North Carolina's Guide to Prevention and Management of Diabetes 3rd Edition

North Carolina Diabetes Advisory Council

Introduction

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Introduction

More than 1 million adults in North Carolina have diabetes (12.4% of the adult population[1]), and 34.6% of the adult population are at high risk for developing type 2 diabetes.[2] In 2022, diabetes was responsible for over 3,800 deaths per 100,000 residents in North Carolina, ranking the state 11th in the nation for diabetes-related deaths.[3]

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) that negatively impact quality of life. Diabetes places a substantial personal and financial burden on those affected and their caregivers, as well as significant costs on individuals, employers, health care systems, communities, and all levels of government statewide. In 2017, the estimated total direct medical expenses for diagnosed diabetes in North Carolina were $7.7 billion. The total indirect costs due to lost productivity amounted to $2.9 billion, bringing the overall cost of diabetes to $10.6 billion.[2]

To address the complexities of diabetes and reduce its burdens, North Carolina must consider personal and environmental factors at the individual, relationship, community, and societal levels. Social, economic, and policy environments influence individual behaviors and collectively constitute the Social Determinants of Health (SDoH). Beyond managing diabetes, it is essential to focus on preventing the disease and its complications—or at least delaying its onset—through efforts at the individual, community, and systems level.

Purpose and Mission

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).

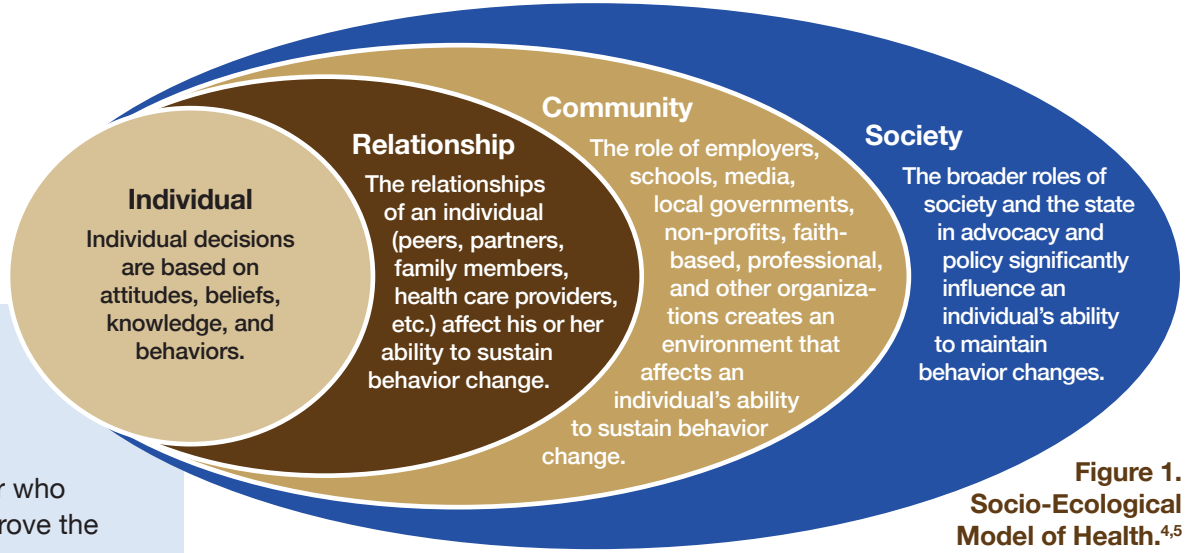


Figure 1. Socio-Ecological Model of Health.[4,5]

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.
3. Provides specific strategies for community groups, employers, and health care providers to implement and to assist people in reducing their risk for developing diabetes and/or managing their diabetes, including reducing risk of complication.
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.

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.

