	5.4 (0.75) (4.0–7.1)	19.0 (1.25) (16.6–21.7)	28.3 (3.69) (21.4–36.4)	7.6 (0.89) (6.0–9.6)	21.1 (1.30) (18.6–23.9)	35.9 (3.78) (28.7–43.9)	42.9 (2.32) (38.2–47.6)	45.4 (2.69) (40.0–50.9)	61.9 (2.24) (57.2–66.3)	66.5 (2.19) (61.9–70.8)	33.5 (2.19) (29.2–38.1)
65–74	22.0 (1.91) (18.3–26.1)	3.8 (1.13) (2.1–6.9)	25.8 (2.34) (21.3–30.8)	14.7 (3.78) (8.6–24.2)	9.5 (2.39) (5.6–15.6)	31.4 (3.08) (25.5–38.0)	30.3 (5.71) (20.1–43.0)	45.6 (4.20) (37.2–54.2)	42.5 (4.12) (34.4–51.0)	71.3 (4.27) (61.9–79.2)	73.8 (4.24) (64.3–81.5)	26.2 (4.24) (18.5–35.7)
≥65	22.9 (1.53) (19.9–26.1)	5.1 (0.86) (3.6–7.1)	27.9 (1.99) (24.1–32.2)	18.2 (2.36) (13.9–23.5)	11.1 (1.95) (7.7–15.8)	34.1 (2.67) (28.9–39.7)	32.7 (3.92) (25.3–41.1)	45.5 (2.81) (39.9–51.2)	42.5 (3.18) (36.2–49.1)	73.4 (2.69) (67.6–78.5)	76.6 (2.91) (70.2–82.0)	23.4 (2.91) (18.0–29.8)
≥75	24.3 (2.58) (19.5–30.0)	7.2 (1.30) (5.0–10.3)	31.5 (2.95) (25.8–37.8)	22.8 (3.60) (16.3–30.9)	13.8 (2.75) (9.1–20.4)	38.6 (3.50) (31.7–45.9)	35.9 (5.46) (25.7–47.6)	45.4 (3.12) (39.1–51.8)	42.6 (3.75) (35.2–50.4)	76.9 (2.82) (70.7–82.1)	81.2 (2.65) (75.2–86.0)	18.8 (2.65) (14.0–24.8)
Female												
12–19	3	3	3	3	3	0.8 (0.36) (0.3–2.0)[2]	3	8.5 (1.84) (5.5–13.1)	15.0 (2.89) (10.0–21.9)	9.2 (1.87) (6.0–13.8)	15.8 (2.88) (10.8–22.6)	84.2 (2.88) (77.4–89.2)
≥20	9.4 (0.51) (8.4–10.5)	2.3 (0.27) (1.8–2.9)	11.7 (0.53) (10.7–12.8)	19.8 (2.17) (15.7–24.5)	4.7 (0.49) (3.8–5.7)	14.0 (0.75) (12.6–15.6)	33.1 (2.62) (28.0–38.7)	31.3 (1.40) (28.6–34.3)	34.4 (1.44) (31.5–37.4)	43.1 (1.48) (40.1–46.1)	48.4 (1.61) (45.2–51.7)	51.6 (1.61) (48.3–54.8)
20–44	3.3 (0.33) (2.7–4.0)	1.2 (0.30) (0.7–2.0)	4.5 (0.41) (3.7–5.4)	26.6 (5.51) (17.0–39.2)	2.2 (0.49) (1.4–3.4)	5.5 (0.58) (4.4–6.8)	39.7 (6.03) (28.2–52.3)	16.9 (1.45) (14.1–20.1)	21.5 (1.78) (18.1–25.4)	21.4 (1.64) (18.2–24.9)	27.0 (1.99) (23.2–31.3)	73.0 (1.99) (68.7–76.8)
45–64	12.0 (0.94) (10.2–14.0)	2.7 (0.44) (1.9–3.8)	14.6 (1.13) (12.5–17.1)	18.4 (2.45) (13.9–23.9)	4.7 (0.78) (3.4–6.6)	16.4 (1.26) (14.0–19.1)	28.9 (3.81) (21.8–37.2)	39.3 (2.12) (35.1–43.7)	42.8 (2.33) (38.2–47.6)	53.9 (2.29) (49.2–58.5)	59.2 (2.61) (53.8–64.4)	40.8 (2.61) (35.6–46.2)
65–74	18.2 (2.07) (14.4–22.8)	4.3 (0.76) (3.0–6.2)	22.5 (1.92) (18.9–26.7)	19.2 (3.75) (12.7–28.0)	6.3 (1.11) (4.4–9.0)	24.8 (2.31) (20.4–29.7)	25.5 (4.49) (17.5–35.7)	51.1 (3.19) (44.7–57.6)	49.7 (3.60) (42.4–56.9)	73.7 (3.82) (65.2–80.7)	74.4 (4.46) (64.3–82.4)	25.6 (4.46) (17.6–35.7)
≥65	19.0 (1.48) (16.2–22.2)	4.2 (0.68) (3.1–5.9)	23.3 (1.52) (20.3–26.5)	18.3 (2.83) (13.2–24.7)	10.4 (1.31) (8.0–13.4)	29.7 (2.24) (25.4–34.5)	34.9 (3.17) (28.7–41.6)	50.4 (2.57) (45.2–55.6)	48.6 (3.10) (42.3–54.9)	73.7 (2.83) (67.5–79.0)	78.3 (3.60) (70.1–84.7)	21.7 (3.60) (15.3–29.9)
≥75	20.2 (2.17) (16.1–25.0)	4.1 (1.23) (2.2–7.5)	24.3 (2.39) (19.8–29.5)	17.0 (4.58) (9.6–28.4)	16.2 (2.88) (11.1–22.9)	36.8 (3.56) (29.9–44.3)	43.9 (5.15) (33.9–54.5)	49.4 (3.81) (41.7–57.1)	47.0 (4.39) (38.2–55.9)	73.7 (3.33) (66.4–79.9)	83.8 (4.50) (72.5–91.1)	16.2 (4.50) (8.9–27.5)
Race/ethnicity and age (years)												
Non-Hispanic white												
12–19	3	3	3	3	3	3	3	10.5 (2.09) (6.9–15.6)	14.4 (2.77) (9.6–21.0)	11.2 (2.25) (7.4–16.6)	15.1 (2.94) (10.0–22.1)	84.9 (2.94) (77.9–90.0)

Appendix 3.3 continues on the next page.

