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Health > Health Predisposition

Type 2 Diabetes

POWERED BY 23ANDME RESEARCH

In type 2 diabetes, sugar builds up in the blood, which over time can lead to complications like heart disease and stroke. Excess weight and physical inactivity are important factors, but genetics also play a role.

Overv	view Scientific Details Frequently Asked Questions
	Jamie, your genetics are associated with an increased likelihood of developing type 2 diabetes.
	m 23andMe research participants, people of European descent with genetics estimated 55% chance of developing type 2 diabetes at some point between the ages of 42 (your current age) and 80.
0% TYPICA	100%

Your genetic likelihood is higher than typical. But your overall likelihood also depends on factors like weight, diet, and exercise. This means it's important to maintain a healthy lifestyle.

See your estimated likelihood broken down by age



This report **does not diagnose** any health conditions or provide medical advice and should not be used to make medical decisions. **Consult with a healthcare professional** if you are concerned about your likelihood of developing type 2 diabetes, have a personal or family history of diabetes, or before making any major lifestyle changes.

Explore how genetics and other factors add up

How common is type 2 diabetes in 23andMe research participants with genetics like yours who have different ages, weights, and other characteristics?

Age		
Height	Weight	
ft	in lb	
How many times d	o you eat fast food each week?	
Select fast foo	od frequency	\sim
How many times d	o you exercise each week?	
Select exercis	e frequency	~

Percent who have type 2 diabetes

Input values to see how common type 2

diabetes is in people with different characteristics.															

You can **update your ethnicity** in your account settings. Estimates are not available for all ethnicities. European is used as the default for people of mixed ancestry and for those of ancestries for which we do not yet have enough research participants. Keep in mind that this tool does not include all possible factors that affect the likelihood of developing type 2 diabetes and does not predict your personal overall likelihood of developing type 2 diabetes.

Ways to take action

Experts agree that healthy lifestyle choices can reduce the likelihood of developing type 2 diabetes.

If you have already been diagnosed with prediabetes by a healthcare professional \checkmark

If you have already been diagnosed with type 2 diabetes by a healthcare professional \sim

	Maintain a healthy weight	~
	Get active	~
Þ	Eat healthy foods	~
	Don't smoke	~
Y .	Talk to a healthcare professional	~
P	Consider a diabetes prevention program	~

About type 2 diabetes

What is type 2 diabetes?

The body breaks down food into glucose to use for energy. A hormone called insulin signals to cells to take up the glucose so it can be used or stored for later. In type 2 diabetes, cells gradually become less sensitive to insulin and the pancreas cannot produce enough insulin to compensate. As a result, glucose builds up in the blood. Type 2 diabetes is by far the most common form of diabetes and, unlike type 1 diabetes, is usually diagnosed in adults.

Symptoms and complications

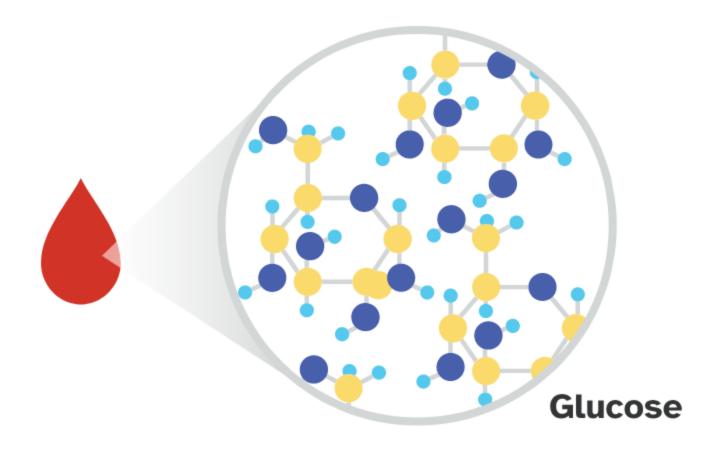
People with type 2 diabetes may not experience symptoms at first, but early symptoms can include things like increased thirst, frequent urination, fatigue, blurred vision, and frequent infections. Over time, type 2 diabetes can lead to serious complications like heart disease, stroke, vision loss, kidney damage, and nerve damage. But treatment with medication and a healthy lifestyle can help manage type 2 diabetes and may reduce the likelihood of complications.

