North Carolina's Guide to Diabetes Prevention and Management

Diabetes and Prediabetes in North Carolina



MANAGE WEIGHT | LIVE TOBACCO FREE | PARTICIPATE IN LIFESTYLE CHANGE PROGRAMS PARTICIPATE IN DIABETES EDUCATION | ADHERE TO TREATMENT PLAN | GET ADEQUATE SLEEP



## North Carolina's Guide to Diabetes Prevention 2020 and Management

### Introduction

In 2020, nearly one-half of North Carolinians have diabetes (12.5% of the population<sup>1</sup>) or are at high risk for developing diabetes (34.5% of adults have prediabetes<sup>2</sup>). It is also projected that over 3,000 people will die directly or indirectly because of diabetes and its complications, ranking North Carolina as 7th in the nation for diabetes related deaths.<sup>3</sup>

Diabetes is a complex disease and daily self-management can be challenging. Uncontrolled diabetes is associated with serious complications (e.g., heart disease, hypertension, stroke, vision loss, kidney failure, nerve damage, depression, and hearing loss), which negatively impact quality of life for persons with diabetes. In addition to the substantial personal burden of diabetes to those who have it, and the families who also are touched by caregiving, there are substantial financial burdens to individuals, employers, health systems, and communities across the state including multiple levels of government. The annual healthcare cost of diabetes in North Carolina is estimated to surpass \$17 billion by 2025.<sup>4</sup> In addressing diabetes as a complex disease and the challenges of reducing its burdens, NC must consider personal and environmental factors at individual, relationship, community, and societal levels. Our behaviors as individuals shape and are shaped by our social, economic, and policy environment. Together these terms are often grouped and referred to as the Social Determinants of Health (SDoH). In addition to caring for those who already have diabetes, preventing

diabetes and related complications, if not delaying onset of the disease, is important at the individual, community, and systems level.



This Guide is organized around four levels of social and environmental concepts described by the Centers for Disease Control and Prevention (CDC) and the Socio-Ecological Model of Health (SEM) (Figure 1).

#### The Guide:

- 1. Addresses what diabetes is and what diabetes looks like in North Carolina.
- 2. Focuses on actions that individuals at risk for diabetes or who have diabetes, families, and peers can implement to improve the health of North Carolinians.
- Provides specific strategies for community groups, employers, and healthcare providers to implement toward assisting people to manage their risk for developing and/or managing diabetes, including reducing risk of complications.
- 4. Shares opportunities to focus on what we can do in our various communities to reduce the burden of diabetes, and the evolving role for our broader society including policy and advocacy in North Carolina.

**Statistics Used in this Guide:** Throughout this Guide, we have made every effort to cite the most recent statistics available at the time of going to press.

The Guide's mission is to reduce the burden of diabetes in North Carolina. The North Carolina Diabetes Advisory Council (NC DAC) hopes that the information presented in the Guide will increase understanding of the impact of diabetes in North Carolina for our audience (or readers), and what we as individuals, families, and our communities across the state can do to reduce these burdens.

This Guide is also a **Call to Action** to prevent and manage diabetes. After reading it, we hope you will join the NC DAC in our mission to make a difference.



#### Modeling the Language of Diabetes

Words matter in diabetes care and management. Persons diagnosed with prediabetes or diabetes communicate and engage with their healthcare team, families, friends, employers, communities, etc., in order to successfully manage their diabetes. Language is the tool that makes effective communication possible and supports the person with diabetes on this journey. All language should be person centric. Words that promote inclusion, respect, positivity, and acceptance without judgment fosters collaboration between persons with or at risk for diabetes and their healthcare team.

Throughout this guide we will model language that enhances written and spoken communication when discussing diabetes. We have added the research recommendations from the joint task force of the American Diabetes Association (ADA) and the Association of Diabetes Care and Education Specialists (ADCES) that addresses language best practices in the delivery of diabetes care and diabetes self-care management education and support (DSMES).<sup>7</sup> The term **"sugar"** is commonly used by persons with diabetes but can be confusing as there are many types of sugars. In fact, table sugar (sucrose) contains equal amounts of two sugars: glucose and fructose. The chief sugar our bodies use is "glucose" and the one whose level is regulated by insulin and the rest of our metabolism. Throughout this document we will use the term glucose.

## What Is Diabetes?



According to the **CDC's diabetes glossary**, **insulin resistance** refers to the body's inability to respond to and use the insulin it produces. Insulin resistance may be linked to obesity, hypertension, and high levels of fat in the blood. Diabetes, also known as diabetes mellitus, is a chronic condition in which the body either does not make any insulin or becomes resistant to insulin resulting in a relative deficiency of insulin. Insulin carries glucose (or sugar—see callout box), into the cells so it can be stored for energy. In Type 2 diabetes, the liver produces too much glucose which leads to excess glucose levels in the blood.<sup>8</sup> Without enough insulin, or when insulin is not working properly, people with diabetes are unable to use the glucose that they eat in their diet, resulting in high blood glucose.

Keeping blood glucose in a healthy range is key to successfully reducing the risk of complications for people with diabetes. Sustained high glucose levels over time can result in serious health complications such as high blood pressure and cholesterol, heart disease and stroke, blindness, kidney failure, infections, peripheral neuropathy, and peripheral arterial disease. These latter three conditions increase the risk of amputation of the legs and arms.<sup>9</sup> Persons with diabetes and prediabetes also have an increased risk for other complications: hearing loss, sleep apnea, oral diseases, certain forms of cancer including colorectal and breast, sexual dysfunction, diabetes distress including anxiety and depression, and cognitive impairments including dementia.<sup>10</sup>

#### There are three primary types of diabetes:

Type 1 diabetes

Gestational diabetes, which is only present during pregnancy Type 2 diabetes11

North Carolina's Guide to Diabetes Prevention and Management 2020 - Diabetes and Prediabetes in North Carolina

#### **Prediabetes**

Prediabetes is a condition where people have higher than normal glucose (sugar) levels, but not yet high enough to be diagnosed as diabetes. Prediabetes is sometimes referred to as impaired glucose tolerance (IGT) or impaired fasting glucose (IFG), depending on the test that was used.<sup>12</sup> About 88 million American adults—approximately 1 in 3—have prediabetes.<sup>11</sup> Prediabetes is serious because it increases the chance of developing Type 2 diabetes, heart disease and stroke.<sup>13</sup>