Prevalence and Incidence of Type 2 Diabetes and Prediabetes

APPENDIX 3.3. (continued)

	PERCENT (STANDARD ERROR) (95% CONFIDENCE INTERVAL)											
CHARACTERISTICS	Diagnosed Diabetes A1c or FPG	Undiagnosed Diabetes A1c or FPG	Total Diabetes* A1c or FPG	Percent of Total Diabetes Undiagnosed A1c or FPG	Undiagnosed Diabetes A1c, FPG, or 2-hr PG	Total Diabetes* A1c, FPG, or 2-hr PG	Percent of Total Diabetes Undiagnosed A1c, FPG, or 2-hr PG	Prediabetes A1c or FPG	Prediabetes A1c, FPG, or 2-hr PG	Total Dysglycemia* A1c or FPG	Total Dysglycemia* A1c, FPG, or 2-hr PG	Normal Glucose Levels A1c, FPG, or 2-hr PG
≥20	8.7 (0.47) (7.8–9.8)	2.2 (0.26) (1.7–2.8)	10.9 (0.54) (9.9–12.1)	20.1 (2.06) (16.2–24.6)	4.3 (0.57) (3.3–5.6)	13.0 (0.81) (11.5–14.7)	32.9 (3.03) (27.1–39.4)	34.4 (1.58) (31.3–37.7)	37.1 (1.56) (33.9–40.3)	45.4 (1.60) (42.1–48.6)	50.1 (1.53) (47.0–53.2)	49.9 (1.53) (46.8–53.0)
20–44	2.3 (0.30) (1.8–3.0)	0.7 (0.19) (0.4–1.2)	3.1 (0.32) (2.5–3.8)	24.3 (5.64) (14.7–37.5)	0.9 (0.24) (0.5–1.6)	3.2 (0.38) (2.5–4.1)	27.9 (6.23) (17.1–42.2)	21.5 (1.96) (17.8–25.8)	25.8 (2.13) (21.7–30.4)	24.6 (2.04) (20.7–29.0)	29.0 (2.25) (24.7–33.8)	71.0 (2.25) (66.2–75.3)
45–64	10.8 (1.01) (9.0–13.1)	2.8 (0.55) (1.9–4.1)	13.6 (1.03) (11.7–15.9)	20.5 (3.82) (13.8–29.3)	5.0 (0.92) (3.4–7.2)	15.6 (1.18) (13.4–18.2)	31.7 (5.04) (22.4–42.8)	40.0 (2.10) (35.8–44.3)	43.3 (2.60) (38.1–48.7)	53.6 (2.23) (49.1–58.1)	59.0 (2.59) (53.6–64.1)	41.0 (2.59) (35.9–46.4)
65–74	16.9 (1.91) (13.4–21.2)	3.2 (0.88) (1.8–5.6)	20.1 (2.02) (16.3–24.5)	15.9 (4.13) (9.1–26.2)	6.4 (1.73) (3.7–11.0)	23.5 (2.42) (18.9–28.8)	27.3 (6.33) (16.4–41.9)	49.6 (3.80) (41.9–57.2)	47.4 (3.88) (39.6–55.3)	69.6 (4.27) (60.3–77.6)	70.9 (4.11) (61.9–78.5)	29.1 (4.11) (21.5–38.1)
≥65	17.6 (1.22) (15.2–20.2)	4.0 (0.65) (2.9–5.6)	21.5 (1.51) (18.6–24.8)	18.5 (2.46) (14.0–24.1)	9.7 (1.65) (6.9–13.7)	27.6 (2.34) (23.1–32.6)	35.3 (3.74) (28.1–43.2)	49.6 (2.65) (44.3–55.0)	47.8 (2.93) (41.9–53.7)	71.2 (2.75) (65.3–76.4)	75.3 (2.98) (68.8–80.9)	24.7 (2.98) (19.1–31.2)
≥75	18.4 (2.15) (14.5–23.2)	5.1 (0.85) (3.6–7.1)	23.5 (2.17) (19.4–28.2)	21.7 (3.72) (15.0–30.2)	14.4 (2.80) (9.6–21.1)	33.4 (3.83) (26.1–41.6)	43.2 (4.90) (33.6–53.3)	49.8 (3.20) (43.3–56.2)	48.2 (2.97) (42.3–54.3)	73.3 (2.76) (67.3–78.5)	81.6 (3.20) (74.2–87.3)	18.4 (3.20) (12.7–25.8)
Non-Hispanic black												
12–19	0.5 (0.26) (0.2–1.4)[2]	[3]	0.6 (0.28) (0.3–1.5)[2]	[3]	[3]	1.0 (0.43) (0.4–2.4)[2]	[3]	18.8 (2.57) (14.1–24.6)	21.7 (3.11) (16.0–28.7)	19.4 (2.64) (14.6–25.4)	22.7 (3.12) (17.0–29.7)	77.3 (3.12) (70.3–83.0)
