

BRCA1/BRCA2 (Selected Variants)

Specific genetic variants in the BRCA1 and BRCA2 genes are associated with an increased risk of developing breast cancer (in females and males) and ovarian cancer. These variants may also be associated with an increased risk for prostate cancer, pancreatic cancer, and potentially other cancers. This test includes 44 out of more than 4,000 variants in the BRCA1 and BRCA2 genes that are known to increase cancer risk.

[Overview](#)[Scientific Details](#)[Frequently Asked Questions](#)

Jamie, you have an **increased risk** of developing male breast cancer and prostate cancer.

You have one of the genetic variants we tested. Males with this variant have an increased risk of developing male breast cancer and prostate cancer. They also have an increased risk for pancreatic cancer.

1 variant detected
in the BRCA2 gene

Please share your result with a healthcare professional. Results should be confirmed by an independent genetic test prescribed by your own healthcare provider before taking any medical action.

How To Use This Test

This test does not diagnose cancer or any other health conditions and should not be used to make medical decisions. Results should be confirmed by an independent genetic test prescribed by your own healthcare provider before taking any medical action.

Please talk to a healthcare professional about additional testing to confirm this result and to better understand your potential cancer risks.

[Review the BRCA1/BRCA2 \(Selected Variants\) tutorial](#)

[See Frequently Asked Questions](#)

[See Scientific Details for complete Indications for Use statement and full list of Warnings, Precautions, and Limitations](#)

+ Intended Uses

- Tests for 44 variants in the BRCA1 and BRCA2 genes. These variants are associated with an increased risk of developing certain cancers.
- Provides information on whether a person's genetic result is associated with an increased risk for breast and ovarian cancer and may be associated with an increased risk for prostate cancer, pancreatic cancer, and potentially other cancers.

- Limitations

- Does **not** test for all possible variants in the BRCA1 and BRCA2 genes. More than 4,000 variants in these genes are known to increase cancer risk. Only 44 of those variants are included in this test.
- Does **not** test for variants in other genes linked to hereditary cancers.
- Does **not** account for non-genetic factors, like environment and lifestyle, that influence overall cancer risk.
- Does **not** report if someone has two BRCA1 or two BRCA2 variants (due to technical limitations).
- The interpretation of your genetic result depends on the birth sex you reported in your account settings.

🌐 Ethnicity Considerations

- This test does **not** include the majority of BRCA1 and BRCA2 variants found in people of most ethnicities.

- Of the variants included in this test, the majority are most commonly found in people of Ashkenazi Jewish, African American, European, and Hispanic/Latino descent.

You have an **increased risk** of developing male breast cancer and prostate cancer based on your result.

People with this result also have an increased risk for pancreatic cancer. It is important to talk with a healthcare professional about options for cancer screening. It is also important to confirm this result with an independent genetic test prescribed by your own healthcare provider before taking any medical action.