Who is most likely to get type 2 diabetes?

Across the general US population, around 40% of people are expected to develop type 2 diabetes in their lifetime. Anyone can get type 2 diabetes, but some important risk factors besides genetics, age, weight, and lifestyle are:

- being of African American, Asian American, Hispanic/Latino, Native American, or Pacific Islander descent
- family history of type 2 diabetes
- prediabetes (where blood sugar is elevated, but not high enough to be called diabetes)
- history of gestational diabetes (diabetes that develops during pregnancy)

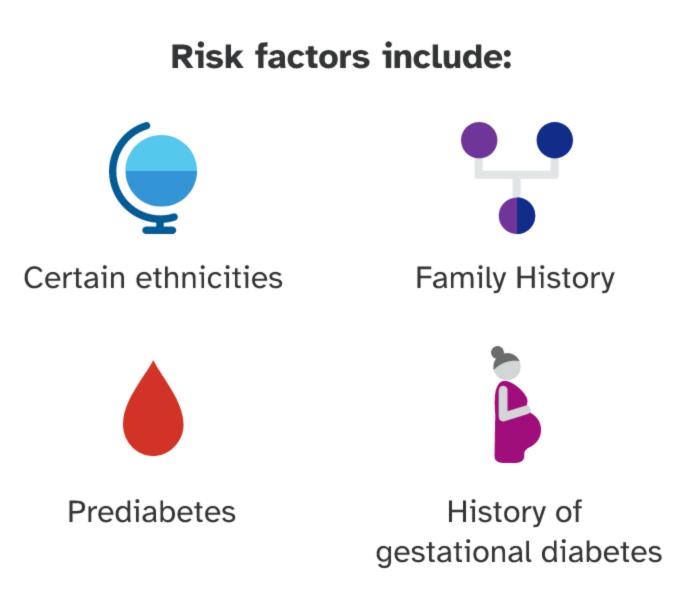
Take the American Diabetes Association risk test."







Heart disease Kidney disease Vision loss



Keep in mind

Consult with a healthcare professional if you are concerned about your likelihood of developing type 2

diabetes, have a personal or family history of diabetes, or before making any major lifestyle changes.

