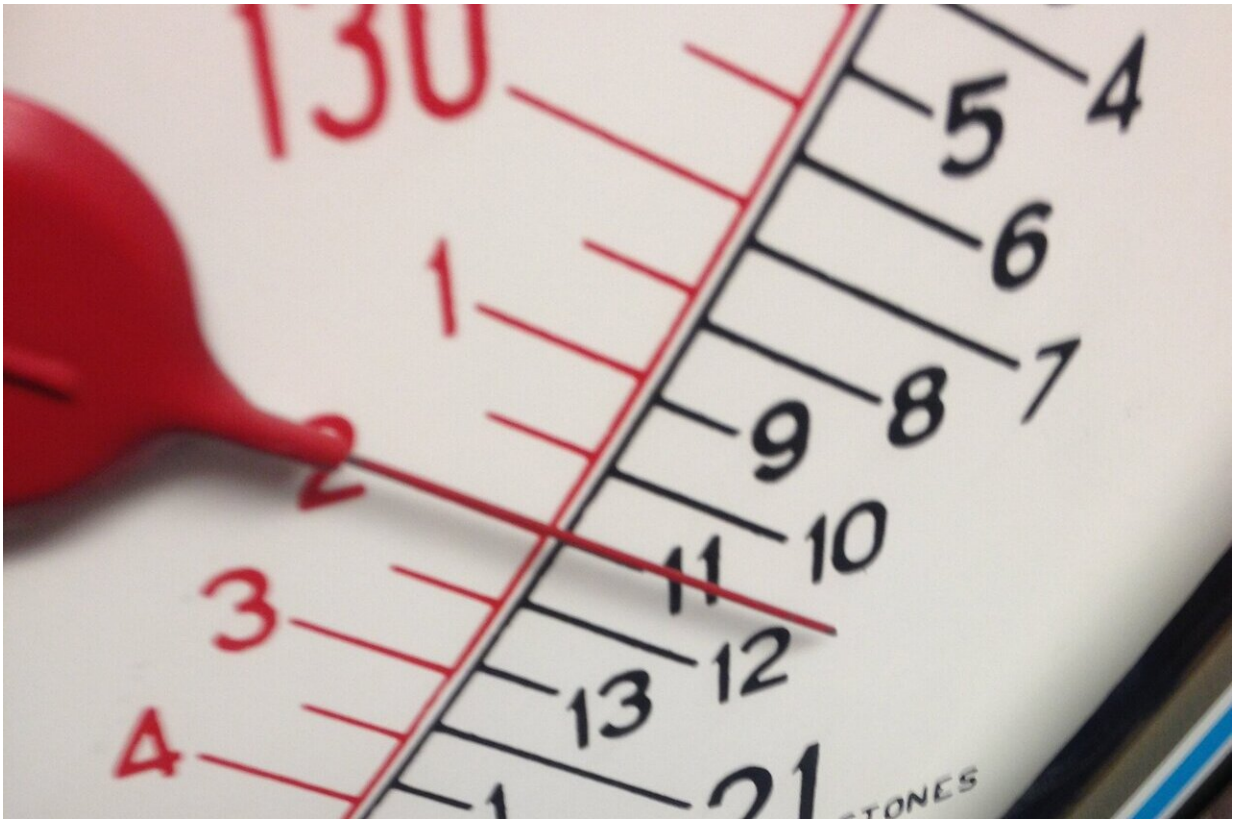
# Genetic ancestry linked to diabetes, heart failure and obesity among Native Hawaiians

February 11 2021




The free high-resolution photo of writing, hand, number, line, measure, weight, fitness, measurement, close up, font, handwriting, organ, calligraphy, scales, shape, loss, emotion, pound, measuring, weight scale, weight loss, overweight. Credit: Pxhere

With advances in analyzing human DNA, some well-studied populations

have benefited from insights about how their health is affected by their genetic heritance. Others, however, have been left behind. Among them are people of Polynesian descent from Hawaii.

