

Longevity, the Biology of Aging: Behavior dominates Genes.

Summary: This is a complex subject. Recent studies have shifted the balance of importance further towards behavior. The contribution of genes to the variation in longevity is now believed to be less than 10%.

A recent article ⁽¹⁾ conclusively found that, regardless of their genetic risk factors, participants who had a higher rate of physical activity showed a lower risk of mortality, and those who had a higher level of sedentary behavior increased their chances of dying". ⁽²⁾

Studies look at longevity variations across relatives. However, in addition to common genes, there are likely to be common environmental, "sociocultural" factors. Attributing longevity variations between these factors is a challenging data and statistical activity. The study ⁽³⁾ *Estimates of the Heritability of Human Longevity Are Substantially Inflated due to Assortative Mating* analyzed 54.43 million family trees from 406 million people's birth and death records. The data came from *Ancestry.com*, spanning the nineteenth century and the first half of the twentieth century. It is important to present a summary of the three core variables in the model used:

The first, transferable variance (t^2), is the phenotypic (life span) variance attributable to transferable factors (genotype and sociocultural factors). It is akin to, and includes, heritability (h^2), but it also encompasses the variance due to inherited sociocultural factors (b^2) as well as covariance between the two. The second core variable is the inheritance coefficient (β), which describes the extent to which genetic and sociocultural factors are transferred from one parent to one child. The third core variable is the assortative mating coefficient (a), which describes the correlation between the latent genetic and sociocultural states of spouses. This term is meant to encompass all mechanisms of assortative mating (primary assortment on the phenotype, secondary assortment on other phenotypes, inbreeding, and social homogamy, etc.).

It is complex! Assortative mating is probably a new concept to most. Assortative mating is when people with similar genotypes mate with each other with greater frequency than expected by a random pattern. For example, deaf people tend to marry each other.

The study concluded that: *the true heritability of human longevity for birth cohorts across the 1800s and early 1900s was well below 10%, and that it has been generally overestimated due to the effect of assortative mating.*

Previous estimates have been in the 15% to 30% range. For example, from a US government website: ⁽⁴⁾ *The study of longevity genes is a developing science. It is estimated that about 25 percent of the variation in human life span is determined by genetics, but which genes, and how they contribute to longevity, are not well understood.*

With the importance of genes diminishing, longevity is even more driven by good everyday wellness behaviors. For a discussion of the latter, please see our book: *Wellness Travel, Wellness-orientated adventures in Japan. good daily wellness behaviors whilst exploring Japan's hinterlands*. It is available on *Amazon*.

References:

- 1) *Associations of Accelerometer-Measured Physical Activity and Sedentary Time with All-Cause Mortality by Genetic Predisposition for Longevity*, by Alexander Ivan B. Posis, John Bellettiere, Rany M. Salem, Michael J. LaMonte, JoAnn E. Manson, Ramon Casanova, Andrea Z. LaCroix, and Aladdin H. Shadyab, 2022
- 2) *Longevity Isn't Really About Our Genes, Study Reveals*, by Emma Suttle, Epoch Health, Epoch Times, 16 June 2023
- 3) *Estimates of the Heritability of Human Longevity Are Substantially Inflated due to Assortative Mating*, by J. Graham Ruby, Kevin M. Wright, Kristin A. Rand, Amir Kermany, Keith Noto, Don Curtis, Neal Varner, Daniel Garrigan, Dmitri Slinkov, Ilya Dorfman, Julie M. Granka, Jake Byrnes, Natalie Myres, and Catherine Ball, 2018
- 4) *Is longevity determined by genetics?*
<https://medlineplus.gov/genetics/understanding/traits/longevity/#:~:text=The%20study%20of%20longevity%20genes,longitude%2C%20are%20not%20well%20understood>