National Diabetes Education Program:

National Diabetes Survey 2016

National Institute of
Diabetes and Digestive
and Kidney Diseases

National Diabetes Education Program:
National Diabetes Survey (NNDS): 2016

Final Report

Table of Contents

Figures

Boxes

Acronyms

A1C	Glycosylated hemoglobin or hemoglobin A1C
BP	Blood pressure
CATI	Computer-assisted telephone interview
CDC	Centers for Disease Control and Prevention
CVD	Cardiovascular disease
FPL	Federal poverty level
GfK	Gesellschaft für Konsumforschung (Society for Consumer Research)
HCP	Health care provider
HHS	U.S. Department of Health and Human Services
KP	KnowledgePanel®
NDEP	National Diabetes Education Program
NIDDK	National Institute of Diabetes and Digestive and Kidney Diseases
NIH	National Institutes of Health
NNDS	NDEP National Diabetes Survey
OMB	Office of Management and Budget
PA	Physical activity
PAR	People at risk
PWD	People with diabetes
PWP	People with prediabetes
RDD	Random digit dialing
U.S.	United States

Foreword

The National Diabetes Education Program (NDEP) was retired in 2019 after more than 20 years of collaborative partnership between the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) and the Centers for Disease Control and Prevention (CDC), plus a network of more than 200 individuals and organizations. NDEP was successful in coalescing the diabetes community at the national level and raising awareness about diabetes prevention and management. Going forward, NIDDK will continue to advance science-based information and resources on diabetes.

The National Diabetes Education Program

EXECUTIVE SUMMARY

Founded in 1997, the National Diabetes Education Program (NDEP) is a federally sponsored initiative that involves public and private partners in efforts to improve diabetes management and outcomes, promote early diagnosis, and prevent or delay the onset of diabetes in the United States and its territories. The overall goal of the NDEP is to reduce the burden of diabetes and prediabetes by facilitating the adoption of proven approaches to prevent or delay the onset of diabetes and its complications. The NDEP National Diabetes Survey (NNDS) was implemented to address the lack of national data on diabetes-related knowledge, attitudes, and behaviors among U.S. adults, as well as on the management and control of diabetes by people with the disease. The survey has been conducted every 2 to 3 years since 2006 and has provided the NDEP with data that have guided program strategies and helped to assess the program's reach and effectiveness.

This report presents the findings from the 2016 NNDS and includes trend analyses, where comparable data are available, from the 2011 and 2014 surveys. The 2014 and 2016 survey questionnaires differed from previous versions of the survey in that they included questions that captured progress toward behavior change.[1] Questionnaire items developed in 2006 remained largely unchanged through 2011. In 2014, the NNDS was updated based on recent literature and program stakeholder input to reflect current diabetes understanding and interests, especially as these related to behavior change. For questions that were first included in the 2014 NNDS, trends analyses are provided for 2014 and 2016 NNDS data.

NNDS data collection methods also changed in 2014. From 2006 through 2011, the NNDS was administered as a random digit dialing (RDD) telephone survey that was probability-based and nationwide. The 2014 NNDS moved to a national probability-based online (web) panel survey to achieve more comprehensive coverage of minorities, younger adults, and cell phone-only household members. From 2008 to the present, the NNDS focused on adults ages 35 years and older. The 2006 survey included adults ages 45 years and older and is not discussed in this report.[2]

The 2016 target sample size was met (n=2,517), as were the targets for the oversampled groups of Hispanics (n=840) and non-Hispanic Blacks (n=839). Because the 2016 NNDS sample was derived from an online panel and administered as a web survey, we discuss response in terms of a survey completion rate rather than a response rate. The calculated survey completion rate represents the number of people who completed the survey divided by the number of eligible people invited to complete the survey. The survey completion rate for the 2016 NNDS total sample was 46 percent.[3] The sample for the 2016 NNDS

[1] The behavioral change information included such items as people's intention to change, steps they may take in preparation, changes they make, and the length of time they have sustained these changes with regard to diabetes.
[2] Published information on the 2006 NNDS can be found in Gallivan et al., 2009; Griffey et al., 2015; and Piccinino et al., 2015. Gallivan, J., Brown, C., Greenberg, R., & Clark, C. M. (2009). Predictors of Perceived Risk of the Development of Diabetes. *Diabetes Spectrum*, *22*(3), 163–169. https://doi.org/10.2337/diaspect.22.3.163; Griffey, S., Piccinino, L., Gallivan, J., Lotenberg, L. D., & Tuncer, D. (2015). Applying national survey results for strategic planning and program improvement: The National Diabetes Education Program. *Evaluation and Program Planning*, *48*, 83–89. https://doi.org/10.1016/j.evalprogplan.2014.10.002; Piccinino, L., Griffey, S., Gallivan, J., Lotenberg, L. D., & Tuncer, D. (2015). Recent Trends in Diabetes Knowledge, Perceptions, and Behaviors. *Health Education & Behavior*, *42*(5), 687–696. https://doi.org/10.1177/1090198115577373.
[3] Prior to 2014, the NNDS were conducted as RDD surveys; therefore, survey response rates were calculated. The RDD response rates reflected the number of people who were interviewed in the telephone survey divided by the number of eligible people interviewed plus the number of eligible people not interviewed plus all other cases of

was weighted to allow comparability of the survey sample profiles across the three time periods: 2011, 2014, and 2016.

The diabetes status categories used in this report have been in place since the surveys were first implemented in 2006 and were assigned in the analysis phase of the study based on information collected in the survey.

Diabetes Status

- **People with diabetes (PWD)** had been told by a doctor or other health care professional that they had diabetes or sugar diabetes.
- **People with prediabetes (PWP)** had been told by a doctor or other health care professional that they had prediabetes, impaired fasting glucose, impaired glucose tolerance, borderline diabetes, or high blood sugar.
- **People at risk (PAR)** whose self-reported height and weight gave them a body mass index of 25 or greater had been told by a doctor or other health care professional they were at high risk for diabetes, or had been told by a health care professional that they had gestational diabetes or high blood sugar during pregnancy.
- **All Others** met none of the above criteria.

Methodology

In 2014 and 2016, GfK, a private research organization specializing in probability-based sampling, conducted a national probability-based online survey of potential respondents ages 35 and older from diverse geographical regions and with differing demographic characteristics. The content and approach to conducting the 2016 NNDS therefore was similar to that of the 2014 NNDS. For this reason, the NNDS results for these two survey years are more comparable than for earlier survey years. Although the survey methodology and questions were somewhat different for the 2011 NNDS, select data from the surveys conducted in 2011 and 2014 were included in some analyses for this report to provide information on trends over time. Some important results of the 2016 NNDS and trend analyses are highlighted below.

Major Findings—Highlights

- The proportion of people with diabetes (PWD) in the full sample of survey respondents increased significantly[4] from 2011 to 2016. The proportion of PWP also increased significantly from 2011 to 2016 for respondents ages 45-64.
- Doctors and family members appeared to play a major role in providing advice/counseling on diabetes prevention and management.
- Race/ethnicity was significantly related to a diagnosis of diabetes, with rates of diabetes significantly higher among both non-Hispanic Blacks and Hispanics when compared to non-Hispanic Whites.
- Awareness of the link between diabetes and cardiovascular disease (CVD) remained low. Only three-quarters of respondents were aware of the link between diabetes and CVD, and only slightly more were aware of the diabetes-kidney disease link.
- The use of social media as a source of information on diabetes remained low for all at-risk groups (PAR/PWP). Among PWDs, social media was not used widely for diabetes management. Paper tools remained most popular.

unknown eligibility. The survey response rate for 2011 was 30 percent. The survey completion rate for 2014 was 47 percent.

[4] Throughout this report, significance is defined as $p \leq 0.05$.

- Nearly half of those at risk for type 2 diabetes did not feel at risk for diabetes. This proportion also increased slightly from 2014 to 2016 (from 47% to 48%).
- The proportion of survey respondents who reported a family history of diabetes increased significantly from 2011 to 2016 among all age groups, major racial/ethnic groups, and diabetes status groups[5].
- Diabetes prevention awareness remained high. Almost 80 percent of 2016 NNDS respondents reported that they were aware that type 2 diabetes could be prevented. Nevertheless, when comparisons were made on demographic characteristics, non-Hispanic Black and Hispanic respondents and respondents living at or below 100 percent of the federal poverty level were significantly less likely to report that they were aware that diabetes could be prevented.
- The proportion of people with prediabetes (PWP) who felt that they personally were at risk for diabetes increased significantly from 2011 to 2016, but approximately one-fifth of PWP still believed that they were not at risk.
- More than half of those at risk were taking some action to prevent diabetes.
- The proportion of people who did not have diabetes (non-PWD) who reported receiving diabetes prevention advice or counseling from diabetes educators increased significantly from 13 percent (n=70) in 2014 to 21 percent (n=83) in 2016. Conversely, the proportion of non-PWD who reported receiving diabetes prevention advice or counseling from doctors decreased substantially, from 89 percent (n=352) in 2014 to 82 percent (n=348) in 2016. This decrease approached but did not reach statistical significance.
- Knowing their prediabetes diagnosis seemed to influence behaviors among those at risk. Specifically, PWPs were significantly more likely than PARs to report taking action in the past 12 months to reduce their chance of getting diabetes.
- Approximately 89 percent of PWD respondents reported that they had heard of the A1C or the glycosylated hemoglobin test, a significant increase over the 2014 proportion of PWD reporting that they had heard of this test.
- Regular care by a diabetes educator was low (9 percent) among those who sought care in addition to that from their usual health care provider (HCP).

Potential Program Implications

A synthesis of key results generated the following list of potential implications for the NDEP:

- Continue to educate about the link between CVD and diabetes.
- Disseminate messages to health care providers about diabetes education and improving outcomes.
- Increase support for family interventions.
- Use NNDS information to focus and refine messages and materials, as needed.
- Promote confidence building and support for diabetes management.
- Focus on health insurance/health care coverage education.
- Focus on glycemic self-monitoring and self-management.
- Focus on increasing screening for prediabetes/diabetes.

[5] Tests of significance (standard errors and confidence intervals) were computed for cross tabulations within the 2016 survey year to determine significance at the $p<.05$ level. Pearson Chi-square tests were run with cross tabulations to test for significant differences in trends across pairs of survey years using SPSS Complex Samples module, a computer software package for analyzing data obtained from complex survey designs.

Please keep in mind:

- Question responses reflect people's perceptions at the time each survey was conducted—there are no right or wrong answers.
- Except for those who reported they were diagnosed by a health professional as having diabetes or prediabetes, people did not necessarily know their diabetes status at the time of the survey. Respondents were categorized in analysis as having prediabetes or being at risk of diabetes based on their responses to a series of questions.
- All percentages are weighted unless otherwise noted.
- All instances in which prevention of diabetes is mentioned throughout this report refer specifically to the prevention of type 2 diabetes.

1. NDEP Background

This report presents information on trends in diabetes-related knowledge, attitudes, and behaviors at three points in time—2011, 2014, and 2016—and is based on the results from the National Diabetes Education Program's (NDEP) National Diabetes Survey (NNDS) of the adult general public. Earlier rounds of the NNDS were conducted in 2006 and 2008. The 2006 NNDS was limited to adults ages 45 years and older; these results were discussed in a prior report. The 2016 NDEP NNDS Report presented NNDS trend results for 2011, 2014, and 2016. Over the years, the NDEP has used the survey results to assess the program's progress, guide its strategic directions, and inform future program initiatives.

National Diabetes Education Program History

Founded in 1997, the U.S. Department of Health and Human Services' NDEP is a federally sponsored initiative that involves public and private partners in efforts to improve diabetes management and outcomes, promote early diagnosis, and prevent[6] or delay the onset of diabetes in the United States and its territories. The National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) of the National Institutes of Health (NIH) and the Division of Diabetes Translation of the Centers for Disease Control and Prevention (CDC) jointly sponsor the NDEP, together with the support of more than 200 partner organizations.

The overall goal of the NDEP is to reduce the burden of diabetes and prediabetes by facilitating the adoption of proven approaches to prevent or delay the onset of diabetes and its complications, with the following program objectives:

- Increase awareness and knowledge of the seriousness of diabetes, its risk factors, and effective strategies for preventing diabetes or the complications associated with diabetes.
- Increase the number of people who live well with diabetes and effectively manage their disease to prevent or delay complications and improve quality of life.
- Decrease the number of people in the United States with undiagnosed diabetes.
- Among people at risk for diabetes, increase the number who make and sustain lifestyle changes that prevent diabetes.
- Facilitate efforts to improve diabetes-related health care and education, as well as systems for delivering care.
- Reduce health disparities in populations disproportionately burdened by diabetes.
- Facilitate the incorporation of evidenced-based research findings into health care practice.

Use of the NNDS to Guide and Inform NDEP Program Focus

The NDEP launched the first NNDS in 2006 because of the paucity of national data on diabetes-related knowledge, attitudes, and behaviors among U.S. adults, as well as on the management and control of diabetes by people with the disease. The survey has been conducted periodically (roughly every 2 to 3 years) to provide the NDEP with information about program reach and effectiveness as well as specific information needed to focus program strategies.

Although asking the same questions at 2- to 3-year intervals provided valuable trend data, after the completion of the 2011 survey the NDEP concluded that the NNDS needed to include new questions to elicit better information on intent to act and actions taken with respect to diabetes management and prevention. Questions were added to the NNDS beginning in 2014 that were designed to capture

[6] All instances where prevention of diabetes is mentioned refer specifically to the prevention of type 2 diabetes.

respondents' progress toward behavior change (e.g., people's intention to change, steps they may take in preparation, changes they make, and the length of time they have sustained these changes).

2. METHODOLOGY

The 2014 NNDS and 2016 NNDS differed from the 2006, 2008, and 2011 surveys in how the sample was obtained and the survey administered. The NNDS originally was conducted using a random digit dialing (RDD) telephone survey that was probability-based and nationwide. With the RDD, telephone numbers in exchanges with a high proportion of Hispanic and non-Hispanic Black households were oversampled to obtain a sufficient number of respondents in these subgroups to allow their proper representation in the analysis. Because of the continued decline in response to RDD landline phone surveys, in 2014 the NNDS became a national probability-based online (web) survey. This approach meant more comprehensive coverage of racial/ethnic minorities, younger adults, and cell phone-only household members—people who increasingly are poorly represented or absent in RDD landline samples but are important to the NDEP.

Sampling

For the 2016 survey, the sample was drawn from the GfK KnowledgePanel® (KP), a probability-based online panel of the U.S. population that is considered representative of U.S. demographic benchmarks such as age and ethnicity distributions. The online panel utilizes address-based sampling (ABS).[7] ABS has been gaining acceptance as the industry "gold standard," largely due to its high coverage of U.S. households through inclusion of cell phone-only households, Spanish-speaking households, low-income households, and households that did not previously have internet access.[8,9,10]

GfK, a private research organization specializing in probability-based sampling, recruits and maintains the KP research panel. The KP from which the 2016 survey sample was drawn included approximately 42,000 U.S. households at the time, corresponding to approximately 55,000 adult members ages 18 and older.[11] As part of their initial panel-recruitment process, GfK collected demographic data in advance, as well as other data elements for sample-selection purposes and project-specific data analysis. This advance collection of information helped free up survey time and question space for the 2016 survey.

The 2016 target sample size was 2,500 completed interviews, with a target oversample of an estimated 830 Hispanics and 830 non-Hispanic Blacks. For households with adults ages 35 and older in the 2016 NNDS sample, the target sample size was met (2,517), as were the targets for the oversampled groups of Hispanics (840) and non-Hispanic Blacks (839).

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[7] Link MW. Address-based sampling. In Lavrakas PJ, ed. *Encyclopedia of Survey Research Methods.* Thousand Oaks, CA: Sage Publications, Inc. 2008:8–9. doi: http://dx.doi.org/10.4135/9781412963947.n6

[8] Iannacchione VG. The changing role of address-based sampling in survey research. *Public Opinion Quarterly*. 2011:75(3):556–575.

[9] DiSogra C. Update: Address-based sampling nets success for KnowledgePanel® recruitment and sample representation. *Accuracy's Impact on Research.* 2010. http://www.knowledgenetworks.com/accuracy/spring2010/pdf/disogra-spring10.pdf. Accessed August 8, 2017.

[10] Link M, et al. Building a new foundation: transitioning to address-based sampling after nearly 30 years of RDD. Paper presented to the 64th Annual Meeting of the American Association for Public Opinion Research; 2009; Hollywood, FL.

[11] GfK, personal communication, June 19, 2017.

Data Collection

The field of survey research has been shifting toward using web-based surveys. In addition to the advantages noted above, and helping to ensure better response rates, the online (web) survey has other benefits including:

- Limiting the burden on respondents because they only see the questions that are relevant to them based on their responses to prior questions.
- Allowing respondents to complete the survey at a time convenient for them.
- Providing respondents with more privacy in answering questions.

The 2016 NNDS was administered as an online survey during August 17–25, 2016. The survey was fielded via the internet to KP members whose email addresses were sampled. Individuals received an email notification that the survey was available for completion, with the link to the survey embedded in the email. Spanish language-only speakers were provided access to the survey in Spanish; and internet access and hardware were provided to panel members with no access to the survey otherwise. The surveys averaged 20 minutes and were self-administered and accessible at any time of day for the designated period. Two reminder emails were sent to people who were invited to participate but had not yet responded to the survey.

Figure 1. Survey Sample Size and Duration of Survey, by Round

Survey Round (Year and Period)	Survey Population	Sample Size
2006: March through June	Adults 45 years of age and older	1,763
2008: August through November	Adults 35 years of age and older	2,078
2011: July through September	Adults 35 years of age and older	2,234
2014: December	Adults 35 years of age and older	2,535
2016: August	Adults 35 years of age and older	2,517

Screening and Consent

Once participants entered the online survey, they were asked to verify their age. Eligible participants were adults ages 35 years and older in the United States. Participants were then asked to give informed consent for participation in the online survey by selecting the appropriate link for consent on the web survey screen.

Survey Response and Weighting

The survey completion rate[12] for the 2016 NNDS total sample was 46 percent[13] (45 percent for non-Hispanic Blacks, 40 percent for Hispanics, and 55 percent for "All Others").

The sample of respondents for the 2016 survey was weighted as in previous rounds of the survey to allow comparability of the survey sample profiles across the three time periods: 2011, 2014, and 2016. In this way, each survey year's sample is representative of the nation as a whole. Sample weights were applied to

[12] The survey completion rate is the number of people who completed the survey divided by the number of eligible participants invited to complete the survey.
[13] Overall response rates for 2011, 2014, and 2016 were 30, 47, and 46 percent respectively. Response rates for 2011 were calculated using the definitions from the American Association for Public Opinion Research (AAPOR). Each phone number in the sample was assigned a single disposition code according to AAPOR's standard definitions http://www.aapor.org/Standards-Ethics/Standard-Definitions-(1).aspx.

the survey data. using the methods described in Appendix A. All percentages reported in this document are weighted unless otherwise specified.[14]

3. 2016 NNDS

The 2014 and 2016 NNDS questionnaires differed from the previous surveys in both design and mode of implementation. Many of the questions were redesigned, with input from NDEP staff members and partners, to increase the survey's focus on perceived risk of diabetes, diabetes prevention, and diabetes management behaviors. The 2014 and 2016 NNDS sections included:

- General Health, Diabetes Diagnosis, and Family History of Diabetes
- Perceived Risk (among people not diagnosed with diabetes [non-PWD[15]])
- Behaviors to Prevent/Delay Diabetes (non-PWD)
- Diabetes Self-Management/Self-Efficacy (PWD Only)
- Personal Health Care.

2016 NNDS Sample Profile

As with the NNDS conducted since 2008, the 2016 NNDS included adults ages 35 and older in the United States. In 2016, almost one-quarter (23%) of respondents were in the younger group sampled (ages 35-44), nearly one-half (49%) were in the middle-age range (ages 45-64), and more than one-quarter (27 percent) were older adults ages 65 and older.

Based on self-reports of race and ethnicity, the proportion of respondents by race/ethnicity also changed little over the time periods. In 2016, approximately 13 percent of respondents reported themselves as Hispanic, 11 percent as non-Hispanic Black, and 69 percent as non-Hispanic White. All other races and ethnicities comprised the remaining 7 percent of the sample ages 35 years and older. Most of the sample (94 percent) completed the English version of the online survey, with the remainder submitting the Spanish version.

The distribution by gender in 2016 was similar to previous surveys, at about half female (52 percent) and half male (48 percent). (Please see Appendix B for a sample breakdown by gender and other socio-demographic variables for 2011, 2014, and 2016.)

[14] Tests of significance (standard errors and confidence intervals) were computed for cross-tabulations within the 2016 survey year to determine significance at the $p<.05$ level. Pearson Chi-square tests were run with cross-tabulations to test for significant differences in trends across pairs of survey years using SPSS Complex Samples module, a computer software package for analyzing data obtained from complex survey designs.
[15] Non-PWD refers to people not diagnosed with diabetes. In this report, non-PWD includes PWP, PAR, and All Others.

4. General Health, Diabetes Diagnosis, and Family History of Diabetes

The NNDS was designed to gather information on diabetes and diabetes-related topics from the general U.S. population of adults ages 35 years and older. The survey began with questions about the health of this population and its risk factors for diabetes. Data were collected to discover whether a person was told by a health professional that they had diabetes and, if so, whether it was type 1 or type 2. Respondents were routed through the survey depending on their answers to these key questions. Questions asked in the General Health, Diabetes Diagnosis, and Family History of Diabetes sections of the survey were used in the analysis phase of the study to classify the diabetes status of survey respondents *post hoc* based on the information they reported. The four classifications historically used are people with diabetes (PWD), people with prediabetes (PWP), people at risk (PAR), and All Others (see below).

Figure 2. Definitions for *Post hoc* Classification of Diabetes Status

Diabetes Status	Abbreviation	Definition
People with diabetes	PWD	People who had been told by a doctor or other health care professional that they had diabetes or sugar diabetes.
People with prediabetes	PWP	People who had been told by a doctor or other health care professional that they had prediabetes, impaired fasting glucose, impaired glucose tolerance, borderline diabetes, or high blood sugar.
People at risk	PAR	People whose self-reported height and weight gave them a body mass index of 25 or greater who had been told by a doctor or other health care professional that they were at high risk for diabetes, or had been told by a health care professional that they had gestational diabetes or high blood sugar during pregnancy.
All Others	All Others	People who met none of the above criteria.

Diabetes Status

In the 2016 NNDS, about 15 percent (n=487)[16] of respondents reportedly were told by a doctor or other health care professional that they had diabetes. This proportion was the same for the 2014 NNDS and represented a few percentage points less than in the 2011 NNDS (17 percent).

Age

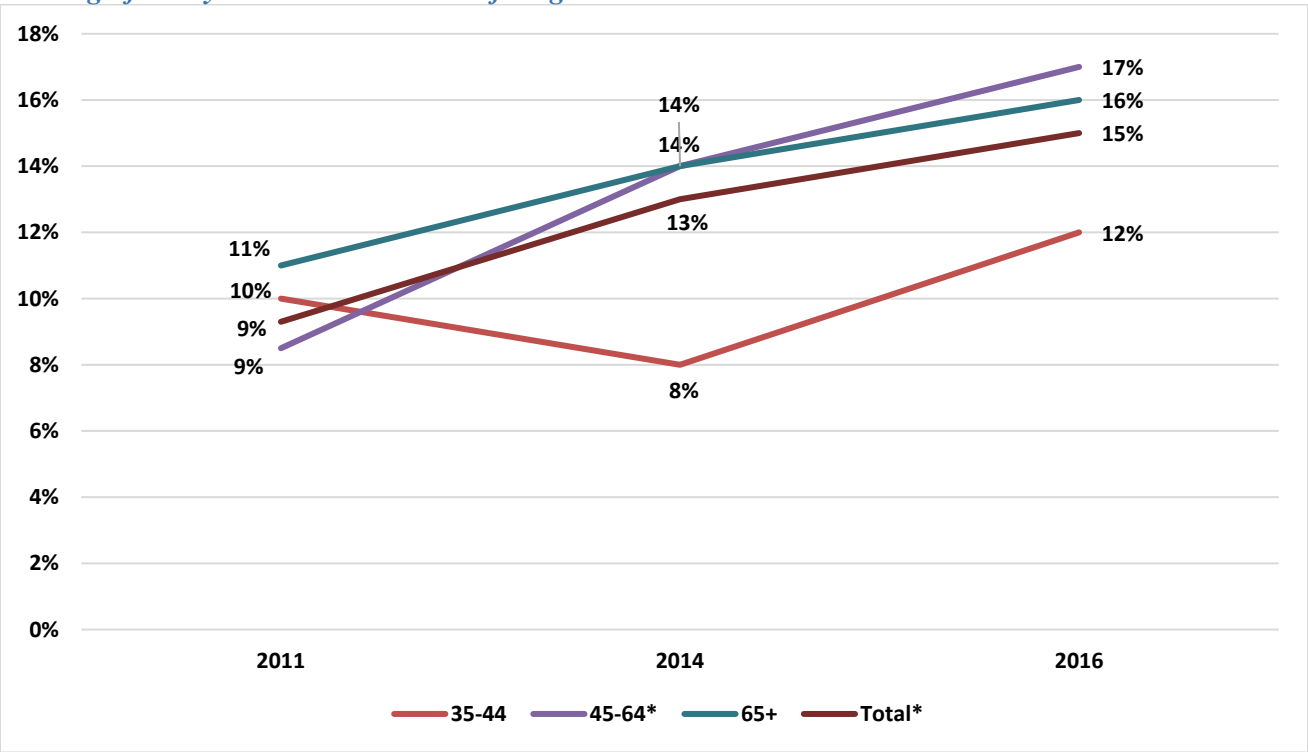
With the growing interest in diabetes prevalence among younger adults, we paid particular attention to the reported trends in diabetes status for 35–44 year-olds over time. Among PWD, there were no significant changes in any of the age groups. For 2016, the proportion of PWD was lowest at 7 percent (n=45), in the 35–44 year age group, at 15 percent (n=248) for the middle age group (45-64 years); and highest at 23 percent (n=194), in the oldest age group (65 years and older).