#### **Gestational Diabetes**

Gestational diabetes mellitus (GDM) occurs in women who did not have diabetes prior to pregnancy, but whose increasing demand for insulin or resistance during their pregnancy becomes greater than what insulin their pancreas can produce. Gestational diabetes occurs in approximately 10% of pregnancies.<sup>14</sup> During pregnancy, women with GDM require special care and attention to their glucose levels through proper diet, weight management and sometimes temporary use of medications and/or insulin. Without such care women and their babies are at risk for complications of the pregnancy including maternal death, stillbirth and infant death. After delivery, half of these women<sup>15</sup> are expected to develop Type 2 diabetes in 10-20 years.<sup>16</sup> Their children are also at increased risk of developing diabetes. After delivery, it is important that women with gestational diabetes return for a six-week postpartum visit for additional testing to be sure their gestational diabetes has resolved. Because of the increased risk for development of Type 2 diabetes, the ADA recommends screening for diabetes every 1–3 years for women with a history of gestational diabetes.<sup>17</sup>

#### **Type 1 Diabetes**

Type 1 diabetes is caused by an autoimmune destruction of cells in the pancreas that produce insulin.<sup>8</sup> It affects approximately 5 to 10% of the population with diabetes. Type 1 diabetes requires the person to take insulin, as the body does not produce enough or any of its own insulin. Other than pancreas or islet cell transplants, there is no cure for this type of diabetes.

#### **Type 2 Diabetes**

People who have Type 2 diabetes may be insulin resistant, have relative insulin deficiency, have an overproduction of glucose, or a combination of all three. Type 2 diabetes is the most common form of diabetes, accounting for up to 90 to 95% of diagnosed diabetes.<sup>8</sup> It affects about 1 in 10 people in the US.<sup>18</sup> The risk of developing Type 2 diabetes increases with age, for those who are overweight or obese, or physically inactive across all genders. It occurs more frequently in women with a history of gestational diabetes, among those with high blood pressure (hypertension) or high cholesterol (dyslipidemia) and in certain racial/ethnic groups (African American, American Indian, Hispanic/Latinx and Asian American). It is often associated with a strong genetic predisposition.<sup>19</sup>

Older names such as insulin-dependent, juvenile-onset, non-insulin-dependent, and adult-onset diabetes are no longer used. Both Type 1 and Type 2 diabetes can occur at any age, and individuals with either type may require insulin for adequate blood sugar control.

# 3.5 million

What do prediabetes and diabetes look like and cost in North Carolina?

#### **Prediabetes Prevalence**

It is estimated that in 2020 over 3.5 million North Carolinians have prediabetes. While in 2018, approximately 12.1% of North Carolinians self-reported (in the **Behavioral Risk Factor Surveillance System Survey**) being told that they had prediabetes,<sup>20</sup> the actual prevalence may be as much as three times higher than this, since more than 80% of people who have prediabetes are not aware that they have the condition.<sup>21</sup> In fact, the CDC now projects that on average at least 34.5% of all adults across the United States have prediabetes,<sup>2</sup> and North Carolina may exceed that average.

#### **Diabetes Prevalence**

In 2020 it is projected that 12.5% of the state's population, or 1.3 million North Carolinians, have Type 1 or Type 2 diabetes.<sup>1</sup> There has been more than a 33% increase in the percentage of people diagnosed with diabetes in North Carolina in the past decade (a prevalence of 9.3% in 2008). The actual number of people with diabetes in North Carolina is likely to be much higher, since about 21% of people with diabetes are undiagnosed.<sup>11, 22</sup> Diabetes incidence and prevalence has been increasing in adults for many years, but disturbingly in the last few decades is now also increasing in children and youth.<sup>23</sup>

The term "**prevalence**" refers to the number of people who have a disease or health condition in a particular population. This differs from "**incidence**" which refers to the number of newly diagnosed cases in a population in a specific time period, usually a year. Prevalence includes both newly diagnosed and existing cases, so it is larger than incidence.



#### Personal and Financial Burden of Diabetes Is Complicated by Racial/Ethnic and Geographic Disparities

North Carolinians do not equally share the burden of diabetes. Below are summaries of racial, ethnic, geographic, and economic inequalities in diabetes burden. The economic burden of diabetes affects us all, either directly for those who have diabetes, or indirectly for those without diabetes who pay higher premiums and other healthcare expenses because of shifts in cost coverage. More information on the implications of racial/ethnic disparities, and how social determinants of health factor into an even greater burden of diabetes in racial/ethnic minority groups, are included in included in the section of this Guide (page 26) about the Importance of Social Determinants of Health and Health Equity.

## Racial/Ethnic Inequalities in Diabetes Prevalence and Mortality

Diabetes, particularly Type 2 diabetes, disproportionally affects all racial and ethnic minority groups in North Carolina. In 2018, the prevalence of diagnosed diabetes was about 31% higher for African Americans (15.9%) compared to non-Hispanic whites (12.2%).<sup>20</sup> While data are not available for 2018, earlier data (2012) indicate that about 19% of American Indians in North Carolina had been diagnosed with diabetes.<sup>24</sup> While only about 7.7% of Hispanics/Latinx in the state have been diagnosed with diabetes, the low reported rate for this population may be due to under-reporting.<sup>20, 25</sup> While diabetes prevalence increases with age for all racial groups, the disease disproportionately affects older African Americans, affecting more than one-quarter of African Americans aged 55 to 64 and more than a third of African Americans between the ages of 65 and 74.26,27 Statewide, diabetes was the third leading cause of death for American Indians, the fourth leading cause of death for African Americans, and the seventh leading cause of death for non-Hispanic whites.<sup>27, 28</sup> In 2018, African Americans and American Indians were more than twice as likely to die from diabetes than non-Hispanic Whites.<sup>29</sup>

