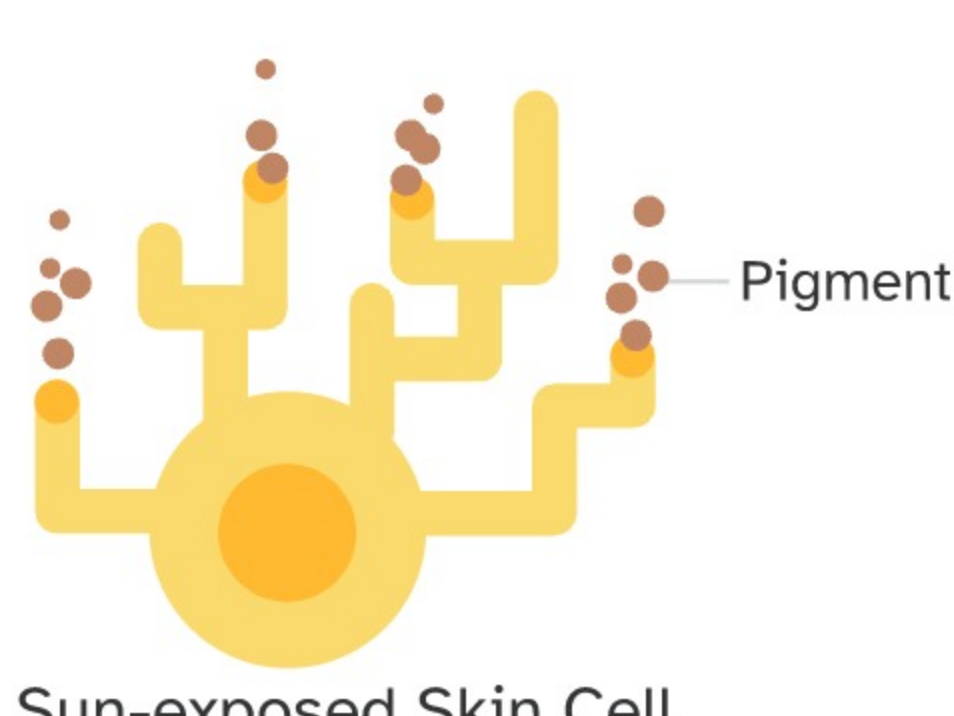


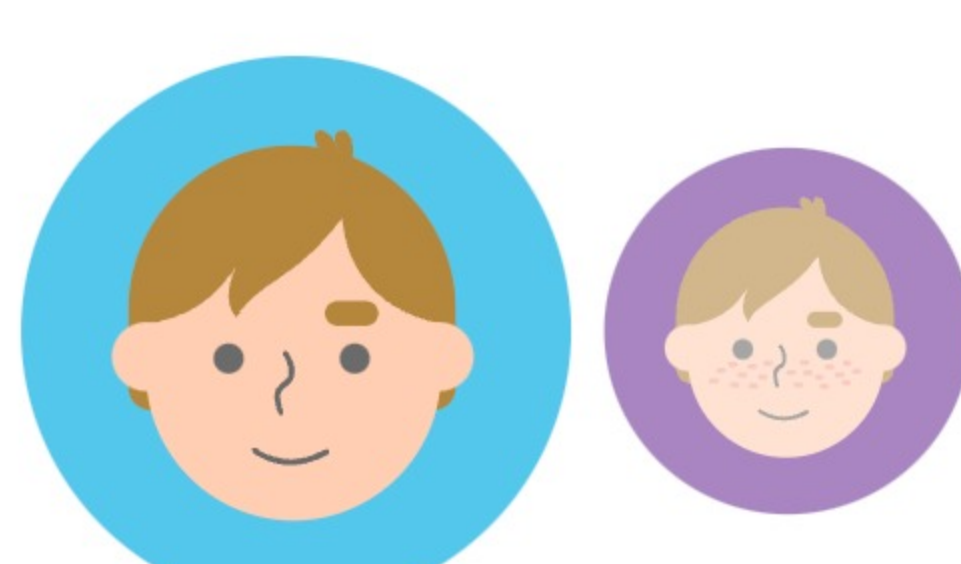
# Freckles

Overview Scientific Details



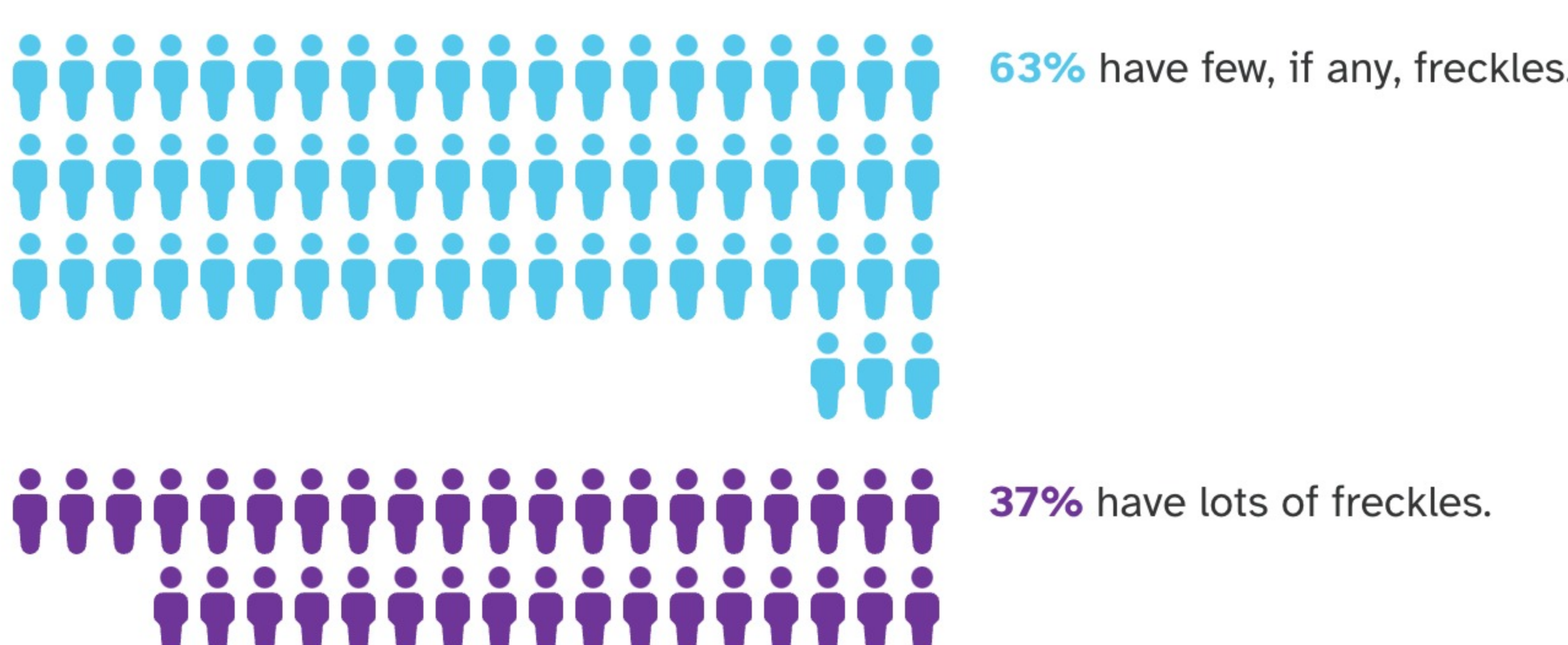
## Spotty cell reception

In people with freckles, some skin cells respond to sun exposure by making more pigment, while other cells apparently don't get the message.



Jamie, the combination of your genetics and other factors makes you likely to have **few, if any, freckles.**

Of 23andMe research participants with results like yours:

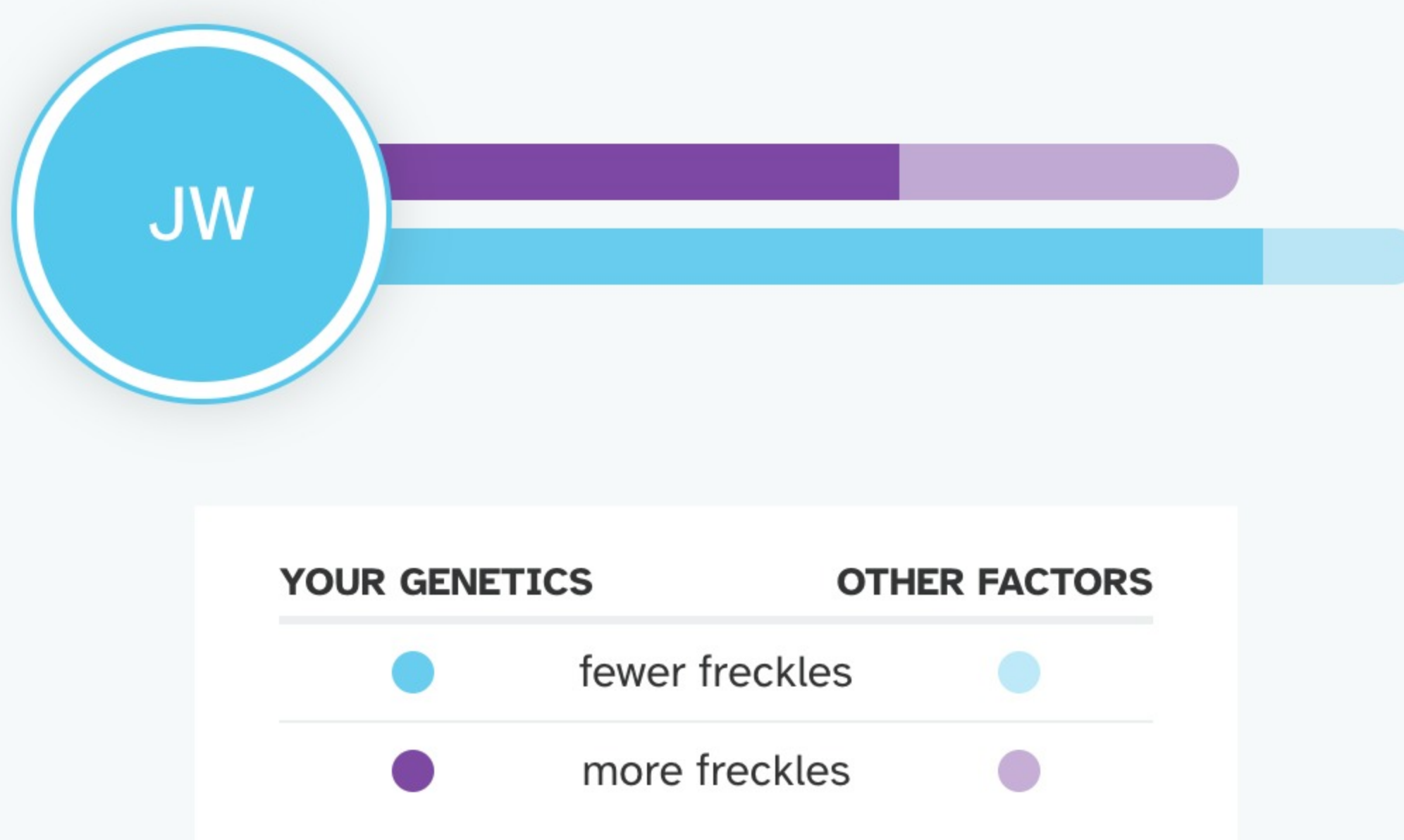


Do you have lots of freckles?

## How did we calculate your result?

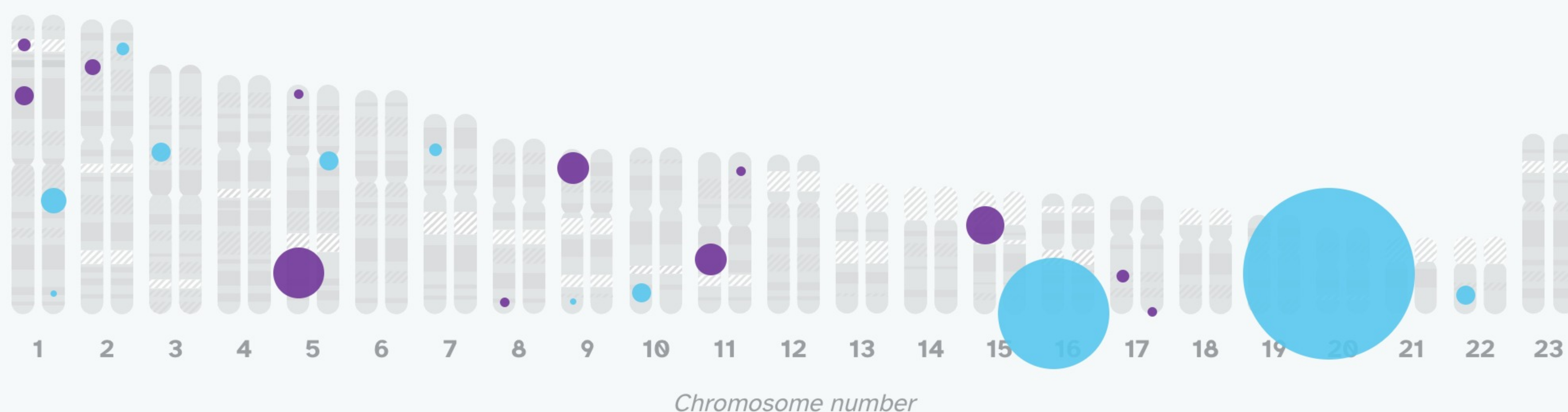
We added up the effect of your genetic variants at 34 places in your DNA (genetic markers) plus the effect of other factors, including your age and sex.