The figure below shows trends over the three survey periods in the proportion of people classified with diabetes status "PWP." A significant 6 percentage point increase was found among the proportion of PWP overall from 2011 to 2016. In addition, the proportion of PWP increased significantly since 2011 in the 45-64 years age group. There were no significant changes in the 35-44 years and the 65 years and older age groups.

[16] The "n" refers to the unweighted count that is represented by the weighted percentage for that characteristic. All percentages are based on weighted numbers except where otherwise noted.

Figure 3. People with Prediabetes (PWP) by Age Group

PWP significantly increased overall and for ages 45 to 64



*2016 significantly different from 2011, p<0.05

Race/Ethnicity

The highest proportion of PWD was among non-Hispanic Blacks, at 25 percent (n=206), based on information reported in 2016; this percentage was followed by Hispanics at 18 percent (n=165) and non-Hispanic Whites at 13 percent (n=107). Non-Hispanic Blacks and Hispanics were significantly more likely than non-Hispanic Whites to have reported a diabetes diagnosis. There were no significant differences in the levels of PWP and PAR across the racial/ethnic groups, but non-Hispanic Whites were significantly more likely than non-Hispanic Blacks to fall into the "Other" diabetes status category (i.e., non-PWD non-Hispanic Blacks were significantly more likely to be at risk of diabetes compared to non-PWD non-Hispanic Whites).

Diabetes Type: Type 1 and Type 2

Unlike previous surveys, the 2014 NNDS and 2016 NNDS asked people who reported being told they had diabetes also to indicate whether it was type 1 or type 2 diabetes. In 2016, 487 people reported being told they had diabetes. Of those who were told they had diabetes, 10 percent (n=45) responded they had type 1 diabetes and 83 percent (n=413) reported they had type 2 diabetes. The remainder indicated that they did not know or preferred not to answer the question.

High Blood Pressure/Hypertension, High Cholesterol, and Other Related Conditions

The NNDS traditionally has collected data on people who reported having certain conditions that are commonly associated with diabetes such as high blood pressure (HBP)/hypertension, high cholesterol, and other related conditions.

The proportion of NNDS respondents who reported being told by a health care professional that they had HBP/hypertension was 42 percent (n=1,135) in 2016, which was similar to previous survey years and

reflected no significant change overall. In the period 2008 to 2014, the percentage of reported HBP/hypertension:

- Decreased significantly among non-Hispanic Blacks from 2011 to 2016, from 68 percent in 2011 (n=393), to 56 percent in 2014 (n=486), to 52 percent in 2016 (n=462).
- Remained relatively stable among Hispanics, at 35 percent (n=316). This proportion represents a nonsignificant increase from 2014 and a non-significant decrease from 2011.

Approximately 40 percent of respondents to the 2016 survey reported high cholesterol (n=1,062). Overall, there was no significant increase since 2011 in the percentage of people who reported a doctor or other health care professional told them that they had high cholesterol. There also were no significant increases in reported rates of high cholesterol for any age, racial/ethnic, or diabetes status groups from 2011 to 2016.

Gestational Diabetes

Of the women surveyed who reported being pregnant in the 10 years prior to the 2016 NNDS, 17 percent (n=27) were told by a doctor or other health care professional that they had gestational diabetes or high blood sugar during their pregnancy.

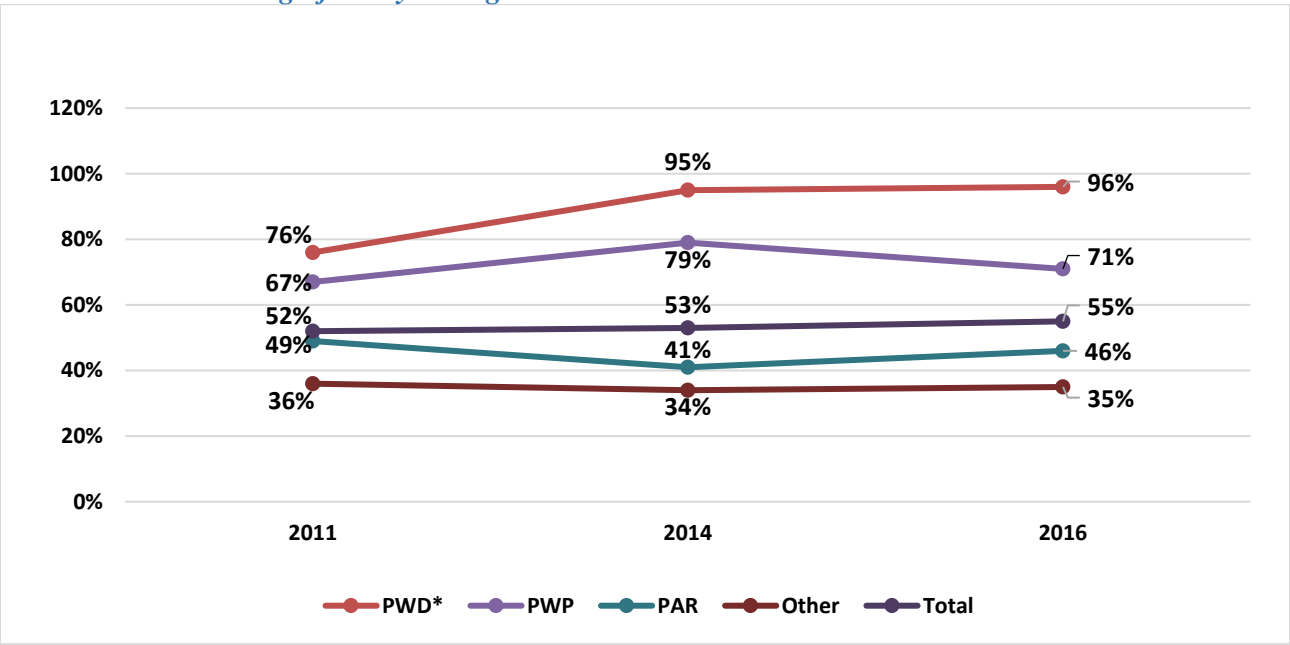
Tests for Diabetes

The 2016 NNDS asked people questions about tests for diabetes that they might have had in the 12 months prior to the survey. These questions were used in analysis to determine the respondents' diabetes status. Previous rounds of the survey asked whether people *ever* had a blood test to see if they had diabetes or high blood sugar; but the 2014 and 2016 surveys were more specific. In 2014, two separate items were added to capture the types of blood test(s) people had—the hemoglobin A1C or glycosylated hemoglobin test, and the fasting blood sugar test. The NNDS questions about diabetes tests also were revised to include the more restricted timeframe of "in the past 12 months," as opposed to "ever" in prior surveys. This revision was made to reduce recall bias. Approximately half of the people who responded to the questions (n=1,326) in 2016 had one or both types of blood tests. Thirty-one percent (n=884) had an A1C test, and 42 percent (n=1,088) had a fasting blood sugar test.

In analysis, we combined the two 2016 question items about hemoglobin A1C/glycosylated hemoglobin tests and fasting blood sugar tests into one "blood test" variable to enable approximate comparisons to the 2011 survey question. The oral glucose tolerance test was examined separately so that the analysis results would be consistent with analyses performed for the 2014 NNDS report. Using this created variable, we examined trends in receipt of a blood test by race/ethnicity, diabetes status, and age group. The response options differed between 2011 and 2014/2016; the 2011 survey included a response for having received a blood test "less than one year ago," which was used to compare to the "past 12 months" time period used in the 2014 and 2016 surveys. Trends showed no significant changes across the three survey periods by age group or race/ethnicity for having received a blood test. Significant increases by diabetes status were seen from 2011 to 2016 in the proportions of PWD, but not of PWP, who received a "blood test" in the year prior to the survey, as shown in the figure below. The proportion of PWP who had received a diabetes blood test in the past 12 months actually declined from 2014 to 2016, but this decline did not reach significance.

Figure 4. Had a Blood Test for Diabetes in the Past 12 Months/Year Prior to the Survey, by Diabetes Status

Blood tests increased significantly among PWD



*2016 significantly different from 2011, p<0.05

In the 2016 NNDS, 5 percent of people (n=166) reported having had a third test, the oral glucose tolerance test, within 12 months before the survey.

Family History

In the 2016 NNDS, people were asked about their biological or blood relatives and diabetes; that is, if they had a biological mother, father, sister or half-sister, or brother or half-brother who had diabetes.[17] If they reported any of these family members having diabetes, they were considered to have a family history of diabetes. The 2014 and 2016 family history data are comparable, but not exactly equivalent, to previous survey years. Observed differences from 2011 results may be due, in part, to changes in the way the question was asked.

Among all NNDS 2016 participants who responded to the family history questions, 39 percent reported a family history of diabetes (n=1,126). This proportion represents a nonsignificant increase from 2014, when 36 percent of respondents reported a family history of diabetes (n=1,074); and a significant increase from 2011, when 27 percent of respondents reported a family history of diabetes (n=708).[18] We ran a separate analysis of reported family history in 2014 and 2016 that included "Don't Know" responses. In 2014, 3 percent of respondents did not know if they had a family history of diabetes. In 2016, this proportion decreased to 2 percent.

[17] In 2011, if a respondent reported they had a member of their immediate family with diabetes, they were asked which family member it was. If they had a mother, father, brother, or sister with diabetes ("immediate family"), they were considered to have a family history of the disease.

[18] Because family history was reported and recorded differently in 2011, missing data were treated differently for that year. For 2011, "Does Not Apply" or "Don't Know" responses were included in the analysis, whereas these responses were analyzed as missing data in 2014 and 2016.

Age

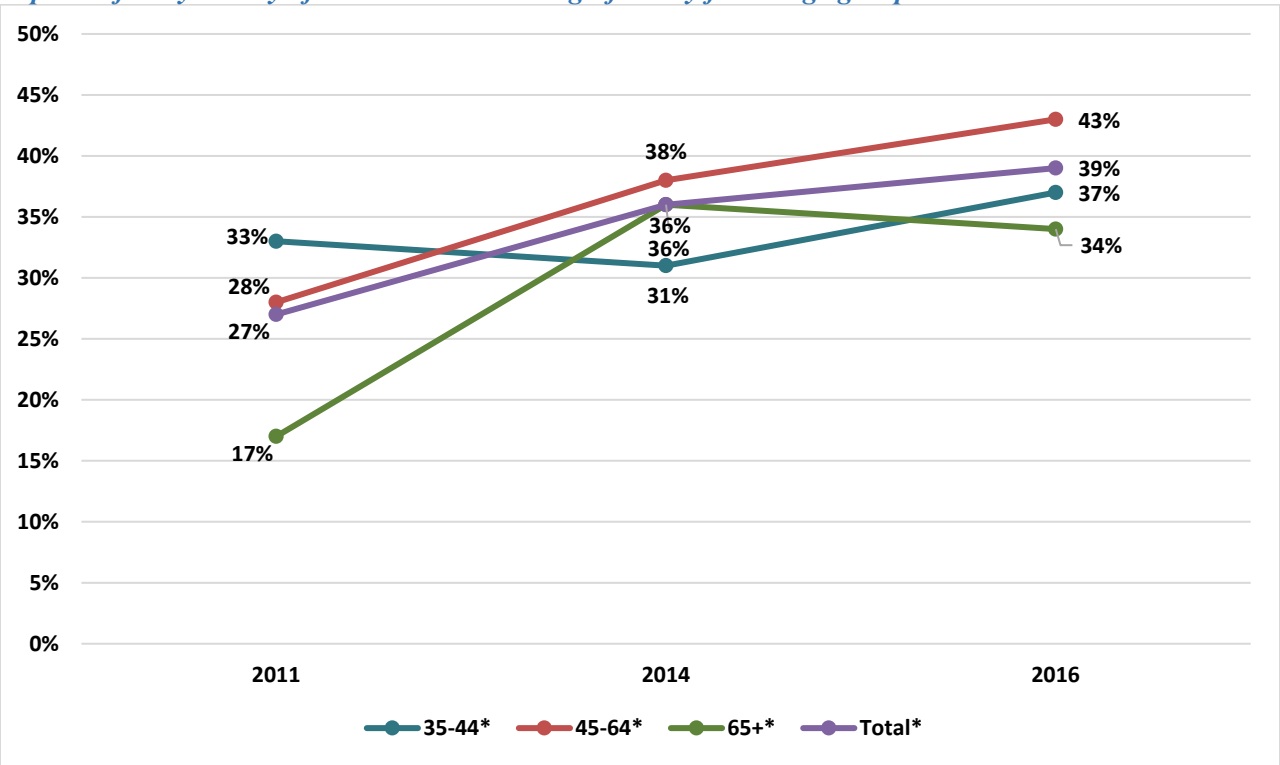
In 2016, family history of diabetes varied significantly across the age groups, with the following rates for each age group:

- 37 percent among ages 35-44 years (n=212);
- 43 percent among ages 45-64 years (n=618); and
- 34 percent among ages 65 years and older (n=296).

Trends over time showed significant increases in reported family history of diabetes for the total sample and for all age groups. Overall, reported family history of diabetes increased from 27 percent in 2011 (n=708) to 39 percent in 2016 (n=1,126). Reported family history of diabetes for the youngest age group increased from 33 percent (n=117) in 2011 to 37 percent (n=212) in 2016. For the middle age group (45-64 years), the proportion reporting a family history of diabetes increased from 28 percent (n=317) in 2011 to 43 percent (n=618) in 2016. For the oldest age group (65 years and above), reported family history increased from 17 percent (n=202) in 2011 to 34 percent (n=296) in 2016.

Figure 5. Reported Family History of Diabetes by Age Group

Reported family history of diabetes increased significantly for all age groups



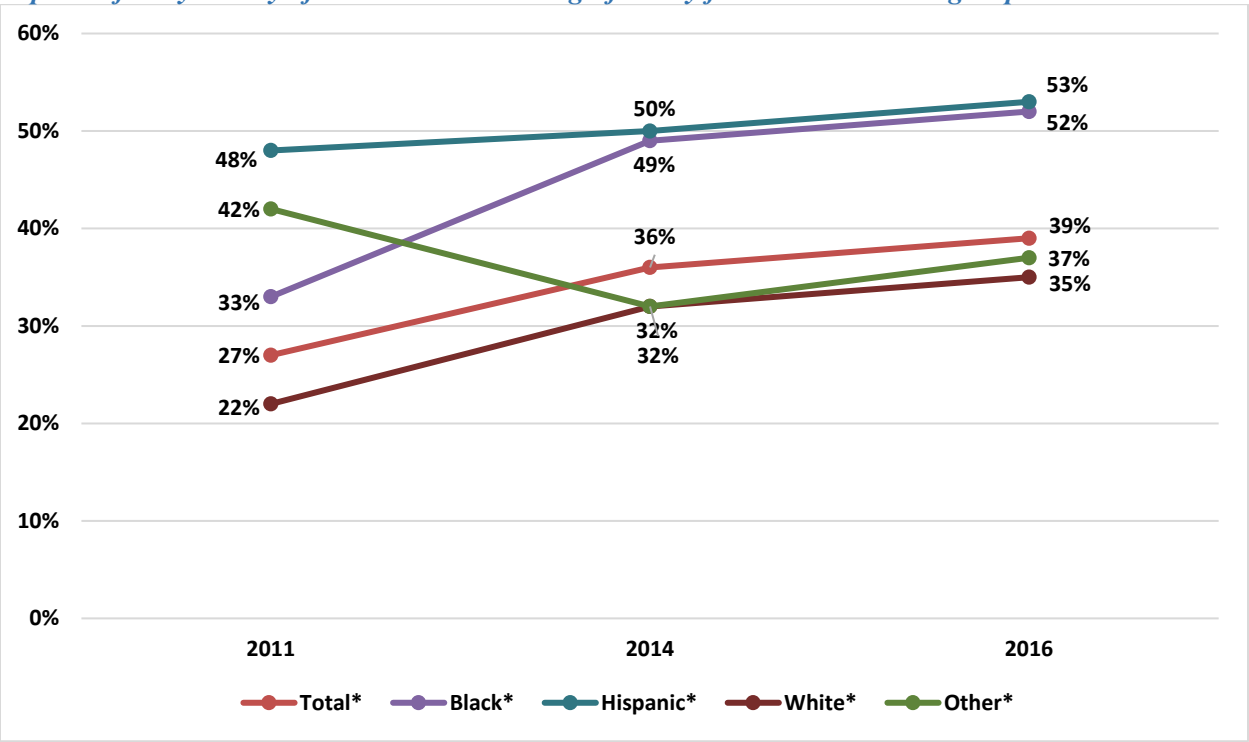
*2016 significantly different from 2011, p<0.05

Race/Ethnicity

Significant increases in reported family history were found among all racial/ethnic groups from 2011 to 2016. Reported family history of diabetes increased among non-Hispanic Blacks from 33 percent (n=208) in 2011 to 52 percent (n=414) in 2016, with the trend showing signs of leveling off since 2014. Among Hispanics, reported family history gradually increased between 2011 and 2016, from 48 percent in 2011 (n=261) to 53 percent (n=431) in 2016.

Figure 6. Trends in Reported Family History of Diabetes by Race/Ethnicity: 2011, 2014, and 2016

Reported family history of diabetes increased significantly for all racial/ethnic groups



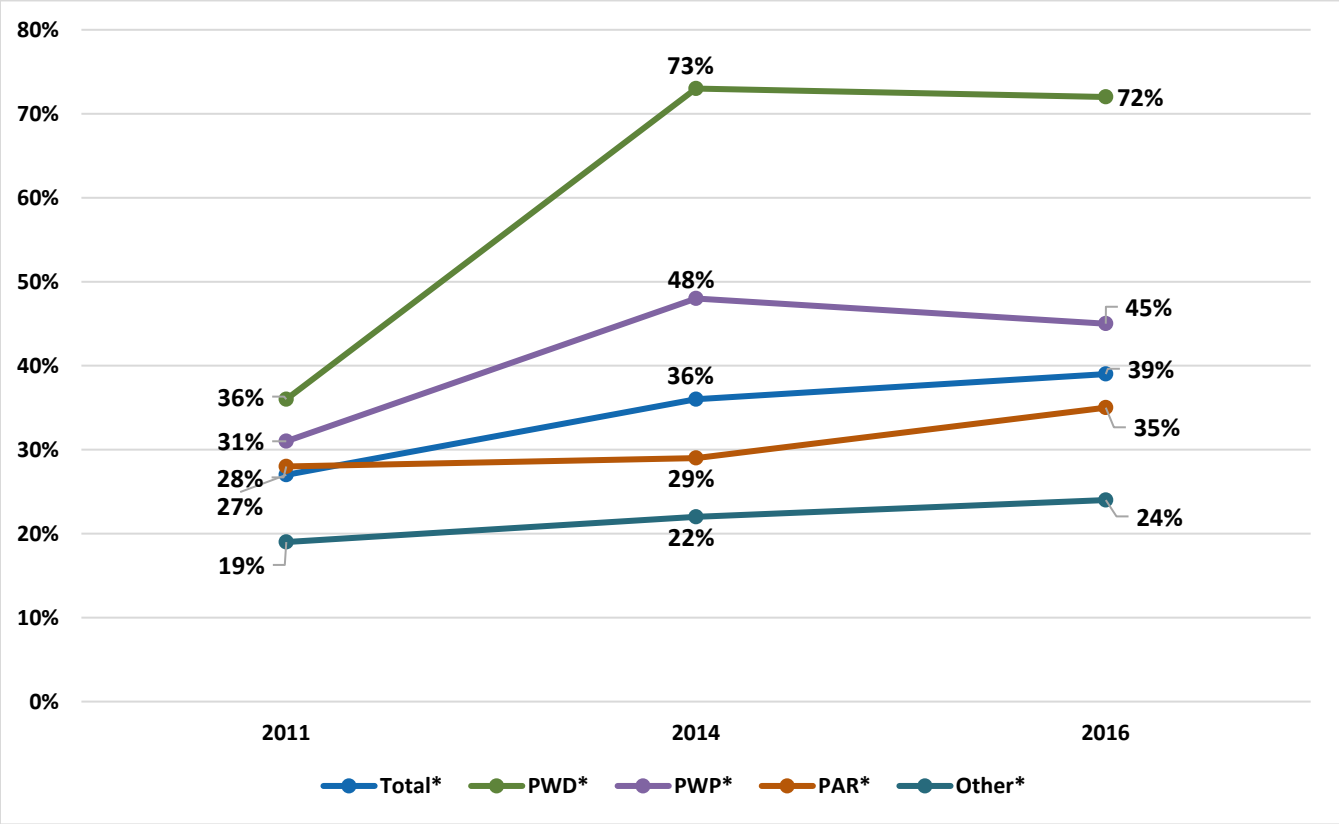
*2016 significantly different from 2011, p<0.05

Diabetes Status

PWD in the 2016 NNDS were significantly more likely to report family members with diabetes compared to other diabetes status groups: 72 percent (n=341) among PWD, 45 percent (n=218) among PWP, 35 percent (n=402) among PAR, and 24 percent (n=165) among All Others. There was a sizable and significant increase in reported family history among PWD between 2011 and 2014, from 36 percent (n=218) in 2011 to 73 percent (n=336) in 2014. In addition, the proportion of survey respondents who reported a family history of diabetes increased significantly for each diabetes status group.

Figure 7. Trends in Family History of Diabetes by Diabetes Status Group: 2011, 2014, and 2016

Reported family history of diabetes increased significantly for all diabetes status groups



*2016 significantly different from 2011, p<0.05

Health Problems and Diabetes: Beliefs

In the 2014 NNDS and the 2016 NNDS, respondents were asked about a list of health problems and whether they thought the problems could be caused by diabetes. This question was followed by a question that asked, "of the problems the respondents selected, which were the three most serious?" In previous surveys, respondents spontaneously mentioned health problems caused by diabetes that they thought were most serious.