#### **Geographic Disparities**

A regional analysis of North Carolina diabetes rates shows geographic differences across the state. In the Piedmont, where most of the state's largest cities are located (including Charlotte, Raleigh, Greensboro and Durham), the prevalence of diagnosed diabetes is 11.4%.<sup>30</sup> In the eastern and western regions, which are largely rural, the prevalence of diagnosis is higher at 14.4% and 13.0%, respectively.<sup>30</sup> Regional disparities also include racial disparities. For example, in the Piedmont, 12.5% of African Americans report a diabetes diagnosis, while 11.9% of non-Hispanic whites do so.<sup>31</sup> The Eastern counties of NC make up what the CDC calls the "Diabetes Belt," where diabetes affects at least 15% of the population.<sup>32</sup> Complications of diabetes, particularly lower extremity amputation (LEA)<sup>33</sup> and end stage renal disease (ESRD),<sup>34</sup> are higher for African Americans and American Indians.<sup>35</sup>

#### **Economic Burden**

People with diabetes have medical expenses approximately 2.3 times higher than those without

diabetes.<sup>24</sup> A majority (67.3%) of the medical costs are paid by government programs, including Medicare, Medicaid, Indian Health Service and military health programs.<sup>36</sup> Seventy-two percent of national diabetes costs are attributed to direct healthcare costs, while 28% represent lost productivity from work-related absenteeism, unemployment and premature death.<sup>37</sup>

Like the rest of the nation, North Carolina continues to face increases in diabetes-related spending. In 2017, diabetes accounted for nearly \$11 billion in direct (\$7.79 billion) and indirect (\$2.90 billion) costs in North Carolina.<sup>38</sup> Diabetes is associated with an elevated hospital admission rate (1.9 per 1,000 population), with an average stay of 4.7 days.<sup>39</sup> Diabetes was the primary cause for 23,713 hospitalizations at a cost of \$790 million in hospital charges in North Carolina in 2018; that is over \$33,000 per hospitalized person with diabetes per year.<sup>39</sup> If the state does not take steps to help bring the diabetes epidemic under control, annual healthcare costs are projected to surpass \$17 billion by 2025.<sup>4</sup>

## References

1. Annual Report: North Carolina Summary 2019. America's Health Rankings, United Health Foundation. americashealthrankings.org/explore/annual/measure/Diabetes/ state/NC. Accessed July 9, 2020.

2. Centers for Disease Control and Prevention. *National Diabetes Statistics Report, 2020.* Atlanta, GA: Centers for Disease Control and Prevention, U.S. Dept of Health and Human Services. 2020; page 10. cdc.gov/diabetes/pdfs/data/statistics/national-diabetes-statistics-report.pdf.

3. Diabetes Mortality by State. National Center for Health Statistics. cdc.gov/nchs/pressroom/sosmap/diabetes\_mortality/ diabetes.htm. Updated April 29, 2020. Accessed July 9, 2020.

4. Konen J, Page J. The state of diabetes in North Carolina. *N C Med J.* 2011; 72(5): 373-378. classic.ncmedicaljournal.com/ wp-content/uploads/2011/09/72505-web.pdf.

5. Israel BA, Schulz AJ, Parker EA, Becker AB, Allen AJ, Guzman JR. Critical issues in developing and following CBPR principles. In Minkler M, Wallerstein N, ed. *Community-based participatory research for health.* San Francisco, CA: Jossey-Bass; 2003:53-76.

6. Models and Frameworks for the Practice of Community Engagement. Agency for Toxic Substances and Disease Registry. atsdr.cdc.gov/communityengagement/pce\_models. html. Updated June 25, 2015. Accessed July 10, 2020.

7. Dickinson JK, Guzman SJ, Maryniuk MD, O'Brian CA, Kadohiro JK, Jackson RA, et al. The use of language in diabetes care and education. *The Diabetes Educator*. 2017 Dec 1; 43(6); 551-564. doi.org/10.1177/0145721717735535.

8. American Diabetes Association. Standards of Medical Care in Diabetes – 2020. *Diabetes Care*. 2020 Jan; 43(S1): S1-S212. doi.org/10.2337/dc20-SINT.

9. Boyko EJ, Seelig AD, Ahroni JH. Limb- and person-level risk factors for lower-limb amputation in the Prospective Seattle Diabetic Foot Study. *Diabetes Care.* 2018 Apr; 41(4): 891-898. doi.org/10.2337/dc17-2210.

10. American Diabetes Association. Standards of Medical Care in Diabetes–2015. *Diabetes Care.* 2015 Jan; 38 (S1): S11, S38. care.diabetesjournals.org/content/38/Supplement\_1.

11. Centers for Disease Control and Prevention. *National Diabetes Statistics Report, 2020.* Atlanta, GA: Centers for Disease Control and Prevention, U.S. Dept of Health and Human Services. 2020. cdc.gov/diabetes/pdfs/data/statistics/national-diabetes-statistics-report.pdf.

12. Diabetes Overview: Diagnosis. American Diabetes Association. diabetes.org/a1c/diagnosis. Accessed July 8, 2020.

13. The Surprising Truth About Prediabetes. cdc.gov. cdc.gov/ diabetes/library/features/truth-about-prediabetes.html. Updated June 11, 2020. Accessed July 8, 2020.

14. Gestational Diabetes. cdc.gov. cdc.gov/diabetes/basics/ gestational.html. Updated May 30, 2019. Accessed July 8, 2020.

15. Gestational Diabetes and Pregnancy. cdc.gov. cdc.gov/ pregnancy/diabetes-gestational.html. Updated February 27, 2020. Accessed July 8, 2020.

16. American Diabetes Association. Management of Diabetes in Pregnancy: Standards of Medical Care in Diabetes–2020. *Diabetes Care*. 2020 Jan; 43(S1): S190. doi.org/10.2337/ dc20-S014.

17. American Diabetes Association. Management of Diabetes in Pregnancy: Standards of Medical Care in Diabetes – 2020. *Diabetes Care*. 2020 Jan; 43(S1): S183-S192. doi.org/10.2337/ dc20-S014.

18. Type 2 Diabetes. cdc.gov. cdc.gov/diabetes/basics/type2. html. Updated May 30, 2019. Accessed July 8, 2020.

19. American Diabetes Association. Classification and Diagnosis of Diabetes: Standards of Medical Care in Diabetes–2020. *Diabetes Care*. 2020 Jan; 43(S1): S19-20. doi.org/10.2337/ dc20-S002.

