

### **What is diabetes?**

Diabetes is a disorder of metabolism—the way our bodies use digested food for growth and energy. Most of the food we eat is broken down into glucose, the form of sugar in the blood. Glucose is the main source of fuel for the body.

After digestion, glucose passes into the bloodstream, where it is used by cells for growth and energy. For glucose to get into cells, insulin must be present. Insulin is a hormone produced by the [pancreas](#), a large gland behind the stomach.

When we eat, the pancreas automatically produces the right amount of insulin to move glucose from blood into our cells. In people with diabetes, however, the pancreas either produces little or no insulin, or the cells do not respond appropriately to the insulin that is produced. Glucose builds up in the blood, overflows into the [urine](#), and passes out of the body. Thus, the body loses its main source of fuel even though the blood contains large amounts of glucose.

## What are the types of diabetes?

The three main types of diabetes are

- [type 1 diabetes](#)
- [type 2 diabetes](#)
- [gestational diabetes](#)

### Type 1 Diabetes

Type 1 diabetes is an [autoimmune disease](#). An autoimmune disease results when the body's system for fighting infection (the [immune system](#)) turns against a part of the body. In diabetes, the immune system attacks the insulin-producing beta cells in the pancreas and destroys them. The pancreas then produces little or no insulin. A person who has type 1 diabetes must take insulin daily to live.

At present, scientists do not know exactly what causes the body's immune system to attack the beta cells, but they believe that autoimmune, genetic, and environmental factors, possibly viruses, are involved. Type 1 diabetes accounts for about 5 to 10 percent of diagnosed diabetes in the United States. It develops most often in children and young adults, but can appear at any age.

Symptoms of type 1 diabetes usually develop over a short period, although [beta cell](#) destruction can begin years earlier. Symptoms include increased thirst and urination, constant hunger, [weight loss](#), [blurred vision](#), and extreme [fatigue](#). If not diagnosed and treated with insulin, a person with type 1 diabetes can lapse into a life-threatening [diabetic coma](#), also known as diabetic [ketoacidosis](#).

### Type 2 Diabetes

The most common form of diabetes is type 2 diabetes. About 90 to 95 percent of people with diabetes have type 2. This form of diabetes is associated with older age, [obesity](#), [family history](#) of diabetes, previous history of gestational diabetes, physical inactivity, and ethnicity. About 80 percent of people with type 2 diabetes are overweight.

Type 2 diabetes is increasingly being diagnosed in children and adolescents. However, nationally representative data on prevalence of type 2 diabetes in youth are not available.

When type 2 diabetes is diagnosed, the pancreas is usually producing enough insulin, but for unknown reasons, the body cannot use the insulin effectively, a condition called [insulin resistance](#). After several years, insulin production decreases. The result is the same as for type 1 diabetes- glucose builds up in the blood and the body cannot make efficient use of its main source of fuel.

The symptoms of type 2 diabetes develop gradually. Their onset is not as sudden as in type 1 diabetes. Symptoms may include fatigue or nausea, frequent urination, unusual thirst, weight loss, blurred vision, frequent infections, and slow healing of wounds or sores. Some people have no symptoms.

### **Gestational Diabetes**

Gestational diabetes develops only during [pregnancy](#). Like type 2 diabetes, it occurs more often in African Americans, American Indians, Hispanic Americans, and among women with a family history of diabetes. Women who have had gestational diabetes have a 20 to 50 percent chance of developing type 2 diabetes within 5 to 10 years.

#### **+What are the tests for diagnosing diabetes?**

The fasting plasma glucose test is the preferred test for diagnosing type 1 or type 2 diabetes. It is most reliable when done in the morning. However, a diagnosis of diabetes can be made after positive results on any one of three tests, with confirmation from a second positive test on a different day:

- A random (taken any time of day) plasma glucose value of 200 mg/dL or more, along with the presence of diabetes symptoms.
- A plasma glucose value of 126 mg/dL or more after a person has fasted for 8 hours.
- An [oral glucose tolerance test](#) (OGTT) plasma glucose value of 200 mg/dL or more in a blood sample taken 2 hours after a person has consumed a drink containing 75 grams of glucose dissolved in water. This test, taken in a laboratory or the doctor's office, measures plasma glucose at timed intervals over a 3-hour period.