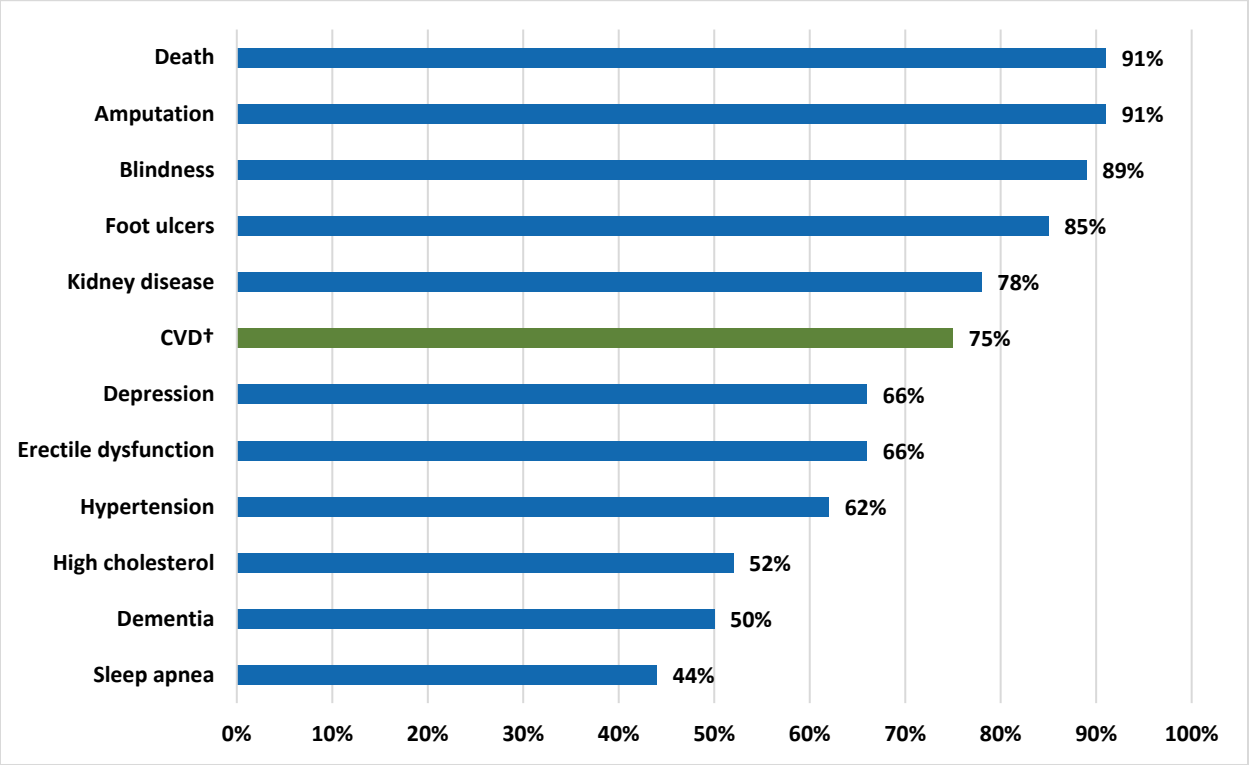
Box 1. Relevant Survey Questions: Beliefs

- Do you think the following health problems can be caused by diabetes?
- Which of those health problems do you think are the three most serious problems?

Health Problems and Diabetes

When 2016 NNDS respondents were asked to review a list of 13 health problems and indicate whether they thought each of the problems could be caused by diabetes, respondents were most likely to select "Amputation," "Foot ulcers," "Blindness," and "Death." The figure below shows the proportion selected by respondents for all 13 conditions and cardiovascular disease (CVD–stroke and heart disease combined).

Figure 8. Reported Health Problems Thought by Respondents to Be Caused by Diabetes: 2016
Awareness of the diabetes and CVD link remains relatively low given that CVD is the leading cause of death among PWD and adults with diabetes are 2 to 4 times more likely to die from CVD[19]



†The CVD category was created by combining the Heart disease and Stroke variables. This category represents the proportion of respondents to this question who reported that heart attack, heart condition, heart disease, and/or stroke were cause by diabetes.

Many 2016 NNDS respondents selected the four CVD[20] outcomes ("stroke" or "heart attack, heart condition, heart disease"), but these outcomes were not among the most frequently cited conditions linked to diabetes. Combining responses for "stroke" or "heart attack, heart condition, heart disease" into one category did not improve the relative ranking for CVD. The proportion of respondents selecting a CVD outcome increased from 2014 (73%) to 75 percent in 2016, but this increase was not significant. For each condition, the proportion of respondents who indicated it could be caused by diabetes did not change significantly from 2014.

Among 2016 NNDS respondents, a significantly larger proportion of PWD thought CVD could be caused by diabetes relative to other diabetes status groups. Eighty-three percent of PWD reported awareness of the relationship between diabetes and CVD compared to 76 percent of PWP, 74 percent of PAR, and 70 percent of All Others. Although differences in awareness of the link between diabetes and CVD were not examined by diabetes status group for the 2014 NNDS report, a more recent analysis of 2014 NNDS data revealed that a significantly larger proportion of PWD respondents reported that CVD could be caused by diabetes relative to other diabetes status groups. Among 2014 NNDS respondents, the same proportion of PWD (83%) reported awareness of the link between diabetes and CVD as in 2016. The

[19] American Heart Association. Cardiovascular disease & diabetes web site. http://www.heart.org/HEARTORG/Conditions/More/Diabetes/WhyDiabetesMatters/Cardiovascular-Disease-Diabetes_UCM_313865_Article.jsp/#.WV-j3Yjyu70. Updated April 14, 2017. Accessed August 8, 2017.
[20] "CVD" in previous survey reports was a created variable that combined *five* conditions: stroke, heart attack, heart condition, cardiovascular disease, and HBP/hypertension.

proportion of PWP who were aware of this link (73%), however, was lower in 2014. Although this difference was not significant, it suggests a possible increase in awareness of the diabetes-CVD link among PWP but not PWD from 2014 to 2016.

In the 2016 NNDS, respondents also were asked to indicate which of the (up to three) conditions they named as caused by diabetes they considered to be most serious. Among all respondents who answered the question, 63 percent (n=1,352) selected "Death," 54 percent (n=1,231) selected "Amputation, loss of foot or leg," and 51 percent (n=1,200) replied "Blindness." A CVD outcome was among the top three most serious conditions considered to be caused by diabetes for 49 percent (n=1,102) among people who responded to this question. Responses regarding the three most serious conditions caused by diabetes did not change significantly from 2014.

Awareness of Diabetes Prevention

Awareness that diabetes can be prevented remained high overall. Approximately 79 percent (n=1,906) of all respondents in 2016 were aware that diabetes can be prevented. There was, however, no significant change in overall awareness compared to 2011 or 2014.

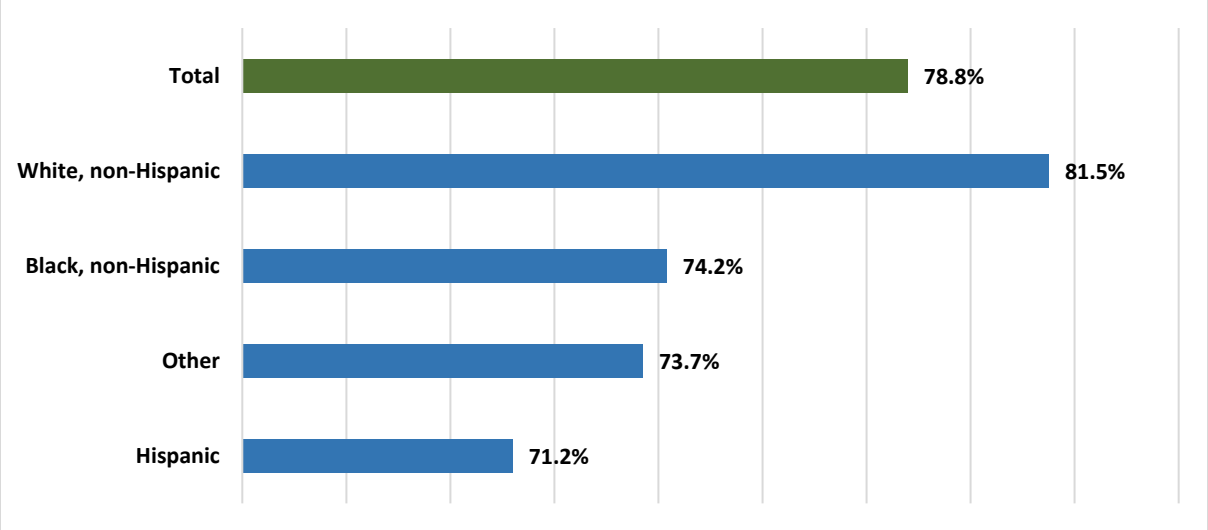
Among non-PWD who indicated that they felt at risk for developing diabetes, however, perceived ability to reduce their personal risk of getting type 2 diabetes decreased significantly from 2011 to 2016. In 2011, 98 percent of these respondents thought that they could reduce their risk of type 2 diabetes. This proportion decreased to 90 percent in 2014 and to 89 percent in 2016.

Race/Ethnicity

Among 2016 NNDS respondents, racial/ethnic groups differed significantly with regard to the proportion reporting that they were aware that diabetes could be prevented. Non-Hispanic Whites were more likely to report that they were aware that diabetes can be prevented (82%, n=626), compared to non-Hispanic Blacks (74%, n=627) and Hispanics (71%, n=603).

Figure 9. Aware that Diabetes Can Be Prevented, by Race: 2016

Awareness that diabetes can be prevented was lower among non-Hispanic Blacks and Hispanics



Age

There were no significant differences in awareness that diabetes could be prevented by age group among 2016 NNDS respondents.

Diabetes Status

Awareness that diabetes[21] is preventable was highest among people with prediabetes (PWP), at 86 percent in 2016 (n=330), but not significantly higher than 81 percent of PWD (n=392). For PAR and All Others, awareness in 2016 was 79 percent and 72 percent, respectively. Respondents in the All Others category were significantly less likely to report awareness that type 2 diabetes could be prevented relative to other diabetes status groups. Awareness among PWD increased from 70 percent (n=355) in 2011 to 81 percent (n=392) in 2016, but this increase did not quite reach significance. Awareness stayed about the same for PWP and PAR from 2011 to 2016. Awareness for All Others decreased significantly from 2011 to 2014, from 80 percent (n=412) to 70 percent (n=440), then increased slightly but not significantly in 2016 to 72 percent (n=399).

Income

Household income as a percentage of the federal poverty threshold[22][23] was calculated based on income and household size information available in the 2016 NNDS. Awareness that type 2 diabetes can be prevented increased with income level and was significantly lower for respondents with a household income at or below 100 percent of the federal poverty level (FPL; 73%, n=325), compared to those with a household income above 250 percent of the FPL (81%, n=1,033).[24]

Personal Health Care Coverage

Insurance and Coverage for Health and Wellness Program

Recent changes in the health insurance arena have focused new attention on the insured status of the U.S. adult population. Prior to 2014, the NNDS did not include questions on health insurance and was not designed to serve as a source of this information. The importance of health insurance and health care coverage, however, led the NDEP to include a few questions on this topic in the 2014 NNDS and 2016 NNDS. The responses help to shed light on people's understanding of the extent of their coverage, if any, and of the types of services covered. Although not comprehensive, these data offer a broader "access to care" context for diabetes prevention and management planning.

Box 2. Relevant Survey Questions: Insurance Coverage

- Do you currently have health insurance or health care coverage that pays for all or part of your medical care?
- Does your health care coverage include any weight loss, exercise, or health or wellness programs?
- Do you need a referral, prescription, or script from your doctor to attend any of these weight loss, exercise, or health or wellness programs?

Approximately 93 percent (n=2,215) of 2016 NNDS respondents reported having health insurance that paid for all or part of their medical care. This proportion represents a significant increase over the 89 percent of 2014 NNDS respondents who reported having health insurance. When asked to report on the types of programs covered, approximately 37 percent (n=774) of those with coverage *did not know* whether their coverage included any weight loss, exercise, or other health or wellness programs. As in 2014, 38 percent (n=938) of 2016 NNDS

[21] The 2016 survey question specified "type 2 diabetes."

[22] Thresholds were computed from the 2016 U.S. Department of Health and Human Services Poverty Guidelines (https://obamacarefacts.com/2016-federal-poverty-guidelines/; https://aspe.hhs.gov/computations-2016-poverty-guidelines) using information on household size obtained from the 2016 NNDS.

[23] Because the income variable provides broad income ranges rather than exact income, the percentages of the FPL categories are approximations.

[24] We created three income categories for this analysis: (1) household income at or below the 2016 FPL; (2) household income above the FPL but low enough to qualify for federal medical assistance, either in the form of Medicaid or a cost-sharing reduction (CSR) in 2016; and (3) household income above the level that qualified for a CSR in 2016. Household incomes above 250 percent of the FPL did not qualify for any cost-sharing subsidy in 2016 Federal Marketplace healthcare plans.

respondents who reported having medical insurance stated that these program types were included in their coverage. Again, as in 2014, about one-quarter (25%, n=177) of 2016 respondents with coverage for wellness programs indicated that they did not know whether they needed a referral to obtain these services.

GfK collects income and other socio-demographic information from its panel members. Information on household income for this survey panel sample was converted in analysis to percent of FPL.[25] When health insurance or health care coverage was examined in terms of percentage of the FPL, a significantly lower proportion of respondents residing in households with incomes below 250 percent of the FPL reported coverage (86%, n=865) compared to residents of households with incomes 250 percent or more of the FPL (97%, n=1,346). Similarly, those with household incomes below 100 percent of FPL were significantly less likely to report coverage compared to those with household incomes at or above 300 percent of the FPL: 78 percent (n=300) and 97 percent (n=1,197), respectively. In addition, respondents who reported coverage and who had household incomes below 100 percent of the FPL were significantly less likely than those with coverage and a household income at or above 300 percent of the FPL to report health insurance that covered weight loss, exercise, or health/wellness programs. Twenty percent (n=87) of insured respondents living at or below 100 percent of the FPL reported this type of coverage compared to 42 percent (n=566) of insured respondents living at or above 300 percent of the FPL.

5. Diabetes Management and Self-Efficacy

The 2014 NNDS and the 2016 NNDS asked the question about knowledge of "the term A1C, also known as glycosylated hemoglobin A1C" only of those who reported that they had been diagnosed with diabetes; whereas, in previous surveys the question was asked of all respondents. New questions also were added to obtain more in-depth information about behaviors that PWD engage in to manage their diabetes and self-efficacy.

Knowledge of A1C

Box 3. Relevant Survey Questions: A1C

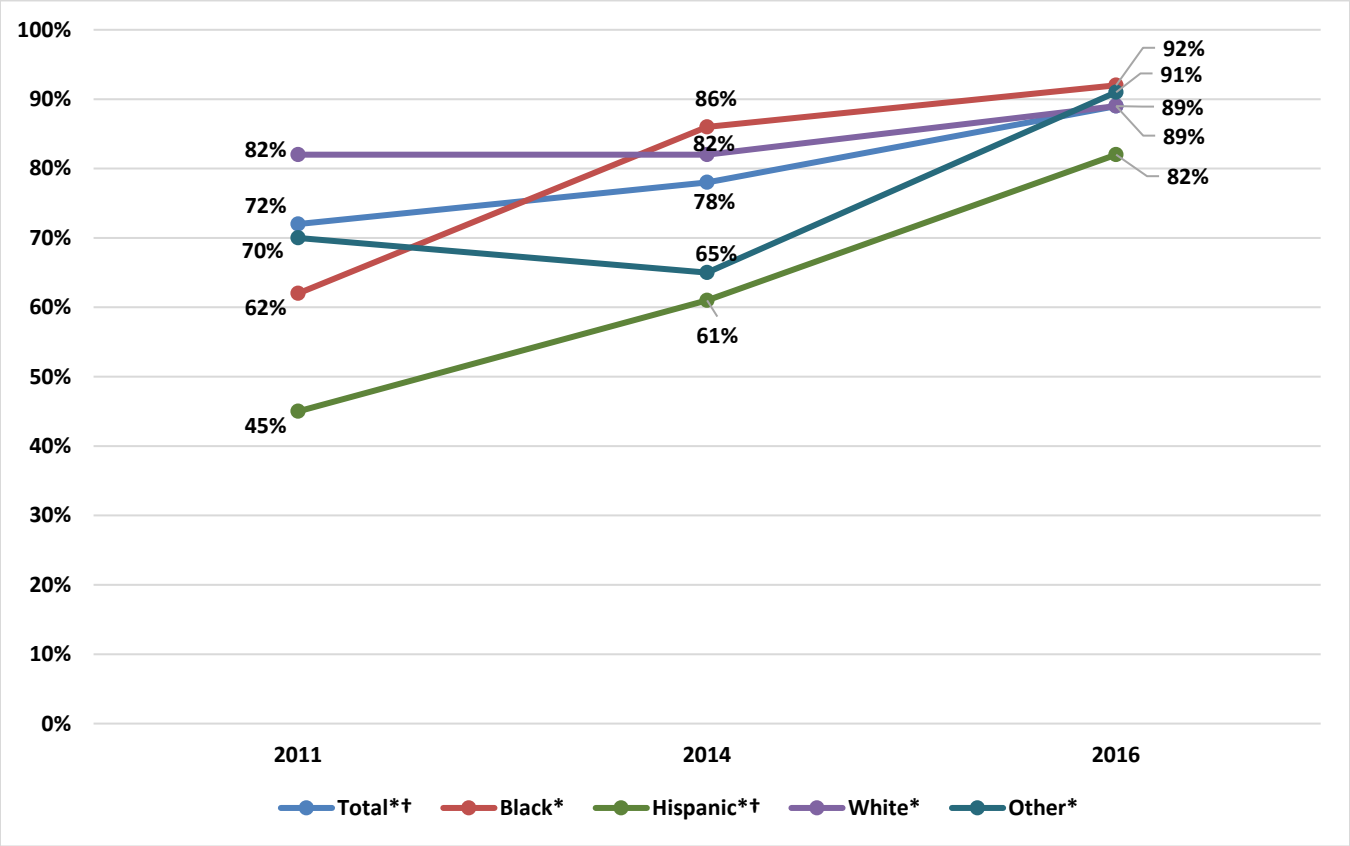
- Have you ever heard of the term A1C, also known as glycosylated hemoglobin or hemoglobin A1C?
- In the past 12 months, how often has a doctor or other health professional checked your A1C level?

PWD commonly reported having heard the terms "A1C," "hemoglobin A1C," or "glycosylated hemoglobin." Overall, 89 percent (n=426) of PWD who responded to the 2016 NNDS reported that they had heard of the A1C or the glycosylated hemoglobin test. This proportion represents a significant increase over the 2014 NNDS proportion of PWD reporting that they had heard of these tests (78%, n=373). In 2016, the percentage was lower among Hispanic PWD, at 82 percent (n=131) than among non-Hispanic Black PWD, at 92 percent (n=191) or among non-Hispanic White PWD, at 89 percent (n=96). Trend data from 2011 to 2016 showed a significant increase overall, especially for Hispanic and non-Hispanic Black PWD.

[25] Thresholds were computed from the 2016 U.S. Department of Health and Human Services Poverty Guidelines (https://obamacarefacts.com/2016-federal-poverty-guidelines/; https://aspe.hhs.gov/computations-2016-poverty-guidelines) using information on household size obtained from the 2016 NNDS.

Figure 10. Ever Heard of the A1C Test (PWD)

Non-Hispanic Black and Hispanic PWD showed significant increases in A1C awareness



*2016 significantly different from 2011, $p<0.05$
†2016 significantly different from 2014, $p<0.05$

Familiarity with A1C testing increased significantly among PWD ages 65 and older, from 71 percent (n=143) in 2011, to 93 percent (n=178) in 2016. A1C awareness did not increase significantly for the two younger age groups.

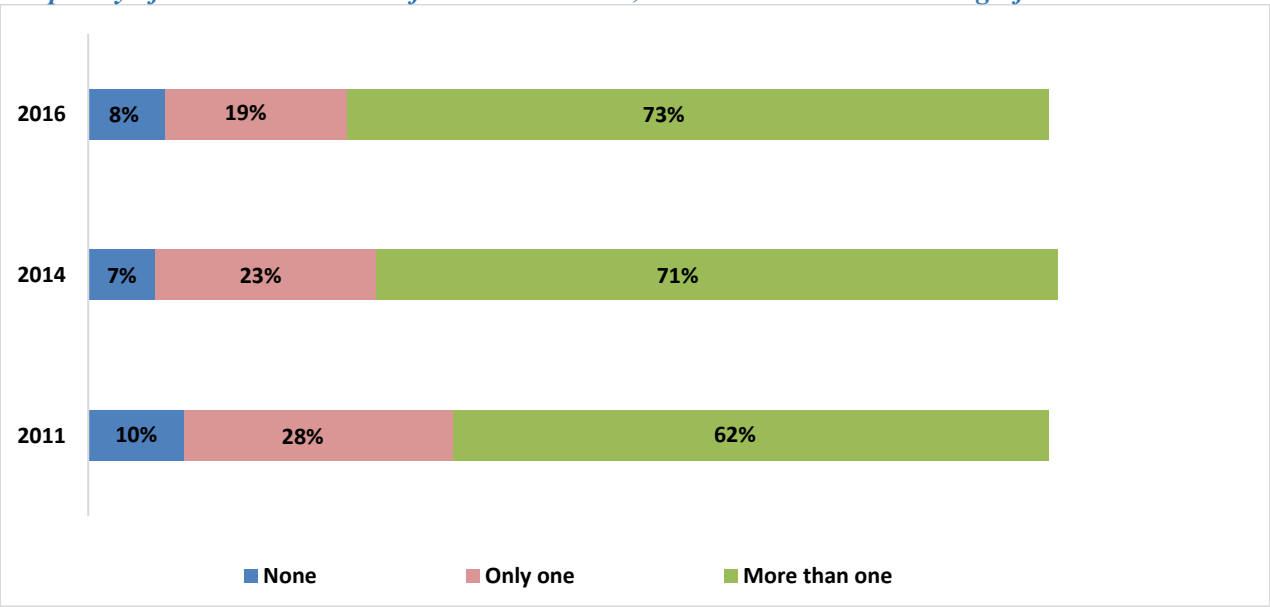
A1C Testing Frequency in Year Prior to Survey

In the 2016 NNDS, the proportion of PWD who reported having received at least one A1C test in the year prior to the survey was high (87%, n=432), while the proportion of PWD who *did not know* whether they had the test declined from 9 percent in 2014 to 6 percent in 2016. (The subsequent discussion excludes respondents who answered "Don't Know.")

Among those who were aware they were checked ("Don't Know" was coded as missing data), the percentage of PWD who had their A1C levels checked more than once by a doctor or other health care professional in the prior year was 73 percent (n=348). Trends by race/ethnicity and age over the last three survey years were not significant.

Figure 11. Number of A1C Tests in the Past Year (PWD)

Frequency of A1C tests increased from 2011 to 2016, but the increase was non-significant



Usual Health Care Providers (HCPs)

The 2016 NNDS included a series of questions about whether people had someone they thought of as their usual HCP,[26] the type of health care provider this usual provider was, and the frequency with which they received care from this provider and other provider types.

Box 4. Relevant Survey Questions: Usual HCP

- Who do you think of as your usual health care provider?
- How often do you receive care from your usual health care provider?

Having a usual source of care was common—approximately 94 percent of 2016 NNDS respondents reported that they had a usual HCP (n=2,327). [27] Of those with a usual source of care, doctors, at 84 percent (n=2,121), were the most often cited as their usual HCP. Regular care by a diabetes educator was low (9 percent) among those who sought care in addition to that from their usual health care provider.

Six percent of respondents (n=172) reported having no usual HCP[28]. Hispanics, at 11 percent (n=83), were significantly more likely to report *not* having a usual HCP than were non-Hispanic Whites, at

[26] People who reported they thought of "no one" as their usual health care provider were not asked the follow-up question about whether they regularly see other providers.

[27] The question response options were "Doctor, Nurse practitioner, Physician's assistant (PA), Nurse, Other (specify), or No one."