20. 2018 BRFSS Survey Results: North Carolina, Prediabetes. NC State Center for Health Statistics. schs.dph.ncdhhs.gov/ data/brfss/2018/nc/all/prediab.html. Published August 16, 2019. Accessed July 8, 2020.

21. Prediabetes – Your Chance to Prevent Type 2 Diabetes. cdc.gov. cdc.gov/diabetes/basics/prediabetes.html. Updated June 11, 2020. Accessed July 8, 2020.

22. 2012 BRFSS Survey Results: North Carolina, Diabetes. NC State Center for Health Statistics. schs.dph.ncdhhs.gov/data/ brfss/2012/nc/all/DIABETE3.html. Accessed November 20, 2013.

23. Divers J, Mayer-Davis EJ, Lawrence JM, et al. Trends in incidence of type 1 and type 2 diabetes among youths—Selected counties and Indian reservations, United States, 2002–2015. *MMWR Morb Mortal Wkly Rep.* 2020; 69: 161–165. doi.org/10.15585/mmwr.mm6906a3.

24. 2012 BRFSS Survey Results: North Carolina, Diabetes. NC State Center for Health Statistics. schs.dph.ncdhhs.gov/data/ brfss/2012/nc/all/DIABETE3.html. Published August 2, 2013. Accessed November 20, 2013. 25. Young LA et al. Diabetes in North Carolina: Descriptive epidemiology and meaningful use of electronic health records. *N C Med J.* 2011 Sep-Oct; 72(5): 383-386. ncbi.nlm.nih.gov/pmc/articles/PMC3392185.

26. 2012 BRFSS Survey Results: North Carolina, Diabetes — African Americans. NC State Center for Health Statistics. schs.dph.ncdhhs.gov/data/brfss/2012/nc/afam/ DIABETE3.html. Published August 6, 2013. Accessed November 20, 2013.

27. North Carolina Resident Population Health Data by Race and Ethnicity. NC State Center for Health Statistics. schs.dph.ncdhhs. gov/schs/pdf/NCPopHealthDatabyRaceEthOct2019v2.pdf. Published October 2019. Accessed July 8, 2020.

28. Leading Causes of Death, North Carolina Residents, 2012. NC State Center for Health Statistics. schs.dph.ncdhhs.gov/ data/vital/lcd/2012/pdf/TblsA-F.pdf. Published December 2013. Accessed March 10, 2014.

29. North Carolina Department of Health and Human Services, Office of Minority Health and Health Disparities. *Racial and Ethnic Health Disparities in North Carolina: North Carolina Health Equity Report 2018.* schs.dph.ncdhhs.gov/SCHS/pdf/ MinorityHealthReport\_Web\_2018.pdf. Accessed March 1, 2020.

30. 2018 BRFSS Survey Results: North Carolina, Diabetes. NC State Center for Health Statistics. schs.dph.ncdhhs.gov/data/ brfss/2018/nc/all/DIABETE3.html. Published August 16, 2019. Accessed April 8, 2020.

31. 2018 BRFSS Survey Results: Piedmont North Carolina, Chronic Health Conditions. NC State Center for Health Statistics. schs.dph.ncdhhs.gov/data/brfss/2018/pied/DIABETE3.html. Published August 16, 2019. Accessed July 8, 2020.

32. Barker LE et al. Geographic distribution of diagnosed diabetes in the U.S.: A diabetes belt. *Am J Prev Med.* 2011 Apr; 40(4): 434-439. doi.org/10.1016/j.amepre.2010.12.019.

 Harding JL et al. Trends of nontraumatic lower-extremity amputation in end-stage renal disease and diabetes: United States, 2000-2015. *Diabetes Care.* 2019 Aug; 42(8): 1430-1435. doi.org/10.2337/dc19-0296.

34. Norton JM et al. Social determinants of racial disparities in CKD. *JASN*. 2016 Sep; 27(9): 2576-2595. doi.org/10.1681/ASN.2016010027.

35. Glantz NM et al. Racial disparities in the burden of end-stage renal disease due to diabetes among Medicare beneficiaries. *Diabetes.* 2018 Jul; 67(S1). doi.org/10.2337/db18-1281-P.

36. The Cost of Diabetes. American Diabetes Association. diabetes.org/resources/statistics/cost-diabetes. Accessed July 8, 2020.

37. American Diabetes Association. Economic costs of diabetes in the U.S. in 2012. *Diabetes Care*. 2013 Apr; 36(4): 1033, 1038. doi.org/10.2337/dc12-2625.

38. American Diabetes Association. Economic costs of diabetes in the U.S. in 2017. *Diabetes Care*. 2018 May; 41(5): Supplementary data. doi.org/10.2337/dci18-0007.

39. Inpatient Hospital Utilization and Charges by Principal Diagnosis and County of Residence, North Carolina, 2018. NC State Center for Health Statistics. schs.dph.ncdhhs.gov/data/ databook. Accessed June 12, 2019.

40. Guh DP, Zhang W, Bansback N, Amarsi Z, Birmingham CL, Anis AH. The incidence of co-morbidities related to obesity and overweight: A systematic review and meta-analysis. *BMC Public Health.* 2009 Mar 25; 9: 88. doi.org/10.1186/1471-2458-9-88.

41. Franz MJ. Weight management: Obesity to diabetes. *Diabetes Spectrum.* 2017 Aug; 30(3): 149-153. doi.org/10.2337/ ds17-0011.

42. American Diabetes Association. Facilitating behavior change and well-being to improve health outcomes: Standards of Medical Care in Diabetes–2020. *Diabetes Care*. 2020 Jan; 43(S1): 50-54. doi.org/10.2337/dc20-S005.

43. Evert AB, Dennison M, Gardner CD, Garvey WT, Lau KHK, MacLeod J, Mitri J, Pereira RF, Rawlings K, Robinson S, Saslow L, Uelmen S, Urbanski PB, Yancy WS Jr. Nutrition therapy for adults with diabetes or prediabetes: A consensus report. *Diabetes Care.* 2019 May; 42(5): 731-754. doi.org/10.2337/ dci19-0014.