≥20	13.1 (0.51) (12.1–14.2)	4.1 (0.68) (2.9–5.7)	17.2 (0.99) (15.3–19.3)	23.7 (2.85) (18.4–30.0)	5.5 (0.82) (4.0–7.4)	18.5 (1.17) (16.2–21.0)	29.7 (2.82) (24.3–35.7)	36.7 (1.70) (33.3–40.2)	38.3 (1.77) (34.8–42.0)	53.9 (1.81) (50.2–57.6)	56.8 (1.89) (52.9–60.6)	43.2 (1.89) (39.4–47.1)
20–44	3.3 (0.61) (2.3–4.8)	2.3 (0.81) (1.1–4.7)[1]	5.6 (1.11) (3.7–8.3)	40.5 (8.90) (24.3–59.1)	2.8 (0.98) (1.4–5.7)[1]	6.2 (1.22) (4.1–9.2)	45.9 (9.11) (28.7–64.2)	30.8 (2.44) (26.1–36.0)	33.5 (2.48) (28.6–38.7)	36.4 (2.42) (31.6–41.5)	39.6 (2.65) (34.4–45.2)	60.4 (2.65) (54.8–65.6)
45–64	19.2 (1.44) (16.5–22.3)	5.8 (1.01) (4.0–8.2)	25.0 (2.06) (21.0–29.4)	23.1 (2.88) (17.8–29.5)	6.6 (1.15) (4.6–9.4)	25.4 (2.28) (21.0–30.3)	25.9 (2.98) (20.3–32.5)	43.8 (2.92) (38.0–49.8)	45.4 (2.87) (39.7–51.3)	68.8 (2.40) (63.7–73.5)	70.8 (2.78) (64.9–76.2)	29.2 (2.78) (23.8–35.1)
65–74	28.7 (2.91) (23.2–35.0)	7.8 (1.65) (5.1–11.9)	36.6 (3.24) (30.3–43.4)	21.4 (4.06) (14.3–30.8)	13.0 (3.24) (7.7–21.1)	41.2 (4.11) (33.2–49.7)	31.6 (6.17) (20.5–45.3)	45.8 (3.85) (38.1–53.7)	43.5 (3.91) (35.8–51.6)	82.4 (4.27) (72.0–89.5)	84.7 (4.12) (74.4–91.4)	15.3 (4.12) (8.6–25.6)
≥65	35.0 (2.41) (30.2–40.0)	6.6 (1.26) (4.4–9.6)	41.5 (2.75) (36.1–47.2)	15.8 (2.70) (11.0–22.1)	12.6 (2.78) (7.9–19.4)	46.8 (3.75) (39.3–54.5)	26.9 (4.53) (18.7–37.0)	40.7 (3.11) (34.5–47.1)	37.7 (3.43) (31.0–44.9)	82.2 (3.92) (72.8–88.9)	84.5 (3.60) (75.7–90.5)	15.5 (3.60) (9.5–24.3)
≥75	48.0 (4.46) (39.1–57.1)	3.9 (1.66) (1.6–9.1)[2]	51.9 (5.08) (41.6–62.0)	7.5 (2.90) (3.3–15.9)[1]	11.7 (3.65) (6.1–21.4)[1]	58.5 (6.36) (45.3–70.6)	20.0 (5.01) (11.7–32.1)	30.0 (4.69) (21.4–40.3)	25.6 (6.23) (15.0–40.1)	81.9 (5.18) (68.9–90.2)	84.1 (4.38) (73.1–91.1)	15.9 (4.38) (8.9–26.9)
Hispanic (all)												
12–19	[3]	[3]	0.7 (0.30) (0.3–1.7)[2]	[3]	[3]	0.7 (0.31) (0.3–1.7)[2]	[3]	16.9 (2.33) (12.7–22.2)	21.1 (2.15) (17.0–25.8)	17.6 (2.28) (13.4–22.8)	21.7 (2.13) (17.7–26.4)	78.3 (2.13) (73.6–82.3)
≥20	9.8 (0.90) (8.1–11.8)	3.9 (0.49) (3.0–5.0)	13.6 (1.09) (11.6–16.0)	28.4 (2.93) (22.9–34.8)	6.7 (0.76) (5.3–8.4)	16.4 (1.42) (13.7–19.5)	40.8 (2.63) (35.6–46.3)	34.4 (1.47) (31.5–37.5)	35.9 (1.52) (32.9–39.1)	48.0 (1.90) (44.2–51.9)	52.3 (1.87) (48.5–56.1)	47.7 (1.87) (43.9–51.5)
20–44	3.6 (0.70) (2.4–5.3)	1.7 (0.57) (0.9–3.4)[1]	5.4 (0.89) (3.8–7.5)	32.3 (8.40) (17.9–51.1)	3.8 (0.82) (2.4–5.8)	7.4 (1.16) (5.3–10.1)	50.9 (6.60) (37.7–64.0)	28.8 (2.25) (24.5–33.6)	31.0 (2.41) (26.3–36.1)	34.2 (2.37) (29.5–39.1)	38.3 (2.71) (33.0–44.0)	61.7 (2.71) (56.0–67.0)
45–64	17.2 (1.55) (14.3–20.6)	7.2 (0.96) (5.5–9.4)	24.4 (2.07) (20.5–28.9)	29.6 (2.80) (24.2–35.6)	9.7 (1.26) (7.4–12.6)	26.7 (1.99) (22.9–30.9)	36.2 (3.66) (29.1–43.9)	43.3 (2.28) (38.7–48.0)	45.7 (2.62) (40.4–51.0)	67.8 (2.29) (62.9–72.3)	72.4 (2.20) (67.7–76.6)	27.6 (2.20) (23.4–32.3)