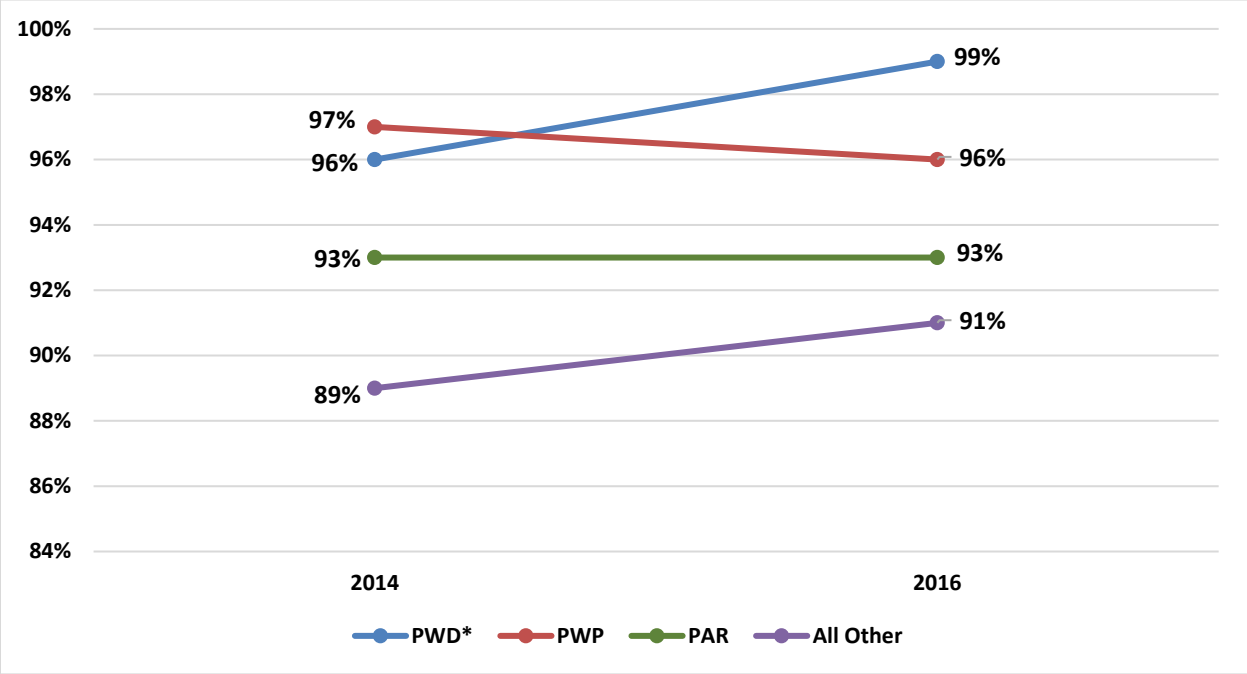
[28] A few respondents who reported "Other" as their usual care provider indicated in the comments that their usual care provider was not a medical institution or individual (e.g., myself, cousin, wife, God). It appears that some individuals who reported "Other" as usual care provider and gave this type of response in 2014 might have been counted as not having a usual care provider, but others who gave similar responses were counted. Because the 2014 coding documentation was unavailable, we decided to count *all* respondents who reported a usual care provider, even if their comments suggested that the individual was not a medical provider. Our counts for 2014 NNDS respondents who did and did not report a usual care provider therefore differ slightly from the counts provided in the 2014 report (i.e., the number of respondents reporting a usual care provider increased by six and the number reporting no usual care provider decreased by the same number).

5 percent (n=31), or non-Hispanic Blacks, at 9 percent (n=51). Analyses of 2014 NNDS data also revealed that Hispanics were significantly less likely to report having a usual HCP.

People not considered to be at risk of diabetes (All Others) were significantly more likely to report *no* usual care provider (9%, n=57) compared to PWD (1%, n=11). The proportion of PWD reporting a usual care provider increased significantly from 2014 to 2016, from 96 percent (n=455) to 99 percent (n=473).

Figure 12. Report a Usual Care Provider

The proportion of PWD reporting a usual care provider increased significantly from 2014 to 2016



*2016 significantly higher than 2014, $p<0.05$

Respondents in the youngest age group (35-44) were significantly more likely to report *not* having a usual HCP, at 11 percent (n=68), compared to respondents ages 45 to 64, at 7 percent (n=93), and respondents ages 65 and older at only 1 percent (n=11). Analyses of 2014 NNDS data also revealed that respondents in the youngest age group were significantly more likely to report *not* having a usual care provider.

Respondents with household incomes at or below the FPL were significantly more likely to report *not* having a usual provider, at 12 percent (n=51), relative to those with incomes at least 300 percent of the FPL, at 4 percent (n=50). NNDS 2014 respondents living in households at or below the FPL also were significantly more likely to report *not* having a usual care provider compared to those living in households with incomes at least 300 percent of the FPL.

Many of those who named a usual HCP received care every few months, at 42 percent (n=1,120), while 38 percent (n=779) did so once a year, and 14 percent (n=268) received care less often. PWD were significantly more likely to see their usual HCP every few months or more often (89%, n=434), compared to PWP (57%, n=241), PAR (40%, n=428), and All Other respondents (28 percent, n=172).

The frequency with which 2016 NNDS respondents saw their usual HCP varied significantly by race/ethnicity, with 64 percent (n=500) of non-Hispanic Blacks reporting visiting their usual HCP every few months or more often, followed by Hispanics (53%, n=420). Non-Hispanic Whites were significantly less likely to report visits at least every few months (45%, n=332). Analyses of 2014 NNDS responses

revealed that non-Hispanic Whites also were significantly less likely to report visiting their usual HCP at least every few months.

Diabetes-related Advice or Counseling

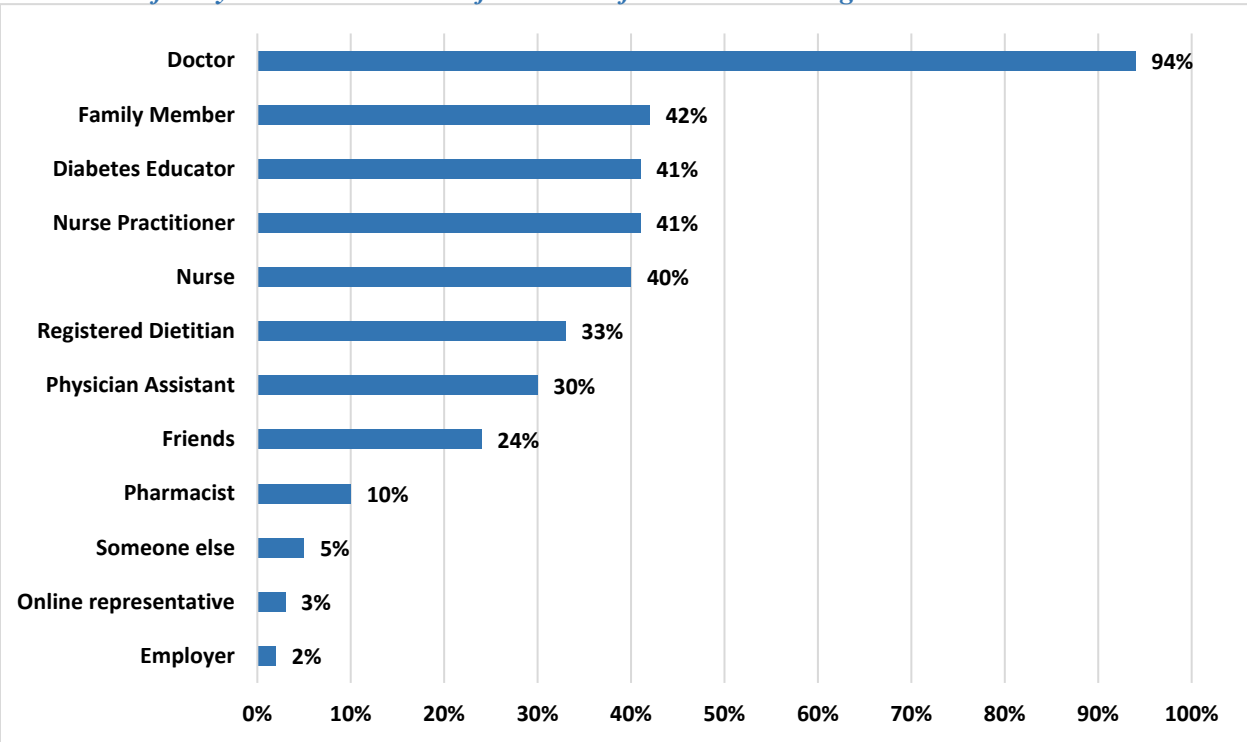
In 2014 and 2016, the NNDS included questions related to advice and counseling for diabetes management (Figure 13 below). Among respondents to the 2016 NNDS, receiving advice or counseling for diabetes management in the past 12 months was common among PWD, at 62 percent (n=325). This proportion did not change significantly from 2014. The source of advice or counseling was most frequently a doctor, at 94 percent (n=302). Other types of HCPs were less commonly reported as sources, such as a nurse practitioner, at 41 percent (n=122); a nurse, at 40 percent (n=103); a registered dietitian at 33 percent (n=84); or a physician's assistant, at 30 percent (n=86). A family member, diabetes educator, and friend also were relatively frequent sources of advice/counseling, at 42 percent (n=124), 41 percent (n=107), and 24 percent (n=82) of PWD, respectively.

Box 5. Relevant Survey Questions: Diabetes-related Advice or Counseling

- In the past 12 months, did anyone give you advice or counseling about how to prevent other health problems caused by diabetes?
- In the past 12 months, which of the following people gave you advice or counseling about how to prevent other health problems caused by diabetes?

Figure 13. Source of Advice or Counseling for Diabetes Management (PWD): 2016[29]

Doctors and family members were a major source of advice/counseling



[29] Proportions did not change significantly from 2014.

Diabetes Self-management and Self-efficacy

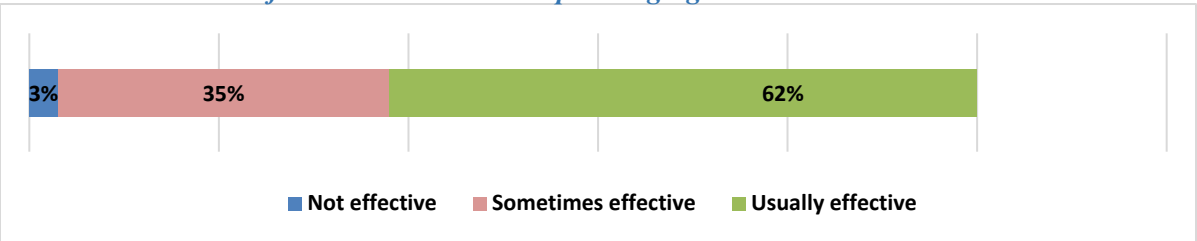
Several NDEP diabetes campaign messages such as those found in "Managing Diabetes. It's not easy, but it's worth it*"* campaign, are designed to address self-efficacy in diabetes management among PWD. Beginning in 2014, new questions were added to the NNDS to ask PWD how effective they felt their diabetes management had been and their levels of confidence and distress in managing the disease.

Self-management

The majority of PWD (62%, n=299) reported that their way of managing their diabetes had "usually been effective." On the other hand, more than one-third indicated that their approach to managing diabetes was at least partially ineffective, with 35 percent (n=162) responding "sometimes effective," and 3 percent responding "not effective." These proportions did not change significantly between 2014 and 2016.

Figure 14. Self-management of Diabetes (PWD): 2016[30]

More than one-third of PWD needed more help managing their diabetes



Confidence with managing hyperglycemia/hypoglycemia

Beginning in 2014, the NNDS asked new questions to elicit a measure of PWD's confidence in knowing what to do should they encounter issues with their blood sugar such as spikes or drops in their desired levels. The questions were based on a 5-point scale adapted from the Lorig 8-item Diabetes Self-Efficacy Scale.[31] The endpoints of the scale in the survey questions were labeled as "Not at all confident" and "Totally confident." A majority of PWD reported scale values above the midpoint value of "3" for both hyperglycemia at 60 percent (n=284), and hypoglycemia at 61 percent (n=299). Thirty-five percent (n=176) of PWD expressed total confidence in their knowledge of what to do when their blood sugar went higher than it should (hyperglycemia), and 40 percent (n=198) in knowing how to handle their sugar going lower (hypoglycemia) than it should. At the other extreme of the scale, a much smaller percentage did not feel confident about what to do if their blood sugar went higher or lower than it should, at 7 percent (n=44) and 6 percent (n=41), respectively. A majority of the values reported by PWD, however, fell in the mid-range (values "2," "3," and "4") between the scale endpoints with hyperglycemia at 59 percent (n=260) and hypoglycemia at 54 percent (n=240). These proportions did not change significantly between 2014 and 2016 and suggest that many PWD continue to lack confidence in responding when their blood sugar was too high or too low.

Box 6. Relevant Survey Questions: Self-efficacy and Diabetes Management Practices

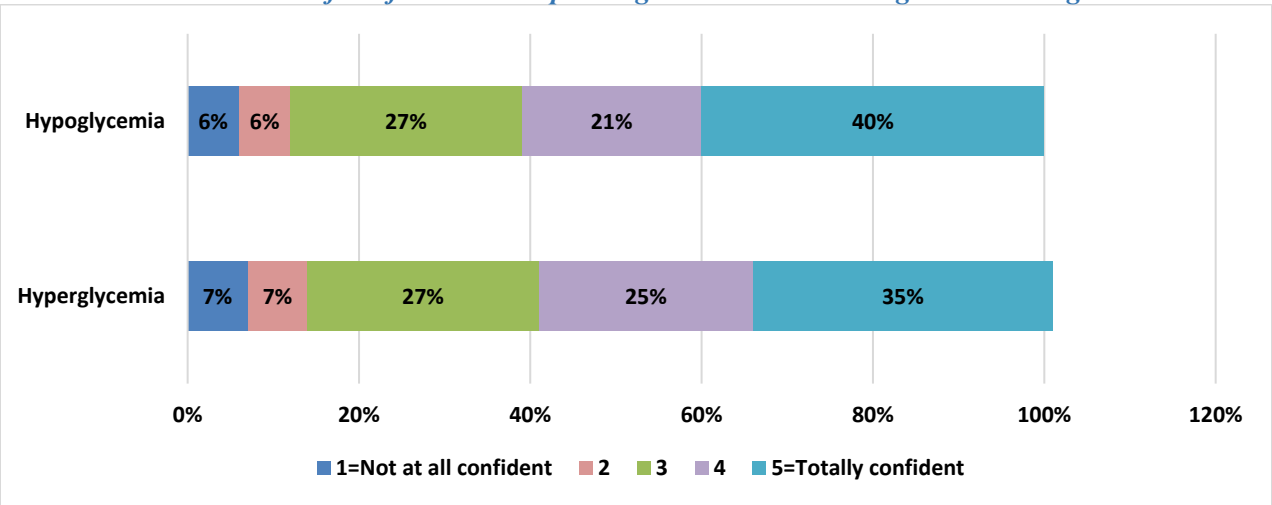
- In general, would you say your way of managing your diabetes has usually been effective, sometimes been effective, or not been effective?
- How confident do you feel that you know what to do when your blood sugar level goes higher than it should be (hyperglycemia) or lower than it should be (hypoglycemia)?
- In the past 4 weeks, what level of distress did you have with the following: the demands of living with diabetes; my diabetes routine; possible serious long-term complications, no matter what I do.

[30] Proportions did not change significantly from 2014.

[31] Stanford Patient Education Research Center. Diabetes self-efficacy scale website. http://patienteducation.stanford.edu/research/sediabetes.html. Accessed August 8, 2017.

Figure 15. Confidence in Managing Hyperglycemia/Hypoglycemia (PWD): 2016[32]

PWD varied in their level of confidence in responding when their blood sugar was too high or too low



Note: Percentages might not add up to 100 due to rounding.

Levels of confidence in handling hypoglycemia (but not hyperglycemia) differed significantly by age group. PWD ages 65 and older reported significantly higher confidence in handling hypoglycemia compared to PWD ages 45 to 64. More than half of PWD ages 65 and older reported that they were totally confident in their ability to handle hypoglycemia (53%, n=92), compared to 30 percent (n=94) of PWD ages 45-64 and 33 percent (n=12) of PWD ages 35-44.

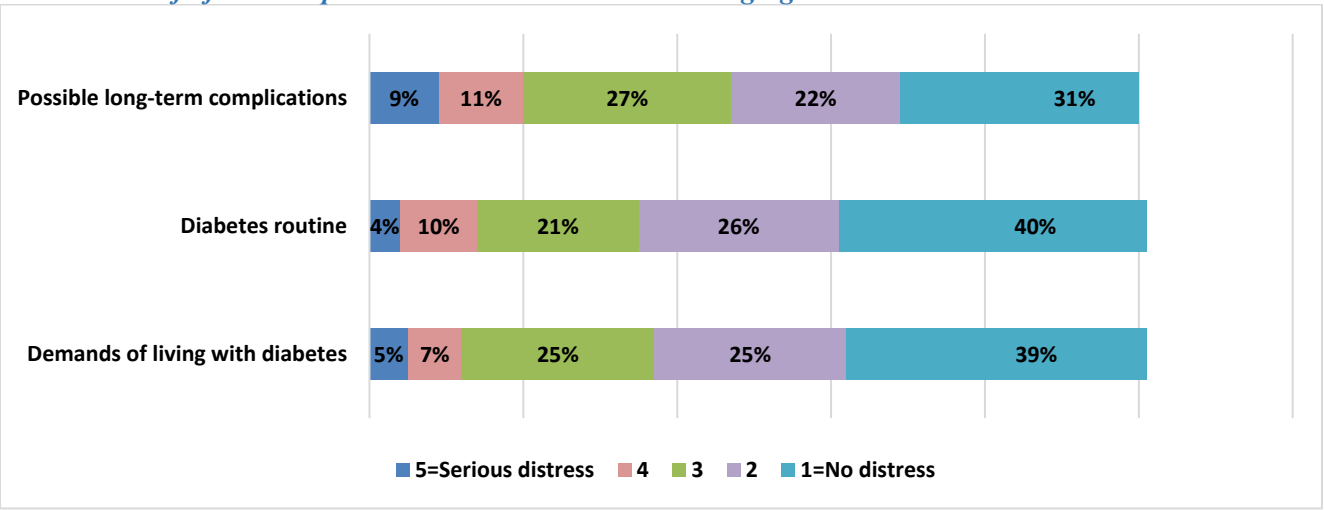
Distress with diabetes

The 2014 NNDS and 2016 NNDS also asked PWD to rate their level of distress in the past 4 weeks due to: (1) "The demands of living with diabetes," (2) "My diabetes routine," and (3) "Possible serious long-term complications, no matter what I do." Respondents indicated their level of distress on a 5-point scale with the end points labeled as "No distress" and "Serious distress." The responses to the 2016 NNDS indicated that, for the majority of PWD, there was some level of distress. The largest proportion of PWD reported distress because of possible long-term complications. The demands of living with diabetes and the diabetes routine also were substantial sources of distress for PWD (see figure below).

[32] Proportions did not change significantly from 2014.

Figure 16. Reported Levels of Distress with Managing Diabetes (PWD)[33]

More than half of PWD experienced some distress with managing diabetes



Note: Percentages might not add up to 100 due to rounding.

Distress ratings in each of the three areas did not change significantly from 2014 to 2016.

Diabetes self-management practices

Three questions about diabetes self-management practices have been asked in all rounds of the NNDS. These relate to respondents' use of insulin, diabetes medication, and blood sugar testing in the past 4 weeks. The wording of the questions changed beginning with the 2014 survey. Beginning in 2014, the timeframe was specified as the past 4 weeks, whereas in previous surveys it was unspecified. The proportion of PWD who indicated they engaged in each of these practices did not change significantly from 2011 to 2016. The proportion of PWD reporting self-testing of blood sugar continued to decline from 78 percent of PWD (n=447) in 2011 to 73 percent (n=380) in 2016. This decline, however, was not significant and was not consistent across age and racial/ethnic groups. For example, blood sugar self-testing declined in non-Hispanic White and non-Hispanic Black racial/ethnic groups but actually increased among Hispanics. Self-testing declined only in the youngest (ages 35- 44) age group but the trend was not significant. The proportions of PWD who reported using insulin increased from 2011 to 2016, from 24 percent (n= 167) in 2011, to 27 percent (n=128) in 2016, and this trend held across age and racial/ethnic groups. The proportion of all PWD who reported taking diabetes medications slightly decreased during this time period from 74 percent (n=379) in 2011, to 73 percent (n=364) in 2016, but the proportions increased for PWD ages 65 and older and for Hispanics.

Box 7. Relevant Survey Questions: Diabetes Self-Management Tools

- In the past 4 weeks, which of the following tools and resources have you used to help manage your diabetes?
- Do you use social media (e.g., Facebook, Twitter) to help you learn about or manage your diabetes?

PWD responding to the 2014 NNDS and 2016 NNDS also were asked about use of non-insulin injectable medicines, following a diabetes meal plan, and regularly exercising in the past 4 weeks. The proportion of PWD who indicated that they engaged in each of these practices did not change significantly from 2014 to 2016, overall or by either age or racial/ethnic group. The proportion of PWD reporting use of non-insulin injectable medicines increased from 7 percent (n=40) in 2014, to 10 percent (n=59) in 2016. The proportion of PWD who reported following a diabetes meal plan increased slightly from 56 percent

[33] Proportions did not change significantly from 2014.

(n=281) in 2014 to 57 percent (n=291) in 2016. The proportion who reported exercising regularly decreased, from 57 percent (n=264) in 2014, to 52 percent (n=280) in 2016.

Self-management tools and resources

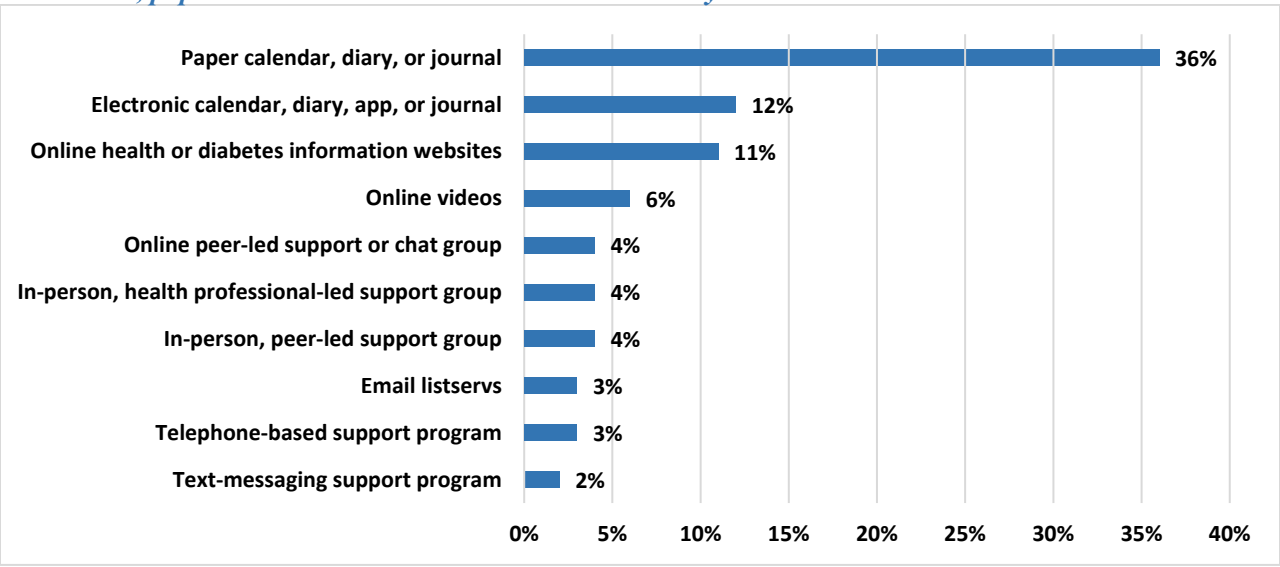
With the expansion and proliferation of technologies for self-help and wellness, opportunities have emerged for PWD to use electronic and social media tools and resources for diabetes learning and self-management. In 2014, the NNDS added questions to determine what tools—traditional and/or emerging—PWD were using at the time. The questions also were designed to try to ascertain whether social media or new technology played a role in PWD's diabetes management. Tools and resources surveyed included in-person support groups; online diabetes community support systems and information (e.g., videos); paper calendars, diaries, and journals for tracking diabetes-related activities; and text-messaging support programs, among others.

According to 2016 NNDS responses, the use of diabetes self-management tools was not common in the 4 weeks prior to survey participation. (See figure below). Paper calendars, diaries, or journals to track diabetes-related activities were used by 36 percent (n=187) of PWD. Twelve percent (n=63) of PWD reported using an electronic calendar, diary, or journal to track diabetes-related activities. The next most popular information/support resource was online health or diabetes information websites, which 11 percent (n=70) of PWD reported using in the past 4 weeks. All other listed tools or resources reportedly were used by less than 10 percent of PWD in the past 4 weeks.

The proportions of PWD who reported using the tools noted in the NNDS to manage their diabetes did not change significantly from 2014 to 2016, with the exception of online videos (e.g., YouTube). Although the proportion remained small, 6 percent (n=29) of PWD who responded to the 2016 NNDS reported using online videos in the past 4 weeks to help them manage their diabetes, compared to only 2 percent (n=21) of PWD who responded to the 2014 NNDS.

Figure 17. Tools and Resources Reported Used to Help Manage Diabetes in 4 Weeks Prior to Survey (PWD): 2016

Traditional, paper-based tools were still the most commonly used



Social media

Social media has become one of the new communication channels for disseminating messages about the prevention and management of diabetes. When asked about their use of social media (e.g., Facebook, Twitter) to help learn about or manage diabetes, 17 percent of PWD reported using it "often" or "only once in a while." The majority of PWD did not report having used social media at all to manage their diabetes. The frequency with which PWD reported using social media to learn about or manage their diabetes did not change significantly from 2014 to 2016.

