Chronic Kidney Disease (APOL1-Related)

Chronic kidney disease is a condition in which the kidneys stop working properly over time. Because the kidneys serve as filters for our blood, chronic kidney disease can cause excess fluid and waste from the blood to build up in the body. This can lead to health problems including bone damage, heart disease, and stroke. This test includes two variants in the APOL1 gene that can increase the risk of developing chronic kidney disease. These variants are most common in people of African descent.

Overview Scientific Details Frequently Asked Questions

Jamie, you **do not have one** of the two genetic variants we tested.

We could not determine your result for the other tested variant. However, most cases of chronic kidney disease are not caused by the variants included in this test. Your risk for chronic kidney disease also depends on other factors like lifestyle, family history, and genetic variants not covered by this test.

The test may not be able to determine a result for every variant tested. This can be caused by random test error or other factors that interfere with the test. If you have a personal or family history of chronic kidney disease, it's important to talk with a healthcare professional.

How To Use This Test

This test does not diagnose chronic kidney disease or any other health conditions.

Please talk to a healthcare professional if this condition runs in your family, you think you might have this condition, or you have any concerns about your results.

Review the Genetic Health Risk tutorial
See Scientific Details
See Frequently Asked Questions

Intended Uses

- Tests for the S342G and N388_Y389del variants in the APOL1 gene, which are used to define the **G1** and **G2** haplotypes, respectively. These haplotypes are linked to an increased risk for chronic kidney disease.

Limitations

- Does **not** test for variants in other genes linked to chronic kidney disease.
- Does **not** provide information on diabetes-related chronic kidney disease.
- Does **not** account for non-genetic factors, such as lifestyle and family history, that influence the risk for chronic kidney disease.

Important Ethnicities

- The variants included in this test are most common and best studied in people of **African** descent.
- These variants are also found in people with African ancestry, including people of **Hispanic** or **Latino** descent.

We could **not determine** your result for one of the two variants we tested linked to APOL1-related chronic kidney disease.

Lifestyle, family history, and genetic factors not included in this test also affect your chances of developing chronic kidney disease.

Your result could not be determined for the G2 variant in the APOL1 gene.

Having this variant could impact your risk of developing APOL1-related chronic kidney disease. This variant is most commonly found in people of **African** descent. It is also found in people with African ancestry, including people of **Hispanic** or **Latino** descent.

See Scientific Details

It's estimated that at least 40% of adults in the U.S. will develop chronic kidney disease during their lifetime.

Most cases of chronic kidney disease are not caused by the APOL1 genetic variants in this report. Your risk is also influenced by many other factors, including lifestyle, family history, and other genetic factors.

See Scientific Details

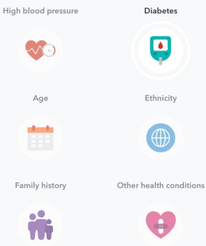
Lifestyle and other factors can also influence the chances of developing chronic kidney disease.

Consult with a healthcare professional before making any major lifestyle changes.

Diabetes

Diabetes is one of the biggest risk factors for chronic kidney disease in adults. Having too much sugar in the blood makes the kidneys work harder to filter the blood, which can damage them over time.

See Scientific Details for more information



About Chronic Kidney Disease

The information here applies to APOL1-related chronic kidney disease as well as chronic kidney disease due to other factors.

When it develops

In general, the risk of developing chronic kidney disease increases with age. Most cases of chronic kidney disease are diagnosed in people age 65 and over. However, people with APOL1-related chronic kidney disease tend to develop the condition at an earlier age. Their kidney function also tends to decline more quickly than people whose chronic kidney disease is due to other factors.

Typical signs and symptoms

Chronic kidney disease often has no symptoms at first. Early chronic kidney disease is often diagnosed using blood and urine tests that look for loss of kidney function (called reduced glomerular filtration rate) and the presence of protein in the urine (called albuminuria).

- **Symptoms** such as nausea, fatigue, high blood pressure, and swelling of the feet and ankles (called edema) can occur as the condition progresses.
- **Complications** of chronic kidney disease include heart disease or stroke, anemia, bone problems, a weakened immune system, and kidney failure.

How common is the condition?

It's estimated that at least 40% of adults in the U.S. will develop chronic kidney disease during their lifetime. Most people with the condition don't know they have it.

