



# ECHO

Environmental influences  
on Child Health Outcomes

A program supported by the NIH

## Study Summary

### ***ECHO Cohort Study Identifies Best Tests of Biological Age to Use for Different Types of Pediatric Tissue Samples***

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#### Who sponsored this study?

The Environmental influences on Child Health Outcomes (ECHO) Program, Office of the Director, National Institutes of Health supported this research.

#### Why was this study needed?

A molecular process called DNA methylation, or DNAm, that adds a tag to the DNA that can control gene expression. Certain well-studied DNAm have been associated with many age-related chronic diseases, including aging itself.

Researchers have developed biochemical models called epigenetic clocks that use DNAm to estimate an individual's [biological age](#). Scientists have studied these clocks in adult populations in whom accelerated biological age (DNAm-predicted age older than actual chronological age) seems strongly connected to age-related health complications. However, only epigenetic clocks for pediatric populations have only recently been built. Epigenetic clocks also allow scientists to evaluate the impact of various environmental exposures on early-life development and children's health outcomes.

This study conducted a comprehensive evaluation on seven of these epigenetic clocks—Horvath, Knight, Bohlin, Lee, Mayne, PedBE, and NeoAge—all of which researchers developed for different purposes and tissue types. It is important for scientists to understand how these clocks perform in different tissue types and developmental stages throughout early life to ensure researchers are designing studies appropriately and then correctly interpreting the results of these studies.

#### What were the study results?

The results of this study suggest that the best epigenetic clock to use depends on the type of sample being studied. For example, the Bohlin and Knight clocks were very similar when predicting gestational age from blood cell samples; the Lee clock outperformed the Mayne clock in predicting gestational age from placental samples; and the PedBE clock was more accurate than the Horvath clock at predicting chronological age from buccal cells. However, the Horvath clock was better at predicting chronological age when using blood cells samples. The study results suggest the importance of researchers choosing the appropriate clock depending on the focus of their study.

Footnote: Results reported here are for a single study. Other or future studies may provide new information or different results. You should not make changes to your health without first consulting your healthcare professional.

### What was the study's impact?

This study provides practical recommendations for selecting the most appropriate epigenetic clock in different research contexts, therefore leading to more accurate estimates of biological age. The findings of this study may help scientists make better research tools, improving child health research.

### Who was involved?

Researchers used data from 3,789 children, who contributed a total of 4,555 samples, from 20 ECHO research sites. The sample set consisted of 2,273 male and 2,282 female samples.

### What happened during the study?

The researchers evaluated seven different epigenetic clocks based on the DNAm data generated from the selected sample set. The study evaluated each clock in corresponding tissues based on previous study results, and then compared clocks across different tissue samples. After comparing the suitability of various epigenetic clocks for each tissue type, researchers evaluated their performance across diverse populations. This evaluation included comparing epigenetic clocks between preterm and term infants within the same tissue type, across different self-reported racial groups, between males and females, and across different tissue types within the same set of participants.

### What happens next?

Future studies may use the various epigenetic clocks as recommended to check the health of babies and children. However, researchers should interpret this data with caution as it pertains to conclusions about the performance of specific epigenetic clocks in pediatric populations with varied health backgrounds. Future studies may examine the effects of genetics on the performance of different epigenetic clocks.

### Where can I learn more?

Access the full journal article, titled "Evaluation of Pediatric Epigenetic Clocks Across Multiple Tissues," in [Clinical Epigenetics](#).

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