### Total effect of your genetics + other factors



### Breakdown of your genetics

The bigger the circle, the stronger the effect your variants have on your overall chances.



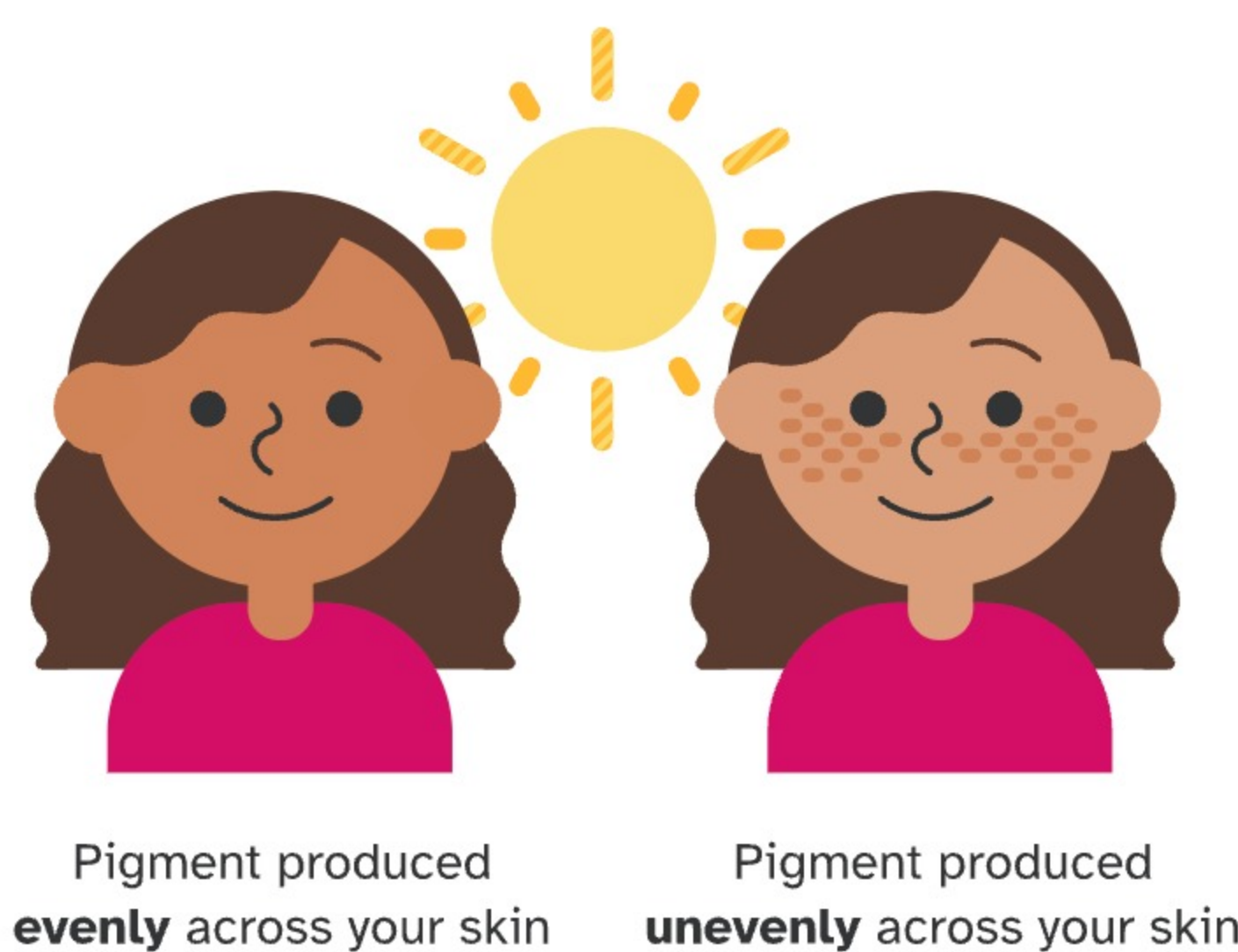
At 12 of the genetic markers we looked at you have variants that make you likely to have more freckles, and at 11 you have variants that make you likely to have fewer freckles. At 11 of the markers that we looked at, you have variants with no effect either way (not shown).