Gestational diabetes is diagnosed based on plasma glucose values measured during the OGTT. Glucose levels are normally lower during

pregnancy, so the threshold values for diagnosis of diabetes in pregnancy are lower. If a woman has two plasma glucose values meeting or exceeding any of the following numbers, she has gestational diabetes: a fasting plasma glucose level of 95 mg/dL, a 1-hour level of 180 mg/dL, a 2-hour level of 155 mg/dL, or a 3-hour level of 140 mg/dL.

### **What are the other forms of impaired glucose metabolism (also called pre-diabetes)?**

People with pre-diabetes, a state between "normal" and "diabetes," are at risk for developing diabetes, [heart attacks](#), and [strokes](#). However, studies suggest that weight loss and increased physical activity can prevent or delay diabetes. There are two forms of pre-diabetes.

#### **Impaired Fasting Glucose**

A person has impaired fasting glucose (IFG) when fasting plasma glucose is 100 to 125 mg/dL. This level is higher than normal but less than the level indicating a diagnosis of diabetes.

#### **Impaired Glucose Tolerance**

[Impaired glucose tolerance](#) (IGT) means that [blood glucose](#) during the oral [glucose tolerance test](#) is higher than normal but not high enough for a diagnosis of diabetes. IGT is diagnosed when the glucose level is 140 to 199 mg/dL 2 hours after a person drinks a liquid containing 75 grams of glucose.

About 35 million people ages 40 to 74 have impaired fasting glucose and 16 million have impaired glucose tolerance. Because some people have both conditions, the total number of U.S. adults ages 40 to 74 with pre-diabetes comes to about 41 million. These recent estimates were calculated using data from the 1988-1994 National Health and Nutrition Examination Survey and projected to the 2000 U.S. population.

Next: [What are the scope and impact of diabetes?](#)

## **What are the scope and impact of diabetes?**

Diabetes is widely recognized as one of the leading causes of death and disability in the United States. In 2000, it was the sixth leading cause of death. However, diabetes is likely to be underreported as the underlying cause of death on death certificates. About 65 percent of deaths among those with diabetes are attributed to heart disease and stroke.

Diabetes is associated with long-term complications that affect almost every part of the body. The disease often leads to blindness, heart and blood vessel disease, stroke, [kidney failure](#), amputations, and nerve damage. Uncontrolled diabetes can complicate pregnancy, and [birth defects](#) are more common in babies born to women with diabetes.

In 2002, diabetes cost the United States \$132 billion. Indirect costs, including disability payments, time lost from work, and premature death, totaled \$40 billion; direct medical costs for diabetes care, including hospitalizations, medical care, and treatment supplies, totaled \$92 billion.