Appendix 3.3 continues on the next page.

CHARACTERISTICS	Diagnosed Diabetes A1c or FPG	Undiagnosed Diabetes A1c or FPG	Total Diabetes* A1c or FPG	Percent of Total Diabetes Undiagnosed A1c or FPG	Undiagnosed Diabetes A1c, FPG, or 2-hr PG	Total Diabetes* A1c, FPG, or 2-hr PG	Percent of Total Diabetes Undiagnosed A1c, FPG, or 2-hr PG	Prediabetes A1c or FPG	Prediabetes A1c, FPG, or 2-hr PG	Total Dysglycemia* A1c or FPG	Total Dysglycemia* A1c, FPG, or 2-hr PG	Normal Glucose Levels A1c, FPG, or 2-hr PG
65–74	26.3 (2.98) (20.7–32.8)	7.6 (1.74) (4.8–12.0)	34.0 (3.60) (27.1–41.6)	22.5 (4.24) (15.0–32.3)	14.1 (1.99) (10.5–18.7)	40.6 (3.23) (34.2–47.3)	34.8 (4.56) (26.2–44.6)	46.5 (4.50) (37.5–55.7)	43.7 (4.22) (35.4–52.4)	80.4 (3.67) (71.9–86.9)	84.3 (3.47) (75.9–90.1)	15.7 (3.47) (9.9–24.1)
≥65	28.5 (3.20) (22.5–35.5)	8.1 (1.66) (5.3–12.2)	36.7 (3.48) (29.9–44.0)	22.2 (4.15) (14.9–31.8)	17.6 (2.25) (13.5–22.6)	46.1 (3.41) (39.3–53.1)	38.1 (4.48) (29.5–47.6)	44.9 (3.60) (37.8–52.3)	39.4 (3.62) (32.3–46.9)	81.6 (2.84) (75.1–86.7)	85.5 (2.39) (79.9–89.7)	14.5 (2.39) (10.3–20.1)
≥75	33.9 (5.80) (23.3–46.5)	9.4 (3.63) (4.1–19.8)[1]	43.3 (6.92) (30.1–57.5)	21.6 (7.12) (10.5–39.4)[1]	26.0 (6.41) (15.1–40.9)	59.5 (8.06) (42.7–74.4)	43.6 (7.77) (28.9–59.5)	41.2 (6.59) (28.7–55.0)	28.8 (6.77) (17.2–44.2)	84.5 (5.39) (70.2–92.6)	88.4 (3.61) (78.8–94.0)	11.6 (3.61) (6.0–21.2)[1]
Mexican American												
12–19	3	3	0.8 (0.39) (0.3–2.1)[2]	3	3	0.8 (0.39) (0.3–2.1)[2]	3	17.2 (3.06) (11.8–24.3)	21.6 (2.91) (16.3–28.1)	18.0 (3.03) (12.6–25.0)	22.4 (2.88) (17.1–28.8)	77.6 (2.88) (71.2–82.9)
≥20	10.4 (1.17) (8.3–13.1)	3.7 (0.50) (2.8–4.8)	14.1 (1.33) (11.6–17.0)	26.2 (3.18) (20.2–33.1)	6.2 (0.84) (4.7–8.2)	16.4 (1.71) (13.2–20.2)	38.0 (3.00) (32.1–44.3)	35.6 (1.89) (31.9–39.5)	37.5 (2.59) (32.4–42.9)	49.7 (2.32) (45.0–54.4)	53.9 (2.68) (48.4–59.3)	46.1 (2.68) (40.7–51.6)
20–44	4.0 (0.92) (2.5–6.4)	1.8 (0.64) (0.9–3.7)[1]	5.8 (1.11) (3.9–8.5)	31.0 (9.14) (15.8–51.7)	4.2 (0.97) (2.6–6.7)	8.1 (1.30) (5.8–11.1)	51.8 (8.29) (35.4–67.9)	31.9 (2.72) (26.6–37.6)	34.1 (3.18) (28.0–40.9)	37.7 (2.52) (32.7–42.9)	42.2 (3.11) (36.0–48.6)	57.8 (3.11) (51.4–64.0)
45–64	20.9 (1.99) (17.2–25.3)	7.4 (1.19) (5.3–10.2)	28.3 (2.57) (23.4–33.8)	26.0 (3.18) (20.0–33.0)	9.0 (1.45) (6.4–12.4)	29.7 (2.25) (25.3–34.5)	30.3 (4.04) (22.7–39.1)	42.9 (3.53) (35.9–50.2)	44.1 (3.55) (37.1–51.4)	71.2 (2.84) (65.1–76.6)	73.8 (2.68) (68.0–78.9)	26.2 (2.68) (21.1–32.0)
65–74	25.1 (4.20) (17.6–34.6)	7.8 (2.19) (4.4–13.6)	33.0 (4.62) (24.3–42.9)	23.7 (6.06) (13.6–38.1)	14.7 (2.70) (10.0–21.0)	40.3 (4.88) (30.9–50.5)	36.3 (6.26) (24.7–49.8)	46.7 (4.56) (37.6–56.0)	48.1 (4.99) (38.2–58.2)	79.7 (5.09) (67.4–88.1)	88.5 (4.46) (75.9–94.9)	11.5 (4.46) (5.1–24.1)[1]
≥65	28.6 (5.45) (18.8–40.8)	7.2 (1.98) (4.1–12.4)	35.8 (5.31) (25.8–47.1)	20.1 (5.97) (10.6–35.0)	14.5 (2.09) (10.7–19.2)	43.0 (5.21) (32.8–53.7)	33.7 (6.06) (22.6–46.9)	42.5 (4.48) (33.7–51.8)	44.6 (4.88) (35.0–54.6)	78.3 (3.98) (69.1–85.3)	87.5 (3.44) (78.7–93.0)	12.5 (3.44) (7.0–21.3)
≥75	38.3 (11.94) (18.1–63.5)[1]	3	43.7 (13.07) (20.8–69.6)	3	14.0 (5.92) (5.6–30.7)[2]	49.8 (12.29) (26.7–73.0)	28.0 (11.53) (10.8–55.5)[2]	30.5 (10.85) (13.4–55.5)[1]	35.3 (10.98) (17.0–59.2)[1]	74.3 (10.07) (49.7–89.4)	85.1 (6.52) (66.7–94.2)	14.9 (6.52) (5.8–33.3)[2]
Non-Hispanic Asian												
12–19	3	3	3	3	3	3	90.8 (8.40) (56.0–98.7)	13.8 (3.72) (7.8–23.2)	19.2 (3.46) (13.1–27.3)	14.0 (3.77) (7.9–23.6)	21.4 (3.88) (14.6–30.4)	78.6 (3.88) (69.6–85.4)
≥20	9.6 (1.08) (7.6–12.0)	5.6 (0.71) (4.4–7.3)	15.2 (1.27) (12.8–18.0)	37.0 (3.98) (29.3–45.4)	8.3 (1.10) (6.3–10.8)	17.9 (1.65) (14.7–21.5)	46.4 (4.01) (38.4–54.6)	31.5 (1.76) (28.1–35.2)	35.4 (1.81) (31.8–39.1)	46.8 (2.38) (41.9–51.6)	53.2 (2.24) (48.6–57.7)	46.8 (2.24) (42.3–51.4)
20–44	3.1 (0.71) (2.0–5.0)	2.6 (0.76) (1.4–4.6)	5.7 (1.08) (3.9–8.3)	44.9 (8.86) (28.2–62.8)	3.0 (0.86) (1.7–5.4)	6.1 (1.10) (4.3–8.8)	48.7 (9.49) (30.5–67.3)	22.1 (2.89) (16.8–28.5)	29.1 (2.71) (23.9–34.9)	27.8 (3.42) (21.4–35.3)	35.2 (3.03) (29.3–41.6)	64.8 (3.03) (58.4–70.7)
45–64	11.6 (1.81) (8.4–15.8)	9.4 (1.68) (6.5–13.4)	21.0 (2.43) (16.4–26.4)	44.9 (5.95) (33.3–57.1)	13.8 (2.20) (9.9–18.9)	25.1 (3.00) (19.5–31.7)	54.9 (5.32) (44.0–65.4)	42.5 (3.11) (36.3–48.9)	45.3 (3.40) (38.5–52.2)	63.4 (3.35) (56.4–70.0)	70.4 (3.21) (63.4–76.5)	29.6 (3.21) (23.5–36.6)
65–74	31.7 (4.20) (23.9–40.8)	6.1 (2.80) (2.3–14.9)[2]	37.8 (5.34) (27.7–49.1)	16.1 (6.24) (6.9–32.9)[1]	11.3 (4.01) (5.3–22.3)[1]	44.0 (6.54) (31.4–57.5)	25.6 (7.29) (13.7–42.9)	43.3 (4.87) (33.7–53.3)	38.8 (6.89) (26.0–53.4)	81.1 (4.76) (69.5–89.0)	82.9 (5.36) (69.1–91.3)	17.1 (5.36) (8.7–30.9)[1]
≥65	31.3 (3.37) (24.9–38.5)	8.8 (2.82) (4.5–16.5)[1]	40.0 (4.25) (31.8–48.9)	21.9 (5.91) (12.2–36.2)	16.2 (4.87) (8.5–28.7)[1]	48.7 (6.24) (36.3–61.2)	33.3 (7.12) (20.6–49.0)	43.1 (4.60) (34.1–52.6)	35.6 (6.83) (23.2–50.4)	83.1 (3.84) (73.8–89.6)	84.3 (4.01) (74.4–90.9)	15.7 (4.01) (9.1–25.6)
≥75	30.2 (8.53) (15.9–49.6)	15.1 (3.66) (9.0–24.1)	45.2 (7.88) (30.2–61.2)	33.3 (9.73) (17.0–54.9)	28.1 (7.23) (15.9–44.7)	60.0 (7.63) (43.9–74.1)	46.9 (11.91) (25.0–70.0)	42.7 (9.38) (25.4–61.9)	27.9 (10.32) (12.0–52.4)[1]	87.9 (5.18) (72.9–95.2)	87.9 (6.05) (69.5–95.8)	12.1 (6.05) (4.2–30.5)[2]