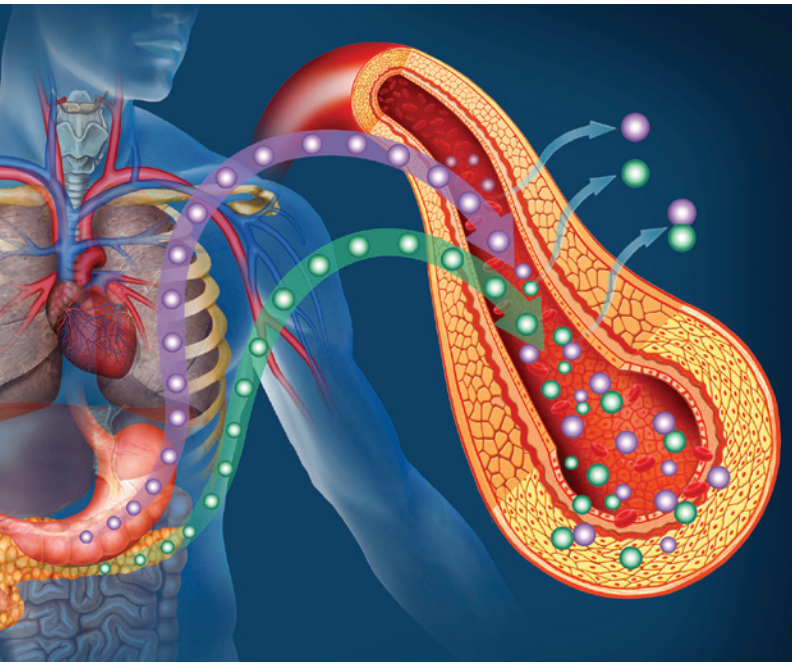
This Guide is also a **Call to Action** to prevent and manage diabetes. We hope, after you read it, you will join the NC DAC in our mission to make a difference.

Modeling the Language of Diabetes

Words matter in diabetes care and management. People diagnosed with prediabetes or diabetes communicate and engage with their health care team, families, friends, employers, and communities 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. Using language that promotes inclusion, respect, positivity, and acceptance without judgment fosters effective collaboration between individuals with or at risk for diabetes and their health care 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 address language best practices in the delivery of diabetes care and diabetes self-care management education and support (DSMES).[6]

Sugar is a general term for sweet chemical compounds found in both food and our bodies. Table sugar (sucrose) is composed of equal parts glucose and fructose. The primary sugar utilized by our bodies is glucose, which is regulated by the hormone insulin. In this document, “glucose” will specifically refer to the sugar present in the bloodstream.



According to the **CDC’s diabetes glossary**, **insulin resistance** refers to the body’s inability to respond to and use the insulin it produces, which increases its need for insulin. People who have genetic or lifestyle risk factors are more likely to develop insulin resistance.

Prediabetes and Diabetes Range

Prediabetes is a condition where people have higher than normal glucose levels but not yet high enough for a doctor to diagnose them with diabetes. Prediabetes is sometimes referred to as impaired glucose tolerance (IGT) or impaired fasting glucose (IFG), depending on the test used.[7] Prediabetes is diagnosed when there is no previous diagnosis of diabetes, and a blood test called hemoglobin A1c is measured between 5.7-6.4%. A fasting glucose of 100-125 mg/dl is consistent with prediabetes as is a glucose over 140 mg/dl during an oral glucose tolerance test, as long as there is no other evidence for diabetes. Prediabetes is serious because it increases the chance of developing type 2 diabetes, heart disease and stroke.[8] About 98 million American adults, or 38.0%, had prediabetes in 2021.[9]

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. This essential hormone produced by the pancreas helps glucose enter the cells so it can be used to store energy. Keeping blood glucose in a healthy range is key to successfully reducing the risk of complications for people with diabetes. Persistent high glucose levels can lead to severe health complications, including high blood pressure and cholesterol, heart disease, stroke, blindness, kidney failure, and infections. Additionally, conditions such as peripheral neuropathy and peripheral arterial disease elevate the risk of limb amputation.[10] People with prediabetes and diabetes also face an increased risk of various complications, including hearing loss, sleep apnea, oral diseases, certain cancers (such as liver, pancreatic, endometrial, colon, rectal, breast, and bladder cancers), sexual dysfunction, diabetes-related distress (including anxiety and depression), and cognitive impairments (such as dementia).[11,12,13]

1 Type 1 Diabetes

Type 1 diabetes is caused by an autoimmune destruction of cells in the pancreas that produce insulin[14] and affects approximately 5 to 10% of people with diabetes.[15] 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. A recently approved medication can delay the onset of high blood glucose symptoms from type 1 diabetes by slowing down or turning off the autoimmune destruction of cells in the pancreas.[16]

