

Adolescent Academic Achievement and Accelerated Aging

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Introduction

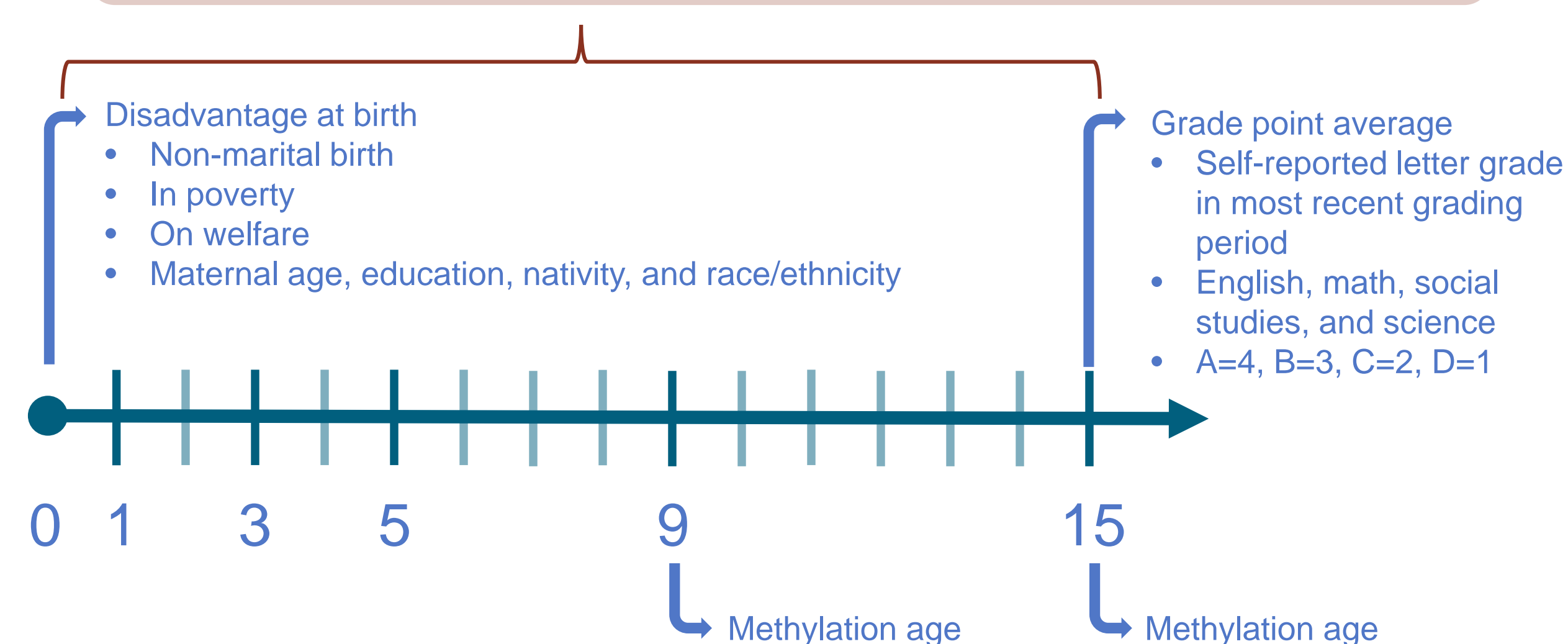
It is well-established that the health returns to educational attainment are not as great for black and Hispanic individuals in the US, compared to white peers⁴. One potential explanation is that the process of achieving greater education is physiologically taxing or costly, particularly for disadvantaged race/ethnic minorities⁵. Researchers documented this pattern among young adults with respect to college completion⁶. It remains unclear when in the educational career these costs first manifest.

We investigated the association between early life disadvantage, academic achievement, and the pace of methylation aging in adolescence in the Fragile Families and Child Wellbeing Study.