Appendix 3.3 continues on the next page.

APPENDIX 3.3. (continued)

CHARACTERISTICS	Diagnosed Diabetes A1c or FPG	Undiagnosed Diabetes A1c or FPG	Total Diabetes* A1c or FPG	Percent of Total Diabetes Undiagnosed A1c or FPG	Undiagnosed Diabetes A1c, FPG, or 2-hr PG	Total Diabetes* A1c, FPG, or 2-hr PG	Percent of Total Diabetes Undiagnosed A1c, FPG, or 2-hr PG	Prediabetes A1c or FPG	Prediabetes A1c, FPG, or 2-hr PG	Total Dysglycemia* A1c or FPG	Total Dysglycemia* A1c, FPG, or 2-hr PG	Normal Glucose Levels A1c, FPG, or 2-hr PG
Sex and race/ethnicity												
Male												
Non-Hispanic white	8.1 (0.54) (7.1–9.3)	2.5 (0.44) (1.8–3.6)	10.7 (0.65) (9.4–12.1)	23.8 (3.48) (17.4–31.6)	4.5 (0.77) (3.2–6.4)	12.7 (0.88) (11.0–14.6)	35.9 (4.34) (27.6–45.1)	34.3 (2.14) (30.1–38.8)	36.0 (2.27) (31.5–40.8)	45.0 (2.11) (40.7–49.3)	48.7 (2.04) (44.5–52.8)	51.3 (2.04) (47.2–55.5)
Non-Hispanic black	10.8 (0.78) (9.4–12.5)	3.4 (0.63) (2.4–5.0)	14.3 (1.04) (12.3–16.5)	24.1 (3.52) (17.6–31.9)	4.4 (0.75) (3.1–6.2)	15.1 (1.16) (12.9–17.6)	29.0 (3.72) (22.0–37.1)	36.6 (1.88) (32.9–40.5)	38.9 (2.44) (34.1–44.0)	50.9 (2.09) (46.6–55.1)	54.0 (2.48) (48.9–59.0)	46.0 (2.48) (41.0–51.1)
Hispanic (all)	7.5 (0.81) (6.1–9.4)	3.6 (0.45) (2.8–4.6)	11.1 (1.00) (9.2–13.3)	32.2 (3.29) (25.9–39.2)	4.5 (0.62) (3.4–5.9)	12.0 (1.12) (9.9–14.5)	37.3 (3.75) (30.0–45.2)	37.2 (1.93) (33.4–41.2)	38.6 (2.10) (34.4–43.0)	48.4 (1.97) (44.4–52.4)	50.6 (2.15) (46.3–55.0)	49.4 (2.15) (45.0–53.7)
Mexican American	7.9 (1.04) (6.0–10.2)	3.5 (0.55) (2.6–4.8)	11.4 (1.27) (9.0–14.2)	30.9 (3.86) (23.7–39.3)	3.9 (0.63) (2.8–5.4)	11.7 (1.42) (9.1–14.9)	33.5 (3.51) (26.7–41.0)	38.3 (2.54) (33.3–43.6)	40.1 (2.80) (34.6–45.9)	49.7 (2.46) (44.7–54.7)	51.8 (2.62) (46.5–57.1)	48.2 (2.62) (42.9–53.5)
Non-Hispanic Asian	9.5 (1.32) (7.2–12.6)	6.3 (0.91) (4.7–8.5)	15.9 (1.45) (13.1–19.1)	39.9 (5.24) (29.8–50.9)	8.0 (1.41) (5.6–11.4)	17.4 (1.84) (14.0–21.5)	45.9 (5.90) (34.3–57.9)	35.4 (2.74) (30.0–41.1)	37.9 (2.67) (32.6–43.4)	51.2 (3.08) (45.0–57.4)	55.3 (2.99) (49.2–61.3)	44.7 (2.99) (38.7–50.8)
Female												
Non-Hispanic white	7.6 (0.55) (6.6–8.8)	1.4 (0.27) (1.0–2.1)	9.0 (0.63) (7.8–10.4)	15.7 (2.70) (11.0–22.0)	3.1 (0.54) (2.2–4.4)	10.7 (0.85) (9.1–12.6)	29.2 (3.70) (22.3–37.3)	29.4 (1.78) (25.9–33.2)	33.2 (1.85) (29.6–37.1)	38.5 (1.87) (34.7–42.3)	43.9 (1.91) (40.1–47.9)	56.1 (1.91) (52.1–59.9)
Non-Hispanic black	11.3 (0.71) (9.9–12.8)	3.4 (0.73) (2.2–5.3)	14.7 (1.12) (12.6–17.1)	23.3 (3.74) (16.5–31.7)	4.9 (0.99) (3.3–7.4)	16.2 (1.33) (13.6–19.1)	30.5 (4.27) (22.5–39.8)	31.4 (2.22) (27.1–36.1)	32.9 (2.53) (27.9–38.2)	46.1 (2.40) (41.3–51.0)	49.0 (2.71) (43.5–54.5)	51.0 (2.71) (45.5–56.5)
Hispanic (all)	8.6 (0.82) (7.0–10.4)	2.8 (0.61) (1.8–4.4)	11.4 (0.96) (9.6–13.5)	24.9 (4.63) (16.7–35.4)	6.5 (0.93) (4.9–8.7)	15.0 (1.36) (12.5–18.0)	43.5 (3.93) (35.7–51.6)	25.2 (1.62) (22.0–28.6)	27.8 (1.88) (24.2–31.8)	36.6 (1.79) (33.0–40.3)	42.9 (1.85) (39.2–46.7)	57.1 (1.85) (53.3–60.8)
Mexican American	8.8 (1.04) (6.9–11.2)	2.4 (0.67) (1.4–4.2)	11.2 (1.12) (9.1–13.7)	21.5 (5.47) (12.4–34.6)	6.1 (1.07) (4.2–8.7)	14.6 (1.59) (11.7–18.2)	41.7 (4.74) (32.5–51.6)	24.7 (2.31) (20.3–29.7)	28.1 (2.89) (22.6–34.3)	35.9 (2.47) (31.0–41.0)	42.7 (2.84) (37.0–48.6)	57.3 (2.84) (51.4–63.0)
Non-Hispanic Asian	7.6 (0.93) (5.9–9.7)	3.8 (0.65) (2.7–5.4)	11.4 (1.23) (9.1–14.1)	33.4 (4.28) (25.3–42.6)	7.1 (1.43) (4.7–10.6)	14.7 (1.93) (11.2–19.1)	48.5 (5.08) (38.3–58.7)	24.4 (1.92) (20.7–28.5)	29.6 (2.19) (25.3–34.2)	35.8 (2.62) (30.7–41.3)	44.3 (2.51) (39.2–49.4)	55.7 (2.51) (50.6–60.8)