Figure 18. Use of Social Media in Diabetes Management

Use Social Media to Learn About Diabetes	N	%
Yes, I often use it to learn about or manage my diabetes	15	3
Yes, but only once in a while to learn about or manage my diabetes	84	15
No, I never use it to learn about or manage my diabetes	381	83

PWD who responded to the 2016 NNDS did not differ significantly by age group in their use of social media for managing their diabetes. PWD did differ significantly by race/ethnicity in their reported use of social media for diabetes management, with Hispanic PWD significantly more likely to report using social media to learn about or manage their diabetes compared to non-Hispanic Black and non-Hispanic White PWD. More than one-third (34%, n=51) of Hispanic PWD reported using social media at least occasionally to help them learn about and manage their diabetes. In contrast, only 19 percent (n=32) of non-Hispanic Black PWD and 13 percent (n=14) of non-Hispanic White PWD reported using social media for this purpose.

6. Perceived Risk

Prior to 2014, the NNDS measured personal risk perceptions by asking people who had not been diagnosed with diabetes (non-PWD) whether they felt they could be at risk for diabetes or prediabetes. Beginning in 2014, the NNDS included a modified wording of the question to specify type 2 diabetes and eliminate the mention of prediabetes.

Box 8. Relevant Survey Questions: Perceived Risk

- Do you feel you have a chance of getting type 2 diabetes?
- How high or low do you think your chance of getting diabetes: very high, somewhat high, somewhat low, or very low?
- I think I have a chance of getting type 2 diabetes because of my: family's history of diabetes, weight, age, race/ethnicity, level of physical activity/exercise, health, history of gestational diabetes/diabetes during my pregnancy *(female only)*, other reason.

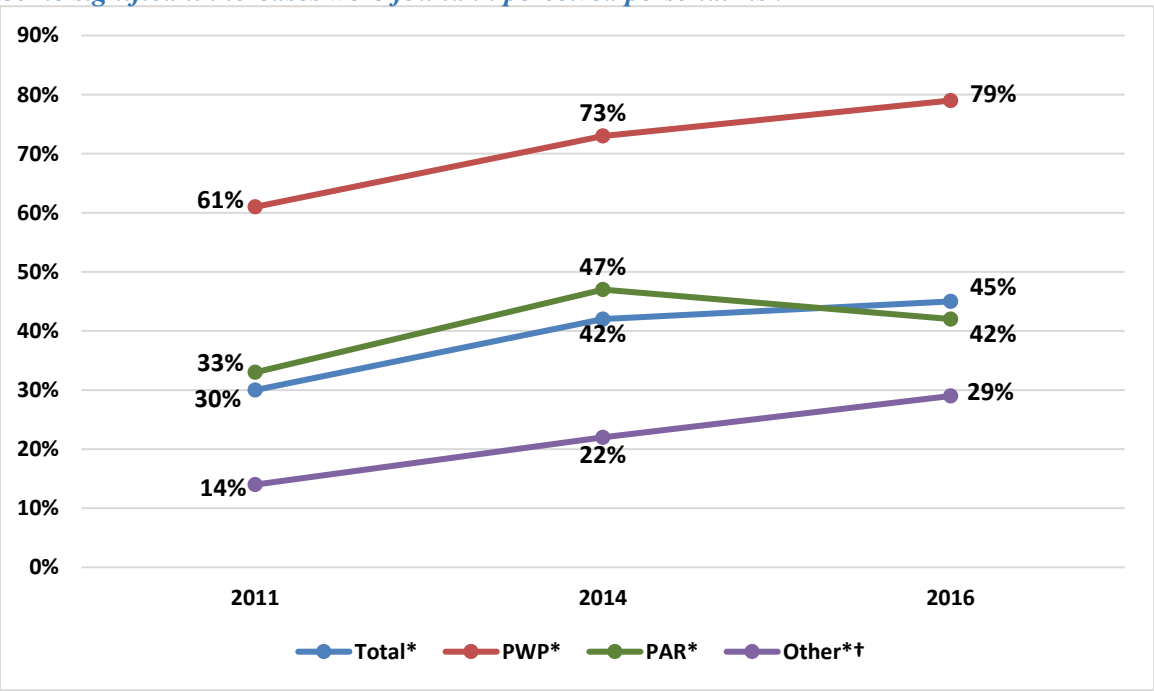
Overall Perceptions of Risk

The proportion of all non-PWD who felt they had a chance of developing diabetes increased significantly from 2011 to 2014. The increase continued from 2014 (42%, n=864) to 2016 (45%, n=837) but was not statistically significant.

Increases in the proportion of respondents who felt they had a chance of getting type 2 diabetes increased for all of the diabetes status subgroups from 2011 to 2016. This increase was significant for PWP, at 61 percent (n=125) in 2011, 73 percent (n=240) in 2014, and 79 percent (n=285) in 2016. Reported perceived risk among PAR changed significantly, from 33 percent (n=252) in 2011 to 47 percent (n=481) in 2014, but this proportion decreased to 42 percent (n=410) in 2016. (This decrease was not statistically significant.) The proportion of respondents who were not deemed to be at risk for diabetes but who felt they were at risk also increased significantly from 2011 to 2016, from 14 percent (n=67) in 2011 to 29 percent (n=142) in 2016.

Figure 19. Feel at Risk of Diabetes (non-PWD)

Some significant increases were found in perceived personal risk



*2016 significantly higher than 2011, $p<0.05$
†2016 significantly higher than 2014, $p<0.05$

Degree of Risk

As a follow-up question for those non-PWD who felt they had a chance of getting diabetes, people were asked in the 2014 NNDS and the 2016 NNDS to report the degree to which they felt at risk. When people were asked to rate their perceived risk from very high to very low, most 2016 NNDS non-PWD respondents (89%, n=731) indicated their risk was in the middle range—either somewhat high or somewhat low–with very few selecting extreme ratings.

Responses to the question about degree of risk did not significantly differ by age or race/ethnicity. Responses did differ significantly by diabetes status, with 65 percent of PWP, 45 percent of PAR, and 15 percent of All Others indicating that their chance of getting diabetes was very or somewhat high.

Overall, responses among non-PWD regarding the degree to which they thought they were at risk for diabetes did not change significantly from 2014 to 2016. Changes in response to this question also were non-significant for all diabetes status groups except for those in the "All Others" category (not considered to be at risk for diabetes). Analyses revealed that the proportion of non-PWD in this category who indicated that their risk was "somewhat low" increased significantly from 2014 to 2016 (from 55%, n=71 in 2014, to 78%, n=90 in 2016).

Reasons for Perceived Chance of Getting Diabetes

In the 2014 and 2016 NNDS, the question about reasons for perceived chance of getting diabetes was modified from the 2011 open-ended version to one that included pre-coded response categories based on

those that had been spontaneously mentioned in prior surveys. The question also dropped the reference to prediabetes and specified type 2 diabetes.

Prior to the NNDS modifications in 2014, few significant trends were found in the reasons given for perceived chance of getting diabetes among adults ages 45 and older with diabetes risk factors. The reason mentioned most often was family history.

In 2016, respondents who indicated that they felt at risk for diabetes were asked to select from eight reasons why they felt at risk: family history, weight, age, race/ethnicity, level of physical activity/exercise, health, gestational diabetes (females), and other. Respondents were able to select more than one possible reason. The most commonly cited reasons were weight (67%, n=512), family history (57%, n=487), and level of physical activity/exercise (51%, n=389). No significant changes were seen between 2014 and 2016 with regard to the reasons respondents gave for feeling at risk for diabetes.

7. Diabetes Preventive Behaviors

Since 2003, the NDEP has launched several waves of campaigns and developed messages and materials around diabetes prevention. Since that time, the NNDS detected significant gains in knowledge that type 2 diabetes can be prevented or delayed and an awareness of the term *prediabetes*. The 2014 and 2016 NNDS took a step further toward asking questions that are more detailed about the type and content of any diabetes prevention information the public was receiving, from whom, and what actions they might have been taking in response to this information.

Advice or Counseling to Prevent or Delay Diabetes

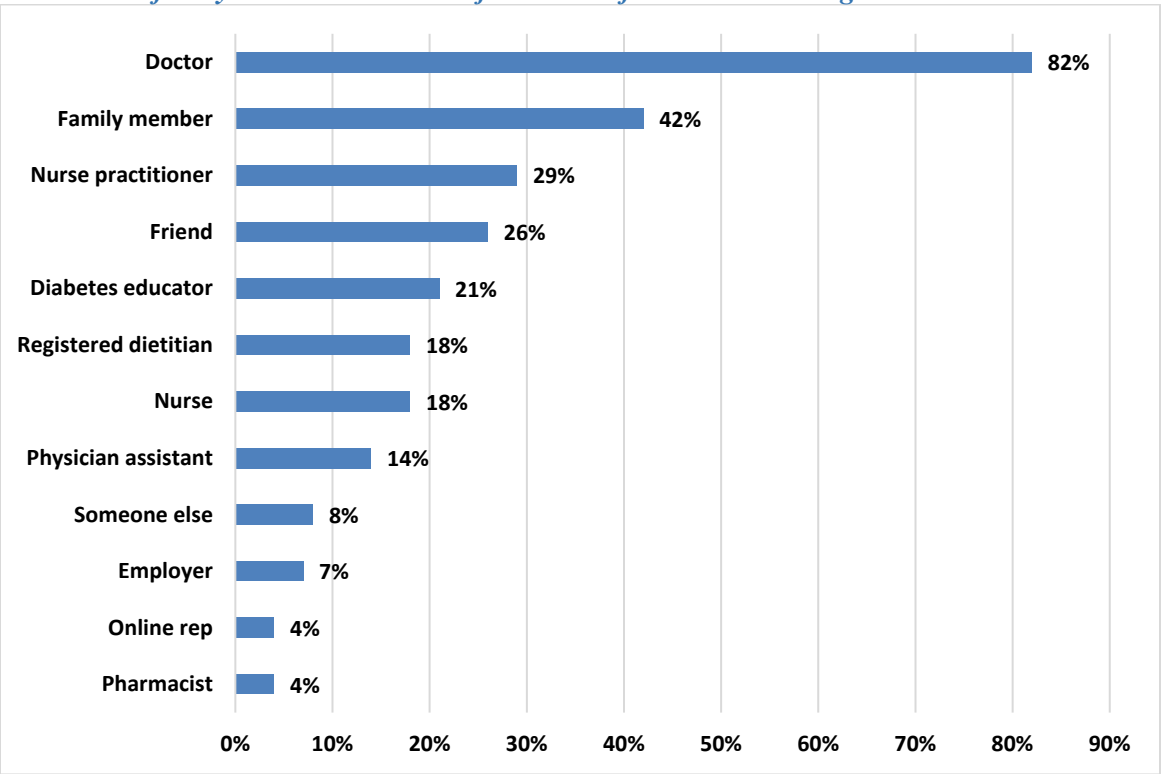
The 2014 and 2016 NNDS asked non-PWD if they had received counseling in the past 12 months about how to prevent diabetes. Among adults ages 35 and older, diabetes prevention advice/counseling for non-PWD was not commonly reported, at 16 percent (n=437). This proportion was 45 percent (n=199) for PWP and significantly lower for PAR at 11 percent (n=162). The main sources of advice and counseling among non-PWD were doctors and family members, at 82 percent (n=348) and 42 percent (n=161), respectively.

Box 9. Relevant Survey Questions: Diabetes Preventive Behaviors

- In the past 12 months, who gave you advice or counseling about how to prevent diabetes?
- Did you receive advice and counseling to control your weight or lose weight, reduce calories and/or portion sizes in your diet, increase your physical activity or exercise, and/or take medicines?

The proportion of non-PWD who reported receiving diabetes prevention advice and counseling from diabetes educators increased significantly, from 13 percent (n=70) in 2014 to 21 percent (n=83) in 2016. Conversely, the proportion of non-PWD who reported receiving diabetes prevention advice and counseling from doctors decreased substantially during the same period, from 89 percent (n=352) in 2014 to 82 percent (n=348) in 2016. This decrease approached but did not reach statistical significance. The proportion of non-PWD reporting advice/counseling from other sources did not change significantly from 2014 to 2016.

Figure 20. Source of Advice or Counseling about How to Prevent Diabetes (non-PWD): 2016
Doctors and family members were a major source of advice/counseling



Type of advice

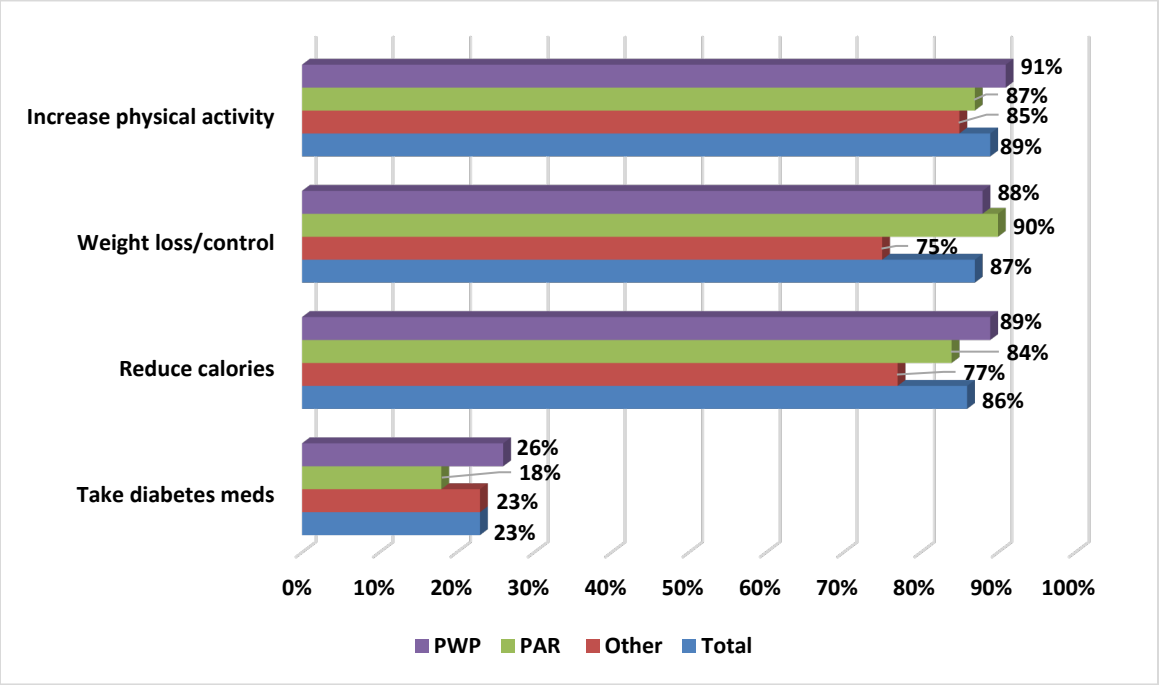
In the 2014 and 2016 NNDS, non-PWD who reported receiving counseling or advice in the past 12 months were asked whether that advice or counseling included four specific recommendations:

- Lose or control weight
- Reduce calories/portion sizes
- Increase physical activity/exercise
- Take medications.

Among all non-PWD who reported receiving advice or counseling in the 2016 NNDS, similar proportions of respondents received advice to control or lose weight (87%, n=371), to reduce calories (86%, n=368) or increase physical activity/exercise (89%, n=389). However, it was much less common, at 23 percent (n=123), for non-PWD to receive advice on taking medicines in relation to diabetes prevention. For 2016, no statistically significant differences were observed between the proportion of PWP, PAR, and All Others who reported receiving each type of advice/counseling.[34]

[34] All non-PWD who reported receiving advice or counseling from any party (doctor, family member, diabetes educator, employer, etc.) to engage in each of the four health practices listed. The proportions that received advice or counseling for each health practice did not change significantly from 2014 to 2016.

Figure 21. Proportion of Non-PWD in Each Diabetes Status Group Who Received Each Type of Advice/Counseling: 2016



Preventive Actions by Respondent

In the 2016 NNDS, respondents who had not been diagnosed with diabetes were asked if they had taken action in the past 12 months to reduce their risk of developing diabetes. Slightly more than half of non-PWD, 53 percent (n=1,148), reported that they had taken action. PWP were significantly more likely to report having taken action than PAR or All Others, at 71 percent (n=308), 52 percent (n=568), and 43 percent (n=272), respectively.

Those who reported taking action were asked whether their activities included nine types of activities. These activities included managing/losing weight, reducing calories or portion sizes, increasing amount of exercise, taking medications, planning bariatric surgery, building more physical activity into daily activities, walking, engaging in light-to-moderate physical activity, and engaging in vigorous physical activity. Among non-PWD, the three most commonly reported activities related to weight, diet, and walking for exercise.

Box 10. Relevant Survey Questions: Diabetes Preventive Behaviors

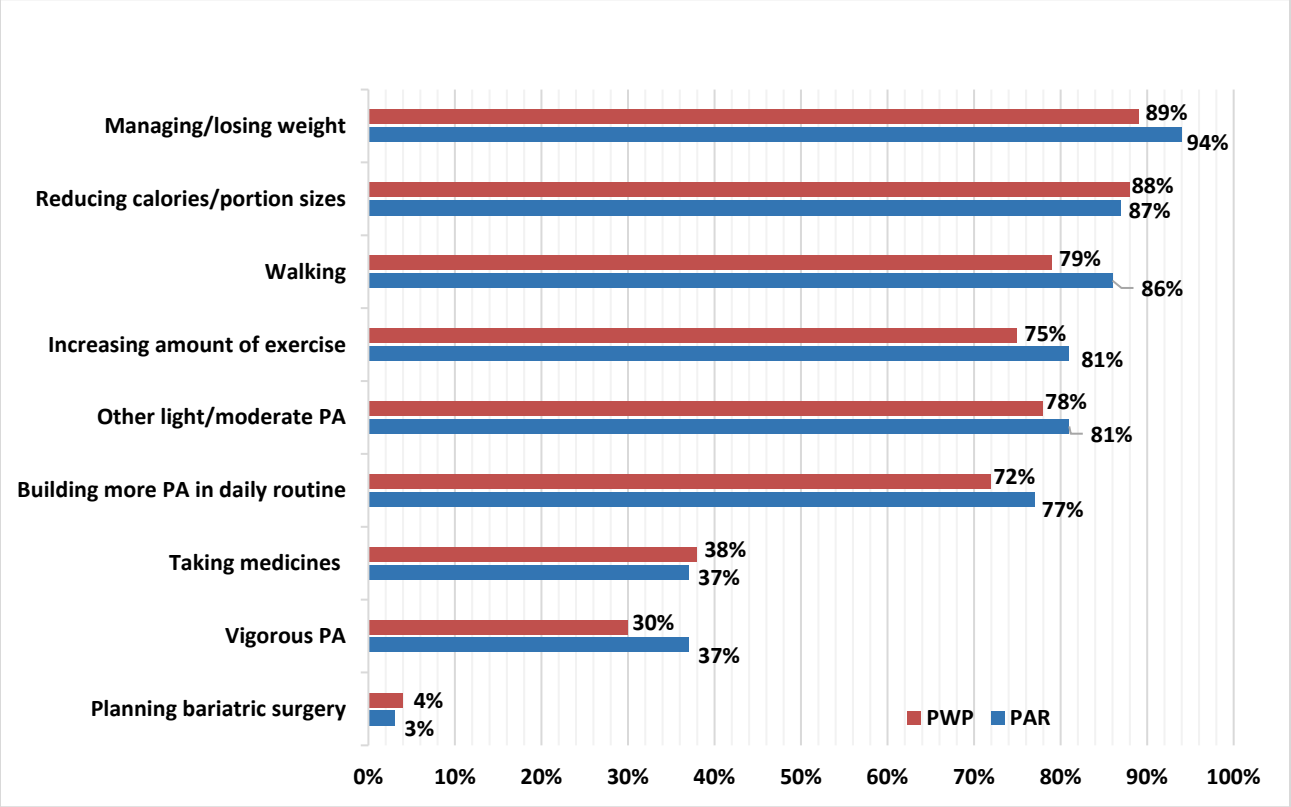
- In the past 12 months, what have you been doing (if anything) to reduce your chance of getting diabetes?
- In the past 12 months, which types of classes, programs, coaching, or counseling sessions to help you prevent or delay your chance of getting diabetes and its complications did you attend?
- Who provided the classes, programs, coaching, or counseling sessions?
- In the next 6 months, how likely are you to become more active to reduce your chance of getting diabetes?
- Why are you not likely to do something to reduce your chance of getting diabetes?
- In the past 12 months, has anyone encouraged you to attend any programs or classes or change your lifestyle to help you prevent diabetes?

Among non-PWD who reported doing anything to reduce their chances of getting diabetes in the past 12 months, the proportion who reported each of the eight activities related to diet, weight, physical activity, and surgery did not change significantly from 2014 to 2016. The proportion who reported taking

medicines as prescribed to reduce their diabetes risk, however, decreased significantly from 44 percent (n=433) in 2014 to 35 percent (n=391) in 2016.

Planning to have bariatric surgery as a diabetes prevention strategy was rare among non-PWD in the 2016 NNDS. Among PWP, 4 percent (n=10), PAR at 3 percent (n=11) and All Others at less than 1 percent (n=1) planned to have bariatric surgery. Significant differences among respondents by diabetes status were found for most exercise-related activities.[35] For these activities, PWP and PAR were significantly less likely than All Others (i.e., all non-PWD who were not already classified as PWP or PAR) to report planning to increase the amount of exercise and engage in vigorous activities or sports. PWP (but not PAR) were significantly less likely than All Others to report planning to walk and to build more physical activity into their daily work or at home.

Figure 22. Diabetes Prevention Activities
Weight control and diet topped the list



[35] "Increasing the amount that you exercise," "Building more PA in to your daily work or at home," "Walking (including walking for exercise, walking to or from and while at work)," and "Doing vigorous activities or sports (e.g., biking, jogging, swimming, or aerobics)."

Types of education/classes

In the 2016 NNDS, people not diagnosed with diabetes were asked whether they had attended any classes, programs, or coaching/counseling sessions in the prior 12 months to help prevent or delay diabetes and its complications. Approximately 3 percent (n=92) of non-PWD reported that they attended classes, etc. Among those who had participated, people stated that the programs, classes, or counseling included:

- Advice related to nutrition: 78 percent (n=68)
- Weight loss: 66 percent (n=55)
- Health and wellness: 63 percent (n=62)
- Exercise: 62 percent (n=57)
- Stress management: 28 percent (n=32)
- Smoking cessation: 18 percent (n=22)
- Other: 8 percent (n=4)

These proportions did not change significantly from 2014 to 2016.

Who provided education/classes?

Among non-PWD who said that they attended classes, programs, or coaching/counseling sessions to prevent diabetes, 2016 NNDS respondents were most likely to report that these were provided by their doctor or another HCP at 65 percent (n=63). Although the numbers were small, the next most common mentions were:

- Their health insurance plan: 43 percent (n=39)
- The local community: 26 percent (n=28)
- Their employer: 19 percent (n=20)
- Private business: 17 percent (n=15).[36]

These proportions did not change significantly from 2014 to 2016.

Likelihood of taking more action, or reasons for not taking action

In 2016, approximately two-thirds (67%, n=1,486) of non-PWD reported that they were "somewhat likely" or "very likely" to become more active in the next 6 months to reduce their chance of getting diabetes. This proportion represents a nonsignificant increase, from 66 percent of non-PWD who responded to the 2014 NNDS. Seventy-one percent (n=1,507) of non-PWD reported that they were "somewhat likely" or "very likely" to lose weight in the next 6 months to reduce their chance of getting diabetes. This proportion also represents a nonsignificant increase, from 68 percent of non-PWD who responded to the 2014 NNDS.