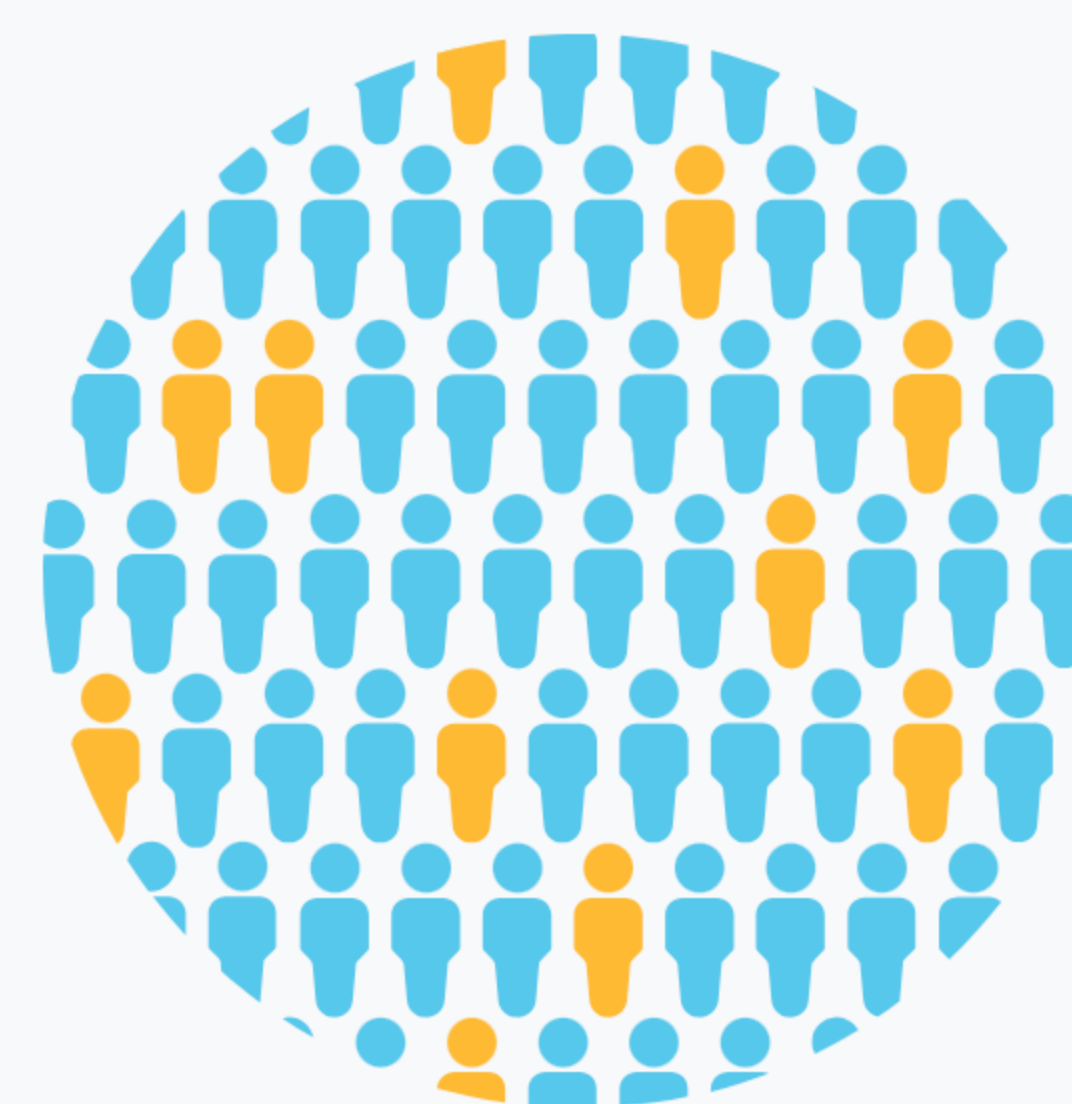
We detected the c.5946del variant in the BRCA2 gene.

[See Scientific Details](#)

Males with a BRCA2 variant have an **increased risk** of developing male breast cancer, prostate cancer, and pancreatic cancer.

Studies suggest that 7-8% of males with a BRCA2 variant develop male breast cancer during their lifetime, compared to about 0.1% in the general population. For prostate cancer and pancreatic cancer, exact risks depend on family history and other factors.

[See Scientific Details](#)



Your mother and any sisters and daughters have a greatly increased risk of developing breast and ovarian cancer if they also have this variant.

Your parents, siblings, and children each have a 50% chance of having the variant we detected. If you are thinking about sharing your results with family members, [see this article](#) for a discussion about things to consider before having the conversation. [Genetic counselors](#) can help your adult family members decide about genetic testing.

People with one BRCA2 variant are also carriers for a genetic condition called Fanconi anemia group D1.

They do not have the condition themselves, but their children may be at risk if both parents are BRCA2 carriers. Consider talking with a [genetic counselor](#) if you're thinking about having children. You can learn more about Fanconi anemia group D1 on our [Frequently Asked Questions](#) page.



There are things you can do to manage your risk for male breast cancer and prostate cancer.

Males with a BRCA1 or BRCA2 variant have an increased risk of developing male breast cancer and may have an increased risk for prostate cancer and pancreatic cancer. But there are options to consider to help manage your risk for these cancers, so it's important to talk with your doctor about your result. Genetic counseling can also help you understand your results and options. For more information about what to think about and possible next steps, see this [help article](#).



Know your family history

Males with a family history of breast, ovarian, prostate, or pancreatic cancer have a higher risk of developing cancer than those without a family history. By knowing your family history, a healthcare professional can better assess your risk.