2 Type 2 Diabetes

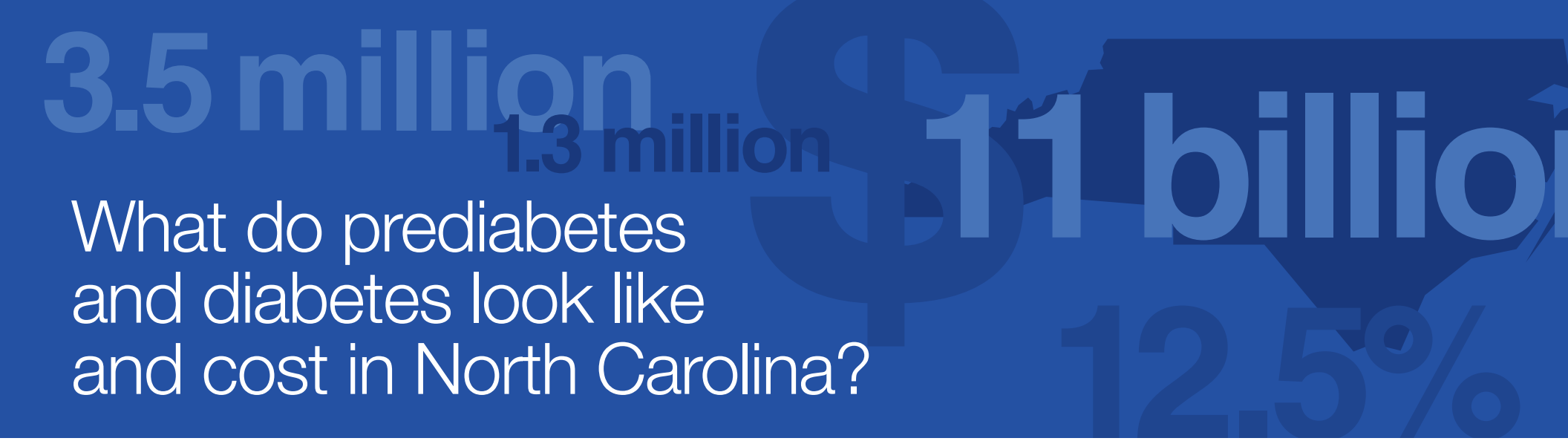
In type 2 diabetes, there is insulin resistance where the body only responds to much higher levels of insulin and in combination with relative insulin deficiency, the liver produces too much glucose and the body is unable to process or metabolize dietary glucose, resulting in high blood glucose. People with type 2 diabetes can have varying degrees of insulin resistance and insulin deficiency which lead to high glucose. The liver produces too much glucose because of insulin resistance. Type 2 diabetes is the most common form of diabetes, accounting for up to 90 to 95% of diagnosed diabetes.[14] It affects about 1 in 10 people in the US.[21] 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/Latin American and Asian American). It is often associated with a strong genetic predisposition.[22]

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 their pancreas can produce. Gestational diabetes is only present during pregnancy and occurs in approximately 8% of pregnancies.[17] 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 pregnancy complications including maternal death, stillbirth and infant death. After delivery, half of these women[15] may develop type 2 diabetes in 10–20 years.[18,19] Their children are also at increased risk of developing diabetes. It is important to screen women with gestational diabetes 4-12 weeks after delivery because of the increased risk for developing type 2 diabetes. Even if screening is negative at the postpartum visit, both the ADA and American College of Obstetricians and Gynecologists (ACOG) recommend assessing glycemic status every 1 to 3 years and counseling patients regarding diet and/or exercise as needed.[20]

3c Type 3c Diabetes and MODY

There are other causes of diabetes. Genetic mutations can cause diabetes and are often referred to as neonatal diabetes or monogenic diabetes of the young (MODY). Type 3c diabetes occurs when the pancreas is damaged by other causes like pancreatitis, cystic fibrosis, cancer, or hemochromatosis leading to reduced insulin secretion.[22]



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

Prediabetes Prevalence

Approximately 1 in 3 adults in the United States has prediabetes.[25] This condition typically has no symptoms, so many individuals only discover they have prediabetes through blood glucose testing conducted by a health care professional.[22] In 2022, 12.1% of respondents to the **Behavioral Risk Factor Surveillance System** (BRFSS) survey indicated being informed by a doctor or other health care provider that they had prediabetes. Among these individuals, 30.3% were racial and ethnic minorities (North Carolina State Center for Health Statistics, BRFSS 2022).[23] The actual prevalence of prediabetes is likely higher, as over 80% of those with the condition are unaware of it. The CDC estimates that around 34.5% of adults in the United States have prediabetes,[24] with the prevalence in North Carolina potentially surpassing the national average.