In 2016, approximately one-third of non-PWD indicated they were "not at all" likely to become more active in the next 6 months to reduce their diabetes risk. Non-PWD who reported they were not likely to take action to prevent diabetes were asked to select from a list of 10 possible reasons. The most common among these were:

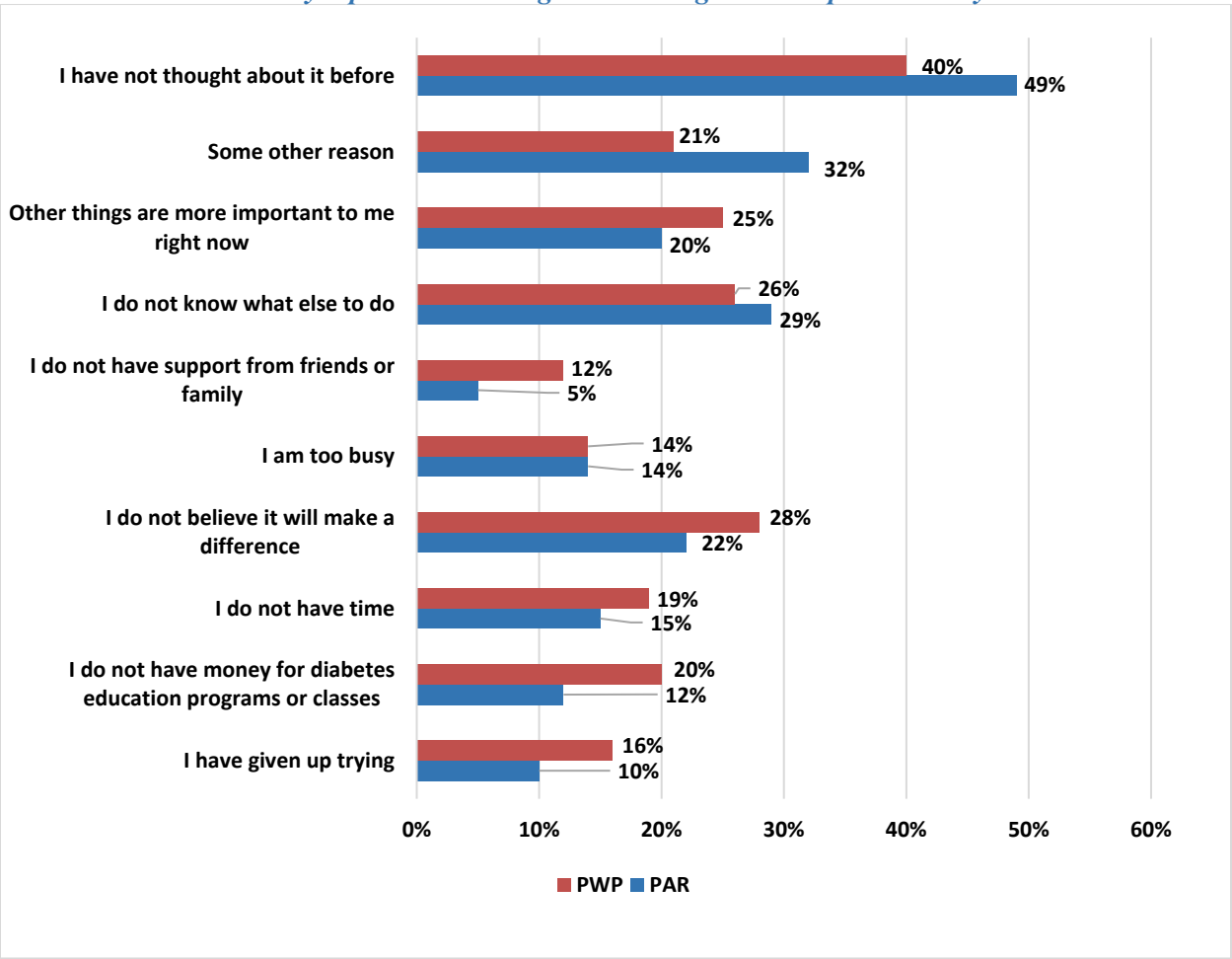
- "I have not thought about it before": 45 percent (n=276)
- "I do not know what else to do": 28 percent (n=182)
- "Other things are more important to me right now": 21 percent (n=128).[37]

[36] "Other" provider was excluded from the analysis because of the small number of respondents (n=4).
[37] The numbers are based on analysis of non-PWD who responded "not at all likely" to either the question about becoming more active or the question about losing weight in the next 6 months.

The three most common reasons for not making the specified lifestyle changes were the same for both 2014 NNDS and 2016 NNDS non-PWD respondents, and the proportions did not change significantly across survey years. Similar proportions of PWP, PAR, and All Others mentioned these three reasons. The proportion of non-PWD giving other reasons for not taking action did not differ significantly across other diabetes status groups, with the exception of "I have given up trying." PWP were significantly more likely to give this reason relative to PAR and All Others.

Figure 23. Reasons People Not Diagnosed with Diabetes Are Not Planning to Take Action to Prevent/Delay Diabetes: 2016

Non-PWD most commonly report not thinking about taking action to prevent/delay diabetes



Sources of encouragement

In the 2016 NNDS, 11 percent (n=335) of non-PWD reported they had been encouraged to attend programs or classes to change their lifestyle to prevent type 2 diabetes. This proportion represents a significant decrease from the 15 percent of non-PWD who reported that they had been encouraged to engage in these activities in the 2014 NNDS.

The figure below presents the sources of encouragement. Encouragement was most likely to come from a respondent's doctor or from family members, at 59 percent (n=188) and 56 percent (n=194), respectively. In 2016, no significant differences were found between diabetes status groups with regard to sources of encouragement to attend programs or classes or make lifestyle changes to prevent diabetes.

Figure 24. Source of Encouragement for Diabetes Prevention: 2016

Source of Encouragement	PWP	PAR	All Others	Total
Doctor	69%	52%	51%	59%
Diabetes educator	15%	9%	8%	11%
Registered Dietitian	12%	5%	2%	8%
Other health professional	19%	22%	16%	20%
Family	46%	66%	52%	56%
Friends	29%	21%	36%	26%
Employer	4%	8%	9%	6%
Someone else	9%	12%	13%	11%

The proportion of non-PWD who reported each source of encouragement did not change significantly from 2014 to 2016, with the exception of diabetes educator. The proportion of non-PWD reporting that a diabetes educator encouraged them to attend programs or classes to change their lifestyle to prevent diabetes increased from 5 percent (n=38) in 2014 to 11 percent (n=47) in 2016.

8. Results Summary

Highlights

The 2016 NNDS, together with previous rounds of the survey, offered several interesting results with potential implications for diabetes outreach and education. Key findings include:

Overall

Awareness of the link between diabetes and heart disease remains low.
As in 2014, only three-quarters of 2016 NNDS respondents reported knowing about the relationship between CVD and diabetes. A higher proportion of respondents reported knowing about the relationship between diabetes and death, amputation, blindness, kidney disease, and foot ulcers. The proportion reporting knowledge about other conditions linked to diabetes, however, was low (66% or less).

A significantly higher proportion of PWD reported awareness of the relationship between CVD and diabetes (83%) compared to other diabetes status groups. Awareness among PWP, however, was only 76 percent in spite of the fact that PWP also are at increased risk of CVD.[38]

Awareness of a family history of diabetes has risen.
The proportion of survey respondents who reported a family history of diabetes increased significantly from 2011 to 2016 among all age groups, major racial/ethnic groups, and diabetes status groups.

Doctors and family members continue to be important sources of information, advice, and counseling about diabetes.
Doctors remained the most common sources of advice and counseling about diabetes in the 2016 NNDS. Among PWD who received advice or counseling about diabetes in the past year, 94 percent reported receiving advice or counseling from their doctor. Family members were the second most common source of advice/counseling, reported by 42 percent of PWD. The proportion of PWD who reported receiving advice/counseling from diabetes educators (41%), nurse practitioners (41%), and nurses (40%) was

[38] Ratner R, Goldberg R, Haffner S, et al. Impact of intensive lifestyle and metformin therapy on cardiovascular disease risk factors in the diabetes prevention program. *Diabetes Care.* 2005;28(4):888–94.

similar. The proportion of PWD who reported receiving advice/counseling from a diabetes educator or nurse increased, whereas the proportion who reported receiving advice/counseling from a family member decreased from 2014 to 2016, but these changes were not significant.

The main source of diabetes prevention advice/counseling among non-PWD also came from doctors (82%), followed by family members (42%). The proportion of non-PWD who reported receiving diabetes prevention advice/counseling from doctors declined from 2014 to 2016, whereas the proportion who reported receiving this advice/counseling from family members increased. These changes, however, were not significant. Notably, the proportion of non-PWD who reported receiving diabetes prevention advice and counseling from diabetes educators increased significantly, from 13 percent (n=70) in 2014 to 21 percent (n=83) in 2016. In addition, the proportion of non-PWD who reported that a diabetes educator encouraged them to attend programs or classes to prevent diabetes increased significantly from 2014 to 2016.

Regular care by a diabetes educator remains low.
Although the proportion of respondents who reported receiving counseling/advice from a diabetes educator increased, regular care by a diabetes educator remained low. In 2016, only 9 percent of those who sought care from someone other than their usual HCP reported receiving care from a diabetes educator.

Health care coverage is high, but knowledge of health/wellness program coverage is unclear.
Only 38 percent of respondents with health care coverage knew that their coverage included health/wellness programs. A similar proportion of respondents with coverage *did not know* whether their coverage included any weight loss, exercise, or other health or wellness programs (37%).

Disparities continue to exist in having a usual HCP and in the frequency of visits to that provider among those who have a usual HCP.
Hispanic, younger, and low-income respondents were significantly less likely to have a usual HCP. For respondents who had a usual HCP, non-Hispanic Whites were significantly less likely to see their HCP regularly (every few months or more often). Similar disparities were found in 2014.

Among PWD

Some diabetes self-management practices appear to be increasing while others are declining.
Self-monitoring of blood sugar declined overall and for all age and racial/ethnic groups except Hispanics, for which self-monitoring increased. The proportion of PWD who reported using insulin increased from 2011 to 2016 among all racial/ethnic groups. Conversely, the proportion of all PWD who reported taking diabetes medications decreased slightly during this time period but increased for the oldest age group and for Hispanics.

Confidence and distress related to managing diabetes remains a problem for PWD.
A large proportion of PWD reported that they were not totally confident in knowing what to do when their blood sugar became too high or too low. In 2016, 65 percent of PWD indicated that they were *not* totally confident in responding to hyperglycemia, and 60 percent indicated that they were *not* totally confident in responding to hypoglycemia. These figures were similar in 2014, with 70 percent of PWD reporting they were *not* totally confident in responding to hyperglycemia and 58 percent reporting they were *not* totally confident in responding to hypoglycemia.

Levels of distress with the daily diabetes care routine, the demands of living with diabetes, and possible long-term complications also did not change significantly from 2014 to 2016. Most PWD respondents to the 2016 NNDS reported some level of distress in these areas.

Use of social media and online tools remains low among PWD.
As in 2014, very few respondents reported regularly using social media as a resource for information on diabetes prevention or management in 2016. Respondents with diabetes continued to prefer print sources.

Frequency and awareness of A1C testing among PWD has improved.
Approximately 89 percent of PWD respondents reported that they had heard of the A1C or the glycosylated hemoglobin test, a significant increase over the 2014 proportion of PWD who reported that they had heard of this test. Trend data from 2011 to 2016 showed a significant increase in A1C awareness overall, especially for Hispanics and non-Hispanic Black PWD. A1C awareness also increased significantly for PWD ages 65 and older during the same time period.

The majority of PWD respondents to the 2016 NNDS indicated that they received an A1C test more than once in the prior year, a finding that is consistent with the A1C guidelines (at least two or more tests per year).[39] The proportion of PWD having the A1C test more than once a year increased from 2011 to 2016, but not significantly.

Among non-PWD

Diabetes prevention awareness remains high but varies by diabetes status and demographic factors.
More than 79 percent of 2016 NNDS respondents (n=1,906) reported that they were aware that type 2 diabetes can be prevented. Non-PWD who have not been told they are at risk for type 2 diabetes, have no history of gestational diabetes, and are not overweight (All Others) were significantly less likely compared to PWP and PAR to know that diabetes could be prevented. Awareness in the "All Others" group also has been decreasing since 2011.

- Non-Hispanic Whites were significantly more likely to report that they were aware that diabetes could be prevented compared to non-Hispanic Blacks and Hispanics.
- Respondents with higher income levels were more significantly likely to report awareness that diabetes could be prevented.

The lack of acknowledgement of risk among many at risk for diabetes continued.
Nearly half of those at risk for type 2 diabetes did not feel at risk for diabetes. This proportion increased slightly from 2014 to 2016 (from 47% to 48%). Among PWP only, however, the proportion who felt that they personally were at risk for diabetes increased significantly from 2011 to 2016, but approximately one-fifth of PWP still believed that they were not at risk. More than half of those at risk were taking some action to prevent diabetes. This proportion increased from 54 percent in 2014 to 57 percent in 2016. The majority of PWP and PAR, however, did not receive diabetes prevention advice or counseling in the past year.

People are taking positive actions to improve their health and reduce their risk of diabetes, but there is room for improvement.
More than half of all respondents reported taking some action in the past year to prevent diabetes. This rate was significantly higher for PWP, at 71 percent.

Perceived ability to reduce one's risk of diabetes is decreasing.
Among non-PWD who felt they were at risk for diabetes, the perceived ability to reduce their personal risk of getting type 2 diabetes decreased significantly from 2011 to 2016.

[39] American Diabetes Association. Standards of medical care in diabetes–2016. *Diabetes Care.* 2016;39(suppl. 1): S39–S42.

Having a known diagnosis of prediabetes might influence behaviors.
Among non-PWD, knowing their prediabetes diagnosis seemed to influence behaviors among those at risk. Specifically, PWPs were significantly more likely than PARs to report taking action in the past 12 months to reduce their chance of getting diabetes. In addition, PWP were significantly more likely to report receiving advice/counseling in the past year about preventing diabetes.

Limitations

A few potential limitations should be kept in mind when interpreting the survey results:

- Because the data are self-reported, they may at times reflect personal influences and subjective information.
- In addition to sampling error, other factors may have introduced error or bias into the findings, such as the way questions were worded or the practicalities of administering the surveys.
- Not all of the differences found across the surveys were statistically significant. This was sometimes due to small cell sizes and their associated large standard errors, particularly when the data were tabulated by subgroup (e.g., race/ethnicity, age group, or diabetes status).
- Changes in the survey administration mode (i.e., from telephone to web survey) do not appear to have affected data trends but may have had some unobserved effects.
- Analyses were performed to identify significant changes from NNDS 2014 to 2016 in responses to the questions added in 2014. Significant changes in responses between the two survey years should not be interpreted to indicate significant longer-term trends because of the short time period between the two surveys.

9. Potential Program Implications

The NDEP's conduct of the NNDS over the last several years has provided the Program and its 200-plus partner organizations across the nation with usable, evidence-based information on the U.S. adult public's perspectives on and practices regarding diabetes. The Program's education efforts apply this information toward the prevention of type 2 diabetes and better diabetes management and control. The findings presented in this report from three NNDS surveys (2011, 2014, and 2016) of adults 35 years of age and older help demonstrate the continued success and effectiveness of the NDEP and its partners.

In 2014, several questions were added to provide the Program with more data, including on preventive actions taken, the source of care and advice/counseling to prevent diabetes, and access to health care and understanding of people's health insurance coverage. These, among other new questions, should prove vital to highlighting opportunities and possible next steps for the NDEP.

Synthesis of key results has generated a list of potential implications for the NDEP:

Continue to address the link between diabetes and CVD.
A quarter of 2016 NNDS respondents did not relate CVD-related problems such as heart disease, heart condition, heart attack, or stroke to diabetes. Even among PWD, almost a fifth did not associate CVD with diabetes. The link between CVD and diabetes should be addressed shortly after a diabetes and possibly a prediabetes diagnosis. Health providers and diabetes educators can help educate people about steps they can take to lower their CVD risk associated with diabetes and prediabetes.

Disseminate messages to HCPs about diabetes education and improving outcomes.
Doctors and other primary HCPs are well positioned to include diabetes prevention and management messages as part of their regular care. Responses from the most recent NNDS indicate that doctors and family members continue to play a central role in providing advice/counseling on the prevention and management of diabetes.

Analyses of 2014 and 2016 NNDS data revealed a notable increase in the use of diabetes educators. Doctors and diabetes educators should be encouraged to work together in primary care settings. Encourage doctors to refer patients to diabetes educators and community programs. Further engagement with HCPs should help improve education, awareness, and prevention for all diabetes status populations.

Increase support for family interventions.
Although recent NNDS have identified doctors as the primary source of advice/counseling, family also was very important. Engage family members with messages about their crucial role in addressing the psychosocial barriers and challenges associated with managing their loved one's disease.

Diabetes education messages should also help empower family members of PWD to obtain screening for diabetes. Diabetes educators also should promote family-based interventions for healthy lifestyles and diets to prevent and delay diabetes onset.

Promote confidence building and support for diabetes management.
The finding showing moderate levels of confidence among PWD respondents to the 2016 NNDS underscore the need for continued support to further increase confidence in managing diabetes. Attention should be focused on increasing confidence in managing hypo- and hyperglycemia. Issues surrounding diabetes distress could be addressed by providing coping and psychosocial/emotional support.

Given the finding that less than half of NNDS 2016 respondents with diabetes still were not fully confident in knowing what to do when their blood sugar was too high or too low, and that they were experiencing some level of distress in managing their diabetes, leveraging resources for diabetes management may be crucial.

Focus on health insurance and health care coverage education.
Analyses of NNDS 2016 responses revealed that more than a third of respondents (37%) indicated they did not know whether their health insurance coverage included diabetes preventive activities and resources. This finding suggests a need to encourage people to ask about and understand what diabetes-related services and care are covered as part of their health insurance. Educate people about ways to overcome barriers and issues related to access to health care coverage. Help those without coverage find resources in their community to manage their diabetes.

Glycemic monitoring and control—focus on self-management and checking blood sugar.
Comparisons of responses to 2011, 2014, and 2016 NNDS indicated that more PWD respondents know about the A1C test and are obtaining A1C tests at the recommended frequency. Analyses also revealed, however, that with the exception of Hispanic PWD, they were checking their own blood sugar less often. Educators have an opportunity to help their clients learn the value of monitoring their own blood sugar and using the results to manage their diabetes.

Focus on increasing screening, early diagnosis, and intervention for prediabetes/diabetes.
Encourage primary HCPs to focus attention on screening for those at risk of diabetes and prediabetes so that, if risk factors are present, an early diagnosis can be made and communicated to the patient. Primary

HCPs should be prepared to help patients with prediabetes initiate lifestyle changes for type 2 diabetes prevention. They should refer patients with newly diagnosed diabetes for diabetes education.

Continue to engage with NDEP partners.
Changes cannot be made in a vacuum. The NDEP recognizes the value of its partnership with member organizations and the important input and collaboration they can provide. The NDEP will continue to work with partner organizations to promote and disseminate NDEP messages.

Appendices

- Appendix A. NNDS 2016 Sampling and Weighting Methodology
- Appendix B. Demographic Characteristics and Diabetes Status, Ages 35+ (2016, 2014, 2011)
- Appendix C. Data Tables for Figures
- Appendix D. NNDS 2016 Questionnaire

APPENDIX A. NNDS 2016 SAMPLING AND WEIGHTING METHODOLOGY

Study Sample

The weighting of the NNDS 2014 and 2016 survey responses differed from the methodology used in previous NNDS survey rounds. GfK's KnowledgePanel (KP) was designed to be representative of the U.S. adult population on a broad set of characteristics, including individuals with Spanish language preference and without access to a landline telephone. To ensure representativeness, however, the entire KP is weighted to the March supplement to the Current Population Survey (CPS) on the following dimensions:

- Gender (Male/Female)
- Age (18–29, 30–44, 45–59, and 60+)
- Race/Hispanic ethnicity (White/Non-Hispanic, Black/Non-Hispanic, Other/Non-Hispanic, 2+ Races/Non-Hispanic, Hispanic)
- Education (Less than High School, High School, Some College, Bachelor and beyond)
- Census Region (Northeast, Midwest, South, West)
- Household income (under $10k, $10K to <$25k, $25K to <$50k, $50K to <$75k, $75K to <$100k, $100K+)
- Home ownership status (Own, Rent/Other)
- Metropolitan Area (Yes, No)
- Internet Access (Yes, No)

When selecting from the KP population for inclusion in this study, GfK applied a probability proportional to size (PPS) procedure based on the weights applied to select a sample that would be fully self-weighted, with the sample limited to the 35+ general population.

Post-Stratification Weights

Once the study sample had been selected and fielded, and all the survey data were edited and made final, design weights were adjusted for any survey nonresponse as well as any under- or over coverage imposed by the study-specific sample design. For this purpose, an iterative proportional fitting (raking) procedure was used to produce final weights that will be aligned with respect to all study benchmark distributions simultaneously. In the final step, calculated weights were examined to identify and, if necessary, trim outliers at the extreme upper and lower tails of the weight distribution. The resulting weights were then scaled to the sum of the total sample size of all eligible respondents.

For this study, GFK started with the pre-weights and weighted all respondents from the combined three race groups (1=white/others, 2=African American, 3=Hispanic) to look like the ages 35+ US population by controlling the demographics within three race/ethnicity groups (1=White, Other, Multi-Races/Non-Hispanic; 2=African American/Non-Hispanic; 3=Hispanic) used for stratification. Then, GFK trimmed the weights separately within the 3 groups and scaled the weights to sum to the sample size of total respondents (n=2517).

For this study, the following benchmark distributions of 35+ U.S. Genpop from the March/2016 data from the Current Population Survey (CPS) were used for the raking adjustment of weights:

- Age (35-44, 45-54, 55-64, 65+)
- Gender (Male, Female)
- Race/Ethnicity (White, Black, Hispanic, Other, 2+ Race)
- Census Region (Northeast, Midwest, South, West)

- Education (less than high school, high school, some college, bachelor or higher)
- Household Income (under $25k, $25k-$49,999, $50k-$74,999 and &75k+)
- Origin (Mexican Hispanic, Puerto Rican Hispanic, Cuban Hispanic, other Hispanic, Non-Hispanic)
- Primary Language Within Hispanics.

Detailed information on the demographic distributions of the benchmarks for the March 2016 general population 35+ can be obtained from the U.S. Census Bureau (http://www.census.gov/cps/).