Diagnosed diabetes is based on self-report. Undiagnosed diabetes is based on A1c ≥6.5%, FPG ≥126 mg/dL, or 2-hr PG ≥200 mg/dL. Prediabetes is based on A1c 5.7%–6.4%, FPG 100–125 mg/dL, or 2-hr PG 140–199 mg/dL. Normal glucose is based on levels below prediabetes for all markers. For further details on methods, refer to descriptions in the chapter text in the section *Data Sources and Limitations*, for the National Health and Nutrition Examination Survey. Conversions for A1c and glucose values are provided in *Diabetes in America Appendix 1 Conversions*. 2-hr PG, 2-hour plasma glucose level from an oral glucose tolerance test; A1c, glycosylated hemoglobin; FPG, fasting plasma glucose.

* Total diabetes includes diagnosed and undiagnosed diabetes. Total dysglycemia includes total diabetes and prediabetes.
[1] Relative standard error >30%–40%
[2] Relative standard error >40%–50%
[3] Estimate is too unreliable to present; relative standard error >50%.

SOURCE: National Health and Nutrition Examination Surveys 2011–2014

APPENDIX 3.4. Age- or Age/Sex-Standardized Prevalence of Diagnosed and Undiagnosed Diabetes, Total Diabetes, Prediabetes, and Total Dysglycemia in Adults Age ≥20 Years, by Sex and Race/Ethnicity, U.S., 2011–2014