See Scientific Details

## More about freckles

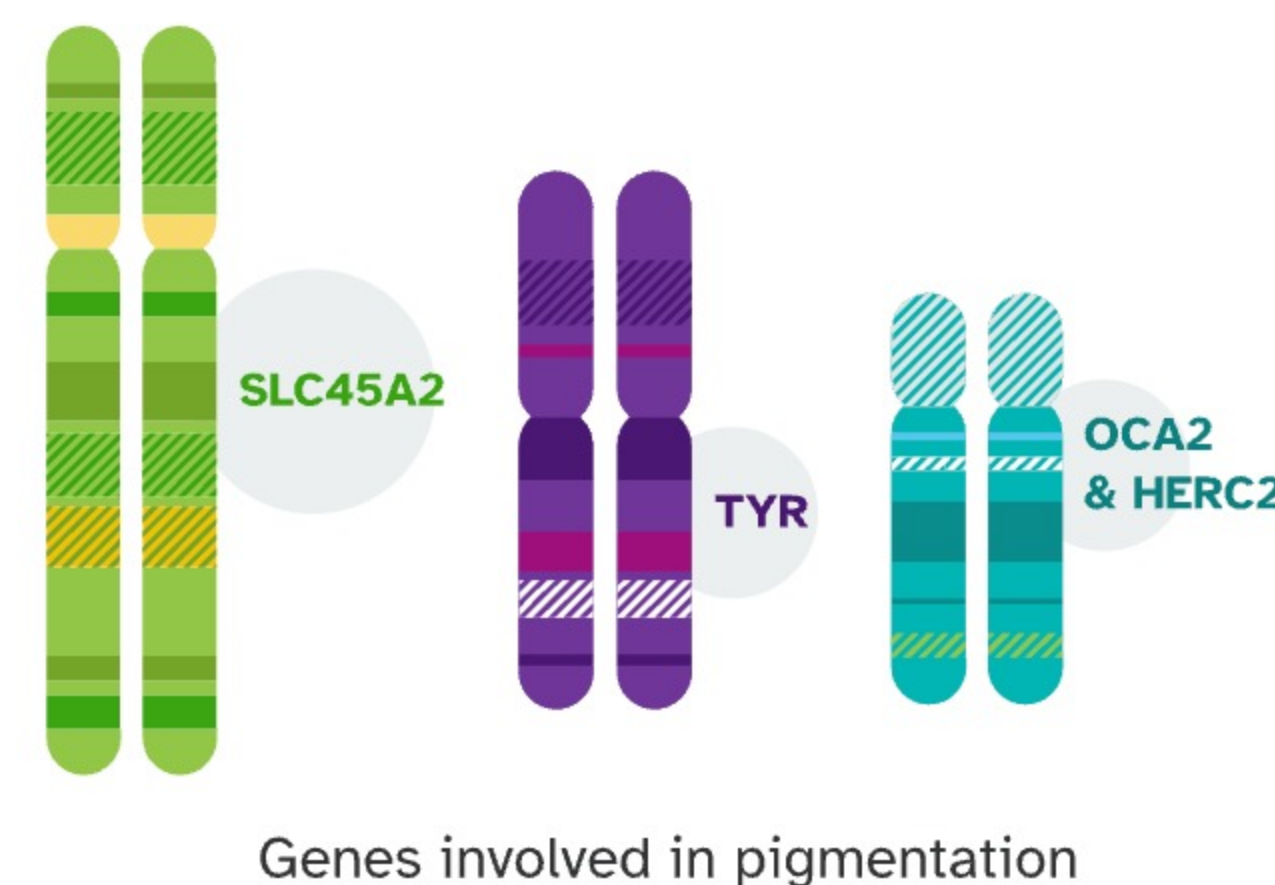
### Why do some people get freckles?