Understand your screening options

National guidelines recommend screening for male breast cancer in people with your genetic result. Discuss your result with your doctor to determine whether prostate cancer screening is appropriate. If you have a family history of pancreatic cancer, your doctor may also recommend pancreatic cancer screening.



Maintain a healthy lifestyle

In general, maintaining a healthy weight can reduce the risk for male breast cancer and prostate cancer. However, more research is needed to fully understand the impact of this and other lifestyle factors on cancer risk in people with your genetic result.

Results should be confirmed by an independent genetic test prescribed by your own healthcare provider before taking any medical action.

[See Scientific Details for more information](#)

About BRCA1/BRCA2-Related Cancers

BRCA1 and BRCA2 variants are associated with an increased risk for several different cancers, including breast cancer (in females and males) and ovarian cancer. Variants in these genes may also be associated with an increased risk for prostate cancer, pancreatic cancer, and potentially other cancers.



Lifetime cancer risks

- Males with a **BRCA1** variant have a 1-2% chance of developing male breast cancer. They may also have an increased risk for prostate cancer and pancreatic cancer.
- Males with a **BRCA2** variant have a 7-8% chance of developing male breast cancer and an increased risk for prostate cancer. They also have an increased risk for pancreatic cancer.
- Females with a BRCA1 or BRCA2 variant have a greatly increased risk for breast and ovarian cancer, and may have an increased risk for pancreatic cancer.
- [See Scientific Details to learn more about these risks](#)



When these cancers develop

In general, the chances of developing cancer increase as a person gets older. However, males with a BRCA1 or BRCA2 variant may develop earlier and more aggressive prostate cancer. Females with a BRCA1 or BRCA2 variant have an increased risk for early-onset breast cancer (before age 45) and multiple breast cancers. In addition, females with a BRCA1 variant may develop ovarian cancer at an earlier age.



How common are BRCA1 and BRCA2 variants?

About 1 in 200 people in the general population has a BRCA1 or BRCA2 variant linked to hereditary male breast cancer, prostate cancer, and pancreatic cancer, although most of those variants are not included in this report. BRCA1 and BRCA2 variants are more common in people of certain ethnicities. For example, among people of Ashkenazi Jewish descent, about 1 in 40 has a variant (usually one of three specific variants in this report: BRCA1 c.68_69del, BRCA1 c.5266dup, or BRCA2 c.5946del).



Screening and prevention

- Guidelines recommend that males with a BRCA1 or BRCA2 variant should be screened for male breast cancer. They should discuss their result with a doctor to determine whether prostate cancer screening is appropriate.
- Females with a BRCA1 or BRCA2 variant should be screened for breast cancer earlier and more often. However, there are currently no ovarian cancer screening tests that have been proven safe and effective. For females with a BRCA1 or BRCA2 variant, surgery and medication have been shown to be effective in reducing the risk of developing breast and ovarian cancer.

- People with a BRCA1 or BRCA2 variant and a family history of pancreatic cancer may also be offered pancreatic cancer screening.
- Always consult with a healthcare professional before taking any medical action.

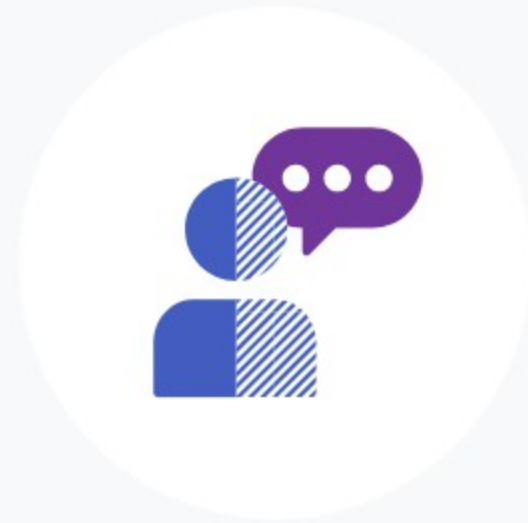
Read more at: [National Cancer Institute`](#) [GeneReviews`](#)