About 13% of African Americans have two APOL1 risk variants, which puts them at an even greater risk for chronic kidney disease.

How it's treated

Treatment for chronic kidney disease depends on the severity of the condition.

- When detected early, chronic kidney disease may be treated in part through lifestyle changes to slow progression. Medications may also be prescribed to treat symptoms.
- If the condition progresses to end-stage kidney disease, patients may require ongoing dialysis or a kidney transplant.

Read more at: National Institute of Diabetes and Digestive and Kidney Diseases* Centers for Disease Control and Prevention* Mayo Clinic*

Learn more about APOL1-related chronic kidney disease.

See our Frequently Asked Questions for more information.

FAQs

If you have a family history of chronic kidney disease or think you have symptoms, consult with a healthcare professional.

Print report

Print

Chronic Kidney Disease (APOL1-Related)

Chronic kidney disease is a condition in which the kidneys stop working properly over time. Because the kidneys serve as filters for our blood, chronic kidney disease can cause excess fluid and waste from the blood to build up in the body. This can lead to health problems including bone damage, heart disease, and stroke. This test includes two variants in the APOL1 gene that can increase the risk of developing chronic kidney disease. These variants are most common in people of African descent.

Overview | **Scientific Details** | Frequently Asked Questions

APOL1-related chronic kidney disease is linked to the G1 and G2 haplotypes.

These haplotypes are defined by variants in the APOL1 gene.

APOL1

The APOL1 gene contains instructions for making a protein that is found in the blood and in multiple organs, including the kidneys. The APOL1 protein plays a role in the immune system, helping the body fight certain parasites called trypanosomes. Although the mechanism is still unknown, certain variants in the APOL1 gene increase the risk for chronic kidney disease, perhaps by causing injury to kidney cells called podocytes.

Read more at Genetics Home Reference

You do not have one of the two genetic variants we tested. Your result for the other tested variant could not be determined.

Variants Detected | View All Tested Markers

Marker Tested	Your Genotype*	Additional Information
G1 Gene: APOL1 Marker: rs73885319	A — Typical copy from one of your parents A — Typical copy from your other parent	(see below)
G2 Gene: APOL1 Marker: rs71785313	**Not determined**	(see below)

G1 — Additional Information

Biological explanation

The variant tested is a change from an A to a G in the DNA sequence of the APOL1 gene. This variant – called S342G – is used to define the G1 haplotype. The S342G variant is also known as c.1024A>G.

Typical vs. variant DNA sequence(s)

A → *Substitution* → G

Typical Sequence | Variant Sequence

Percent of 23andMe customers with variant

Variant: G

European	0.05%
African American	33.44%
East Asian	<0.01%
Hispanic or Latino	2.47%
South Asian	0.01%
Middle Eastern	0.05%

References [5, 12, 17, 18, 28, 36, 44, 53, 57] | ClinVar

G2 — Additional Information

Biological explanation

The variant tested is a deletion of six letters from the sequence of the APOL1 gene. This variant – called N388_Y389del – defines the G2 haplotype. The N388_Y389del variant is also known as c.1164_1169del.

Typical vs. variant DNA sequence(s)

TTATAA → *Deletion* → (–)

Typical Sequence | Variant Sequence

Percent of 23andMe customers with variant

Variant: (–)

European	0.04%
African American	21.56%
Ashkenazi Jewish	<0.01%
East Asian	<0.01%
Hispanic or Latino	1.98%
South Asian	0.01%
Middle Eastern	0.17%

References [5, 12, 17, 18, 28, 36, 44, 57] | ClinVar

*This test cannot distinguish which copy you received from which parent. This test also cannot determine whether multiple variants, if detected, were inherited from only one parent or from both parents. This may impact how these variants are passed down.

23andMe always reports genotypes based on the 'positive' strand of the human genome reference sequence (build 37). Other sources sometimes report genotypes using the opposite strand.

Test Interpretation

This report provides information about risk for chronic kidney disease in people who have two variants or two copies of a variant included in this test.

Health Risk Estimates

Risk estimates for APOL1-related chronic kidney disease are based on clinical studies that identify an association between a genotype and a health condition.

For reference, information about chronic kidney disease and end-stage kidney disease in the general population is provided.