44. Hirahatake KM, Bruno RS, Bolling BW, Blesso C, Alexander LM, Adams SH. Dairy foods and dairy fats: New perspectives on pathways implicated in cardiometabolic health. *Adv Nutr.* 2020 Mar 1; 11(2): 266-279. doi.org/10.1093/advances/nmz105.

45. Bhupathi V, Mazariegos M, Cruz Rodriguez JB, Deoker A. Dairy intake and risk of cardiovascular disease. *Curr Cardiol Rep.* 2020 Jan 29; 22(3): 11. doi.org/10.1007/s11886-020-1263-0.

46. Fontecha J, Visitación Calvo M, Juarez M, Gil A, Martínez-Vizcaino V. Milk and dairy product consumption and cardiovascular diseases: An overview of systematic reviews and meta-analyses. *Adv Nutr.* 2019 May 1; 10(S2): S164-S189. doi.org/10.1093/advances/nmy099.

47. Malik VS, Hu FB. Fructose and cardiometabolic health: what the evidence from sugar-sweetened beverages tells us. *J Am Coll Cardiol.* 2015 Oct; 66(14): 1615–1624. doi.org/10.1016/j. jacc.2015.08.025.

48. Rogers PJ, Hogenkamp PS, de Graaf C, et al. Does lowenergy sweetener consumption affect energy intake and body weight? A systematic review, including meta-analyses, of the evidence from human and animal studies. *Int J Obes.* 2016 Mar; 40(3): 381–394. doi.org/10.1038/ijo.2015.177.

49. Azad MB, Abou-Setta AM, Chauhan BF, et al. Nonnutritive sweeteners and cardiometabolic health: A systematic review and meta-analysis of randomized controlled trials and prospective cohort studies. *CMAJ.* 2017 Jul 17; 189(28): E929–E939. doi.org/10.1503/cmaj.161390.

50. Horne BD, Grajower MM, Anderson JL. Limited evidence for the health effects and safety of intermittent fasting among patients with type 2 diabetes. *JAMA*. 2020 July 2. doi.org/10.1001/jama.2020.3908.

51. Simple Steps to Preventing Diabetes. Harvard T.H. Chan School of Public Health. hsph.harvard.edu/nutritionsource/ preventing-diabetes-full-story/#diet. Accessed July 9, 2020.

52. AlEssa H, Bupathiraju S, Malik V, Wedick N, Campos H, Rosner B, Willett W, Hu FB. Carbohydrate quality, measured using multiple carbohydrate quality metrics, is negatively associated with risk of type 2 diabetes in US women. *Circulation*. 2015 Mar 4; 131(S1): A20. ahajournals.org/doi/abs/10.1161/ circ.131.suppl\_1.20.

53. NCCDPHP Division of Nutrition and Physical Activity. *Research to Practice Series No. 2: Portion Size*. Atlanta, GA: Centers for Disease Control and Prevention. 2006. cdc.gov/ nccdphp/dnpa/nutrition/pdf/portion\_size\_research.pdf.

54. Ahn DT, Stahl R. Is there an app for that? The pros and cons of diabetes smartphone apps and how to integrate them into clinical practice. *Diabetes Spectrum.* 2019 Aug; 32(3); 231-236. doi.org/10.2337/ds18-0101.

55. Ding C, Chan Z, Magkos F. Lean, but not healthy: the 'metabolically obese, normal-weight' phenotype. *Curr Opin Clin Nutr Metab Care.* 2016 Nov; 19(6): 408-417. doi.org/10.1097/ MCO.000000000000317.

56. Perceived Exertion (Borg Rating of Perceived Exertion Scale). cdc.gov. cdc.gov/physicalactivity/basics/measuring/exertion. htm. Updated April 10, 2020. Accessed July 9, 2020.

57. U.S. Department of Health and Human Services. *The Health Consequences of Smoking—50 Years of Progress: A Report of the Surgeon General.* Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health. 2014. cdc.gov/tobacco/data\_statistics/sgr/50th-anniversary/index.htm. Accessed September 11, 2015. 58. Foy CG, Bell FA, Farmer DR, Goff DC, Wagenknect LE. Smoking and incidence of diabetes among U.S. adults: Findings from the insulin resistance atherosclerosis study. *Diabetes Care.* 2005 Oct; 28(10): 2501-2507. doi.org/10.2337/ diacare.28.10.2501.

59. How Does Nicotine Affect Blood Sugar? WebMD.com. webmd.com/diabetes/nicotine-blood-sugar. Published July 1, 2019. Accessed March 25, 2020.

60. American Diabetes Association. Facilitating behavior change and well-being to improve health outcomes: Standards of Medical Care in Diabetes–2020. *Diabetes Care*. 2020 Jan; 43(S1): S48-S65. doi.org/10.2337/dc20-S005.

61. Altun I, Cınar N, Dede C. The contributing factors to poor sleep experiences in according to the university students: A cross-sectional study. *J Res Med Sci.* 2012 Jun; 17(6): 557–561. ncbi.nlm.nih.gov/pmc/articles/PMC3634295.

62. Tononi G, Cirelli C. Sleep function and synaptic homeostasis. *Sleep Med Rev.* 2006 Feb; 10(1): 49-62. doi.org/10.1016/j. smrv.2005.05.002.

63. U.S. Department of Health and Human Services, National Institutes of Health, National Heart, Lung, and Blood Institute. *Your Guide to Healthy Sleep.* 2005 Nov, revised 2011 Aug; NIH Publication No. 11-5271. nhlbi.nih.gov/files/docs/public/sleep/ healthy\_sleep.pdf.

64. Vetter C, Dashti HS, Lane JM, Anderson SG, Schernhammer ES, Rutter MK, Saxena R, Scheer FAJL. Night shift work, genetic risk, and type 2 diabetes in the UK biobank. *Diabetes Care.* 2018 Apr; 41(4): 762-769. doi.org/10.2337/dc17-1933.

65. Gami AS, Olson EJ, Shen WK, et al. Obstructive sleep apnea and the risk of sudden cardiac death: A longitudinal study of 10,701 adults. *J Am Coll Cardiol.* 2013 Aug 13; 62(7): 610–616. doi.org/10.1016/j.jacc.2013.04.080.

