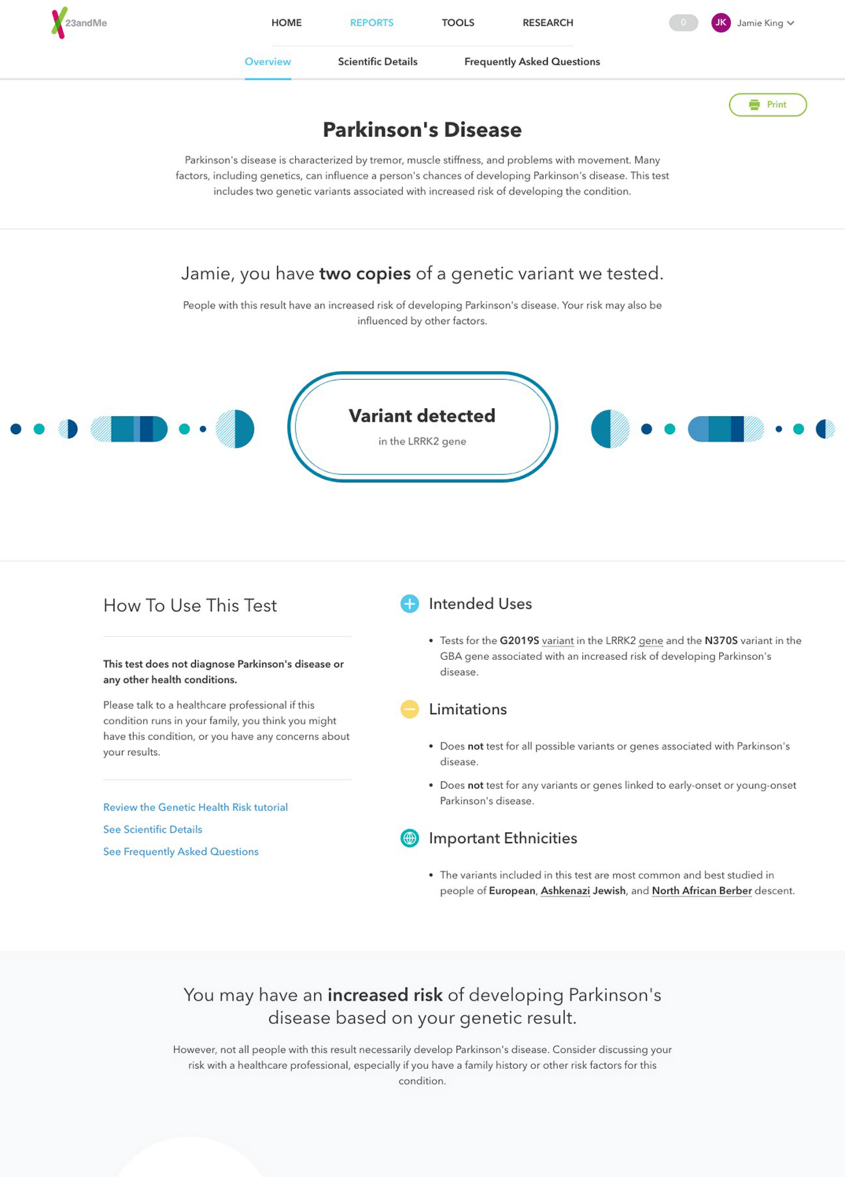


Parkinson's Disease

Parkinson's disease is characterized by tremor, muscle stiffness, and problems with movement. Many factors, including genetics, can influence a person's chances of developing Parkinson's disease. This test includes two genetic variants associated with increased risk of developing the condition.

Jamie, you have **two copies** of a genetic variant we tested.

People with this result have an increased risk of developing Parkinson's disease. Your risk may also be influenced by other factors.

Variant detected

in the LRRK2 gene

How To Use This Test

This test does not diagnose Parkinson's 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 **G2019S** variant in the LRRK2 gene and the **N370S** variant in the GBA gene associated with an increased risk of developing Parkinson's disease.

Limitations

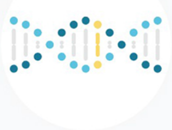
- Does **not** test for all possible variants or genes associated with Parkinson's disease.
- Does **not** test for any variants or genes linked to early-onset or young-onset Parkinson's disease.