Consider talking to a healthcare professional if you have any concerns about your results.

References [2, 9, 11, 12, 13, 14, 15, 17, 18, 25, 28, 30, 34, 39, 46, 47, 48, 52]

General population chronic kidney disease risk | APOL1-related chronic kidney disease risk

About 15% of adults in the U.S. currently have **chronic kidney disease**. It's estimated that at least 40% of adults in the U.S. will develop chronic kidney disease during their lifetime.

Chronic kidney disease can progress to end-stage kidney disease (also called kidney failure). The percentage of people in the U.S. who develop **end-stage kidney disease** during their lifetime varies by ethnicity:

Race/Ethnicity	Male	Female
Non-Hispanic White	3.08%	2.03%
Non-Hispanic Black	8.05%	6.78%
Non-Hispanic Native American	3.80%	3.63%
Non-Hispanic Asian/Pacific Islander	5.05%	3.77%
Hispanic	6.23%	4.32%
Overall	3.96%	2.84%

Other Factors

Other factors besides the genetic variants in this report can influence your chances of developing chronic kidney disease.

This is not a complete list of other factors.

People with multiple risk factors may have a higher risk of developing chronic kidney disease.

Consult with a healthcare professional before making any major lifestyle changes.

Other Factors	References
High blood pressure High blood pressure (also called hypertension) is one of the biggest risk factors for chronic kidney disease in adults. High blood pressure can damage the blood vessels inside the kidneys. This can prevent the filtration units inside the kidneys (called nephrons) from functioning properly.	[3, 9, 37, 38, 56]
Diabetes Diabetes is also one of the biggest risk factors for chronic kidney disease in adults and is the most common cause of end-stage kidney disease. Having too much sugar in the blood makes the kidneys work harder to filter the blood, which can damage them over time. Variants in the APOL1 gene do not increase the risk of developing diabetes-related chronic kidney disease. However, people with two APOL1 risk variants are still at risk for this type of chronic kidney disease.	[4, 9, 37, 38, 51, 56]
Age In general, the risk of developing chronic kidney disease increases as a person ages. About 38% of adults age 65 and older have chronic kidney disease, compared to about 7% of adults under the age of 45. As we age, our kidneys stop filtering blood as well. In addition, older adults are more likely to have other risk factors for chronic kidney disease, such as high blood pressure and diabetes. People with APOL1-related chronic kidney disease tend to develop chronic kidney disease at an earlier age than people whose chronic kidney disease is due to other factors. They also tend to progress more quickly from early- to late-stage kidney disease.	[9, 22, 24, 28, 38, 46, 50, 54]
Ethnicity The rates of early chronic kidney disease are similar in most ethnicities in the U.S. However, end-stage kidney disease is more common in certain ethnicities. For example, African Americans are about three times as likely to develop end-stage kidney disease as Americans of European descent. End-stage kidney disease is also more common in Native Americans, Native Hawaiians/Pacific Islanders, and people of Hispanic or Latino descent. Although genetic factors may play a role in explaining these differences, other factors are important, too. For example, differences in the rates of other risk factors for chronic kidney disease – such as high blood pressure and diabetes – likely play a role. Differences in access to healthcare may also contribute. The two APOL1 variants in this report are thought to account for a large proportion of the excess risk for end-stage kidney disease among African Americans.	[2, 8, 9, 11, 16, 38, 41, 43, 49]
Family history People with a family history of chronic kidney disease are more likely to develop the condition themselves. This may be due to shared genetic factors that increase chronic kidney disease risk. In addition, risk factors like diabetes and high blood pressure tend to run in families, and shared lifestyle factors may also contribute.	[1, 7, 10, 38]
Other genetic factors Genetic variants in about 500 different genes have been linked to chronic kidney disease. Many of these variants cause kidney disease in childhood, whereas others are linked to adult-onset kidney disease. In adults, about 10% of end-stage kidney disease cases are thought to be caused by inherited genetic variants.	[10, 19]
Obesity Being overweight or obese increases the risk for chronic kidney disease. This is partly because obesity increases the risk for other important risk factors for chronic kidney disease, like diabetes and high blood pressure. Obesity may also force the kidneys to work too hard, increasing the pressure inside the kidneys and causing damage over time.	[20, 31, 37, 38]
Other health conditions Certain health conditions – such as sickle cell disease, lupus, and HIV – can increase the risk of developing chronic kidney disease. In addition, people who develop heart disease (in particular, heart failure) are more likely to develop end-stage kidney disease. Abnormal kidney structure and a history of acute kidney injury (caused by infection or other environmental factors) can also increase the risk for chronic kidney disease.	[16, 23, 37, 38, 40]
Smoking Smoking cigarettes is associated with an increased risk of developing chronic kidney disease. This may be partly because smoking increases blood pressure, which can damage the blood vessels inside the kidneys. Smoking also increases inflammation and creates molecules called free radicals that can damage the kidneys. The risk is highest in people who smoke many cigarettes and have smoked for a longer time, and risk appears to go down with time after quitting.	[9, 21, 38, 45, 59, 60]
Sex In the U.S., females are more likely to have chronic kidney disease, but males are more likely to develop end-stage kidney disease (also called kidney failure). Chronic kidney disease may be more common in females because they have a longer life expectancy. Hormonal and lifestyle differences may explain why males progress to end-stage kidney disease more quickly than females.	[6, 9, 42]