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



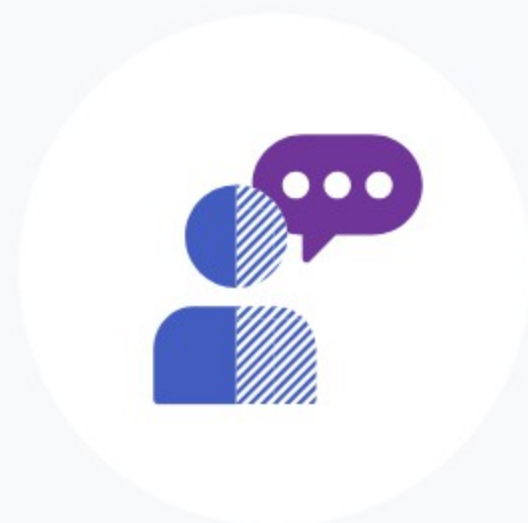
It's important to consult with a healthcare professional to confirm your result and discuss options for cancer screening.

[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.

[Find a genetic counselor](#)



People with one BRCA2 variant are also carriers for a condition called Fanconi anemia group D1. If you're considering having children, a genetic counselor can help you understand if additional testing may be appropriate.

[Find a genetic counselor](#)



See our Frequently Asked Questions for more information.

[FAQs](#)



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Specific genetic variants in the BRCA1 and BRCA2 genes are associated with an increased risk of developing breast cancer (in females and males) and ovarian cancer. These variants may also be associated with an increased risk for prostate cancer, pancreatic cancer, and potentially other cancers. This test includes 44 out of more than 4,000 variants in the BRCA1 and BRCA2 genes that are known to increase cancer risk.

Overview **Scientific Details** Frequently Asked Questions

Genetic variants in the BRCA1 and BRCA2 genes are associated with an increased risk for certain hereditary cancers.

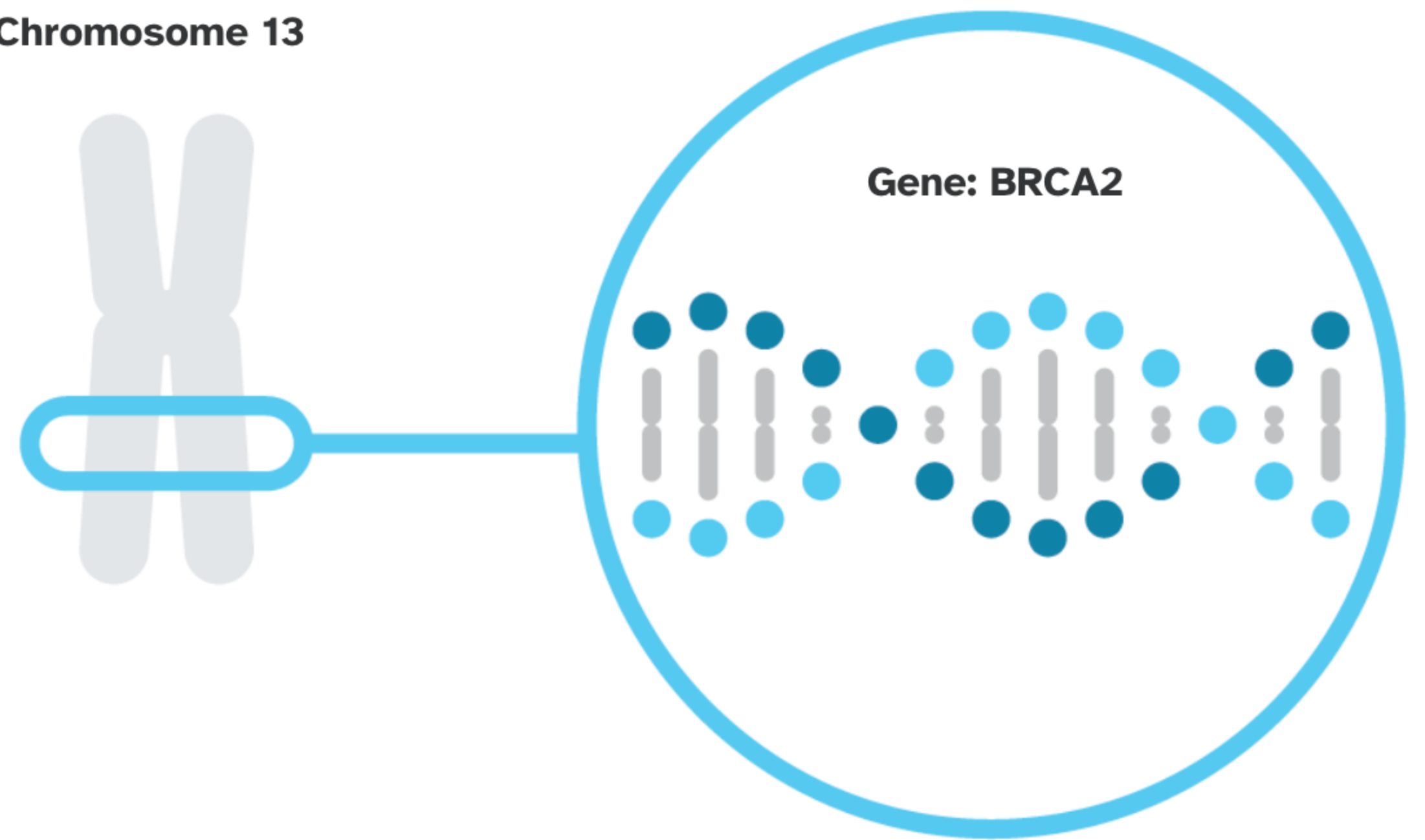
This report includes 24 variants in the BRCA1 gene and 20 variants in the BRCA2 gene. These variants do not account for the majority of the BRCA1 and BRCA2 variants in people of most ethnicities. More than 4,000 variants in these genes are known to increase cancer risk.