Although population studies of Native Hawaiians have shown a substantial increase in risk for obesity, type 2 diabetes, heart disease and certain cancers compared to their neighbors of European and Asian descent, there has been little to no insight into how genetics contribute on top of environmental factors to influence these disparities.

In an attempt to begin rectifying that gap, a USC-led research team has conducted the first study to systematically investigate the genomes of Native Hawaiians and test the components for health risks associated with genetic ancestry. The findings, which appeared in the journal *PLoS Genetics*, show that, for example, Polynesian ancestry in Native Hawaiians is linked to increased risk of diabetes, heart failure and higher body-mass index, a measure of body fat.

"Native Hawaiians really have been understudied from a genetic perspective," said corresponding author Charleston Chiang, an assistant professor of preventive medicine at the Keck School of Medicine of USC and of quantitative and computational biology at USC Dornsife College. "Health disparities are a major research emphasis at USC in general, and my team focuses on looking at the genetic component of health risk within geographically diverse populations."

## Characterizing Hawaiian Polynesian genetics to understand health risk

Chiang and his colleagues correlated health data (from questionnaire, laboratory measurements, and hospital Medicare claims) and the genetics of 3,940 people who identify as Native Hawaiian from the Multiethnic

Cohort Study, a joint project of USC and the University of Hawai'i. The research team found that for each 10% increase in estimated Polynesian ancestry, there is on average an 11% increase in risk of heart failure, an 8.6% increase in risk of type 2 diabetes and a 0.35 unit increase in body-mass index.

Further studies may be able to identify genetic variants and underlying biological factors specific to Polynesian populations, knowledge that could help reduce these health risks. Chiang also hopes to test a hypothesis outlining a combination of nature and nurture.

"For example, it's possible that Native Hawaiians had adapted to a traditional diet, and the introduction of the Western diet has led to all kinds of health problems," he said. "That's actually an interaction between their genetics and their environment."

There was a unique challenge for the study's authors to overcome: Researchers focusing on the genetics of people with roots in Europe, Africa and Asia are able to call upon publicly available genomic references for those populations. No such resource exists for Polynesian ancestry. Native Hawaiians are characterized by a mixture of Polynesian, Asian, European and African ancestry. Using the existing references from other populations to run two analyses, the scientists searched for known origins as reflected both across each participant's entire genome and location by location along their chromosomes. The research team essentially constructed a genomic model for Polynesian ancestry among Native Hawaiians by identifying a subsample of roughly 150 participants with the least amount of external heritance.

## Genomics can't define ethnicity, and biology is not destiny

As should be expected with research charting new territory in biomedical science, the study's authors urge that their findings be interpreted with care and clarity on a few fronts.

Chiang pointed out that race and ethnicity are socially constructed concepts, and distinct from the issues explored in this study—that is how certain genes shared among a population contribute to specific health metrics and outcomes. Ethnicity instead is, and should be, defined by genealogical records or how a person self-identifies.

"Geneticists should not try to quantize a person's ancestry and use that to define whether that person belongs to a particular ethnic group," he said. "While we needed to quantify the proportion of Polynesian ancestry in order to perform our research, we do not want to give the impression that this is a way for people to define their membership in the community based on some arbitrary threshold."

Additionally, Chiang emphasized that the model for Polynesian heritance among Native Hawaiians does not necessarily apply perfectly to populations in other islands such as Samoa.

Perhaps most important, the links between genetics and health revealed in this study should not be construed to mean that being part of any particular population automatically relegates a person to poor health in and of itself.

"Genetics is a window into understanding the biology behind these diseases," Chiang said. "Genetics does not determine everything, and it doesn't necessarily even amount to the majority of the disparity in risk. I want people to know there are modifiable components to your lifestyle, such as a healthy diet and regular hula dancing, that will absolutely help."

**More information:** Sun H, Lin M, Russell EM, Minster RL, Chan TF,

Dinh BL, et al. (2021) The impact of global and local Polynesian genetic ancestry on complex traits in Native Hawaiians. *PLoS Genet* 17(2): e1009273. doi.org/10.1371/journal.pgen.1009273