

Genomic study of high school students from Denmark reveals remarkable genetic homogeneity

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A Danish high school student participates in the "Where Are You From?" outreach program. Credit: Anders Traerup, Aarhus University

People from Denmark are genetically similar to each other no matter which part of the country they come from, report researchers in the journal *Genetics*, a publication of the Genetics Society of America. Eight hundred Danish high school students contributed genetic material to the *Where Are You From?* project, and the data were used to decode population-wide patterns of genetic variation. Although there were subtle traces of the impact of Danish history on genetic similarity between different regions, the study revealed that, in genetic terms and disregarding recent migration in the last two generations, Denmark has a relatively homogeneous population, and people have mixed freely between different parts of the country.

Denmark has played a crucial role in European history over the past thousand years, and the genetic signatures of its occupants can add perspective to that history. A [recent study](#) in the

United Kingdom found that Danes have contributed to British ancestry in an important way, but a deep dive into genetic population studies in Denmark had not been conducted before now.

Georgios Athanasiadis, from Aarhus University in Denmark, led this detailed investigation of Danish genetics.

"Despite its small size and lack of geographic barriers, Denmark has many distinct dialect groups and has been in contact with neighbouring populations. Having a clear vision of the country's [genetic structure](#) is an interesting endeavour," he says.

Athanasiadis and his colleagues used a unique method of enrolling subjects into their study. They launched a nationwide outreach project called [Where Are You From?](#) in which [high school students](#) submitted DNA samples and demographic information. The project also presented seminars for participants to learn more about genetics and basic science with the aim of "building bridges between academia and young students interested in...a scientific career."

"The response was overwhelming. We had more participants interested than the budget actually allowed us to genotype!" says Athanasiadis. Despite budget limitations, participants were able to attend the seminars even if they weren't tested.

Around 800 students contributed DNA and reported information on their ancestry. Researchers used genetic data from these students together with four additional European datasets to explore fine-grain patterns of genetic differences between regions of Denmark and historic mixing with other populations. For some of these analyses, they concentrated on DNA from around 400 students who had all four of

their grandparents born in the country. They found that the majority of the students were distantly related, and they did not observe any strong correlation between geography and genetics. This led them to conclude that people whose ancestors all came from Denmark are genetically homogeneous.

Athanasiadis says that, although many ancestral European populations were also relatively homogeneous, he was impressed by the extent of the result in Denmark.

"I personally was surprised to see that all classical methods for detecting genetic 'structure' in populations failed to pick up strong signals. Even cutting-edge methods returned very similar "mixture profiles" for all regions in Denmark," he says.

Athanasiadis recognizes that their findings are most true for an older Danish population; their sampling was not representative of recent migration to the area that has increased the ethnic diversity. A few regions of Denmark remain underrepresented in the study due to the sampling method, and the gene testing technology used focuses on common [genetic variation](#) instead of rare variation: populations tend to look less homogeneous when rare variants are taken into account. Still, the observation that genetic mixing of the Danish population has happened equally throughout the country is striking, and Athanasiadis is excited to revisit these results as independently-collected datasets continue to become available.

More information: G. Athanasiadis et al, Nationwide Genomic Study in Denmark Reveals Remarkable Population Homogeneity, *Genetics* (2016). [DOI: 10.1534/genetics.116.189241](https://doi.org/10.1534/genetics.116.189241)

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