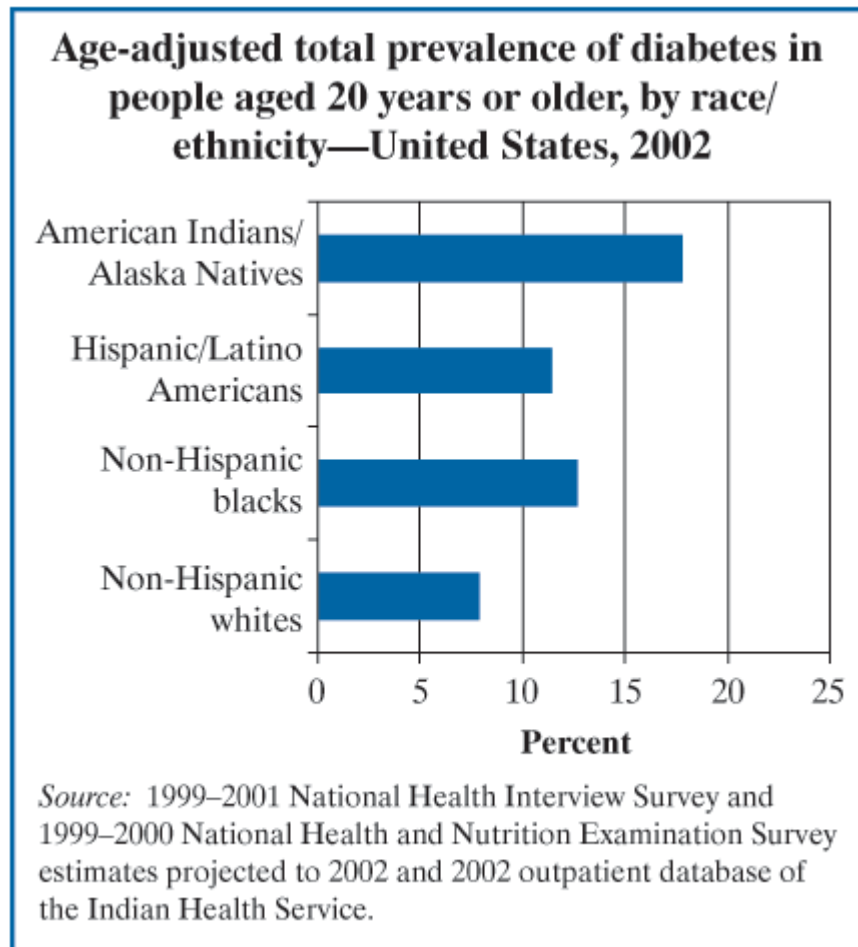
## **Who gets diabetes?**

Diabetes is not contagious. People cannot "catch" it from each other. However, certain factors can increase the risk of developing diabetes.

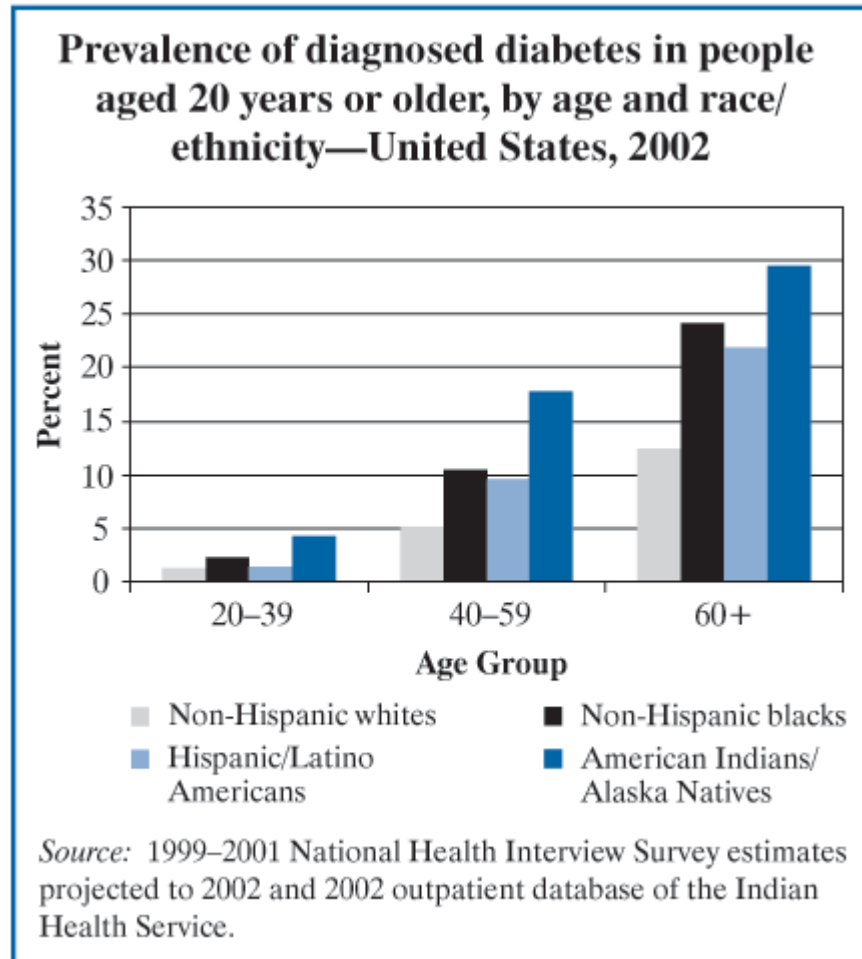
Type 1 diabetes occurs equally among males and females, but is more common in whites than in nonwhites. Data from the World Health Organization's Multinational Project for Childhood Diabetes indicate that type 1 diabetes is rare in most African, American Indian, and Asian populations. However, some northern European countries, including Finland and Sweden, have high rates of type 1 diabetes. The reasons for these differences are unknown.