Important Ethnicities

- The variants included in this test are most common and best studied in people of **European**, **Ashkenazi Jewish**, and **North African Berber** descent.

You may have an **increased risk** of developing Parkinson's disease based on your genetic result.

However, not all people with this result necessarily develop Parkinson's disease. Consider discussing your risk with a healthcare professional, especially if you have a family history or other risk factors for this condition.



We detected two copies of the G2019S variant in the LRRK2 gene.

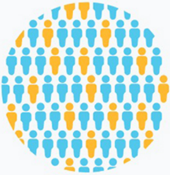
You inherited one copy of this variant from each of your parents.

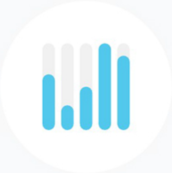
See Scientific Details

Although your risk may be increased, not all people with this result necessarily develop Parkinson's disease.

Studies in people of **European** and **Ashkenazi Jewish** descent have shown that about 25% of individuals with this variant develop Parkinson's disease during their lifetime. The risk may be greater for people with two copies of the variant but there is not enough data to provide a specific risk estimate.

See Scientific Details





Other factors may also influence your risk of developing Parkinson's disease.

It's important to know your family history. Your risk may be higher if Parkinson's disease runs in your family.

Even though nothing has been proven to prevent Parkinson's disease, research is ongoing to understand what causes this condition and the potential benefits of lifestyle factors, such as physical activity. See Resources for more information.

Environment and other factors can also influence the chances of developing Parkinson's disease.

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

Exposure to certain chemicals

Exposure to certain chemicals increases the risk of developing Parkinson's disease. These include chemicals used in agriculture, such as pesticides.

See Scientific Details for more information

Age

Sex

Family history

Exposure to certain chemicals

About Parkinson's Disease

When it develops

Parkinson's disease typically develops in adulthood, after 55 years of age.

How common is the condition?

Parkinson's disease affects people of all ethnicities. About 1 in 100 people develops Parkinson's disease during their lifetime.

Typical signs and symptoms

- Tremor
- Muscle stiffness
- Slow movements
- Problems with balance
- Memory loss in some cases

How it's treated

There is currently no known prevention or cure for Parkinson's disease. Certain medications may be used to delay or ease symptoms. Speech, physical, and occupational therapies may also help with symptom management.

Read more at: Mayo Clinic National Institute of Neurological Disorders and Stroke GeneReviews The Michael J. Fox Foundation for Parkinson's Research

It is important to discuss this result with a healthcare professional.

If you have a family history of this condition or think you have symptoms, consult with a healthcare professional.

Print report

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

See our Frequently Asked Questions for more information.

FAQs

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Parkinson's Disease

Scientific Details

Parkinson's disease is characterized by tremor, muscle stiffness, and problems with movement. Many factors, including genetics, can influence a person's chances of developing Parkinson's disease. This test includes two genetic variants associated with increased risk of developing the condition.

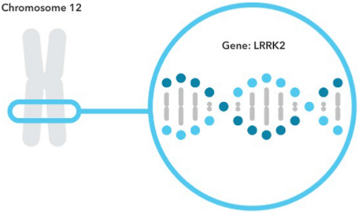
Parkinson's disease is associated with variants in many genes.

This report includes one variant in the LRRK2 gene and one variant in the GBA gene. This test does not cover variants in other genes associated with Parkinson's disease.

LRRK2 GBA

The LRRK2 gene contains instructions for making an enzyme called leucine-rich repeat kinase 2, also called dardarin. This enzyme interacts with other proteins to turn them on and off. Certain variants in the LRRK2 gene cause this enzyme to be too active, which prevents it from properly controlling other proteins.

Read more at Genetics Home Reference



You have two copies of a genetic variant we tested.