BRCA1 BRCA2

Like BRCA1, BRCA2 is a tumor suppressor gene. It contains instructions for making a protein that helps repair damaged DNA. Certain variants in the BRCA2 gene disrupt the protein's function. This can allow DNA errors to build up. These DNA errors can cause cells to grow and divide in an uncontrolled way, leading to cancer.

Read more at [MedlinePlus](#)


Chromosome 13



You have one of the genetic variants we tested.

Variants Detected

[View All Tested Markers](#)

Marker Tested	Genotype*	Additional Information
<p>c.5946del Gene: BRCA2 Marker: rs80359550</p>	<p>(-) Variant copy from one of your parents</p> 	<p>T Typical copy from your other parent</p> <ul style="list-style-type: none"> Biological explanation Typical vs. variant DNA sequence(s) Percent of 23andMe customers with variant References [9, 34, 39, 43, 77, 102] ClinVar

* The percent of 23andMe customers with a variant may not be representative of the general population.

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 several cancers associated with BRCA1 and BRCA2 variants. This test does not take into account non-genetic factors that influence a person's overall risk for these cancers.

Health Risk Estimates

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

Numerical risk estimates are not available for people who have both a BRCA1 and a BRCA2 variant. An interpretation of "increased risk" is provided to people with this result. It is likely that their risk is at least as high as the risk for people with just one variant. More research is needed to understand the risk for people with this result.

For some cancers, numerical risk estimates are not available.

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

References [[19](#), [27](#), [46](#), [92](#), [93](#)]

Lifetime risk

The risk estimates shown below represent the proportion of people expected to develop a given cancer during their lifetime. Estimates for the general population are based on observed cancers among people in the United States. Estimates for people with a BRCA1 or BRCA2 variant are based primarily on studies of people of European and Ashkenazi Jewish descent. Estimates for people with a BRCA1 or BRCA2 variant represent the risk of developing cancer by the age of 70 (for females) or during their lifetime (for males).

Cancer type	General population	BRCA1 variant	BRCA2 variant
Breast (female)	12.9%	45-85%	45-85%
Ovarian	1.1%	39-46%	10-27%
Breast (male)	0.1%	1-2%	7-8%
Prostate	12.6%	May have an increased risk ⓘ	Increased risk
Pancreatic	1.7%	May have an increased risk	Increased risk
<u>Melanoma</u>	2.1%	Research ongoing	Research ongoing

[See risk estimates by race and ethnicity for the general population](#)

Other Factors

Many factors are known to influence the risk of developing male breast cancer, prostate cancer, and pancreatic cancer in the general population. In people with your genetic result, the effects of most of these factors on cancer risk are not as well understood.

This is not a complete list of other factors.