Test Details

Indications for Use

The 23andMe PGS Genetic Health Risk Report for Chronic Kidney Disease (APOL1-Related) is indicated for reporting of the S342G and N388_Y389del variants in the APOL1 gene. These variants define the G1 and G2 haplotypes, respectively. This report describes if a person's genetic result is associated with an increased risk of developing chronic kidney disease, but it does not describe a person's overall risk of developing chronic kidney disease. This report is most relevant for people of African descent.

Special Considerations

- This report does not include the I384M variant in the APOL1 gene, which is part of the G1 haplotype. However, the S342G variant included in this report is often used to define the G1 haplotype in clinical studies and genetic tests. S342G is sufficient to increase risk for chronic kidney disease.
- Genetic testing for APOL1 variants in the general population is not currently recommended by any healthcare professional organizations.

Test Performance Summary

Clinical Performance [11, 16, 49]

- The two variants in this report are thought to account for a large proportion of the excess risk for end-stage kidney disease among African Americans.
- Among African Americans, an estimated 68% of FSGS cases, 68% of HIV-associated nephropathy (HIVAN) cases, and 52% of HA-ESKD cases can be attributed to having two APOL1 risk variants.
- The G1 and G2 haplotypes are the only APOL1 variants that have been linked to an increased risk for chronic kidney disease.

Analytical Performance

Accuracy was determined by comparing results from this test with results from sequencing. Greater than 99% of test results were correct. While unlikely, this test may provide false positive or false negative results. For more details on the analytical performance of this test, refer to the package insert.

Warnings and Limitations

- This test does not cover all variants that could cause chronic kidney disease.*
- This test does not diagnose any health conditions.
- Share results with your healthcare professional for any medical purposes.
- If you are concerned about your results, consult with a healthcare professional.

See the **Package Insert** for more details on use and performance of this test.

* Variants not included in this test may be rare, may not be available on our genotyping platform, or may not pass our testing standards.

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Hide additional references

Change Log

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

Date	Change
Aug. 5, 2020	Chronic Kidney Disease (APOL1-Related) report created.

Chronic Kidney Disease (APOL1-Related)

Chronic kidney disease is a condition in which the kidneys stop working properly over time. Because the kidneys serve as filters for our blood, chronic kidney disease can cause excess fluid and waste from the blood to build up in the body. This can lead to health problems including bone damage, heart disease, and stroke. This test includes two variants in the APOL1 gene that can increase the risk of developing chronic kidney disease. These variants are most common in people of African descent.

Overview Scientific Details Frequently Asked Questions

Chronic Kidney Disease (APOL1-Related)

How is APOL1-related chronic kidney disease different from other types of chronic kidney disease?

Chronic kidney disease is a condition in which the kidneys stop working properly over time. Many factors can influence a person's chances of developing chronic kidney disease, including genetics, family history, lifestyle, and other health conditions. For example, diabetes and high blood pressure are two of the biggest risk factors for chronic kidney disease.