Diabetes Prevalence

Approximately 1,028,026 people in North Carolina—about 12.3% of the adult population—have been diagnosed with diabetes, a rate that exceeds the national average. Furthermore, an estimated 244,000 North Carolinians have undiagnosed diabetes, which significantly heightens their health risks. The actual number of people with diabetes in the state is likely much higher, as about 21% of individuals with diabetes remain undiagnosed.[9] Diabetes prevalence and incidence have been increasing among adults for many years, and troubling recent trends show a rising number of cases among children and adolescents as well.[26]

Racial/Ethnic Inequalities in Diabetes Prevalence and Mortality

Diabetes, particularly type 2 diabetes, disproportionately affects all racial and ethnic minority groups in North Carolina.

Specifically, rates are higher among American Indian/Alaska Native, non-Hispanic Black, Hispanic, and non-Hispanic Asian in that order.[23] While diabetes prevalence increases with age for all racial groups, the disease disproportionately affects older African Americans, with 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 diagnosed.[28,29] Complications of diabetes, particularly lower extremity amputation (LEA)[27] and end stage renal disease (ESRD),[38] are higher for African Americans and American Indians. 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.[29,30] In 2018, African Americans and American Indians were more than twice as likely to die from diabetes than non-Hispanic whites.[31]

Geographic Disparities

For both men and women, prevalence is higher among adults living in nonmetropolitan areas compared to those in metropolitan areas.[32] 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 10.7%.[33] In the eastern and western regions, which are largely rural, the prevalence of diagnosis is higher at 13.9% and 12.8%, respectively.[34,35] Regional disparities also include racial disparities. For example, in the Piedmont, 15.4% of African Americans report a diabetes diagnosis, while 11.9% of non-Hispanic whites do so.[36] The Eastern counties of NC make up what the CDC calls the "Diabetes Belt," where diabetes affects at least 15% of the population.[37]

Economic Burden

Diagnosed diabetes costs an estimated $10.6 billion in North Carolina each year. People with diabetes have medical expenses approximately 2.3 times higher than those who do not have diabetes. Total direct medical expenses for diagnosed diabetes in North Carolina were estimated at $7.7 billion in 2017. In addition, another $2.9 billion was spent on indirect costs from lost productivity due to diabetes.[2] A majority (67.3%) of the medical costs are paid by government programs, including Medicare, Medicaid, Indian Health Service and military health programs.[39] National health care costs related to diabetes have risen by $80 billion over the past decade, increasing from $227 billion in 2012 to $307 billion in 2022. Of this total, $106.3 billion (26%) is attributable to lost productivity, unemployment due to chronic disability, and premature death.[40]

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.[41] Between 2010 and 2019, diabetes hospitalizations significantly increased from 3079.0 to 3280.8 per 100,000 US population, with an average stay of 4.7 days.[42] For people with diabetes, the hospital readmission rate ranges from 14% to 20%, nearly double that of patients without diabetes. Contributing factors to readmission include being male, a longer duration of prior hospitalization, a higher number of previous hospitalizations, the presence and severity of comorbidities, and lower socioeconomic or educational status.[43]

How Can Diabetes Be Prevented or Delayed?

This section describes how to prevent diabetes from occurring or dramatically delaying it (primary prevention), including special considerations for those at high risk who should aggressively work on reducing their risk, and also be monitored for early onset of diabetes through early detection or screening. In the following section we will address the management of diabetes in people already diagnosed and strategies to prevent complications through individual and group self-management programs and the importance of persistence with prescribed medical therapy (tertiary prevention).

Primary prevention in type 1 diabetes remains a topic of intensive research, but few recommendations have emerged on how to prevent this form of diabetes. The symptoms of high blood glucose from type 1 diabetes can be delayed in adults and children aged 8 years and older with a medication designed to slow down or turn off the autoimmune destruction of cells in the pancreas.[2] Several long-term population studies and clinical trials show that most occurrences of type 2 diabetes can indeed be prevented or delayed.