APPENDIX B. NNDS 2016 DEMOGRAPHIC CHARACTERISTICS AND DIABETES STATUS

Appendix Table B1. Demographic Characteristics and Diabetes Status (Number), Ages 35+: 2016, 2014, 2011[40]

Age Group	Total 2016	Total 2014	Total 2011	PWD 2016	PWD 2014	PWD 2011	Prediabetes 2016	Prediabetes 2014	Prediabetes 2011	PAR 2016	PAR 2014	PAR 2011	All Others 2016	All Others 2014	All Others 2011
Total	2517	2535	2016	487	475	475	412	342	216	924	1096	820	576	622	505
35-44	531	574	296	45	43	24	77	60	22	256	308	169	153	163	81
45-64	1313	1321	857	248	242	176	229	190	107	546	566	371	290	323	203
65 and Over	673	640	863	194	190	275	106	92	87	240	222	280	133	136	221

Marital Status	Total 2016	Total 2014	Total 2011	PWD 2016	PWD 2014	PWD 2011	Prediabetes 2016	Prediabetes 2014	Prediabetes 2011	PAR 2016	PAR 2014	PAR 2011	All Others 2016	All Others 2014	All Others 2011
Total	2517	2535	2204	487	475	529	412	342	229	1042	1096	910	576	622	536
Married	1546	1510	1084	262	253	250	268	193	112	656	691	465	360	373	257
Widowed	142	151	391	42	45	108	20	24	42	47	52	130	33	30	111
Divorced	315	327	362	79	81	91	52	42	34	117	124	150	67	80	87
Separated	86	79	74	16	17	22	12	13	8	41	29	36	17	20	8
Never married	353	338	243	74	58	52	50	49	29	146	143	108	83	88	54
Living with partner	75	130	50	14	21	6	10	21	4	35	57	21	16	31	19

Language of Survey	Total 2016	Total 2014	Total 2011	PWD 2016	PWD 2014	PWD 2011	Prediabetes 2016	Prediabetes 2014	Prediabetes 2011	PAR 2016	PAR 2014	PAR 2011	All Others 2016	All Others 2014	All Others 2011
Total	2517	2535	2165	487	475	509	412	342	223	1042	1096	902	576	622	531
English version	2104	2133	1769	400	394	397	323	295	197	911	922	711	470	522	464
Spanish version	413	402	396	87	81	112	89	47	26	131	174	191	106	100	67

[40] Unweighted counts

Race/Ethnicity	Total 2016	Total 2014	Total 2011	PWD 2016	PWD 2014	PWD 2011	Prediabetes 2016	Prediabetes 2014	Prediabetes 2011	PAR 2016	PAR 2014	PAR 2011	All Others 2016	All Others 2014	All Others 2011
Total	2517	2535	2222	487	475	531	412	342	233	1042	1096	915	576	622	543
Non-Hispanic Black	839	840	568	206	200	165	124	120	65	348	338	240	161	182	98
Hispanic	840	842	680	165	156	190	162	112	65	324	384	304	189	190	121
Non-Hispanic White	773	783	878	107	106	154	117	102	92	351	352	342	198	223	290
All Others	65	70	96	9	13	22	9	8	11	19	22	29	28	27	34

Educational Attainment	Total 2016	Total 2014	Total 2011	PWD 2016	PWD 2014	PWD 2011	Prediabetes 2016	Prediabetes 2014	Prediabetes 2011	PAR 2016	PAR 2014	PAR 2011	All Others 2016	All Others 2014	All Others 2011
Total	2517	2535	2196	487	475	519	412	342	232	1042	1096	911	576	622	534
Less than high school	381	376	534	82	82	178	72	44	41	135	151	219	92	99	96
High school	732	691	535	160	146	127	111	90	59	311	305	238	150	150	111
Some college	702	744	568	129	144	136	121	102	65	312	330	224	140	168	143
Bachelor's degree or higher	702	724	559	116	103	78	108	106	67	284	310	230	194	205	184

Gender	Total 2016	Total 2014	Total 2011	PWD 2016	PWD 2014	PWD 2011	Prediabetes 2016	Prediabetes 2014	Prediabetes 2011	PAR 2016	PAR 2014	PAR 2011	All Others 2016	All Others 2014	All Others 2011
Total	2517	2535	2234	487	475	532	412	342	233	1042	1096	924	576	622	545
Male	1304	1243	721	256	236	190	186	152	67	582	573	317	280	282	147
Female	1213	1292	1513	231	239	342	226	190	166	460	523	607	296	340	398

Appendix Table B2. Demographic Characteristics and Diabetes Status (Weighted Percentages), Ages 35+: 2016, 2014, 2011

Age Group	Total 2016	Total 2014	Total 2011	PWD 2016	PWD 2014	PWD 2011	Prediabetes 2016	Prediabetes 2014	Prediabetes 2011	PAR 2016	PAR 2014	PAR 2011	All Others 2016	All Others 2014	All Others 2011
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
35-44	23.4	23.5	25.1	9.2	9.1	5.1	18.4	14.3	25.8	27.4	27.2	25.3	26.9	28.9	29.5
45-64	49.2	49.7	50.2	50.9	50.9	37.1	53.5	55.5	46.5	47.5	51.1	56.8	49.9	47.0	47.7
65 and Over	27.4	26.8	24.7	39.8	40.0	57.9	28.1	30.1	27.7	25.1	21.7	17.9	23.2	24.1	22.9

Marital Status	Total 2016	Total 2014	Total 2011	PWD 2016	PWD 2014	PWD 2011	Prediabetes 2016	Prediabetes 2014	Prediabetes 2011	PAR 2016	PAR 2014	PAR 2011	All Others 2016	All Others 2014	All Others 2011
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Married	67.5	65.3	63.7	61.4	56.0	62.7	69.7	66.3	67.3	68.8	67.7	66.2	67.7	66.0	59.4
Widowed	5.1	5.8	8.7	8.2	10.9	10.4	2.8	6.6	6.3	5.3	4.6	7.3	4.5	4.6	10.6
Divorced	11.4	10.4	13.7	12.5	12.5	14.8	13.2	6.8	10.2	9.5	9.4	12.3	12.7	12.3	16.5
Separated	2.2	2.2	1.7	2.0	5.6	2.7	3.1	1.5	1.8	2.3	1.3	1.9	1.5	2.1	0.6
Never married	11.6	11.5	9.7	14.0	12.0	8.1	9.6	11.7	10.0	11.3	12.4	10.0	11.8	10.0	9.9
Living with partner	2.2	4.8	2.5	1.9	3.0	1.3	1.6	7.1	4.4	2.8	4.6	2.2	1.9	4.9	3.0

Language of Survey	Total 2016	Total 2014	Total 2011	PWD 2016	PWD 2014	PWD 2011	Prediabetes 2016	Prediabetes 2014	Prediabetes 2011	PAR 2016	PAR 2014	PAR 2011	All Others 2016	All Others 2014	All Others 2011
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
English version	93.6	93.7	95.4	92.1	92.0	93.7	90.5	94.5	98.3	94.9	93.7	94.5	94.1	94.2	96.8
Spanish version	6.4	6.3	4.6	7.9	8.0	6.3	9.5	5.5	1.7	5.1	6.3	5.5	5.9	5.8	3.2

Race/Ethnicity	Total 2016	Total 2014	Total 2011	PWD 2016	PWD 2014	PWD 2011	Prediabetes 2016	Prediabetes 2014	Prediabetes 2011	PAR 2016	PAR 2014	PAR 2011	All Others 2016	All Others 2014	All Others 2011
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Non-Hispanic Black	11.1	10.6	11.6	18.0	15.6	22.0	9.9	9.1	11.3	10.9	10.3	12.0	8.0	9.0	5.0
Hispanic	13.3	12.8	10.8	15.7	14.7	13.6	16.2	13.8	10.6	12.5	13.3	10.3	11.4	10.7	9.9
Non-Hispanic White	68.8	69.8	71.8	59.7	62.5	57.7	68.2	70.3	74.6	72.3	72.9	73.9	68.5	68.7	76.1
All Others	6.9	6.8	5.8	6.6	7.2	6.7	5.7	6.8	3.4	4.3	3.5	3.9	12.0	11.6	9.0

Educational Attainment	Total 2016	Total 2014	Total 2011	PWD 2016	PWD 2014	PWD 2011	Prediabetes 2016	Prediabetes 2014	Prediabetes 2011	PAR 2016	PAR 2014	PAR 2011	All Others 2016	All Others 2014	All Others 2011
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Less than high school	11.8	11.9	12.9	17.1	14.1	22.8	13.0	9.7	15.7	10.8	9.7	12.1	9.7	14.9	7.4
High school	30.6	30.8	31.6	36.5	37.7	30.9	26.7	28.7	24.6	31.9	33.4	36.2	27.2	24.4	27.2
Some college	25.9	26.1	25.9	24.6	26.8	26.7	28.9	25.0	23.9	27.9	29.5	22.7	21.6	21.4	30.4
Bachelor's degree or higher	29.8	31.2	31.8	21.9	21.4	19.6	31.4	36.7	35.8	29.3	27.5	29.1	41.5	39.4	35.0

Gender	Total 2016	Total 2014	Total 2011	PWD 2016	PWD 2014	PWD 2011	Prediabetes 2016	Prediabetes 2014	Prediabetes 2011	PAR 2016	PAR 2014	PAR 2011	All Others 2016	All Others 2014	All Others 2011
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
English version	93.6	93.7	95.4	92.1	92.0	93.7	90.5	94.5	98.3	94.9	93.7	94.5	94.1	94.2	96.8
Spanish version	6.4	6.3	4.6	7.9	8.0	6.3	9.5	5.5	1.7	5.1	6.3	5.5	5.9	5.8	3.2

APPENDIX C. DATA TABLES FOR FIGURES

Figure 1. Survey Sample Size and Duration of Survey, by Round

Survey Round (Year and Period)	Survey Population	Sample Size
2006: March through June	Adults 45 years of age and older	1,763
2008: August through November	Adults 35 years of age and older	2,078
2011: July through September	Adults 35 years of age and older	2,234
2014: December	Adults 35 years of age and older	2,535
2016: August	Adults 35 years of age and older	2,517

Figure 2. Definitions for *Post hoc* Classification of Diabetes Status

Diabetes Status	Abbreviation	Definition
People with diabetes	PWD	People who had been told by a doctor or other health care professional that they had diabetes or sugar diabetes.
People with prediabetes	PWP	People who had been told by a doctor or other health care professional that they had prediabetes, impaired fasting glucose, impaired glucose tolerance, borderline diabetes, or high blood sugar.
People at risk	PAR	People whose self-reported height and weight gave them a body mass index of 25 or greater who had been told by a doctor or other health care professional that they were at high risk for diabetes, or had been told by a health care professional that they had gestational diabetes or high blood sugar during pregnancy.
All Others	All Others	People who met none of the above criteria.

Figure 3. People with Prediabetes (PWP) by Age Group[41]

PWP significantly increased overall and for ages 45 to 64

Respondent Population	2011	2014	2016
35-44	9.5%	7.7%	12.0%
45-64	8.5%	14.0%	16.6%
65+	10.6%	14.1%	15.7%
Total	9.3%	12.5%	15.3%

Note: 2016 significantly different from 2011, $p<0.05$

Figure 4. Had a Blood Test for Diabetes in the Past 12 Months/Year Prior to the Survey, by Diabetes Status

Blood tests increased significantly among PWD

Respondent Population	2011	2014	2016
PWD	76.2%	95.4%	96.2%
PWP	67.2%	79.1%	70.5%
PAR	49.3%	41.3%	45.9%
All Others	35.5%	34.4%	35.2%
Total	51.9%	52.9%	55.2%

Note: 2016 significantly different from 2011, $p<0.05$

[41] All analyses were run to generate output showing one decimal point only.

Figure 5. Reported Family History of Diabetes by Age Group

Reported family history of diabetes increased significantly for all age groups

Respondent Population	2011	2014	2016
35-44	33.0%	30.9%	37.3%
45-64	27.9%	38.2%	42.9%
65+	17.4%	36.1%	33.8%
Total	26.9%	35.9%	39.1%

Note: 2016 significantly different from 2011, $p<0.05$

Figure 6. Trends in Reported Family History of Diabetes by Race/Ethnicity: 2011, 2014, and 2016

Reported family history of diabetes increased significantly for all racial/ethnic groups

Respondent Population	2011	2014	2016
Non-Hispanic Black	33.2%	48.5%	52.3%
Hispanic	47.6%	49.6%	53.0%
Non-Hispanic White	21.6%	32.0%	34.7%
Other	42.3%	32.1%	36.5%
Total	26.9%	35.9%	39.1%

Note: 2016 significantly different from 2011, $p<0.05$

Figure 7. Trends in Family History of Diabetes by Diabetes Status Group: 2011, 2014, and 2016

Reported family history of diabetes increased significantly for all diabetes status groups

Respondent Population	2011	2014	2016
PWD	35.7%	73.4%	72.2%
PWP	30.5%	48.1%	45.0%
PAR	27.7%	29.3%	34.6%
All Others	19.1%	21.9%	24.3%
Total	26.9%	35.9%	39.1%

Note: 2016 significantly different from 2011, $p<0.05$

Figure 8. Reported Health Problems Thought by Respondents to Be Caused by Diabetes: 2016

Awareness of the diabetes and CVD link remains relatively low given that CVD is the leading cause of death among PWD and adults with diabetes are 2 to 4 times more likely to die from CVD

Health Problem	Respondent Percentage
Death	90.5%
Amputation	91.2%
Blindness	88.5%
Foot ulcers	84.6%
Kidney disease	78.3%
CVD	74.7%
Heart disease	68.6%
Stroke	68.6%
Depression	66.2%
Erectile dysfunction	66.2%
Hypertension	62.2%
High cholesterol	52.4%
Dementia	50.3%
Sleep apnea	44.4%

Note: The CVD category was created by combining the Heart disease and Stroke variables. This category represents the proportion of respondents to this question who reported that heart attack, heart condition, heart disease, and/or stroke were cause by diabetes.

Figure 9. Aware that Diabetes Can Be Prevented, by Race: 2016

Awareness that diabetes can be prevented was lower among non-Hispanic Blacks and Hispanics

Respondent Population	Respondent Percentage
Non-Hispanic Black	74.2%
Hispanic	71.2%
Non-Hispanic White	81.5%
Other	73.7%
Total	78.8%

Figure 10. Ever Heard of the A1C Test (PWD)

Non-Hispanic Black and Hispanic PWD showed significant increases in A1C awareness

Respondent Population	2011	2014	2016
Non-Hispanic Black	62.1%	86.0%	91.9%
Hispanic	45.3%	61.1%	81.6%
Non-Hispanic White	82.4%	82.1%	89.3%
Other	70.0%	65.2%	90.7%
Total	72.0%	78.2%	88.6%

Notes: 2016 significantly different from 2011, $p<0.05$. 2016 significantly different from 2014, $p<0.05$.

Figure 11. Number of A1C Tests in the Past Year (PWD)

Frequency of A1C tests increased from 2011 to 2016, but the increase was non-significant

Frequency of A1C Test	2011	2014	2016
None	10.2%	6.7%	7.5%
Only Once	28.3%	22.6%	19.2%
More than one	61.5%	70.7%	73.3%

Figure 12. Report a Usual Care Provider

The proportion of PWD reporting a usual care provider increased significantly from 2014 to 2016

Respondent Population	2014	2016
PWD	95.9%	98.6%
PWP	96.5%	95.5%
PAR	93.0%	93.0%
All Others	88.8%	91.2%

Note: 2016 significantly higher than 2014, $p<0.05$

Figure 13. Source of Advice or Counseling for Diabetes Management (PWD): 2016

Doctors and family members were a major source of advice/counseling

Source	PWD Respondent Percentage
Doctor	93.9%
Family member(s)	41.6%
Diabetes educator	40.7%
Nurse practitioner	41.2%
Nurse	40.4%
Registered dietician	33.4%
Physician's assistant	30.4%
Friend(s)	23.5%
Pharmacist	10.4%
Someone else	5.2%
Online help representative	3.2%
Employer	2.4%

Figure 14. Self-management of Diabetes (PWD): 2016

More than one-third of PWD needed more help managing their diabetes

Effective Management Level	PWD Respondent Percentage
Not effective	3.2%
Sometimes effective	34.9%
Usually effective	61.9%

Figure 15. Confidence in Managing Hyperglycemia/Hypoglycemia (PWD): 2016

PWD varied in their level of confidence in responding when their blood sugar was too high or too low

Confidence Level	1=Not at all confident	2	3	4	5=Totally confident
Hyperglycemia	6.9%	7.1%	26.6%	24.9%	34.6%
Hypoglycemia	6.4%	6.4%	26.6%	21.0%	39.5%

Note: Percentages might not add up to 100 due to rounding.

Figure 16. Reported Levels of Distress with Managing Diabetes (PWD): 2016

More than half of PWD experienced some distress with managing diabetes

Distress Level	1=Not distress	2	3	4	5=Serious distress
Possible Long-term Complications	31.3%	21.8%	26.9%	11.3%	8.8%
My Diabetes Routine	40.4%	25.5%	20.6%	9.8%	3.7%
Demands of Living with Diabetes	38.7%	24.5%	24.5%	7.3%	5.1%

Note: Percentages might not add up to 100 due to rounding.

Figure 17. Tools and Resources Reported Used to Help Manage Diabetes in 4 Weeks Prior to Survey (PWD): 2016

Traditional, paper-based tools were still the most commonly used

Tools and Sources	PWD Respondent Percentage
Paper calendar, diary, or journal	35.6%
Electronic calendar, diary, app, or journal, etc.	12.3%
Online health or diabetes information websites	11.2%
Online video (e.g., YouTube)	5.8%
In-person, health professional –led support group	4.3%
Online peer-led support or chat groups	3.9%
Telephone-based support program	3.2%
In-person peer-led support group	3.5%
Email listservs	2.6%
Text-messaging support program	2.3%

Figure 18. Use of Social Media in Diabetes Management

Use Social Media to Learn About Diabetes	N	%
Yes, I often use it to learn about or manage my diabetes	15	3
Yes, but only once in a while to learn about or manage my diabetes	84	15
No, I never use it to learn about or manage my diabetes	381	83

Figure 19. Feel at Risk of Diabetes (non-PWD*)*

Some significant increases were found in perceived personal risk

Respondent Population	2011	2014	2016
Total	29.5%	42.1%	44.7%
PWP	61.3%	73.2%	78.7%
PAR	33.3%	46.8%	42.0%
Other	13.9%	21.8%	29.1%

Note: 2016 significantly higher than 2011, $p<0.05$. 2016 significantly higher than 2014, $p<0.05$.

Figure 20. Source of Advice or Counseling about How to Prevent Diabetes, 2016 (non-PWD)

Doctors and family members were a major source of advice/counseling

Source	Non-PWD Respondent Percentage
Doctor	82.1%
Family member	41.8%
Nurse practitioner	28.7%
Friend	26.3%
Diabetes educator	21.4%
Registered dietician	17.8%
Nurse	18.2%
Physician assistant	14.0%
Someone else	7.7%
Employer	7.4%
Online representative	4.1%
Pharmacist	3.6%

Figure 21. Proportion of Non-PWD in Each Diabetes Status Group Who Received Each Type of Advice/Counseling (2016)

Respondent Population	PWP	PAR	All Others	Total
Increase your physical activity or exercise	91.1%	86.8%	84.9%	88.7%
Control you weight or lose weight	88.2%	90.3%	75.3%	87.2%
Reduce calories and/or portion sizes in your diet	89.3%	83.5%	76.9%	85.6%
Take medicines	26.1%	18.1%	22.7%	22.8%

Figure 22. Diabetes Prevention Activities

Weight control and diet topped the list

Diabetes Prevention Activities	PWP	PAR	Other	Total
Managing/losing weight	89.0%	93.5%	89.8%	91.4%
Reducing calories/portion sizes	87.6%	87.4%	82.3%	86.2%
Walking	78.9%	85.5%	90.2%	85.1%
Increasing amount of exercise	75.3%	81.3%	88.3%	81.6%
Other light/moderate physical activity (PA)	78.4%	80.7%	84.8%	81.2%
Building more PA in daily routine	71.8%	77.3%	84.3%	77.8%
Vigorous PA	29.9%%	37.2%	57.9%	40.7%
Taking medicines	37.5%	36.6%	27.5%	34.5%
Planning bariatric surgery	4.1%	2.5%	0.1%	2.3%

Figure 23. Reasons People Not Diagnosed with Diabetes Are Not Planning to Become More Active to Prevent/Delay Diabetes (2016)

Non-PWD most commonly report not thinking about taking action to prevent/delay diabetes

Reasons for not taking action	PWP	PAR	Other	Total
Some other reason	20.7%	32.1%	34.9%	32.1%
I have not thought about it before	39.5%	48.9%	42.9%	45.1%
Other things are more important to me right now	25.1%	19.8%	20.8%	20.9%
I am too busy	14.0%	14.3%	12.6%	13.5%
I do not have time	18.5%	14.6%	11.6%	13.7%
I don't have money for diabetes education programs or classes	20.2%	11.8%	8.6%	11.4%
I do not believe it will make a difference	27.6%	22.2%	16.7%	20.4%
I have given up trying	16.0%	9.8%	3.9%	7.9%
I do not have support from friends or family	11.9%	5.4%	6.6%	6.7%
I do not know what else to do	25.9%	28.8%	28.0%	28.1%

Figure 24. Source of Encouragement for Diabetes Prevention (2016)

Source of Encouragement	PWP	PAR	All Others	Total
Doctor	69%	52%	51%	59%
Diabetes educator	15%	9%	8%	11%
Registered Dietitian	12%	5%	2%	8%
Other health professional	19%	22%	16%	20%
Family	46%	66%	52%	56%
Friends	29%	21%	36%	26%
Employer	4%	8%	9%	6%
Someone else	9%	12%	13%	11%

APPENDIX D. NNDS 2016 QUESTIONNAIRE

SECTION 1: GENERAL HEALTH, DIABETES DIAGNOSIS, AND FAMILY HISTORY OF DIABETES [ASKED OF ALL RESPONDENTS]

Q1

Has a doctor or other health professional ever told you that you have diabetes or sugar diabetes? Please do not include prediabetes, gestational diabetes or high blood sugar during pregnancy, or borderline diabetes.

1. Yes, I have been told I have diabetes
2. No, I have not been told I have diabetes [IF Q1=2 and PPGENDER=2, Skip to Q4] [IF Q1=2 and PPGENDER=1, Skip to Q6] [FEMALES SKIP TO Q. 4; MALES SKIP TO Q. 6]
3. Don't know
4. Prefer not to answer

Q2

Type 1 diabetes is when the body does not make insulin and must take insulin on a daily basis. This is also known as juvenile diabetes or insulin-dependent diabetes.

Have you been told by a doctor or other health professional that you have type 1 diabetes?

1. Yes, I have been told I have type 1 diabetes [SKIP TO Q. 8]
2. No, I have not been told I have type 1 diabetes
3. Don't know
4. Prefer not to answer

Q3

Type 2 diabetes is when the body does not make or use insulin well. This is the most common form of diabetes. Type 2 is also known as adult-onset diabetes.

Have you been told by a doctor or other health professional that you have type 2 diabetes?

1. Yes, I have been told I have type 2 diabetes [SKIP TO Q. 8]
2. No, I have not been told I have type 2 diabetes
3. Don't know
4. Prefer not to answer

Q4

Have you been pregnant in the past 10 years; that is, since 2006?

1. Yes
2. No [SKIP TO Q.6]
3. Prefer not to answer

Q5
Were you told by a doctor or other health professional that you had gestational diabetes or high blood sugar during pregnancy?

1. Yes
2. No
3. Prefer not to answer

Q6
Have you ever been told by a doctor or other health professional that you have any of the following:

Statements in row:

1. Higher than normal blood sugar, but not high enough to be called diabetes?
2. Prediabetes?
3. Borderline diabetes?
4. High blood sugar, impaired fasting glucose, or glucose intolerance?

Statements in column:

1. Yes
2. No

Prefer not to answer

Q7
Have you ever been told by a doctor or other health professional that you are at high risk for diabetes?

1. Yes, I have been told I am at high risk for diabetes
2. No, I have not been told I am at high risk for diabetes
3. Prefer not to answer

Q8
In the past 12 months, have you had any of these tests?

Statements in row:

1. Hemoglobin A1C or glycosylated hemoglobin test
2. Fasting blood sugar test
3. Oral glucose tolerance test

Statements in column:

1. Yes
2. No
3. Don’t know

Q9
This question is about your biological or blood relatives. Does your mother, father, sister or half-sister, or brother or half-brother have diabetes?

Statements in row:

1. Mother (biological)
2. Father (biological)
3. Sister or half-sister (biological)
4. Brother or half-brother (biological)

Statements in column:

1. Yes
2. No
3. Don't know
4. Does not apply

Q10
How much do you weigh without shoes?

___ pounds

Prefer not to answer

Q10a
You entered **[INSERT VALUE FROM Q10]** pounds, is this correct?

1. Yes
2. No **[IF Q10a=2; loop Q10]**

Q11
How tall are you without shoes?

__ Feet **[Range 4-7]** __ inches **[Range 0-11]**

Prefer not to answer

Q11a
You entered **[INSERT FROM Q11]** feet, **[INSERT FROM Q11]** inches, is this correct?

1. Yes
2. No **[IF Q11a=2; loop Q11]**

Q12
Do you think the following health problems can be caused by diabetes?

Statements in row:

1. Blindness
2. Foot ulcers
3. Impotence, erectile dysfunction (ED)
4. High cholesterol
5. High blood pressure or hypertension
6. Memory loss, dementia
7. Sleep apnea or short pauses in breathing while sleeping
8. Amputation, loss of foot or leg
9. Stroke
10. Heart attack, heart condition, heart disease
11. Kidney disease
12. Depression
13. Death

Statements in column:

1. Yes
2. No

Q13

Of the health problems you think can be caused by diabetes, which do you think are the **3 most serious** problems? **PLEASE CHOOSE NO MORE THAN 3 ANSWERS.**

1. Blindness
2. Foot ulcers
3. Impotence, erectile dysfunction (ED)
4. High cholesterol
5. High blood pressure or hypertension
6. Memory loss, dementia
7. Sleep apnea or short pauses in breathing while sleeping
8. Amputation, loss of foot or leg
9. Stroke
10. Heart attack, heart condition, heart disease
11. Kidney disease
12. Depression
13. Death

Q14

Are you aware that type 2 diabetes can be prevented?

1. Yes
2. No

SECTION 2: PERCEIVED RISK [ASKED OF PEOPLE NOT DIAGNOSED WITH DIABETES]

Q15
Do you feel you have a chance of getting type 2 diabetes?

1. Yes
2. No [SKIP TO Q. 19]

Q16
How high or low do you think is your chance of getting diabetes: very high, somewhat high, somewhat low or very low?

1. Very high
2. Somewhat high
3. Somewhat low
4. Very low

Q17
I think I have a chance of getting type 2 diabetes because of my:

Statements in row:

1. Family's history of diabetes
2. Weight
3. Age
4. Race/ethnicity
5. Level of physical activity/exercise
6. Health
7. History of gestational diabetes/diabetes during my pregnancy
8. Other reason

Statements in column:

1. Yes
2. No

Q18
Do you think you can reduce your chance of getting type 2 diabetes?

1. Yes
2. No
3. Don't know

SECTION 3: ADVICE/COUNSELING TO PREVENT/DELAY DIABETES [ASKED OF PEOPLE NOT DIAGNOSED WITH DIABETES]

Q19
In the past 12 months, did anyone give you advice or counseling about how to prevent diabetes?

1. Yes, I got advice or counseling
2. No, no one gave me advice or counseling [SKIP TO Q. 31]

Q20
In the past 12 months, who gave you advice or counseling about how to prevent diabetes?