Except for age and family history, the effects of these factors on cancer risk in people with your genetic result are not as well understood.

People with multiple risk factors may have a higher risk of developing cancer.

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

Other Factors

References

Age

[[63](#), [92](#)]

In general, the chances of developing male breast cancer, prostate cancer, and pancreatic cancer increase with age. However, males with a BRCA1 or BRCA2 variant may develop prostate cancer at an earlier age and may develop more aggressive forms of prostate cancer.

Family history

[[5](#), [6](#), [7](#)]

Males with a first-degree relative who has had breast, ovarian, or prostate cancer have a higher risk of developing male breast cancer and prostate cancer. This is likely due to other shared genetic and non-genetic factors. A family history of pancreatic cancer is also expected to increase a person's risk for that cancer.

Weight

[[5](#), [6](#), [7](#), [49](#)]

In the general population, being overweight increases the chances of developing male breast cancer. The association between obesity and prostate cancer is less clear. However, some studies have found that males who are overweight are more likely to develop aggressive forms of prostate cancer. Obesity is also associated with a higher risk for pancreatic cancer. These increased risks may be due to differences in hormone levels in people who are overweight.

Ethnicity

[5, 6, 92]

In general, African Americans have a greater risk of developing prostate cancer than males of other ethnicities. In the U.S., about 1 in 6 African American males develops prostate cancer during their lifetime, compared to about 1 in 9 males of European descent. African Americans are also more likely to develop prostate cancer at an earlier age, and are slightly more likely to develop pancreatic cancer. These differences may be due to a combination of genetic and lifestyle factors.

Other genetic variants

[50, 53]

Other genetic variants seem to influence cancer risk in people with a BRCA1 or BRCA2 variant. In combination, these other variants may increase or decrease the risk for cancer compared to other people with a BRCA1 or BRCA2 variant. Scientists are still working to understand how these other variants modify cancer risk.

Liver disease

[1, 5, 7]

In the general population, conditions such as liver cirrhosis, which can be caused by drinking too much alcohol, can increase the chances of developing male breast cancer. The increase in cancer risk is thought to be due to a decrease in testosterone and an increase in estrogen in the body. Liver cirrhosis may also increase the risk for pancreatic cancer.

The American Cancer Society states that it's best not to drink alcohol at all. For those who choose to drink, experts recommend limiting alcohol consumption to ≤ 1 drink per day for females and ≤ 2 drinks per day for males.

Smoking

[5, 6]

In the general population, smoking is associated with an increased risk of dying from prostate cancer. The effect of smoking on the risk of developing prostate cancer is less clear. Smoking is also a major risk factor for pancreatic cancer, accounting for about 25% of all cases. Smoking does not appear to increase the risk for male breast cancer.

Cancer Screening and Prevention Guidelines

Cancer screening can help detect certain cancers at an earlier stage, when they may be more treatable. The guidelines below apply to people with a BRCA1 or BRCA2 variant. These guidelines may help you and your doctor decide on the best screening and prevention plan for you.



Females

Females with a BRCA1 or BRCA2 variant should be screened for breast cancer earlier and more often than other females. However, there are currently no ovarian cancer screening tests that have been proven safe and effective. Females with a BRCA1 or BRCA2 variant may also consider preventive surgery or medication to reduce the risk for breast and ovarian cancer. If they have a family history of pancreatic cancer, these individuals may also be offered pancreatic cancer screening. Learn more about breast, ovarian, and pancreatic cancer screening and/or prevention options from [Facing Our Risk of Cancer Empowered](#).



Males

Males with a BRCA1 or BRCA2 variant should be screened for male breast cancer. They should discuss their result with a doctor to determine whether prostate cancer screening is appropriate. People with a BRCA1 or BRCA2 variant and a family history of pancreatic cancer may also be offered pancreatic cancer screening. Learn more about screening for male breast cancer, prostate cancer, and pancreatic cancer from [Facing Our Risk of Cancer Empowered](#).