Most of your skin cells don't make their own pigment. Specialized skin cells called melanocytes manufacture little bags of pigment and hand them out to other skin cells. Pigment production gets ramped up in response to sunshine. If pigment is produced evenly across your skin, you end up with a tan — but if more pigment is produced in some areas than others, you get freckles. Scientists still aren't sure what causes skin cells to behave differently when they're located in freckles versus the paler areas between freckles.



### Genetics

We probably don't have to tell you freckles are more common in people with lighter skin and hair. These traits share some, but not all, of their genetics in common. 23andMe research found 34 genetic markers associated with the likelihood of having freckles. Many of these markers are near genes we already know play a role in skin pigmentation, eye color, and/or hair color, like SLC45A2, OCA2, HERC2, and TYR.



## Keep exploring your Traits results.

**Contribute**

Join the research effort and contribute to new discoveries.

**Compare**

Compare your results to your family and friends.

**Discuss**

Join the discussion with other 23andMe customers interested in Traits.

Did you find this interesting?



Give the gift of DNA discovery.

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- Your Connections
- GrandTree
- Advanced DNA Comparison



# Freckles

[Overview](#)
[Scientific Details](#)

We use one of two different methods to calculate your trait results.

## Statistical Model

Most traits are influenced by many different factors, including genetics, lifestyle, and environment. Usually, a statistical model using many factors provides better predictions than looking at single factors by themselves. To develop our models, we first identify genetic markers associated with a trait using data from tens of thousands of 23andMe customers who have consented to research. Then, we use statistical methods to generate a "score" for that trait using your genotype at the relevant genetic markers as well as your age and sex. We predict your likelihood of having different versions of the trait based on the survey responses of 23andMe customers with similar scores. These predictions apply best to customers who are of the same ethnicity as the people whose data contributed to the model. The accuracy of these predictions varies from trait to trait.

[Read more about our statistical methodology](#)

## Curated Model

For some traits, just a few genetic markers can strongly predict whether a person will have a particular version of the trait. For curated models, we first evaluate published scientific studies to identify genetic markers with well-established associations with the trait. Then, we look at genetic and survey data from tens of thousands of 23andMe customers who have consented to research. We estimate your likelihood of having different versions of the trait based on survey responses from customers who are genetically similar to you at those markers. These results apply best to customers who are of the same ethnicity as the people whose data contributed to the predictions.

## About your Freckles result

Your result for this trait was calculated using a **statistical model**.

### About the Freckles model

Created based on customers of ethnicity: **European**

Number of customers used to create: **150,000**

Number of markers: **34**

Area Under Curve (AUC): **0.662**

Non-genetic factors: **Age, Sex**

Bin #	A lot of freckles	Little freckling
1	15.67%	84.33%
2	19.12%	80.88%
3	22.52%	77.48%
4	23.55%	76.45%
5	26.90%	73.10%
6	27.80%	72.20%
7	30.22%	69.78%
8	31.73%	68.27%
9	34.95%	65.05%
<b>JW</b> 10	<b>36.80%</b>	<b>63.20%</b>
11	38.81%	61.19%
12	40.01%	59.99%
13	42.78%	57.22%
14	45.48%	54.52%
15	47.92%	52.08%
16	50.63%	49.37%
17	54.34%	45.66%
18	58.18%	41.82%
19	62.78%	37.22%
20	73.34%	26.66%
<b>Overall European</b>	<b>39.18%</b>	<b>60.82%</b>

## References

- [Bastiaens M et al. \(1999\). "Ephelides are more related to pigmentary constitutional host factors than solar lentigines." \*Pigment Cell Res.\* 12\(5\):316-22.](#)
- [Bastiaens M et al. \(2004\). "Solar lentigines are strongly related to sun exposure in contrast to ephelides." \*Pigment Cell Res.\*17\(3\):225-9.](#)
- [Breathnach A and Wyllie L. \(1964\). "Electron microscopy of melanocytes and melanosomes in freckled human epidermis." \*J Invest Dermatol.\* 42:389-94.](#)
- [Praetorius C et al. \(2014\). "Sun-induced freckling: ephelides and solar lentigines." \*Pigment Cell Melanoma Res.\* 27\(3\):339-50.](#)

## Change Log

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

Date	Change
<b>Dec. 15, 2017</b>	Freckles report updated with revised content and design.
<b>June 22, 2017</b>	Freckles report separated from the Skin report.
<b>Oct. 21, 2015</b>	Skin report created.



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