

Project 1

Increasing longevity (lifespan) or slowing down aging in human population is becoming a trendy topic among the research community. The basic concept is that individuals with a biological age lower than the respective chronological age are expected to have increased longevity (or have slower aging rate) when compared to individuals with a higher biological age than the chronological age. Evidence from different human populations is on the basis to hypothesize that diet is one of the main drivers of slowing down the aging process. As such, researchers have been trying to demonstrate the age reversal of an individual using different dietary and lifestyle intervention.

In this context, Fitzgerald et al (2021) performed a pilot randomized clinical trial (phases I/II) in 38 men divided in a diet and lifestyle intervention (n=18) and a control group (n=20). The primary endpoint of this clinical trial was the biological age at the end of the trial (after 8 weeks). The biological age of the individuals is typically estimated using DNA methylation data as available in the GEO database (<https://www.ncbi.nlm.nih.gov/gds>) under the accession number GSE149747 (basic clinical data are also available therein).

Describe the data and conduct an appropriate statistical analysis to answer the following questions:

- Is there any positive effect on the biological age of the individuals in the diet/lifestyle intervention when compared to the control group at the end of the trial? Estimate the biological age using Horvath and Hannun epigenetic clocks (go to <https://dnamage.genetics.ucla.edu/home>) and compare the results using these different estimates.
- What is the statistical power of the observed differences in mean biological ages between the two groups at the end of the trial according to Hannun and Horvath epigenetic clock data?
- What are your recommendations for the eventual continuation of the trial to a phase III?

Some Useful R packages: GEOquery, Table1, pwr.

Reference

Fitzgerald KN, Hodges R, Hanes D, et al. Potential reversal of epigenetic age using a diet and lifestyle intervention: a pilot randomized clinical trial [published correction appears in Aging (Albany NY). 2022 Jul 27;14(14):5959]. Aging (Albany NY). 2021;13(7):9419-9432. doi:10.18632/aging.202913