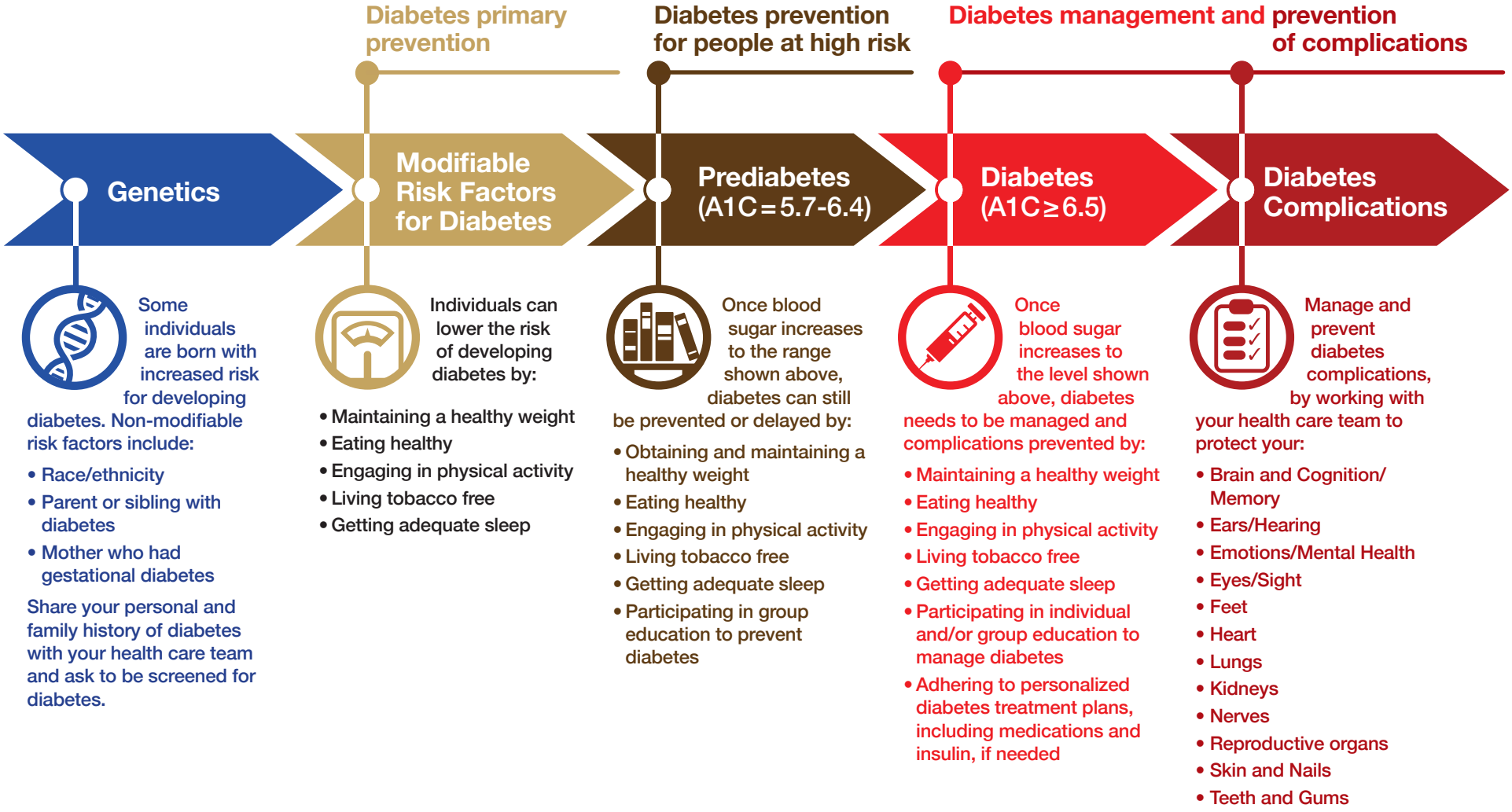
A major focus of this Guide and the Diabetes Advisory Council is on type 2 diabetes because it is more common and is potentially preventable. For the remainder of this document, the use of the word “diabetes” will be referring to type 2 diabetes unless indicated otherwise.

Figure 2 shows the progression of diabetes and what individuals can do to prevent and manage diabetes at each stage.

FIGURE 2.

Lifetime Risk Management for Developing and Managing Type 2 Diabetes

The risk of developing diabetes increases with age.



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