66. Pippitt K, Li M, Gurgle HE. Diabetes mellitus: Screening and diagnosis. *Am Fam Physician*. 2016 Jan 15; 93(2): 103-109. aafp.org/afp/2016/0115/p103.html.

67. Diabetes Risk Factors. cdc.gov. cdc.gov/diabetes/basics/ risk-factors.html. Updated March 24, 2020. Accessed February 24, 2020.

68. National Diabetes Prevention Program. cdc.gov. cdc.gov/ diabetes/prevention/index.html. Updated August 10, 2019. Accessed July 9, 2020.

69. PCOS (Polycistic Ovary Syndrome) and Diabetes. cdc.gov. cdc.gov/diabetes/basics/pcos.html. Updated March 24, 2020. Accessed July 9, 2020.

70. Make Your Workout Work for You. cdc.gov. cdc.gov/features/ diabetes-physical-activity/index.html. Updated April 12, 2019. Accessed July 9, 2020. 71. Wilcox G. Insulin and insulin resistance. *Clin Biochem Rev.* 2005 May; 26(2): 19-39. ncbi.nlm.nih.gov/pmc/articles/ PMC1204764.

72. Portillo-Sanchez P, Bril F, Maximos M, et al. High prevalence of nonalcoholic fatty liver disease in patients with type 2 diabetes mellitus and normal plasma aminotransferase levels. *J Clin Endocrinol Metab.* 2015 Jun; 100(6): 2231-2238. doi.org/10.1210/jc.2015-1966.

73. Diabetes Prevention Program Research Group. Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. *N Engl J Med.* 2002 Feb 7; 346: 393-403. doi.org/10.1056/NEJMoa012512.

74. Diabetes prevention program. Medicare.gov. medicare.gov/ coverage/diabetes-prevention-program. Accessed February 27, 2020.

75. American Diabetes Association. Standards of Medical Care in Diabetes–2017. *Diabetes Care*. 2017 Jan 1; 40(S1); S1-S135. doi.org/10.2337/dc17-S001.

76. American Diabetes Association. Classification and Diagnosis of Diabetes: Standards of Medical Care in Diabetes–2020. *Diabetes Care*. 2020 Jan; 43(S1): S14-S31. doi.org/10.2337/ dc20-S002.

77. American Diabetes Association. Comprehensive Medical Evaluation and Assessment of Comorbidities: Standards of Medical Care in Diabetes – 2020. *Diabetes Care*. 2020 Jan; 43(S1): S37-S47. doi.org/10.2337/dc20-S004.

78. Umpierrez GE, Klonoff DC. Diabetes technology update: Use of insulin pumps and continuous glucose monitoring in the hospital. *Diabetes Care.* 2018 Aug; 41(8): 1579–1589. doi.org/10.2337/dci18-0002.

79. Battelino T, Danne T, Bergenstal RM, Amiel SA, Beck R, Biester T, Bosi E, Buckingham BA, Cefalu WT, Close KL, Cobelli C, Dassau E, DeVries JH, Donaghue KC, Dovc K, Doyle FJ 3rd, Garg S, Grunberger G, Heller S, Heinemann L, Hirsch IB, Hovorka R, Jia W, Kordonouri O, Kovatchev B, Kowalski A, Laffel L, Levine B, Mayorov A, Mathieu C, Murphy HR, Nimri R, Nørgaard K, Parkin CG, Renard E, Rodbard D, Saboo B, Schatz D, Stoner K, Urakami T, Weinzimer SA, Phillip M. Clinical targets for continuous glucose monitoring data interpretation: Recommendations from the international consensus on time in range. *Diabetes Care.* 2019 Aug; 42(8): 1593-1603. doi.org/10.2337/dci19-0028.

80. Lu J, Ma X, Zhou J, et al. Association of time in range, as assessed by continuous glucose monitoring, with diabetic retinopathy in type 2 diabetes. *Diabetes Care.* 2018 Nov; 41(11): 2370–2376. doi.org/10.2337/dc18-1131.

81. American Diabetes Association. Glycemic Targets: Standards of Medical Care in Diabetes –2020. *Diabetes Care*. 2020 Jan; 43(S1): S68. doi.org/10.2337/dc20-S006. 82. Beck RW, Bergenstal RM, Cheng P, et al. The relationships between time in range, hyperglycemia metrics, and HbA1c. *J Diabetes Sci Technol.* 2019 Jan 13; 13(4): 614-626. doi.org/10.1177/1932296818822496.

 Strawbridge L, Lloyd J, Meadow A, Riley G, Howell B. One-year outcomes of diabetes self-management training among Medicare beneficiaries newly diagnosed with diabetes. *Med Care*. 2017 Apr; 55(4): 391-397. doi.org/10.1097/ MLR.000000000000653.

84. Davies MJ, D'Alessio DA, Fradkin J, Kernan WN, Mathieu C, Mingrone G, Rossing P, Tsapas A, Wexler DJ, Buse JB. Management of Hyperglycemia in Type 2 Diabetes, 2018: A Consensus Report by the American Diabetes Association (ADA) and the European Association for the Study of Diabetes (EASD). *Diabetes Care*. 2018 Dec; 41(12): 2669–2701. doi.org/10.2337/ dci18-0033.

85. American Association of Diabetes Educators. An effective model of diabetes care and education: Revising the AADE7 Self-Care Behaviors<sup>®</sup>. *The Diabetes Educator*. 2020 Apr 1; 46(2): 139-160. doi.org/10.1177/0145721719894903.

86. Beck J, Greenwood D, Blanton L, et al. 2017 national standards for diabetes self-management education and Support. *The Diabetes Educator*. 2017 Oct 1; 43(5): 449-464. doi.org/10.1177/0145721717722968.

87. Chrvala CA, Sherr D, Lipman RD. Diabetes self-management education for adults with Type 2 diabetes mellitus: a systematic review of the effect on glycemic control. *Patient Educ Couns.* 2016 Jun; 99(6): 926-943. doi.org/10.1016/j.pec.2015.11.003.