CHARACTERISTICS	Diagnosed Diabetes (A1c or FPG)	Undiagnosed Diabetes (A1c or FPG)	Total Diabetes* (A1c or FPG)	Percent of Total Diabetes Undiagnosed (A1c or FPG)	Undiagnosed Diabetes (A1c, FPG, or 2-hr PG)	Total Diabetes* (A1c, FPG, or 2-hr PG)	Percent of Total Diabetes Undiagnosed (A1c, FPG, or 2-hr PG)	Prediabetes (A1c or FPG)	Prediabetes (A1c, FPG, or 2-hr PG)	Total Dysglycemia* (A1c or FPG)	Total Dysglycemia* (A1c, FPG, or 2-hr PG)	Normal Glucose Levels (A1c, FPG, or 2-hr PG)
Total (Crude) (n=5,719)	9.6 (0.41) (8.8–10.4)	2.9 (0.19) (2.5–3.3)	12.5 (0.46) (11.6–13.4)	23.3 (1.34) (20.7–26.1)	5.0 (0.39) (4.3–5.9)	14.6 (0.64) (13.3–15.9)	34.5 (1.79) (30.9–38.2)	34.4 (1.18) (32.1–36.9)	36.9 (1.13) (34.6–39.2)	46.9 (1.21) (44.4–49.4)	51.4 (1.18) (49.0–53.8)	48.6 (1.18) (46.2–51.0)
Sex												
Men	10.1 (0.39) (9.4–11.0)	3.6 (0.38) (2.9–4.5)	13.8 (0.53) (12.7–14.9)	32.4 (2.69) (27.1–38.1)	5.6 (0.60) (4.5–6.9)	15.7 (0.69) (14.4–17.2)	39.0 (2.74) (33.6–44.7)	38.1 (1.67) (34.7–41.5)	39.7 (1.74) (36.2–43.3)	51.8 (1.58) (48.6–55.0)	55.5 (1.55) (52.3–58.6)	44.5 (1.55) (41.4–47.7)
Women	9.3 (0.51) (8.3–10.4)	2.3 (0.27) (1.8–2.9)	11.6 (0.54) (10.5–12.7)	22.1 (2.99) (16.6–28.8)	4.6 (0.47) (3.7–5.7)	13.8 (0.73) (12.4–15.4)	34.9 (3.31) (28.5–41.9)	31.1 (1.24) (28.6–33.7)	34.1 (1.33) (31.5–36.9)	42.7 (1.29) (40.1–45.3)	48.0 (1.47) (45.0–51.0)	52.0 (1.47) (49.0–55.0)
Race/ethnicity												
Non-Hispanic white	8.2 (0.40) (7.4–9.0)	2.1 (0.24) (1.6–2.6)	10.2 (0.45) (9.3–11.2)	21.6 (3.03) (16.1–28.4)	4.0 (0.52) (3.0–5.2)	12.1 (0.69) (10.8–13.6)	30.5 (3.51) (23.8–38.0)	33.3 (1.53) (30.2–36.4)	36.1 (1.56) (33.0–39.3)	43.5 (1.51) (40.4–46.6)	48.2 (1.53) (45.1–51.4)	51.8 (1.53) (48.6–54.9)
Non-Hispanic black	14.8 (0.63) (13.6–16.2)	4.3 (0.67) (3.1–5.9)	19.2 (1.03) (17.2–21.4)	29.8 (4.42) (21.6–39.5)	6.0 (0.82) (4.5–7.9)	20.5 (1.17) (18.2–23.0)	35.1 (4.31) (26.9–44.3)	37.5 (1.46) (34.6–40.5)	38.8 (1.67) (35.4–42.2)	56.7 (1.33) (53.9–59.3)	59.3 (1.64) (55.9–62.6)	40.7 (1.64) (37.4–44.1)
Hispanic (all)	13.1 (0.91) (11.3–15.1)	4.9 (0.60) (3.8–6.3)	18.0 (1.15) (15.7–20.4)	29.6 (4.19) (21.8–38.8)	8.4 (0.84) (6.9–10.3)	21.4 (1.42) (18.7–24.5)	42.6 (3.33) (36.0–49.5)	36.8 (1.28) (34.3–39.5)	37.6 (1.38) (34.9–40.5)	54.8 (1.54) (51.6–57.9)	59.1 (1.41) (56.2–61.9)	40.9 (1.41) (38.1–43.8)
Mexican American	14.6 (1.07) (12.6–16.9)	4.7 (0.63) (3.6–6.2)	19.4 (1.27) (16.9–22.1)	26.9 (4.52) (18.8–37.1)	7.8 (0.79) (6.3–9.6)	22.2 (1.46) (19.4–25.4)	39.0 (3.36) (32.4–46.0)	37.5 (1.42) (34.6–40.4)	39.5 (2.17) (35.2–44.0)	56.8 (1.51) (53.7–59.9)	61.7 (1.68) (58.3–65.1)	38.3 (1.68) (34.9–41.7)
Non–Hispanic Asian	11.4 (1.08) (9.4–13.8)	6.3 (0.80) (4.8–8.1)	17.6 (1.22) (15.3–20.3)	40.4 (4.43) (31.7–49.6)	9.3 (1.25) (7.1–12.2)	20.8 (1.72) (17.5–24.5)	47.9 (5.01) (37.9–58.0)	33.5 (1.63) (30.3–36.9)	36.3 (1.85) (32.6–40.2)	51.2 (2.03) (47.0–55.3)	57.1 (2.07) (52.9–61.3)	42.9 (2.07) (38.7–47.1)
Sex and race/ethnicity												
Men												
Non-Hispanic white	8.7 (0.47) (7.8–9.7)	2.8 (0.47) (1.9–3.9)	11.4 (0.56) (10.4–12.6)	28.0 (3.79) (21.0–36.3)	4.9 (0.81) (3.5–6.9)	13.6 (0.82) (12.0–15.4)	35.8 (3.78) (28.5–43.8)	36.5 (2.29) (31.9–41.2)	38.3 (2.35) (33.6–43.1)	47.9 (2.18) (43.5–52.3)	51.9 (2.12) (47.6–56.2)	48.1 (2.12) (43.8–52.4)
Non-Hispanic black	15.1 (1.12) (13.0–17.5)	4.5 (0.79) (3.1–6.4)	19.6 (1.36) (16.9–22.5)	30.5 (4.85) (21.6–41.2)	5.9 (0.92) (4.2–8.0)	20.5 (1.40) (17.8–23.5)	33.8 (4.88) (24.7–44.3)	39.9 (1.83) (36.2–43.6)	41.7 (2.58) (36.5–47.0)	59.4 (1.96) (55.4–63.4)	62.2 (2.68) (56.6–67.5)	37.8 (2.68) (32.5–43.4)
Hispanic (all)	13.3 (1.19) (11.0–15.9)	5.7 (0.80) (4.3–7.6)	19.0 (1.41) (16.2–22.0)	34.0 (4.85) (24.9–44.4)	7.5 (1.04) (5.6–9.9)	20.6 (1.60) (17.5–24.0)	39.3 (5.74) (28.4–51.4)	41.8 (2.10) (37.6–46.2)	42.2 (2.38) (37.4–47.1)	60.8 (2.22) (56.2–65.2)	62.8 (2.42) (57.7–67.5)	37.2 (2.42) (32.5–42.3)
Mexican American	14.3 (1.32) (11.9–17.2)	5.8 (0.93) (4.2–8.0)	20.2 (1.61) (17.1–23.6)	31.1 (5.06) (21.8–42.2)	7.1 (1.19) (5.0–9.9)	21.2 (1.92) (17.5–25.4)	33.5 (4.73) (24.6–43.7)	43.1 (2.55) (38.0–48.4)	44.3 (3.10) (38.1–50.6)	63.3 (2.40) (58.3–68.0)	65.5 (2.50) (60.2–70.4)	34.5 (2.50) (29.6–39.8)
Non-Hispanic Asian	13.2 (1.65) (10.2–17.0)	8.1 (1.13) (6.1–10.7)	21.3 (1.67) (18.1–24.9)	43.3 (5.08) (33.3–53.7)	9.8 (1.73) (6.8–13.9)	23.0 (2.13) (18.9–27.6)	48.2 (6.01) (36.3–60.3)	38.1 (2.50) (33.2–43.3)	40.7 (2.52) (35.7–45.9)	59.4 (2.59) (54.1–64.6)	63.6 (2.65) (58.1–68.8)	36.4 (2.65) (31.2–41.9)
Women												
Non-Hispanic white	7.7 (0.58) (6.6–9.0)	1.4 (0.28) (1.0–2.1)	9.2 (0.63) (8.0–10.5)	15.5 (4.06) (8.9–25.6)	3.1 (0.54) (2.2–4.4)	10.8 (0.87) (9.2–12.7)	25.3 (4.96) (16.6–36.6)	30.0 (1.63) (26.8–33.5)	33.8 (1.80) (30.3–37.6)	39.2 (1.67) (35.9–42.7)	44.7 (1.87) (40.9–48.5)	55.3 (1.87) (51.5–59.1)
Non-Hispanic black	14.6 (0.78) (13.1–16.3)	4.2 (0.84) (2.8–6.3)	18.8 (1.14) (16.6–21.2)	29.0 (5.98) (18.5–42.5)	6.1 (1.17) (4.1–8.9)	20.5 (1.30) (18.0–23.3)	36.3 (6.52) (24.3–50.3)	35.2 (2.08) (31.1–39.6)	36.0 (2.31) (31.4–40.8)	54.0 (1.78) (50.4–57.6)	56.5 (2.05) (52.3–60.7)	43.5 (2.05) (39.3–47.7)

Appendix 3.4 continues on the next page.