Test Details

Indications for Use

The 23andMe Personal Genome Service (PGS) uses qualitative genotyping to detect select clinically relevant variants in genomic DNA isolated from human saliva collected from individuals ≥ 18 years with the Oragene Dx model OGD500.001 for the purpose of reporting and interpreting genetic health risks, including the 23andMe PGS Genetic Health Risk Report for BRCA1/BRCA2 (Selected Variants). The 23andMe PGS Genetic Health Risk Report for BRCA1/BRCA2 (Selected Variants) is indicated for reporting of 44 variants in the BRCA1 and BRCA2 genes. The report describes if a person's genetic result is associated with an increased risk of developing breast cancer and ovarian cancer and may be associated with an increased risk for prostate cancer, pancreatic cancer, and potentially other cancers. The variants included in this report do not represent the majority of the BRCA1/BRCA2 variants in people of most ethnicities. The test report does not describe a person's overall risk of developing any type of cancer, and the absence of a variant tested does not rule out the presence of other variants that may be cancer-related. This report is for over-the-counter use by adults over the age of 18, and provides genetic information to inform discussions with a healthcare professional. This test is not a substitute for visits to a healthcare provider for recommended screenings or appropriate follow-up and should not be used to determine any treatments. The full list of variants included in this report is: BRCA1: c.68_69del, c.213-11T>G, c.427G>T, c.815_824dup, c.1556del, c.1687C>T, c.1960A>T, c.1961del, c.2681_2682del, c.2864C>A, c.3481_3491del, c.3598C>T, c.3627dup, c.3756_3759del, c.3770_3771del, c.4035del, c.4065_4068del, c.4327C>T, c.4357+1G>A, c.4964_4982del, c.4986+6T>G, c.5123C>A, c.5177_5180del, c.5266dup. BRCA2: c.658_659del, c.771_775del, c.1929del, c.2808_2811del, c.2957_2958insG, c.3170_3174del, c.3264dup, c.3545_3546del, c.3847_3848del, c.4471_4474del, c.5542del, c.5576_5579del, c.5682C>G, c.5946del, c.6037A>T, c.6275_6276del, c.7024C>T, c.7480C>T, c.7934del, c.8904del.

Special Considerations

- Genetic testing for BRCA1 and BRCA2 variants in the general population is not currently recommended by any healthcare professional organizations.
- Cancer risk associated with a BRCA1 or BRCA2 variant varies from person to person. Exact risk depends on family history and other factors. In addition, new research in the future may determine that other cancers — besides those mentioned in this report — may be associated with BRCA1 and BRCA2 variants. Please talk to a healthcare professional if you have questions about new research related to BRCA-associated cancers.

Test Performance Summary

Clinical Performance [12, 15, 34, 35, 37, 39, 40, 47, 51, 52, 62, 72, 74, 75, 77, 79, 80, 96, 101, 102]

The variants included in this report represent a very small subset of all those associated with breast, ovarian, prostate, and pancreatic cancer. The variants tested are associated with an increased risk of developing these cancers. However, not everyone with these variants will develop cancer. In addition, most cases of these cancers are not caused by inherited genetic variants.

- Inherited variants in the BRCA1 and BRCA2 genes account for approximately 5-10% of breast cancers, 10-15% of ovarian cancers, 15-20% of male breast cancers, 1-6% of prostate cancers, and 1-10% of pancreatic cancers. Among people with a family history, these percentages are expected to be higher.
- The variants in this report account for more than 90% of cancer-related BRCA1 and BRCA2 variants among people of Ashkenazi Jewish descent. These variants account for a much smaller proportion of cancer-related BRCA1 and BRCA2 variants found in people of other ethnicities, including about 30-40% among African Americans, people of European descent, and people of Hispanic or Latino descent; about 5-25% among people of East Asian descent; and up to 35% among people of South Asian descent.
- About 1 in 40 people of Ashkenazi Jewish descent is expected to have one of three specific variants in this report (BRCA1 c.68_69del, BRCA1 c.5266dup, or BRCA2 c.5946del). Among people of other ethnicities, about 1 in 200 has a BRCA1 or BRCA2 variant, but most of those variants are not included in this report.

Analytical Performance

Accuracy was determined by comparing results from this test with results from sequencing. Greater than 99% of test results were correct. The widest 95% confidence interval was 47.3% to 100% for the heterozygous BRCA1 c.2864C>A genotype. While unlikely, this test may provide false positive or false negative results. It is possible that the presence of certain mutations in your sample may interfere with the performance of this test. The effects of the interfering mutations on the performance of this test have not been studied. For more details on the analytical performance of this test, refer to the package insert.

