



Personal Genetics Education Project

Ethical, Legal and Social Issues in Personal Genetics

SNAPSHOT

Admixture Testing: How can your DNA provide insights into your ancestry?

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HARVARD
MEDICAL SCHOOL

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SNAPSHOT

Admixture Testing: How can your DNA provide insights into your ancestry?

The Big Picture

Advances in genetics have given researchers new tools for analyzing people's DNA to gain insights into the ancestral histories of human populations. The rise of low-cost DNA ancestry tests marketed to consumers is enabling people to discover their own personal ancestry. Ancestry tests are nuanced, and the results are subject to limitations. Still, these tests can yield results that are warmly welcomed or fill in missing pieces of a family story. They may also provide results that cause people to feel upset or worried, and the results may conflict with an individual's personal and cultural identities.

DNA ancestry testing comes in several varieties, which provide different ways for people to explore their ancestry. Admixture testing (or biogeographical ancestry analysis) analyzes a person's DNA to estimate where their ancestors came from. So how does this type of ancestry testing work?

How Does Admixture Testing Work?

Watch the following video:

- [How does Ancestry Testing work? Exploring Admixture Testing](#)

As we saw in the video, more than 99% of the DNA in all humans is identical. Therefore, ancestry testing focuses on the small differences in the DNA code that commonly vary between people. Admixture testing estimates a person's ancestry by comparing their DNA variants to DNA from reference populations. This is possible because certain DNA variants are more common in some regions of the world than others. In the video, Daisy's results suggest a high percentage of Asian ancestry. This means that Daisy likely shares a high degree of ancestry with people currently living in Asia.

It is important to note that DNA from modern-day people is used as a reference, not DNA from people that were alive during the time of our ancestors. Why does this matter? Migration is a common theme throughout human history, and social identities change over time. So, even though Daisy shares ancestors with people living in Asia today, it is possible that those ancestors might have come from another part of the world and/or not have identified themselves as Asian.

Do Now: Answer questions 1 and 2 on the Student Worksheet.

Why Did My Admixture Results Change?

When browsing the internet for other people's experiences with ancestry testing, you might notice stories of people getting different ancestry results from different testing companies. This is a common experience. And sometimes results from the *same* company can change over time!

How can this happen?

Watch the following video and answer the remaining question on the student worksheet.

- [Why did my Ancestry Results change? Exploring Admixture Testing](#)

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STUDENT WORKSHEET

Name: _____

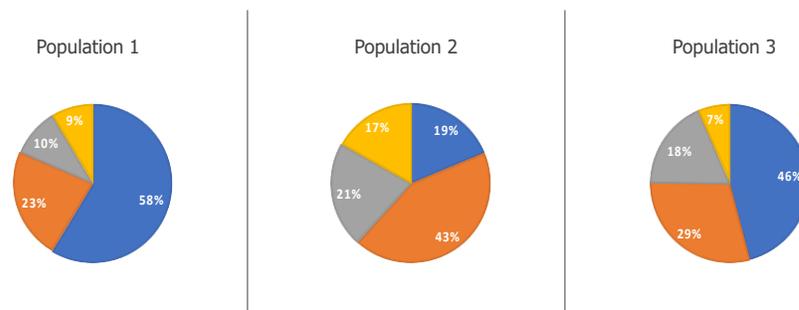
Date: _____

1. How does ancestry testing work? Fill in the blanks, choosing from the following:

reference **estimate** **DNA** **mathematical formulas** **variants**

An ancestry test starts when a customer sends a(n) _____ sample to an ancestry testing company. When the customer's sample arrives in the lab, the DNA is read to determine which DNA _____ the customer has at specific sites in their DNA. For an admixture test, the customer's information is then compared to _____ populations to determine who they are most likely to share ancestry with. After analyzing hundreds of thousands of DNA sites, the company uses complex _____ to put together all the data and provide their customer with a(n) _____ of their ancestry.

2. Sam has taken an ancestry test and carries the blue variant at a specific site in their DNA. The data below shows the distribution of variants at that same DNA site for 3 different reference populations.



- Which populations have the blue variant like Sam?
 - In which population is the blue variant most common?
 - Which population is Sam most likely to share ancestry with?
 - How certain is it that Sam shares ancestry with the population you chose for your answer in 2c? Please explain.
3. Name two reasons why a person may get different admixture results if they are tested by two different companies.

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TEACHER'S GUIDE

Related pgEd lesson plans

- This module was adapted from pgEd's lesson, [How Does Ancestry Testing Work? Exploring Admixture Testing](#). The full lesson contains an additional activity where students take on the role of a scientist at an ancestry testing company to explore this module's concepts in more detail.
- This SNAPSHOT was adapted for [PBS LearningMedia](#) in partnership with WETA and paired with a clip from *Finding Your Roots – Season 7*.
- pgEd has a companion lesson [The Common Thread: DNA and Human Variation](#), which explores genetic similarities and differences across human populations in more detail.
- pgEd has a companion lesson [Ancestry and Identity in the Genomic Age](#), where students examine the impacts that direct-to-consumer ancestry tests can have on people's understanding of their familial and cultural identity.

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STUDENT WORKSHEET TEACHER NOTES

1. Answer key (in order): DNA, variants, reference, mathematical formulas, estimate
2.
 - a. All three reference populations carry the blue variant.
 - b. Population 1
 - c. Population 1
 - d. It is likely that Sam shares ancestry with population 1, but it is not definitive. This is because the blue variant is also found in the other 2 reference populations, and thus it is also possible that Sam shares ancestry with them.
3. One set of reasons is technical: errors may occur when a DNA sample is processed or when the DNA variants are read. Other reasons may be related to how each company interprets the results. Each company has its own way of doing the admixture analysis - using different sets of DNA sites, different reference populations, and different formulas to estimate someone's ancestry. In addition, each company selects different individuals to represent each reference population.