APPENDIX 3.4. (continued)

	PERCENT (STANDARD ERROR) (95% CONFIDENCE INTERVAL)											
CHARACTERISTICS	Diagnosed Diabetes A1c or FPG	Undiagnosed Diabetes A1c or FPG	Total Diabetes* A1c or FPG	Percent of Total Diabetes Undiagnosed A1c or FPG	Undiagnosed Diabetes A1c, FPG, or 2-hr PG	Total Diabetes* A1c, FPG, or 2-hr PG	Percent of Total Diabetes Undiagnosed A1c, FPG, or 2-hr PG	Prediabetes A1c or FPG	Prediabetes A1c, FPG, or 2-hr PG	Total Dysglycemia* A1c or FPG	Total Dysglycemia* A1c, FPG, or 2-hr PG	Normal Glucose Levels A1c, FPG, or 2-hr PG
Hispanic (all)	13.0 (1.08) (11.0–15.4)	4.2 (0.82) (2.8–6.2)	17.2 (1.39) (14.6–20.2)	25.5 (5.88) (15.4–39.1)	9.3 (1.22) (7.1–12.1)	22.3 (1.77) (18.9–26.1)	45.8 (4.30) (37.2–54.6)	31.9 (1.74) (28.5–35.5)	33.2 (2.11) (29.1–37.6)	49.1 (1.79) (45.5–52.7)	55.5 (1.75) (51.9–59.0)	44.5 (1.75) (41.0–48.1)
Mexican American	14.9 (1.40) (12.3–18.0)	3.8 (0.98) (2.2–6.4)	18.7 (1.65) (15.6–22.3)	23.1 (6.85) (12.0–39.7)	8.6 (1.21) (6.4–11.4)	23.3 (1.91) (19.7–27.5)	44.5 (4.83) (35.0–54.5)	32.0 (2.22) (27.7–36.7)	34.7 (3.28) (28.4–41.7)	50.7 (1.79) (47.1–54.4)	58.1 (2.45) (53.0–62.9)	41.9 (2.45) (37.1–47.0)
Non-Hispanic Asian	9.8 (1.10) (7.8–12.2)	4.6 (0.75) (3.3–6.4)	14.4 (1.35) (11.8–17.3)	37.7 (6.22) (26.1–50.9)	8.9 (1.68) (6.0–13.0)	18.9 (2.24) (14.8–23.9)	47.5 (7.30) (33.2–62.1)	28.9 (1.97) (25.1–33.1)	32.0 (2.75) (26.7–37.9)	43.3 (2.35) (38.6–48.1)	51.0 (2.56) (45.8–56.1)	49.0 (2.56) (43.9–54.2)

Diagnosed diabetes is based on self-report. Undiagnosed diabetes is based on A1c ≥6.5%, FPG ≥126 mg/dL, or 2-hr PG ≥200 mg/dL. Prediabetes is based on A1c 5.7%–6.4%, FPG 100–125 mg/dL, or 2-hr PG 140–199 mg/dL. Normal glucose is based on levels below prediabetes for all markers. Estimates for men and women, and men and women further stratified by race/ethnicity, are standardized to the NHANES 2011–2014 total population by age using age groups 20–44, 45–64, and ≥65 years. Estimates for race/ethnicity groups are standardized to the NHANES 2011–2014 total population by sex and age using age groups 20–44, 45–64, and ≥65 years. For further details on methods, refer to descriptions in the chapter text in the section *Data Sources and Limitations,* for the National Health and Nutrition Examination Survey. Conversions for A1c and glucose values are provided in *Diabetes in America Appendix 1 Conversions.* 2-hr PG, 2-hr plasma glucose level from an oral glucose tolerance test; A1c, glycosylated hemoglobin; FPG, fasting plasma glucose.

* Total diabetes includes diagnosed and undiagnosed diabetes. Total dysglycemia includes total diabetes and prediabetes.

SOURCE: National Health and Nutrition Examination Surveys 2011–2014

APPENDIX 3.5. Comparison of Prevalence of Diagnosed Diabetes in Adults Age ≥20 Years in the NHIS and NHANES, by Age, Sex, and Race/Ethnicity, U.S., 2011–2014

	PERCENT (STANDARD ERROR) (95% CONFIDENCE INTERVAL)	
CHARACTERISTICS	NHIS (N=135,668)	NHANES (N=5,719)
Total	9.4 (0.11) (9.2–9.7)	9.6 (0.41) (8.8–10.4)
Age (years)		
20–44	2.6 (0.09) (2.5–2.8)	2.8 (0.22) (2.4–3.3)
45–64	12.2 (0.21) (11.8–12.7)	12.8 (0.83) (11.1–14.5)
≥65	20.6 (0.30) (20.0–21.1)	20.7 (1.06) (18.7–23.0)
Sex		
Men	9.8 (0.15) (9.5–10.0)	9.7 (0.46) (8.8–10.7)
Women	9.1 (0.15) (8.9–9.4)	9.4 (0.51) (8.4–10.5)
Race/ethnicity		
Non-Hispanic white	8.8 (0.13) (8.6–9.1)	8.7 (0.47) (7.8–9.8)
Non-Hispanic black	12.7 (0.30) (12.1–13.3)	13.1 (0.51) (12.1–14.2)
Hispanic (all)	9.8 (0.27) (9.3–10.4)	9.8 (0.90) (8.1–11.8)
Mexican American	10.3 (0.36) (9.6–11.0)	10.4 (1.17) (8.3–13.1)
Non-Hispanic Asian	7.8 (0.36) (7.1–8.5)	9.6 (1.08) (7.6–12.0)

For further details on methods, refer to descriptions in the chapter text in the section *Data Sources and Limitations,* for the National Health Interview Survey and the National Health and Nutrition Examination Survey.

SOURCE: National Health Interview Surveys 2011–2014 and National Health and Nutrition Examination Surveys 2011–2014