Variants Detected | View All Tested Markers

Marker Tested	Your Genotype*			Additional Information
G2019S **Gene:** LRRK2 **Marker:** rs34637584	**A** Variant copy from one of your parents		**A** Variant copy from your other parent	**Biological explanation** **Typical vs. variant DNA sequence(s)** **Percent of 23andMe customers with variant** **References** [4, 8, 9, 11, 12, 13, 19, 20, 21, 22, 23, 31] | ClinVar
N370S **Gene:** GBA **Marker:** i4000415	**T** Typical copy from one of your parents		**T** Typical copy from your other parent	**Biological explanation** **Typical vs. variant DNA sequence(s)** **Percent of 23andMe customers with variant** **References** [1, 2, 18, 25, 28, 29, 34] | 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 risk estimates for people of European, Ashkenazi Jewish, and North African Berber descent. Estimates for other ethnicities are not currently available.

Health Risk Estimates

Risk estimates are based on clinical studies that identify an association between a genotype and a health condition.

Risk estimates are not available for people who have two copies of the G2019S variant or a combination of the two tested variants. An interpretation of "increased risk" is provided to

Lifetime risk | Likelihood ratios

The lifetime risk estimates shown below represent the proportion of people expected to develop Parkinson's disease by age 80. These values are based on studies conducted in people of European, Ashkenazi Jewish, and North African Berber descent. In the general population, about 1 in 100 people (1%) develops Parkinson's disease during their lifetime, typically after the age of 55.

Genotype	Ashkenazi Jewish	European	North African Berber

people with these results because it is likely that their risk is at least as high as for people with one copy of the G2019S variant alone.

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

References [1, 4, 7, 13, 14, 18, 23, 27, 31]

One copy of G2019S variant	26%	24%	91%
One copy of N370S variant	5.9%	Slightly increased risk (exact estimate not available)	Not available
Two copies of N370S variant	9.1%	Not available	Not available

Other Factors

Other factors besides the variants included in this test can influence your chances of developing Parkinson's disease.

This is not a complete list of other factors.

People with multiple risk factors may have a higher risk of developing Parkinson's disease.

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

Other Factors	References
Age The risk of developing Parkinson's disease increases as a person ages. This condition is most often diagnosed in people over the age of 55.	[6]
Sex Men have a higher chance of developing Parkinson's disease than women. The exact reason for this difference between the sexes is unknown. Researchers have proposed that it may be due to higher rates of occupation-related head injury and chemical exposure in men, or that women may be protected by higher estrogen levels.	[6, 24, 32]
Family history First-degree relatives of an individual with Parkinson's disease have a higher chance of developing Parkinson's disease themselves. The risk in individuals with a family history of Parkinson's disease is estimated to be about 3-7%, compared to 1-2% in the general population.	[6, 16, 26]
Exposure to certain chemicals Exposure to certain chemicals increases the risk of developing Parkinson's disease. These include chemicals used in agriculture, such as pesticides.	[6, 26]
Physical activity People who engage in physical activity have a lower risk of developing Parkinson's disease compared to people who rarely or never do. This effect is strongest in people who report engaging in moderate or vigorous physical activity. Some studies suggest that the effect is stronger for men than it is for women.	[3, 30, 33]
Head injury Some studies suggest an association between certain types of head injury and increased risk of developing Parkinson's disease later in life. Head injury that results in prolonged loss of consciousness appears to have the strongest association. Some researchers think that this might be due to inflammation in the brain after the injury.	[5, 15]
Other genes There are other genes and variants that have been linked to Parkinson's disease. However, most of these variants are either rare or have only a small effect on risk.	[6]

Test Details

Indications for Use

The 23andMe PGS Genetic Health Risk Report for Parkinson's Disease is indicated for reporting of the

Warnings and Limitations

G2019S variant in the LRRK2 gene and the N370S variant in the GBA gene. This report describes if a person's genetic result is associated with an increased risk of developing Parkinson's disease, but it does not describe a person's overall risk of developing Parkinson's disease. This report is most relevant for people of European, Ashkenazi Jewish, and North African Berber descent.

Special Considerations

- Genetic testing for Parkinson's disease is not currently recommended by any healthcare professional organizations.

Test Performance Summary

Clinical Performance [6, 10, 17, 27, 29]

The genes and variants included in this report only represent a subset of all those that have been associated with Parkinson's disease. The two variants tested are associated with an increased risk of developing Parkinson's disease. However, many people who have one or both of these variants do not develop the condition. In addition, most cases of Parkinson's disease do not have a genetic cause.