88. Powers MA, Bardsley JK, Cypress M, Funnell MM, Harms D, Hess-Fischl A, Hooks B, Isaacs D, Mandel ED, Maryniuk MD, Norton A, Rinker K, Siminerio LM, Uelmen S. Diabetes self-management education and support in adults with type 2 diabetes: A consensus report of the American Diabetes Association, the Association of Diabetes Care & Education Specialists, the Academy of Nutrition and Dietetics, the American Academy of Family Physicians, the American Academy of PAs, the American Association of Nurse Practitioners, and the American Pharmacists Association. *Diabetes Care*. 2020 Jul; 43(7): 1636-1649. doi.org/10.2337/dci20-0023.

89. Beck J, Greenwood DA, Blanton L, Bollinger ST, Butcher MK, Condon JE, Cypress M, Faulkner P, Fischl AH, Francis T, Kolb LE, Lavin-Tompkins JM, MacLeod J, Maryniuk M, Mensing C, Orzeck EA, Pope DD, Pulizzi JL, Reed AA, Rhinehart AS, Siminerio L, Wang J. 2017 national standards for diabetes self-management education and support. *The Diabetes Educator*. 2020 Feb; 46(1): 46-61. doi.org/10.1177/0145721719897952.

90. American Diabetes Association. Facilitating behavior change and well-being to improve health outcomes: Standards of Medical Care in Diabetes–2020. *Diabetes Care*. 2020 Jan; 43(S1): S49. doi.org/10.2337/dc20-S005. 91. Know your Blood Sugar Numbers: Use Them to Manage Your Diabetes. National Institute of Diabetes and Digestive and Kidney Diseases. niddk.nih.gov/health-information/diabetes/ overview/managing-diabetes/know-blood-sugar-numbers. Published March 2016.

92. Healthy Living with Diabetes: Getting the Vaccines You Need. cdc.gov. cdc.gov/vaccines/adults/rec-vac/health-conditions/ diabetes/infographic/index.html. Updated May 2018. Accessed July 10, 2020.

93. Association of Diabetes Care and Education Specialists (ADCES). *Vaccination Practices for Adults with Diabetes*. Chicago, IL; Association of Diabetes Care and Education Specialists; 2019. diabeteseducator.org/docs/default-source/ practice/educator-tools/vaccination-practices-for-adults-withdiabetesv2.pdf?sfvrsn=2.

94. Diabetes and Vaccines. Association of Diabetes Care and Education Specialists (ADCES). diabeteseducator.org/living-withdiabetes/Tools-and-Resources/vaccine-resources. Accessed July 17, 2020.

95. Fleischman S. I am... I have... I suffer from...: a linguist reflects on the language of illness and disease. *J Med Human.* 1999 Mar; 20(1): 3-32. link.springer.com/ article/10.1023/A:1022918132461.

96. Benedetti F. How the doctor's words affect the patient's brain. *Eval Health Prof.* 2002 Dec 1; 25(4): 369-386. doi.org/10.1177/0163278702238051.

97. Dickinson JK. The experience of diabetes-related language in diabetes care. *Diabetes Spectrum*. 2018 Feb; 31(1): 58-64. doi.org/10.2337/ds16-0082.

98. What You Say Matters. Association of Diabetes Care and Education Specialists (ADCES). diabeteseducator.org/practice/ practice-tools/app-resources/diabetes-language-paper. Accessed July 17, 2020.

99. Disparities. US Department of Health and Human Services, Office of Disease Prevention and Health Promotion. healthypeople.gov/2020/about/foundation-health-measures/ Disparities. Accessed March 1, 2020.

100. What is Health Equity? Robert Wood Johnson Foundation. rwjf.org/en/library/research/2017/05/what-is-health-equity-.html. Published May 1, 2017. Accessed March 1, 2020.

101. County Health Rankings Model. County Health Rankings & Roadmaps. countyhealthrankings.org/explore-health-rankings/ measures-data-sources/county-health-rankings-model. Accessed March 1, 2020.

102. North Carolina Institute of Medicine and North Carolina Department of Health and Human Services. *Healthy North Carolina 2030: A Path Towards Health.* Morrisville, NC: North Carolina Institute of Medicine; 2020. nciom.org/wp-content/ uploads/2020/01/HNC-REPORT-FINAL-Spread2.pdf. Accessed March 1, 2020.

103. University of Wisconsin Population Health Institute. What Works? Social and Economic Opportunities to Improve Health for All. September 2018. countyhealthrankings.org/ reports/what-works-social-and-economic-opportunities-toimprove-health-for-all.

104. Addressing Health Disparities in Diabetes. cdc.gov. cdc.gov/diabetes/disparities.html. Updated April 15, 2019. Accessed March 1, 2020.

105. Robert Wood Johnson Foundation. *A New Way to Talk about the Social Determinants of Health*. Robert Wood Johnson Foundation; 2010. societyforhealthpsychology.org/wp-content/uploads/2016/08/rwjf63023.pdf.

106. Allen NA, Colicchio VD, Litchman ML, Gibson B, Villalta J, Sanchez-Birkhead AC. Hispanic community-engaged research: Community partners as our teachers to improve diabetes selfmanagement. *Hispanic Health Care International*. 2019 Sep 1; 17(3): 125-132. doi.org/10.1177/1540415319843229.

107. Wroe JB. How can the media be best used to influence the diabetes policy makers? *Practical Diabetes International.* 2006 May; 23(4): 178-182. doi.org/10.1002/pdi.939.

108. Gross TT, Story CR, Harvey IS, et al. "As a community, we need to be more health conscious": Pastors' perceptions on the health status of the black church and African American communities. *J Racial Ethn Health Disparities*. 2018 Jun; 5(3): 570-579. doi.org/10.1007/s40615-017-0401-x.

109. National Diabetes Education Program. *Faith Leaders Toolkit: Diabetes Prevention and Management*. National Institutes of Health and Centers for Disease Control and prevention; 2017. peersforprogress.org/wp-content/uploads/2016/06/160627-faithleaders\_toolkit.pdf.

110. Miller RS, Mars D. Effectiveness of a diabetes education intervention in a faith-based organization utilizing the AADE7. *ADCES in Practice*. 2020 Jan 1; 8(1): 10-14. doi.org/10.1177/2633559X20887746.