Statements in row:

1. Doctor
2. Nurse practitioner
3. Nurse
4. Physician's assistant (PA)
5. Diabetes educator
6. Registered dietitian (RD)
7. Pharmacist
8. Family member(s)
9. Friend(s)
10. Employer
11. Online help representative
12. Someone else

Statements in column:

1. Yes
2. No

Q21
From your doctor, did you receive advice or counseling to:

Statements in row:

1. Control your weight or lose weight
2. Reduce calories and/or portion sizes in your diet
3. Increase your physical activity or exercise
4. Take medicines

Statements in column:

1. Yes
2. No

Q22
From your nurse practitioner, did you receive advice or counseling to:

Statements in row:

1. Control your weight or lose weight
2. Reduce calories and/or portion sizes in your diet
3. Increase your physical activity or exercise
4. Take medicines

Statements in column:

1. Yes
2. No

Q23
From your nurse, did you receive advice or counseling to:

Statements in row:

1. Control your weight or lose weight
2. Reduce calories and/or portion sizes in your diet
3. Increase your physical activity or exercise
4. Take medicines

Statements in column:

1. Yes
2. No

Q24
From your physician's assistant (PA), did you receive advice or counseling to:

Statements in row:

1. Control your weight or lose weight
2. Reduce calories and/or portion sizes in your diet
3. Increase your physical activity or exercise
4. Take medicines

Statements in column:

1. Yes
2. No

Q25

From your diabetes educator, did you receive advice or counseling to:

Statements in row:

1. Control your weight or lose weight
2. Reduce calories and/or portion sizes in your diet
3. Increase your physical activity or exercise
4. Take medicines

Statements in column:

1. Yes
2. No

Q26

From your registered dietitian (RD), did you receive advice or counseling to:

Statements in row:

1. Control your weight or lose weight
2. Reduce calories and/or portion sizes in your diet
3. Increase your physical activity or exercise
4. Take medicines

Statements in column:

1. Yes
2. No

Q27

From your pharmacist, did you receive advice or counseling to:

Statements in row:

1. Control your weight or lose weight
2. Reduce calories and/or portion sizes in your diet
3. Increase your physical activity or exercise
4. Take medicines

Statements in column:

1. Yes
2. No

Q28
From your family member(s), did you receive advice or counseling to:

Statements in row:

1. Control your weight or lose weight
2. Reduce calories and/or portion sizes in your diet
3. Increase your physical activity or exercise
4. Take medicines

Statements in column:

1. Yes
2. No

Q29
From your friend(s), did you receive advice or counseling to:

Statements in row:

1. Control your weight or lose weight
2. Reduce calories and/or portion sizes in your diet
3. Increase your physical activity or exercise
4. Take medicines

Statements in column:

1. Yes
2. No

Q29a
From your employer, did you receive advice or counseling to:

Statements in row:

1. Control your weight or lose weight
2. Reduce calories and/or portion sizes in your diet
3. Increase your physical activity or exercise
4. Take medicines

Statements in column:

1. Yes
2. No

Q30
From your online help representative, did you receive advice or counseling to:

Statements in row:

1. Control your weight or lose weight
2. Reduce calories and/or portion sizes in your diet
3. Increase your physical activity or exercise
4. Take medicines

Statements in column:

1. Yes
2. No

Q30a
From someone else, did you receive advice or counseling to:

Statements in row:

1. Control your weight or lose weight
2. Reduce calories and/or portion sizes in your diet
3. Increase your physical activity or exercise
4. Take medicines

Statements in column:

1. Yes
2. No

Q31
In the past 12 months, have you been doing anything to reduce your chance of getting diabetes?

1. Yes
2. No [SKIP to Q. 33]

Q32
In the past 12 months, have you been doing any of the following to reduce your chance of getting diabetes?

Statements in row:

1. Managing your weight or losing weight?
2. Reducing calories and/or portion sizes in your diet?
3. Increasing the amount that you exercise?
4. Taking medicines as prescribed?
5. Planning to have bariatric surgery?
6. Building more physical activity into your daily work or at home?
7. Walking (including walking for exercise, walking to or from and while at work)?
8. Doing other light or moderate household (e.g., chores, gardening) or recreational activities or sports (e.g., bowling, yoga)?
9. Doing vigorous activities or sports (e.g., biking, jogging, swimming, or aerobics)?

Statements in column:

1. Yes
2. No

Q33

In the past 12 months, did you attend any classes, programs, coaching or counseling sessions to help you prevent or delay your chance of getting diabetes and its complications?

1. Yes
2. No [SKIP TO Q. 43]

Q34

In the past 12 months, which types of classes, programs, coaching or counseling sessions to help you prevent or delay your chance of getting diabetes and its complications did you attend?

Statements in row:

1. Weight loss
2. Exercise
3. Nutrition
4. Health/Wellness
5. Stress management
6. Smoking cessation
7. Other, specify

Statements in column:

1. Yes
2. No

Q35
In the past 12 months, how often do/did you attend classes, programs, coaching or counseling sessions for:

Statements in row:

1. Weight loss
2. Exercise
3. Nutrition
4. Health and Wellness
5. Stress management
6. Smoking cessation
7. Other

Statements in column:

1. I attend regularly
2. I attend occasionally
3. I attended only once

Q36
Did any of the following offer or provide the classes, programs, coaching or counseling sessions for weight loss?

Statements in row:

1. My doctor or other health professional
2. My health care insurance plan
3. My employer
4. The local community
5. Private business

Statements in column:

1. Yes
2. No

Q37
Did any of the following offer or provide the classes, programs, coaching or counseling sessions for exercise?

Statements in row:

1. My doctor or other health professional
2. My health care insurance plan

3. My employer
4. The local community
5. Private business

Statements in column:

1. Yes
2. No

Q38
Did any of the following offer or provide the classes, programs, coaching or counseling sessions for nutrition?

Statements in row:

1. My doctor or other health professional
2. My health care insurance plan
3. My employer
4. The local community
5. Private business

Statements in column:

1. Yes
2. No

Q39
Did any of the following offer or provide the classes, programs, coaching or counseling sessions for health and wellness?

Statements in row:

1. My doctor or other health professional
2. My health care insurance plan
3. My employer
4. The local community
5. Private business

Statements in column:

1. Yes
2. No

Q40
Did any of the following offer or provide the classes, programs, coaching or counseling sessions for stress management?

Statements in row:

1. My doctor or other health professional
2. My health care insurance plan
3. My employer
4. The local community
5. Private business

Statements in column:

1. Yes
2. No

Q41
Did any of the following offer or provide the classes, programs, coaching or counseling sessions for smoking cessation?

Statements in row:

1. My doctor or other health professional
2. My health care insurance plan
3. My employer
4. The local community
5. Private business

Statements in column:

1. Yes
2. No

Q42
Did any of the following offer or provide the classes, programs, coaching or counseling sessions for other topics

Statements in row:

1. My doctor or other health professional
2. My health care insurance plan
3. My employer
4. The local community
5. Private business

Statements in column:

1. Yes
2. No

Q43

In the next 6 months, how likely are you to become more active to reduce your chance of getting diabetes?

1. Very likely
2. Somewhat likely
3. Not at all likely

Q44

In the next 6 months, how likely are you to lose weight to reduce your chance of getting diabetes?

1. Very likely
2. Somewhat likely
3. Not at all likely

Q45

Why are you not likely to do something to reduce your chance of getting diabetes?

Statements in row:

1. I do not know what else to do
2. I do not have support from friends or family
3. I have given up trying
4. I do not believe it will make a difference
5. I do not have money for diabetes education programs or classes
6. I do not have time
7. I am too busy
8. Other things are more important to me right now
9. I have not thought about it before
10. Some other reason

Statements in column:

1. Yes
2. No

Q46

In the past 12 months, has anyone encouraged you to attend any programs or classes or change your lifestyle (such as changing, eating or exercise habits) to help you prevent diabetes:

1. Yes
2. No [SKIP TO Q. 48]

Q47

In the past 12 months, who encouraged you to attend programs or classes or change your lifestyle (such as changing, eating or exercise habits) to help you prevent diabetes?

Statements in row:

1. Doctor
2. Diabetes educator
3. Registered dietitian (RD)
4. Other health professional (e.g., nurse, nurse practitioner, physician assistant, pharmacist)
5. Family member(s)
6. Friend(s)
7. Employer
8. Someone else

Statements in column:

1. Yes
2. No

Q48

Do you use social media (e.g., Facebook, Twitter) to help you learn about diabetes?

1. Yes, I often use it to learn about diabetes
2. Yes, but only once in a while to learn about diabetes
3. No, I never use it to learn about diabetes

SECTION 4: DIABETES SELF-MANAGEMENT/SELF-EFFICACY [ASKED OF PEOPLE WITH DIABETES ONLY]

Q49

How old were you when a doctor or other health professional first told you that you had diabetes?

__ age (in years) when first told had diabetes

Q49a

You entered **[Insert from Q49]** years, is this correct?

1. Yes
2. No [RE-ENTER CORRECT AGE]

Q50

Have you ever heard of the term A1C, also known as glycosylated hemoglobin or hemoglobin A1C?

1. Yes
2. No

Q51

The A1C test measures the average level of blood sugar over the previous 3 months.

In the past 12 months, how often has a doctor or other health professional checked your A1C level?

1. More than once
2. Only once
3. Not at all
4. Don't know

Q52

In the past 12 months, did anyone give you advice or counseling about how to prevent other health problems caused by diabetes?

1. Yes
2. No [SKIP TO Q. 65]

Q53

In the past 12 months, which of the following people gave you advice or counseling about how to prevent other health problems caused by diabetes?

Statements in row:

1. Doctor
2. Nurse practitioner
3. Nurse
4. Physician's assistant (PA)
5. Diabetes educator
6. Registered dietitian (RD)
7. Pharmacist
8. Family member(s)
9. Friend(s)
10. Employer
11. Online help representative
12. Someone else

Statements in column:

1. Yes
2. No

Q54

From your doctor, did you receive advice or counseling to:

Statements in row:

1. Control your weight or lose weight
2. Reduce calories and/or portion sizes in your diet
3. Follow your diabetes meal plan
4. Increase your physical activity or exercise
5. Visit your doctor regularly
6. Take your medicine

Statements in column:

1. Yes
2. No

Q55

From your nurse practitioner, did you receive advice or counseling to:

Statements in row:

1. Control your weight or lose weight
2. Reduce calories and/or portion sizes in your diet
3. Follow your diabetes meal plan
4. Increase your physical activity or exercise
5. Visit your doctor regularly
6. Take your medicine

Statements in column:

1. Yes
2. No

Q56

From your nurse, did you receive advice or counseling to:

Statements in row:

1. Control your weight or lose weight
2. Reduce calories and/or portion sizes in your diet

3. Follow your diabetes meal plan
4. Increase your physical activity or exercise
5. Visit your doctor regularly
6. Take your medicine

Statements in column:

1. Yes
2. No

Q57

From your physician's assistant (PA), did you receive advice or counseling to:

Statements in row:

1. Control your weight or lose weight
2. Reduce calories and/or portion sizes in your diet
3. Follow your diabetes meal plan
4. Increase your physical activity or exercise
5. Visit your doctor regularly
6. Take your medicine

Statements in column:

1. Yes
2. No

Q58

From your diabetes educator, did you receive advice or counseling to:

Statements in row:

1. Control your weight or lose weight
2. Reduce calories and/or portion sizes in your diet
3. Follow your diabetes meal plan
4. Increase your physical activity or exercise
5. Visit your doctor regularly
6. Take your medicine

Statements in column:

1. Yes
2. No

Q59

From your registered dietitian (RD), did you receive advice or counseling to:

Statements in row:

1. Control your weight or lose weight
2. Reduce calories and/or portion sizes in your diet
3. Follow your diabetes meal plan
4. Increase your physical activity or exercise
5. Visit your doctor regularly
6. Take your medicine

Statements in column:

1. Yes
2. No

Q60

From your pharmacist, did you receive advice or counseling to:

Statements in row:

1. Control your weight or lose weight
2. Reduce calories and/or portion sizes in your diet
3. Follow your diabetes meal plan
4. Increase your physical activity or exercise
5. Visit your doctor regularly
6. Take your medicine

Statements in column:

1. Yes
2. No

Q61

From your family member(s), did you receive advice or counseling to:

Statements in row:

1. Control your weight or lose weight
2. Reduce calories and/or portion sizes in your diet
3. Follow your diabetes meal plan
4. Increase your physical activity or exercise
5. Visit your doctor regularly
6. Take your medicine

Statements in column:

1. Yes
2. No

Q62

From your friend(s), did you receive advice or counseling to:

Statements in row:

1. Control your weight or lose weight
2. Reduce calories and/or portion sizes in your diet
3. Follow your diabetes meal plan
4. Increase your physical activity or exercise
5. Visit your doctor regularly
6. Take your medicine

Statements in column:

1. Yes
2. No

Q62a

From your employer, did you receive advice or counseling to:

Statements in row:

1. Control your weight or lose weight
2. Reduce calories and/or portion sizes in your diet
3. Follow your diabetes meal plan
4. Increase your physical activity or exercise
5. Visit your doctor regularly
6. Take your medicine

Statements in column:

1. Yes
2. No

Q63

From your online help representative, did you receive advice or counseling to:

Statements in row:

1. Control your weight or lose weight
2. Reduce calories and/or portion sizes in your diet
3. Follow your diabetes meal plan
4. Increase your physical activity or exercise
5. Visit your doctor regularly
6. Take your medicine

Statements in column:

1. Yes
2. No

Q64

From someone else, did you receive advice or counseling to:

Statements in row:

1. Control your weight or lose weight
2. Reduce calories and/or portion sizes in your diet
3. Follow your diabetes meal plan
4. Increase your physical activity or exercise
5. Visit your doctor regularly
6. Take your medicine

Statements in column:

1. Yes
2. No

Q65

In the past 6 months, how often have you been doing any of the following to manage your diabetes to prevent other health problems caused by diabetes?

Statements in row:

1. Managing my weight or losing weight
2. Reducing calories and/or portion sizes in my diet
3. Following my diabetes meal plan
4. Increasing the amount that I exercise
5. Taking medicines as prescribed (e.g., Metformin, insulin)
6. Building more physical activity into my daily work routine or athome
7. Walking (including walking for exercise, walking to or from and while at work, climbing stairs)

8. Doing other light or moderate household (e.g., chores, gardening) or recreational activities or sports (e.g., bowling, yoga)
9. Doing vigorous activities or sports (e.g., biking, jogging, swimming, or aerobics)

Statements in column:

1. Regularly
2. Occasionally
3. Not at all

Q66

When do you plan to start doing something to manage your diabetes to prevent other health problems caused by diabetes?

1. Not planning to start
2. Within the next month
3. Not sure when

Q67

In the past 6 months, have you considered having bariatric surgery (weight loss surgery)?

1. Yes
2. No

Q68

In the past 4 weeks, have you been doing any of the following to manage your diabetes?

Statements in row:

1. Using insulin
2. Taking diabetes pills
3. Using non-insulin injectable medicines for diabetes
4. Following my diabetes meal plan
5. Exercising regularly
6. Checking my blood sugar

Statements in column:

1. Yes
2. No

Q69

In general, would you say your way of managing your diabetes has usually been effective, sometimes been effective, or not been effective?

1. Usually been effective
2. Sometimes been effective
3. Not been effective

Q70

On a scale of 1 to 5, where **1 is no distress** and **5 is serious distress**, please choose the number that matches your level of distress in the past 4 weeks.

Statements in row: **In the past 4 weeks, the level of distress I had with:**

1. The demands of living with diabetes
2. My diabetes routine
3. Possible serious long-term complications, no matter what I do

Statements in column:

1. No distress
2. Some distress
3. Distress
4. Moderate distress
5. Serious distress

Q71

On a scale of 1 to 5, where **1 is not at all confident** and **5 is totally confident**, please choose the number that matches how confident you feel doing each of the following activities:

Statements in row:

1. Eating your meals or snacks as recommended
2. Following your diet when you have to prepare or share food with other people who do not have diabetes
3. Choosing the appropriate foods to eat when you are hungry (e.g., snacks)
4. Exercising 15 to 30 minutes for 4 to 5 times a week
5. Doing something to prevent your blood sugar level from dropping when you exercise
6. Judging when the changes in your illness mean you should visit the doctor
7. Managing your diabetes so that it does not interfere with the things you want to do
8. Correctly using the results from your blood sugar monitoring

Statements in column:

1. Not at all confident
2. Somewhat confident
3. Confident
4. More confident
5. Totally confident

Q72

On a scale of 1 to 5, where **1 is not at all confident** and **5 is totally confident**, please choose the number that matches how confident you feel that you know what to do:

Statements in row:

1. When your blood sugar level goes higher than it should be (hyperglycemia)?
2. When your blood sugar level goes lower than it should be (hypoglycemia)?

Statements in column:

1. Not at all confident
2. Somewhat confident
3. Confident
4. More confident
5. Totally confident

Q73

In the past 12 months, has anyone encouraged you to attend any programs, self-help groups, or classes to help you manage your diabetes?

1. Yes
2. No [SKIP TO Q. 75]

Q74

In the past 12 months, who has encouraged you to attend programs, self-help groups, or classes to help you manage your diabetes?

Statements in row:

1. Doctor
2. Nurse practitioner
3. Nurse
4. Physician's assistant (PA)
5. Diabetes educator

6. Registered dietitian (RD)
7. Pharmacist
8. Family member(s)
9. Friend(s)
10. Employer
11. Online help representative
12. Someone else

Statements in column:

1. Encouraged me
2. Did not encourage me

Q75

In the past 12 months, did you attend any programs, self-help groups, or classes to help you manage your diabetes?

1. Yes
2. No [SKIP TO Q. 84]

Q76

In the past 12 months, which programs, self-help groups, or classes did you attend to help you manage your diabetes?

Statements in row:

1. Weight loss
2. Exercise
3. Nutrition
4. Diabetes education classes
5. Diabetes support group
6. Other, specify

Statements in column:

1. Attended
2. Did not attend

Q77

In the past 12 months, how often do/did you attend:

Statements in row:

1. Weight loss

2. Exercise
3. Nutrition
4. Diabetes education classes
5. Diabetes support group
6. [Insert Q76_6]

Statements in column:

1. I attend regularly
2. I attend occasionally
3. I attended only once

Q78

Which of the following offered or provided the program(s) for weight loss?

PLEASE CHECK ALL THAT APPLY

1. Doctor
2. Nurse practitioner
3. Physician's assistant (PA)
4. Nurse
5. Diabetes educator
6. Registered dietitian (RD)
7. Pharmacist
8. Hospital
9. Health care insurance plan
10. Diabetes organization
11. Employer
12. The local community
13. Private business
14. Other

Q79

Which of the following offered or provided the program(s) for exercise?

PLEASE CHECK ALL THAT APPLY

1. Doctor
2. Nurse practitioner
3. Physician's assistant (PA)
4. Nurse
5. Diabetes educator
6. Registered dietitian (RD)
7. Pharmacist

8. Hospital
9. Health care insurance plan
10. Diabetes organization
11. Employer
12. The local community
13. Private business
14. Other

Q80

Which of the following offered or provided the program(s) for nutrition?

PLEASE CHECK ALL THAT APPLY

1. Doctor
2. Nurse practitioner
3. Physician's assistant (PA)
4. Nurse
5. Diabetes educator
6. Registered dietitian (RD)
7. Pharmacist
8. Hospital
9. Health care insurance plan
10. Diabetes organization
11. Employer
12. The local community
13. Private business
14. Other

Q81

Which of the following offered or provided the program(s) for diabetes education classes?

PLEASE CHECK ALL THAT APPLY

1. Doctor
2. Nurse practitioner
3. Physician's assistant (PA)
4. Nurse
5. Diabetes educator
6. Registered dietitian (RD)
7. Pharmacist
8. Hospital
9. Health care insurance plan
10. Diabetes organization
11. Employer

12. The local community
13. Private business
14. Other

Q82

Which of the following offered or provided the program(s) for a diabetes support group?

PLEASE CHECK ALL THAT APPLY

1. Doctor
2. Nurse practitioner
3. Physician's assistant (PA)
4. Nurse
5. Diabetes educator
6. Registered dietitian (RD)
7. Pharmacist
8. Hospital
9. Health care insurance plan
10. Diabetes organization
11. Employer
12. The local community
13. Private business
14. Other

Q83

In the past 12 months, others may have helped you to take actions to manage your diabetes. Did they:

Statements in row:

1. Help you to eat better or healthier?
2. Exercise with you?
3. Give you rides to classes or programs?
4. Help you with medicines?
5. Offer encouragement?
6. Help you manage stress?
7. Take care of your children so you could participate in classes, programs, or exercise?
8. Other, specify?

Statements in row:

1. Yes
2. No
3. Does not apply

Q84

In the past 4 weeks, have you used any of the following tools and resources to help you manage your diabetes?

Statements in row:

1. Paper calendar, diary, or journal to track diabetes-related activities (blood sugar results, dose of insulin, food intake, exercise, etc.)
2. Electronic calendar, diary, app, or journal, etc.
3. In-person peer-led support group
4. In-person, health professional-led support group
5. Online peer-led support or chat groups
6. Online health or diabetes information websites
7. Text-messaging support program
8. Telephone-based support program
9. Email listservs
10. Online videos (e.g., YouTube)

Statements in column:

1. Yes
2. No

Q85

Do you use social media (e.g., Facebook, Twitter) to help you learn about or manage your diabetes?

1. Yes, I often use it to learn about or manage my diabetes
2. Yes, but only once in a while to learn about or manage my diabetes
3. No, I never use it to learn about or manage my diabetes

SECTION 5: PERSONAL HEALTH CARE [ASKED OF ALL RESPONDENTS]

Q86

Who do you think of as your usual health care provider?

1. Doctor
2. Nurse practitioner

3. Physician's assistant (PA)
4. Nurse
5. Other, specify _____
6. No one [SKIP TO Q. 89]

Q87

How often do you receive care from your usual health care provider?

1. Weekly
2. Monthly
3. Every few months
4. Once a year
5. Less than once a year

Q88

Do you regularly see any of the following providers?

Statements in row:

1. Diabetes educator
2. Registered dietitian (RD)
3. Pharmacist
4. Mental health professional (social worker, psychologist, psychiatrist)
5. Other ***[Do not include your usual health care provider]***, specify _____

Statements in column:

1. Yes
2. No

Q89

Do you get advice about diabetes that you can trust from your:

Statements in row:

1. Doctor
2. Nurse practitioner
3. Nurse
4. Physician's assistant (PA)
5. Diabetes educator
6. Registered dietitian (RD)
7. Pharmacist

8. Mental health professional (social worker, psychologist, psychiatrist)
9. Online/Internet/Web
10. Family
11. Friends
12. Employer
13. Other, specify_____

Statements in column:

1. Yes
2. No

Q90

This question asks about you in particular, not your family members.

Do you currently have health insurance or health care coverage that pays for all or part of your medical care?

1. Yes
2. No [SKIP TO Q. 93]

Q91

Does your health care coverage include any weight loss, exercise, or health or wellness programs?

1. Yes
2. No [SKIP TO Q. 93]
3. Don't know [SKIP TO Q. 93]

Q92

Do you need a referral, prescription or script from your doctor to attend any of these weight loss, exercise, or health or wellness programs?

1. Yes
2. No
3. Don't know

Q93

Has a doctor or other health professional ever told you that you had any of the following conditions?

Statements in row:

1. High cholesterol
2. High blood pressure/hypertension

3. A heart condition
4. Damaged or failing kidneys
5. A stroke
6. A heart attack
7. Dental or oral health issues
8. Eye health or vision issues
9. Nerve pain or nerve damage
10. Memory problems
11. Sleep apnea
12. Depression

Statements in column:

1. Yes
2. No

Q94

Are you regularly taking medication for, or having treatment for, these conditions?

Statements in row:

1. High cholesterol
2. High blood pressure/hypertension
3. A heart condition
4. Damaged or failing kidneys
5. A stroke
6. A heart attack
7. Dental or oral health issues
8. Eye health or vision issues
9. Nerve pain or nerve damage
10. Memory problems
11. Sleep apnea
12. Depression

Statements in column:

1. Yes
2. No

DEMOGRAPHICS

Do you speak a language other than English at home?

Yes.....1
No..... 2

What language do you speak at home other than English?

Spanish..... 1
Chinese (any dialect)..... 2
Tagalog..... 3
Vietnamese..... 4
French..... 5
German..... 6
Another language..... 7

How well do you speak English?

Very well..... 1
Well..... 2

National Institutes of Health

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