Warnings, Precautions, and Limitations

- This test does not diagnose cancer or any other health conditions and cannot determine your overall risk of developing cancer in the future.
- This test should not be used to make medical decisions. Results should be confirmed by an independent genetic test prescribed by your own healthcare provider before taking any medical action.
- This test does not cover all variants that could increase risk for cancer.* The absence of a variant tested does not rule out the presence of other genetic variants that may impact cancer risk.
- Other factors, such as environmental and lifestyle risk factors, may affect your risk of developing cancer. This test does not account for those factors, and does not test for variants in other genes linked to hereditary cancers.
- Your ethnicity may affect how relevant this test is for you.
- This test is intended to provide you with genetic information to inform conversations with your doctor or other healthcare professional.
- This device is not intended for prenatal testing.
- This test should not be used to assess the presence of genetic variants that may impact response to medications.
- This test is not intended to detect the presence of deterministic variants in autosomal dominant diseases or conditions.
- This test is not a substitute for visits to a healthcare professional for recommended screenings. Consult with a healthcare professional if you have any questions or concerns about your results or your current state of health.
- Some people feel a little anxious after getting genetic health risk results. This is normal. If you feel very anxious, you should speak to your doctor or a genetic counselor.

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.

References

1. [American Cancer Society. "Alcohol Use and Cancer." Retrieved Dec 6, 2022, from https://www.cancer.org/cancer/cancer-causes/diet-physical-activity/alcohol-use-and-cancer.html](https://www.cancer.org/cancer/cancer-causes/diet-physical-activity/alcohol-use-and-cancer.html) ↗
2. [American Cancer Society. "American Cancer Society Recommendations for Prostate Cancer Early Detection." Retrieved Dec 6, 2022, from https://www.cancer.org/cancer/types/prostate-cancer/detection-diagnosis-staging/acs-recommendations.html](https://www.cancer.org/cancer/types/prostate-cancer/detection-diagnosis-staging/acs-recommendations.html) ↗
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10. [Baudi F et al. \(2001\). "Evidence of a founder mutation of BRCA1 in a highly homogeneous population from southern Italy with breast/ovarian cancer." Hum Mutat. 18\(2\):163-4.](#) ↗

[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	Change
Oct. 16, 2023	<p>41 genetic variants were added to the report for customers on the most recent version of the 23andMe genotyping platform (V5). If any of these variants were detected, customers will see this reflected in their result.</p> <p>For customers with a BRCA2 variant detected, the interpretation of the genetic result was changed from "may have an increased risk for pancreatic cancer" to "increased risk for pancreatic cancer" based on updated clinical guidelines.</p> <p>For customers with a BRCA1 variant detected, information about Fanconi anemia group S was added.</p> <p>Variant names were updated to align with the naming conventions used in the scientific literature. The names of the three Ashkenazi Jewish founder variants have been updated as follows: 185delAG is now c.68_69del, 5382insC is now c.5266dup, and 6174delT is now c.5946del.</p>
Nov. 5, 2020	<p>Information about pancreatic cancer screening was added for people with a BRCA1 or BRCA2 variant and a family history of pancreatic cancer.</p>
April 9, 2018	<p>BRCA1/BRCA2 (Selected Variants) report created.</p>



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BRCA1/BRCA2 (Selected Variants)

What does this test do?

What does this test **not** do?

Who is at risk for breast, ovarian, prostate, and other cancers?

The report says this report does **not** include the majority of BRCA1 and BRCA2 variants found in people of most ethnicities. What does this mean?

Where can I learn more about cancer, support groups, and other resources?

My report says **one variant** was detected in the BRCA2 gene. What does this mean?

What does **increased risk** mean?

My report says that males with a BRCA2 variant have a **7-8% chance** of developing male breast cancer. What does this percentage mean?

Why doesn't my report include numerical risk estimates for prostate cancer and pancreatic cancer?

My report says that BRCA1 and BRCA2 variants may potentially be associated with an increased risk for other cancers. What does this mean?

What does it mean that people with one BRCA2 variant are carriers for a condition called Fanconi anemia group D1?

My report says **one variant** was detected in the BRCA2 gene. What are some things I could do?

How could my result affect my family?

I have questions about my results. Who should I talk to?

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