111. Sawani J. A new type of church outreach: Diabetes education. Michigan Health Lab. labblog.uofmhealth.org/ body-work/a-new-type-of-church-outreach-diabetes-education. Published October 4, 2018.

112. Eat Smart, Move More North Carolina. *North Carolina's Plan to Address Overweight and Obesity*. Raleigh, NC: Eat Smart, Move More North Carolina; 2020. eatsmartmovemorenc.com/ who-we-are/#ObesityPlan.

113. Acting Locally. In Institute of Medicine (US) and National Research Council (US) Committee on Childhood Obesity Prevention Actions for Local Governments; Parker L, Burns AC, Sanchez E, ed. *Local Government Actions to Prevent Childhood Obesity*. Washington (DC): National Academies Press (US); 2009. ncbi.nlm.nih.gov/books/NBK219685.

114. Olenik NL, Fletcher LM, Gonzalvo JD. The community pharmacist as diabetes educator. *AADE in Practice*. 2015 Sep 1; 3(5): 46-50. doi.org/10.1177/2325160315597197.

115. Claypool TM. Pharmacy medication therapy management: A critical piece of the diabetes management puzzle. *AADE in Practice*. 2015 Mar 1; 3(2): 12-16. doi.org/10.1177/2325160314568368.

116. Association of Diabetes Care and Education Specialists (ADCES). *Community Health Workers as Diabetes Paraprofessionals in DSMES and Prediabetes*. Chicago, IL; Association of Diabetes Care and Education Specialists; 2019. 1-5. diabeteseducator.org/docs/default-source/practice/practicedocuments/practice-papers/adces-community-health-workersas-diabetes-paraprofessionals-in-dsmes-and-prediabetes---final-4-1-20.pdf?sfvrsn=4.

117. Crespo R, Hatfield V, Hudson J, Justice M. Partnership with community health workers extends the reach of diabetes educators. *AADE in Practice*. 2015 Mar 1; 3(2): 24-29. doi.org/10.1177/2325160315569046.

118. Diabetes Prevention: Interventions Engaging Community Health Workers Improve Risk Factors and Health Outcomes. The Guide to Community Preventive Services (The Community Guide): Recommendations from the Community Preventive Services Task Force (CPSTF). the community guide.org/content/ community-health-worker-interventions-help-prevent-diabetes. Published April 2017.

119. Brunton S. Therapeutic inertia is a problem for all of us. *Clinical Diabetes.* 2019 Apr; 37(2): 105-106. doi.org/10.2337/ cd19-0009.

120. Together 2 Goal. together2goal.org. Accessed July 10, 2020.

121. Overcoming Therapeutic Inertia. American Diabetes Association. professional.diabetes.org/meeting/other/ overcoming-therapeutic-inertia. Accessed March 2020.

122. Local Barbershops and Beauty Salons are the "Heart" of New Program to Improve Heart Health. Blue Cross Blue Shield of North Carolina. mediacenter.bcbsnc.com/news/localbarbershops-and-beauty-salons-are-the-heart-of-new-programto-improve-heart-health. Published February 24, 2020.

123. Pearson TL, Bardsley J, Weiner S, Kolb L. Population Health: The diabetes educator's evolving role. *The Diabetes Educator*. 2019 Aug 1; 45(4): 333-348. doi.org/10.1177/0145721719857728. 124. Green LW, Brancati FL, Albright A, the Primary Prevention of Diabetes Working Group. Primary prevention of type 2 diabetes: Integrative public health and primary care opportunities, challenges and strategies. *Family Practice*. 2012 Apr 1; 29(S1): i13-i23. doi.org/10.1093/fampra/cmr126.

125. Centers for Disease Control and Prevention, Office on Smoking and Health. *Preventing Tobacco Use Among Children and Young Adults: A Report of the Surgeon General.* 2012. cdc.gov/tobacco/data\_statistics/sgr/2012/consumer\_booklet/ pdfs/consumer.pdf. Accessed September 11, 2015.

126. Lycett D et al. The association between smoking cessation and glycemic control in patients with Type 2 diabetes: A THIN database cohort study. *The Lancet Diabetes & Endocrinology*. 2015 June; 3(6): 423–430. doi.org/10.1016/S2213-8587(15)00082-0.

127. Lajous M, Tondeur L, Fagherazzi G, de Lauzon-Guillain B, Boutron-Ruaualt M, Clavel-Chapelon F. Childhood and adult secondhand smoke and type 2 diabetes in women. *Diabetes Care.* 2013 Sep; 36(9): 2720-2725. doi.org/10.2337/dc12-2173.

128. Knopf T. For many, Medicaid expansion is personal. *North Carolina Health News*. 2019 Feb 28. northcarolinahealthnews. org/2019/02/28/for-many-medicaid-expansion-is-personal.

129. Spencer JC, Gertner AK, Silberman PJ. Health status and access to care for the North Carolina Medicaid gap population. *NC Med J.* 2019 Sep-Oct; 80(5): 269-275. doi.org/10.18043/ ncm.80.5.269.

130. Garfield R, Orgera K, Damico A. The Coverage Gap: Uninsured Poor Adults in States That Do Not Expand Medicaid. Henry J Kaiser Family Foundation; January 2020. files.kff.org/ attachment/Issue-Brief-The-Coverage-Gap-Uninsured-Poor-Adults-in-States-that-Do-Not-Expand-Medicaid.

131. Lee J, Callaghan T, Ory M, Zhao H, Bolin JN. The impact of Medicaid expansion on diabetes management. *Diabetes Care*. 2020 May; 43(5): 1094-1101. doi.org/10.2337/dc19-1173.

132. American Diabetes Association. *Diabetes Care*. 1996 Jan; 19(S1): S1-S118. doi.org/10.2337/diacare.19.1.S1; care.diabetesjournals.org/content/19/Supplement\_1.



MANAGE WEIGHT | LIVE TOBACCO FREE | PARTICIPATE IN LIFESTYLE CHANGE PROGRAMS PARTICIPATE IN DIABETES EDUCATION | ADHERE TO TREATMENT PLAN | GET ADEQUATE SLEEP