There are many different types of chronic kidney disease, which are defined based on the underlying cause and how the kidneys are affected. For example, diabetes can lead to diabetes-related chronic kidney disease, and high blood pressure can lead to hypertension-related chronic kidney disease. As chronic kidney disease progresses, it can lead to end-stage kidney disease (also called kidney failure), which is when the kidneys are no longer able to filter waste and extra fluid from the blood.

Two specific variants in the APOL1 gene – called G1 and G2 – are associated with an increased risk for chronic kidney disease. Having two APOL1 variants or two copies of an APOL1 variant increases the risk for many types of chronic kidney disease, including hypertension-related chronic kidney disease and certain types of end-stage kidney disease. Of note, these variants do not increase the risk of developing diabetes-related chronic kidney disease. However, people with two APOL1 variants are still at risk for this type of chronic kidney disease. **See Scientific Details for more information.**

Scientists are still working to understand how the APOL1 G1 and G2 variants increase chronic kidney disease risk. They are also working to understand whether there are underlying differences in kidney function and treatment response in people with APOL1-related chronic kidney disease compared to people with chronic kidney disease due to other factors.

Is this answer helpful? Yes No

What does this test do?

This test looks for the S342G and N388_Y389del variants in the APOL1 gene, which are used to define the G1 and G2 haplotypes, respectively. These haplotypes are linked to an increased risk for chronic kidney disease.

People with both of these variants, or two copies of one variant, have an increased risk of developing chronic kidney disease. However, not everyone with these genetic variants will develop chronic kidney disease.

This test does not include all possible genetic variants that may increase your risk of developing chronic kidney disease.

Is this answer helpful? Yes No

What does this test **not** do?

This test does not diagnose chronic kidney disease. Only a healthcare professional can do that.

This test does not tell you if you have chronic kidney disease or if you will definitely develop the condition in the future.

This test does not test for variants in other genes linked to chronic kidney disease. It also does not provide information on diabetes-related chronic kidney disease.

This test does not provide a complete assessment of your risk of developing chronic kidney disease. For example, it does not account for non-genetic factors, such as lifestyle and family history, that influence the risk for chronic kidney disease.

Is this answer helpful? Yes No

The report says the variants included in this test are most common and best studied in people of **African** descent. What if I'm not of African descent?

The effect of these variants on a person's risk of developing chronic kidney disease is best understood in people of African descent, because the variants are most common in that population. However, if a person who is not of African descent has both of these genetic variants, or two copies of one variant, they are still expected to have an increased risk of developing chronic kidney disease. **See Scientific Details for more information.**

Is this answer helpful? Yes No

Where can I learn more about chronic kidney disease, support groups, and other resources?

You can learn more about chronic kidney disease from the following resources:

- **National Kidney Foundation**
- **American Kidney Fund**
- **American Association of Kidney Patients**
- **Renal Support Network**

If you have questions about your results or how they might affect you or your family, a genetic counselor may be able to help. **Learn more about genetic counseling.**

Is this answer helpful? Yes No

My report says I **do not have one** of the tested genetic variants but my result for **one variant could not be determined.** What does this mean?

This means you do not have one of the two genetic variants we tested. But we could not tell if you have or do not have the other tested variant. This can be caused by random test error or other factors that interfere with the test.

Having the variant we could not determine could impact your risk of developing APOL1-related chronic kidney disease. That variant is most commonly found in people of African descent. It is also found in people with African ancestry, including people of Hispanic or Latino descent.

However, most cases of chronic kidney disease are not caused by the APOL1 genetic variants in this report. People without the variants we tested are **still at risk for chronic kidney disease due to other factors**. It's estimated that at least 40% of adults in the U.S. will develop chronic kidney disease during their lifetime.

Your risk for chronic kidney disease is also influenced by many other factors, including lifestyle, family history, and other genetic variants. **Learn more about other factors.**

Is this answer helpful? Yes No

My report says I **do not have one** of the tested genetic variants but my result for **one variant could not be determined.** What are some things I could do?

This genetic result is not associated with an increased risk of developing APOL1-related chronic kidney disease. However, people with this result are **still at risk for other types of chronic kidney disease** because many other genetic and non-genetic factors can also affect your risk. **Learn more about other factors.**

Consider talking to a healthcare professional if:

- Chronic kidney disease runs in your family.
- You think you might have chronic kidney disease.
- You have questions about other risk factors you may have.

Is this answer helpful? Yes No