- 1-2% of people with Parkinson's disease have the G2109S variant in the LRRK2 gene. Among people with familial Parkinson's disease, 5-7% have this variant.
- 8-14% of people with Parkinson's disease have a variant in the GBA gene. The N370S variant accounts for roughly half of those cases.

Analytical Performance

Accuracy was determined by comparing results from this test with results from sequencing for 187 samples. 187 out of 187 genotype results were correct. While unlikely, this test may provide false positive or false negative results.

- This test does not cover all variants that could cause this condition.*
- 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 very rare, may not be available on our genotyping platform, or may not pass our testing standards.

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Change Log

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

Date	Change
April 17, 2017	Parkinson's Disease report created.

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Overview Scientific Details Frequently Asked Questions

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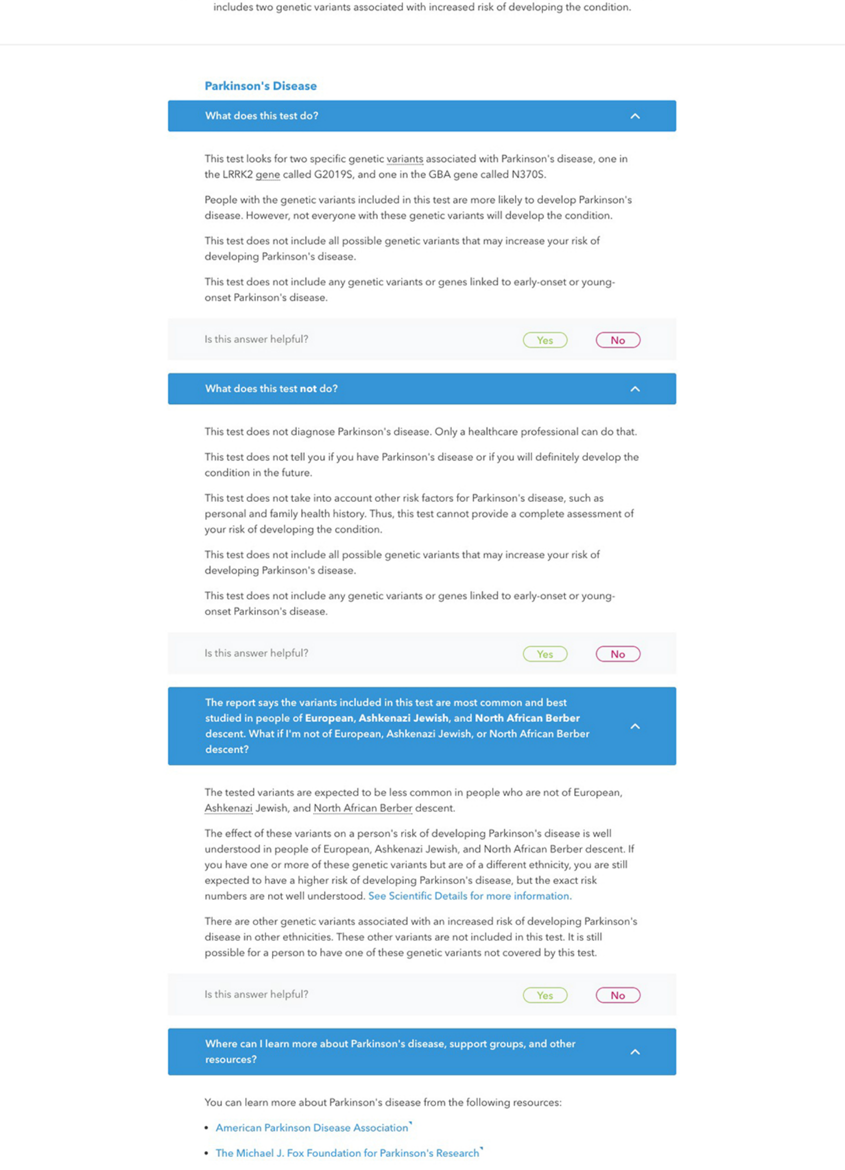
Parkinson's Disease

Frequently Asked Questions

Parkinson's disease is characterized by tremor, muscle stiffness, and problems with movement. Many factors, including genetics, can influence a person's chances of developing Parkinson's disease. This test



includes two genetic variants associated with increased risk of developing the condition.