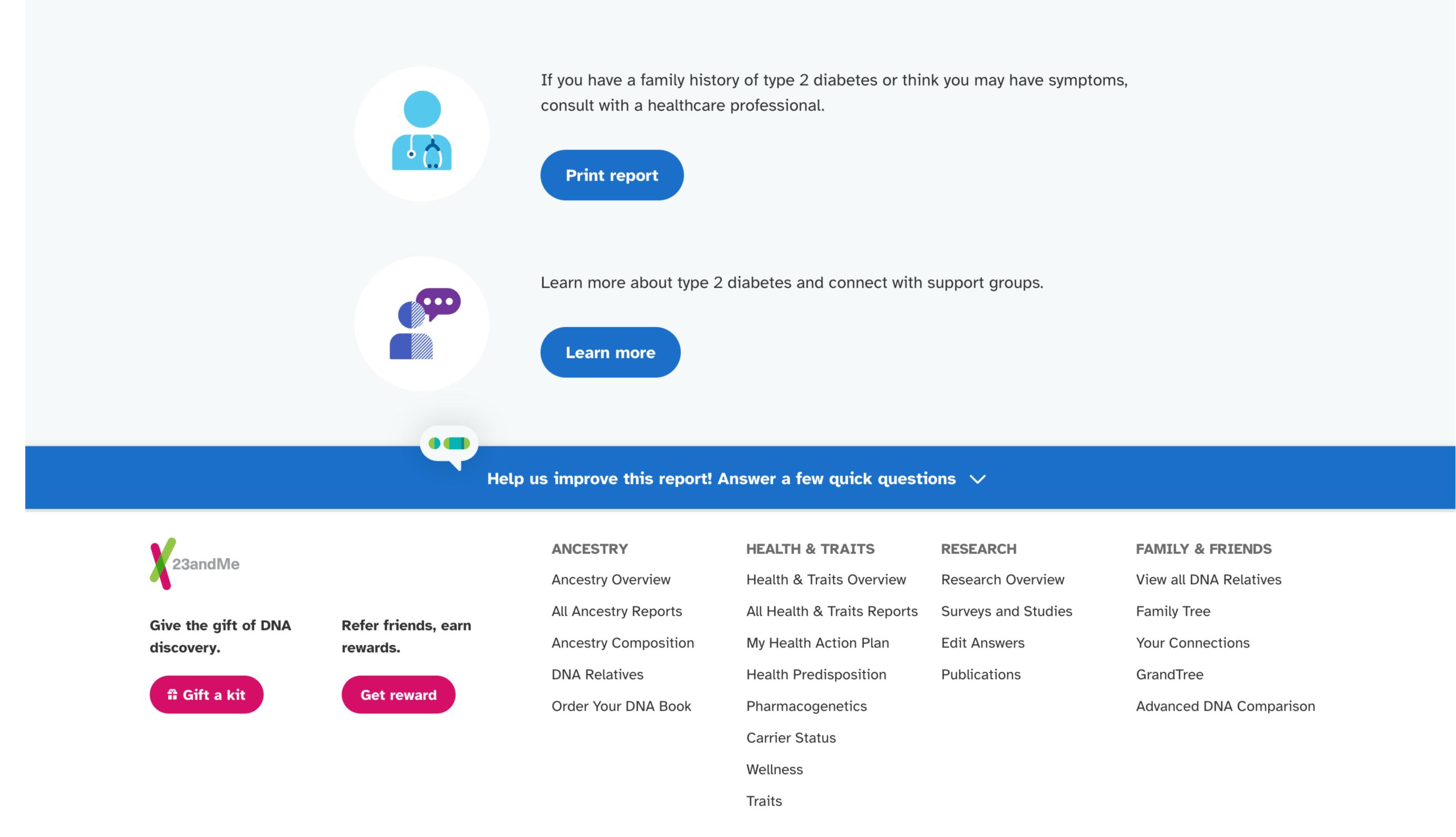


This report **does not diagnose** type 2 diabetes. It also does not provide information about or diagnose other forms of diabetes. The likelihood of developing type 2 diabetes also depends on **other factors**, including age, weight, ethnicity, and family history. This report **does not account for every possible genetic variant** that could affect your likelihood of developing type 2 diabetes.



This report is based on a genetic model created **using data from 23andMe research participants** and has not been clinically validated.

Learn more about type 2 diabetes.