Type 2 diabetes is more common in older people, especially in people who are overweight, and occurs more often in African Americans, American Indians, some Asian Americans, Native Hawaiians and other Pacific Islander Americans, and Hispanic Americans. On average, non-Hispanic African Americans are 1.6 times as likely to have diabetes as non-Hispanic whites of the same age. Hispanic Americans are 1.5 times as likely to have diabetes as non-Hispanic whites of similar age. American Indians have one of the highest rates of diabetes in the world. On average, American Indians and Alaska Natives are 2.2 times as likely to have diabetes as non-

Hispanic whites of similar age. Although prevalence data for diabetes among Asian Americans and Pacific Islanders are limited, some groups, such as Native Hawaiians and Japanese and Filipino residents of Hawaii aged 20 or older, are about twice as likely to have diabetes as white residents of Hawaii of similar age.



The prevalence of diabetes in the United States is likely to increase for several reasons. First, a large segment of the population is aging. Also, Hispanic Americans and other minority groups make up the fastest-growing segment of the U.S. population. Finally, Americans are increasingly overweight and sedentary. According to recent estimates, the prevalence of diabetes in the United States is predicted to reach 8.9 percent of the population by 2025.



Next: [How is diabetes managed](#)

### **How is diabetes managed?**

Before the discovery of insulin in 1921, everyone with type 1 diabetes died within a few years after diagnosis. Although insulin is not considered a cure, its discovery was the first major breakthrough in diabetes treatment.

Today, healthy eating, physical activity, and taking insulin via injection or an [insulin pump](#) are the basic therapies for type 1 diabetes. The amount of insulin must be balanced with food intake and daily activities. Blood glucose levels must be closely monitored through frequent blood glucose checking.

Healthy eating, physical activity, and blood glucose testing are the basic management tools for type 2 diabetes. In addition, many people with type 2



diabetes require oral medication, insulin, or both to control their blood glucose levels.

People with diabetes must take responsibility for their day-to-day care. Much of the daily care involves keeping blood glucose levels from going too low or too high. When blood glucose levels drop too low—a condition known as hypoglycemia—a person can become nervous, shaky, and confused. Judgment can be impaired, and if blood glucose falls too low, [fainting](#) can occur.

A person can also become ill if blood glucose levels rise too high, a condition known as hyperglycemia.

People with diabetes should see a health care provider who will help them learn to manage their diabetes and who will monitor their diabetes control. An endocrinologist is a doctor who often specializes in diabetes care. In addition, people with diabetes often see ophthalmologists for eye examinations, podiatrists for routine foot care, and dietitians and diabetes educators to learn the skills needed for day-to-day diabetes management.

The goal of diabetes management is to keep blood glucose levels as close to the normal range as safely possible. A major study, the Diabetes Control and Complications Trial (DCCT), sponsored by the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK), showed that keeping blood glucose levels close to normal reduces the risk of developing major complications of type 1 diabetes.

This 10-year study, completed in 1993, included 1,441 people with type 1 diabetes. The study compared the effect of two treatment approaches—intensive management and standard management—on the development and progression of eye, kidney, and nerve complications of diabetes. Intensive treatment aimed to keep [hemoglobin A1C](#) as close to normal (6 percent) as possible. [Hemoglobin A1C](#) reflects average blood glucose over a 2- to 3-month period. Researchers found that study participants who maintained lower levels of blood glucose through intensive management had significantly lower rates of these complications. More recently, a followup study of DCCT participants showed that the ability of intensive control to lower the complications of diabetes has persisted 8 years after the trial ended.

The United Kingdom Prospective Diabetes Study, a European study completed in 1998, showed that intensive control of blood glucose and

blood pressure reduced the risk of blindness, [kidney disease](#), stroke, and heart attack in people with type 2 diabetes.