Parkinson's Disease

What does this test do?

This test looks for two specific genetic variants associated with Parkinson's disease, one in the LRRK2 gene called G2019S, and one in the GBA gene called N370S.

People with the genetic variants included in this test are more likely to develop Parkinson's disease. However, not everyone with these genetic variants will develop the condition.

This test does not include all possible genetic variants that may increase your risk of developing Parkinson's disease.

This test does not include any genetic variants or genes linked to early-onset or young-onset Parkinson's disease.

Is this answer helpful? Yes No

What does this test **not** do?

This test does not diagnose Parkinson's disease. Only a healthcare professional can do that.

This test does not tell you if you have Parkinson's disease or if you will definitely develop the condition in the future.

This test does not take into account other risk factors for Parkinson's disease, such as personal and family health history. Thus, this test cannot provide a complete assessment of your risk of developing the condition.

This test does not include all possible genetic variants that may increase your risk of developing Parkinson's disease.

This test does not include any genetic variants or genes linked to early-onset or young-onset Parkinson's 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 **European, Ashkenazi Jewish**, and **North African Berber** descent. What if I'm not of European, Ashkenazi Jewish, or North African Berber descent?

The tested variants are expected to be less common in people who are not of European, Ashkenazi Jewish, and North African Berber descent.

The effect of these variants on a person's risk of developing Parkinson's disease is well understood in people of European, Ashkenazi Jewish, and North African Berber descent. If you have one or more of these genetic variants but are of a different ethnicity, you are still expected to have a higher risk of developing Parkinson's disease, but the exact risk numbers are not well understood. See Scientific Details for more information.

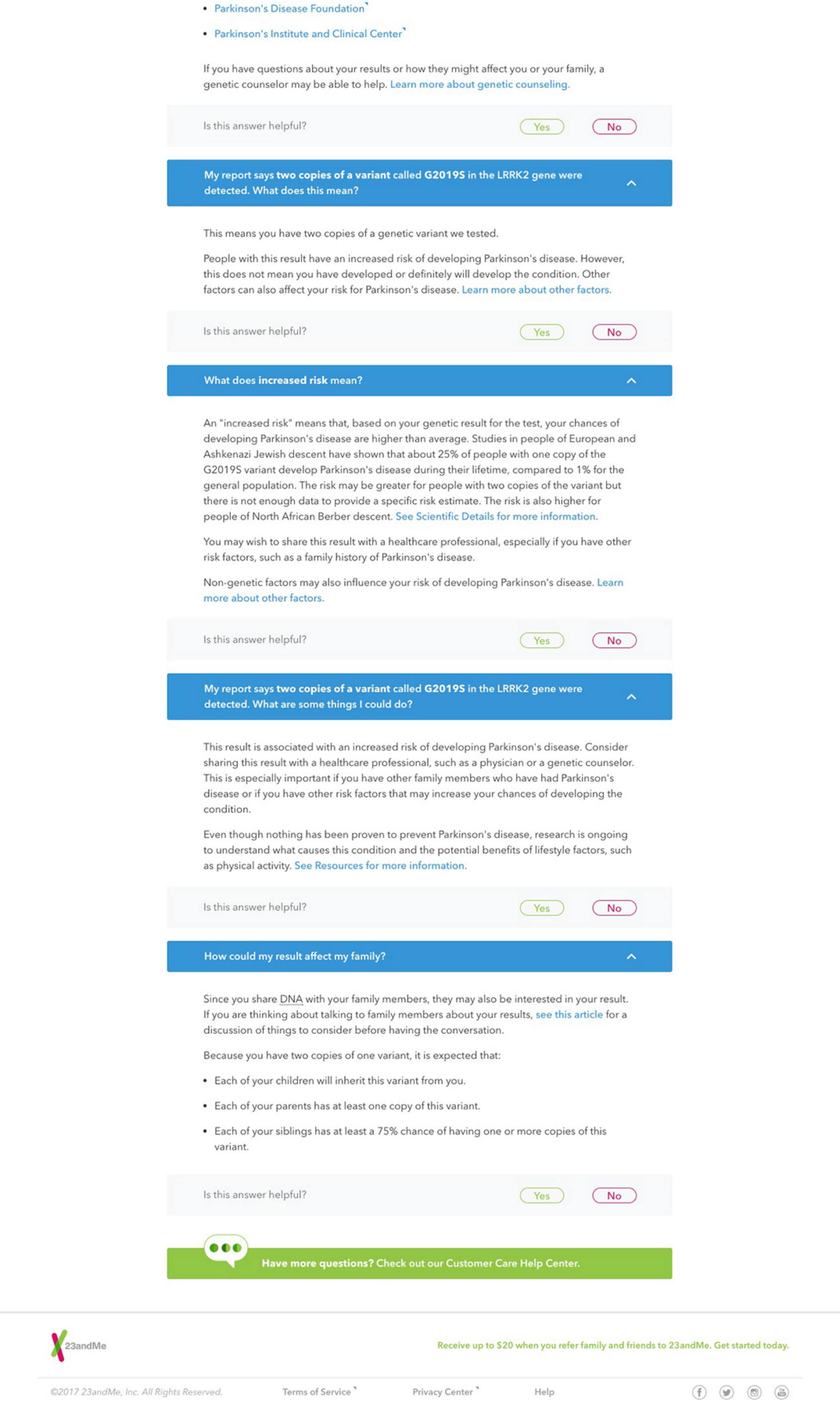
There are other genetic variants associated with an increased risk of developing Parkinson's disease in other ethnicities. These other variants are not included in this test. It is still possible for a person to have one of these genetic variants not covered by this test.