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Type 2 Diabetes

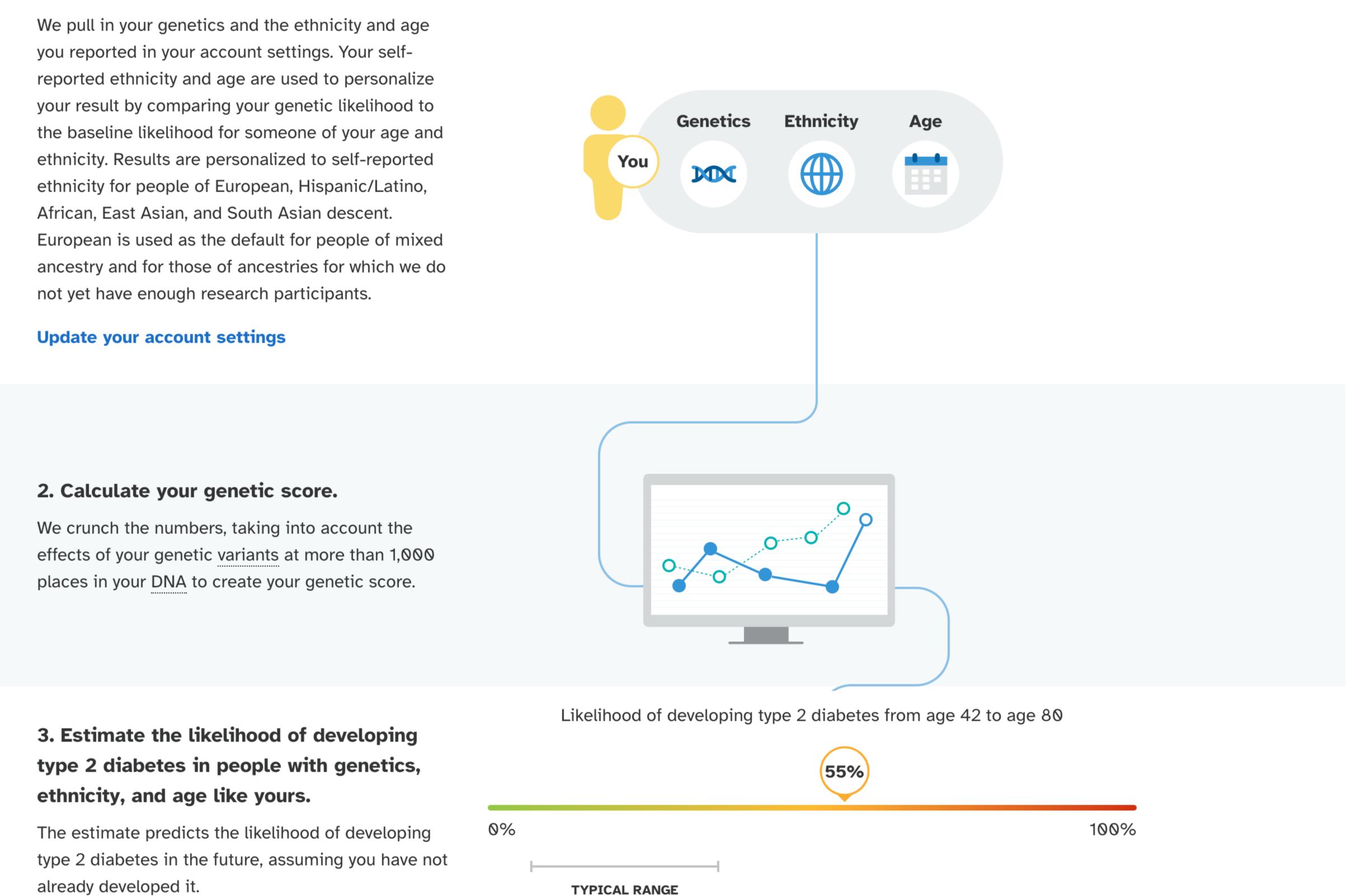
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In type 2 diabetes, sugar builds up in the blood, which over time can lead to complications like heart disease and stroke. Excess weight and physical inactivity are important factors, but genetics also play a role.

Overview Scientific Details Frequently Asked Questions

How we determine your result

1. Gather information from you.



About the type 2 diabetes genetic model

Summary

This report is based on a statistical model that estimates the likelihood of developing type 2 diabetes by looking at genetic variants at 1,244 places in your DNA. We identified these variants and created this model using data from more than 1,110,000 23andMe research participants of European descent.

Performance across ethnicities

We evaluated model performance for people of European, African, Hispanic/Latino, East Asian,

About the likelihood estimate

The estimated likelihood of developing type 2 diabetes is based on your type 2 diabetes genetic score, self-reported ethnicity, and current age. This estimate assumes you do not already have type 2 diabetes. For every year you do not develop type 2 diabetes, your estimated likelihood of developing type 2 diabetes in the future and the "typical range" for your age will both decrease slightly. This estimate is based on data from 23andMe research participants of European descent with your genetic score, combined with Centers for Disease Control data on the average likelihood of developing type 2 diabetes in people of European descent. Overall, about 78% of people have estimated likelihoods that fall into the typical range, while about 22% have increased likelihoods. See our white paper to learn more about how we determined which genetic scores correspond to "typical" vs. "increased" likelihoods.

About "Explore how genetics and other factors add up"

This calculation shows estimates of type 2 diabetes prevalence, or how common type 2 diabetes is, in people with different characteristics, including type 2 diabetes genetic score as well as ethnicity, age, BMI, fast food consumption, and exercise frequency. It was developed using data from more than 530,000 23andMe research participants of European, African, Hispanic/Latino, East Asian, and South Asian descent.

See our white paper to learn more about the science behind this report.

and South Asian descent. This analysis included data from 17,000 or more research participants of each of these ethnicities. The predictive power of the model (AUC) varies across ethnicities, possibly due to factors like limitations in the amount of data available from each ethnicity.

ETHNICITY	AUC VALUE
European	0.652
South Asian	0.603
Hispanic/Latino	0.638
East Asian	0.609
African	0.588

The "Area Under the receiver operating characteristic Curve" (AUC or AUROC) measures how well a statistical model predicts whether or not people have a trait. AUC values usually range from 0.5 to 1, where higher numbers mean the model has more predictive power. The predictive power of the type 2 diabetes model is limited by the fact that type 2 diabetes depends not only on the genetic factors included in this model, but also on non-genetic factors and likely on additional genetic factors that are not yet known.

Diabetes screening guidelines

Testing and diagnosis of type 2 diabetes requires a blood test. The American Diabetes Association recommends testing for diabetes at least every three years in the following groups:



Adults age 35 and older



Adults younger than 35 who are overweight and have other risk factor(s) like belonging to certain ethnicities or having a family history of type 2 diabetes



Learn more about diabetes testing from the **American Diabetes Association.** Note that guidelines from different healthcare professional organizations may differ in their recommendations.

Other factors that may impact your likelihood

Besides genetics, many other factors can increase or decrease your likelihood of developing type 2 diabetes.

This is not a complete list of other factors.	Other factors that may impact your likelihood	References
People with multiple risk factors may have a	Age	[19 , 20]
higher likelihood of developing type 2 diabetes.	It's possible to develop type 2 diabetes at almost any age, but the likelihood	
Consult with a healthcare professional if you are concerned about your likelihood of developing	increases with age up until about age 65. Maintaining a healthy weight, eating a healthy diet, and staying physically active can help reduce the	

type 2 diabetes, have a personal or family history of diabetes, or before making any major lifestyle changes.

likelihood of developing type 2 diabetes at any age.

Family history

Having one parent or sibling with type 2 diabetes has been associated with an increase in the likelihood of developing type 2 diabetes, and having two parents with type 2 diabetes has been associated with an even greater increase. This may be due to the fact that family members share genetics as well as lifestyle habits.

Ethnicity

In the United States, people of African, Hispanic, Asian, Pacific Islander, and Native American descent have an increased likelihood of developing type 2 diabetes. This may be related to differences across ethnicities in risk factors like obesity, socioeconomic factors, and other factors.

Prediabetes

Prediabetes is when blood sugar levels are elevated, but not yet high enough to be called diabetes. People with prediabetes have an increased likelihood of developing diabetes in the future. But diabetes can often be delayed or prevented through a combination of weight loss, diet, exercise, and medication-based interventions.

Gestational diabetes

Gestational diabetes is diabetes that occurs for the first time during pregnancy. In general, the body's ability to respond to insulin (called insulin sensitivity) decreases during pregnancy, and for those whose insulin sensitivity is lower to begin with, this may cause blood sugar levels to reach the diabetic range. Blood sugar levels may return to normal after pregnancy, but having had gestational diabetes in the past is associated with a higher likelihood of developing type 2 diabetes in the future.