Is this answer helpful? Yes No

Where can I learn more about Parkinson's disease, support groups, and other resources?

You can learn more about Parkinson's disease from the following resources:

- American Parkinson Disease Association
- The Michael J. Fox Foundation for Parkinson's Research



- Parkinson's Disease Foundation
- Parkinson's Institute and Clinical Center

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 **two copies of a variant** called **G2019S** in the LRRK2 gene were detected. What does this mean?

This means you have two copies of a genetic variant we tested.

People with this result have an increased risk of developing Parkinson's disease. However, this does not mean you have developed or definitely will develop the condition. Other factors can also affect your risk for Parkinson's disease. Learn more about other factors.

Is this answer helpful? Yes No

What does **increased risk** mean?

An "increased risk" means that, based on your genetic result for the test, your chances of developing Parkinson's disease are higher than average. Studies in people of European and Ashkenazi Jewish descent have shown that about 25% of people with one copy of the G2019S variant develop Parkinson's disease during their lifetime, compared to 1% for the general population. The risk may be greater for people with two copies of the variant but there is not enough data to provide a specific risk estimate. The risk is also higher for people of North African Berber descent. See Scientific Details for more information.

You may wish to share this result with a healthcare professional, especially if you have other risk factors, such as a family history of Parkinson's disease.

Non-genetic factors may also influence your risk of developing Parkinson's disease. Learn more about other factors.

Is this answer helpful? Yes No

My report says **two copies of a variant** called **G2019S** in the LRRK2 gene were detected. What are some things I could do?

This result is associated with an increased risk of developing Parkinson's disease. Consider sharing this result with a healthcare professional, such as a physician or a genetic counselor. This is especially important if you have other family members who have had Parkinson's disease or if you have other risk factors that may increase your chances of developing the condition.

Even though nothing has been proven to prevent Parkinson's disease, research is ongoing to understand what causes this condition and the potential benefits of lifestyle factors, such as physical activity. See Resources for more information.

Is this answer helpful? Yes No

How could my result affect my family?

Since you share DNA with your family members, they may also be interested in your result. If you are thinking about talking to family members about your results, see this article for a discussion of things to consider before having the conversation.

Because you have two copies of one variant, it is expected that:

- Each of your children will inherit this variant from you.
- Each of your parents has at least one copy of this variant.
- Each of your siblings has at least a 75% chance of having one or more copies of this variant.

Is this answer helpful? Yes No

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