Excess weight

Around 80% of people with type 2 diabetes are overweight (BMI \ge 25) or obese (BMI \geq 30). Being overweight or obese is a major risk factor for developing type 2 diabetes, with higher weights being associated with higher likelihood. This may be because fat (adipose) cells play an important role in many biological processes, including how the body regulates blood sugar levels. As a result, having excess adipose tissue can lead to changes like lower insulin sensitivity. Research has found that for people with prediabetes who are overweight or obese, losing at least 7% of their body weight can reduce the likelihood of developing type 2 diabetes, even if BMI remains in the overweight or obese range. For a person who is 200 pounds (91 kg), 7% of their body weight is 14 pounds (6.4 kg).

Physical inactivity

A sedentary lifestyle increases the likelihood of developing type 2 diabetes, even if you don't gain weight as a result. Research supports getting at least 30 minutes of moderate exercise most days (150 total minutes each week), and exercising more than that is associated with an even lower likelihood of developing type 2 diabetes. Evidence also supports including both aerobic exercise and strengthening activities.

Diet

In addition to consuming a moderate number of calories, eating foods with high nutritional quality has been associated with a lower likelihood of developing type 2 diabetes. Diets that emphasize vegetables, fruits, legumes, seeds, nuts, whole grains, fish, seafood, olive oil, and other vegetable oils are associated with a lower likelihood of developing type 2 diabetes. In contrast, diets high in sugar, sugar-sweetened drinks, refined grains, white or russet potatoes, and processed meats are associated with a higher likelihood of developing type 2 diabetes. Diet composition affects many biological processes in the body, and research suggests that diets that include a wide variety of foods with high nutritional quality may support the body's built-in mechanisms for regulating weight.

[22, 24, 28, 30, 38, 45, 49]

[26, 35]

[6, 19, 29, 37, 52]

[15, 30, 31, 58]

[**7**, **10**]

[21, 23, 24, 34, 39, 56]

[24, 39, 41, 48, 50, 59]

Smoking

Smoking cigarettes is associated with an increased likelihood of developing type 2 diabetes. One reason for this may be that smoking is associated with increased fat around the waist, which is a risk factor for type 2 diabetes.

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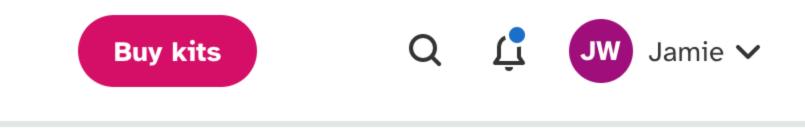
See all references ∨

Change Log

Your report may occasionally be updated based on new information. This Change Log describes updates and revisions to this report.

	Date March 11, 2019	Change Type 2 diabetes repo	ort created		
23andMe Give the gift of DNA discovery.	Refer friends, earn rewards.	ANCESTRY Ancestry Overview All Ancestry Reports Ancestry Composition	HEALTH & TRAITS Health & Traits Overview All Health & Traits Reports My Health Action Plan	RESEARCH Research Overview Surveys and Studies Edit Answers	FAMILY & FRIENDS View all DNA Relatives Family Tree Your Connections
✿ Gift a kit	Get reward	DNA Relatives Order Your DNA Book	Health Predisposition Pharmacogenetics Carrier Status Wellness Traits	Publications	GrandTree Advanced DNA Comparison





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Overview Scientific Details Frequently Asked Questions

Type 2 Diabetes

What does this report do?

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What are the limitations of this report?

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f)

You

What does it mean that this report is based on 23andMe research?	\sim
The report says the type 2 diabetes genetic model was developed using data from 23andMe research participants of European descent. What if I'm not of European descent?	\checkmark
I have already been diagnosed with prediabetes by a healthcare professional. What does this report mean for me?	\sim
Does this report cover type 1 diabetes or other forms of diabetes?	\sim
Where can I learn more about type 2 diabetes, support groups, and other resources?	\sim
My report says my genetics are associated with an increased likelihood of developing type 2 diabetes. What does this mean?	\sim
My report says my genetics are associated with an increased likelihood of developing type 2 diabetes. What are some things I can do?	\checkmark
What does typical range mean?	\checkmark
I have already been diagnosed with type 2 diabetes by a healthcare professional. What does this report mean for me?	\checkmark