Data

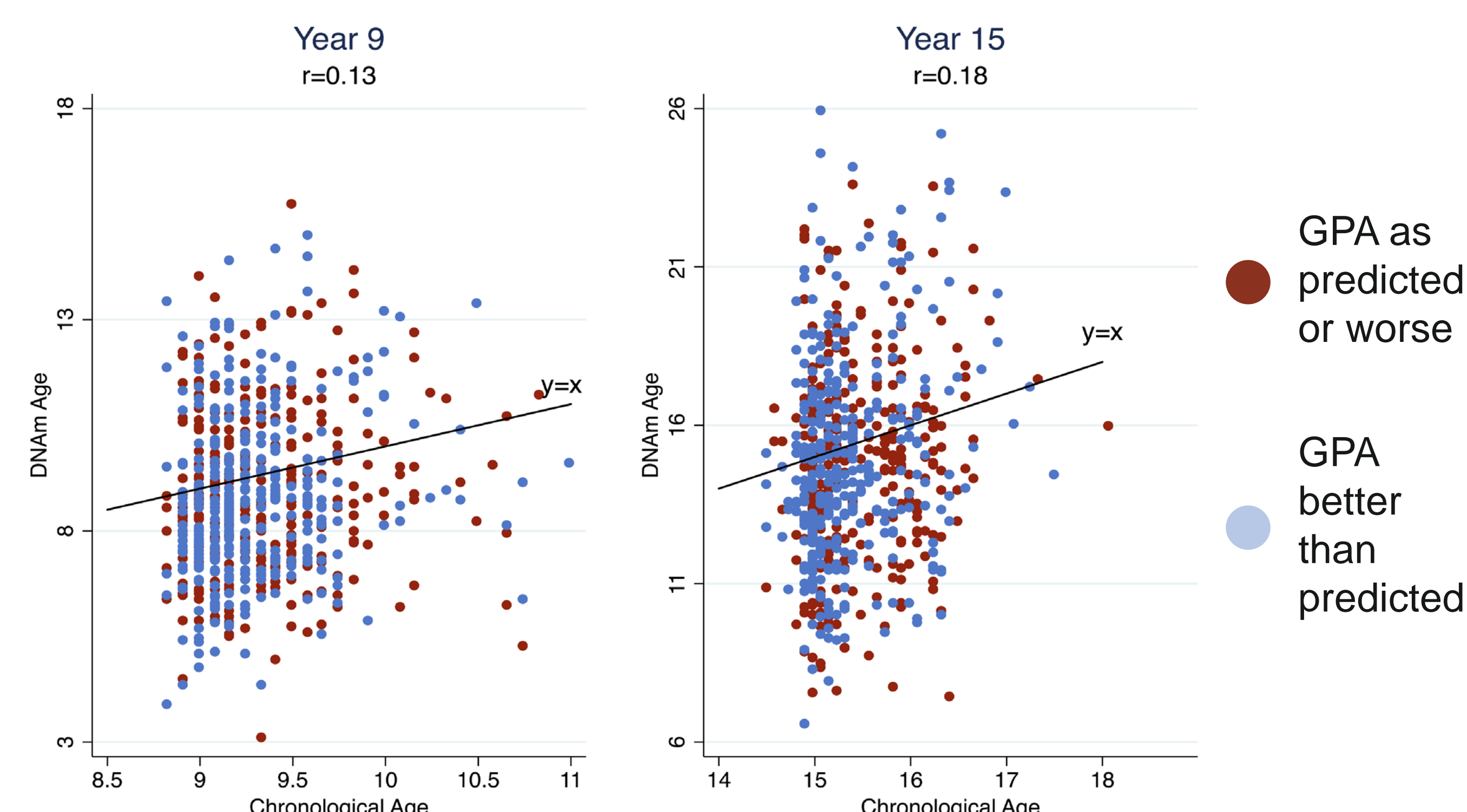
- Fragile Families and Child Wellbeing Study (FFCWS) – longitudinal study of children born in 2000 in 20 US cities, oversample of non-marital births
- Disadvantage at birth
- GPA at Year 15
- Horvath method for calculating methylation age (mAge) at Years 9 and 15
- Chronological age (cAge) at time of Year 9 and 15 interview

Residual GPA – residual from linear regression predicting GPA at Year 15 using measures of disadvantage at birth

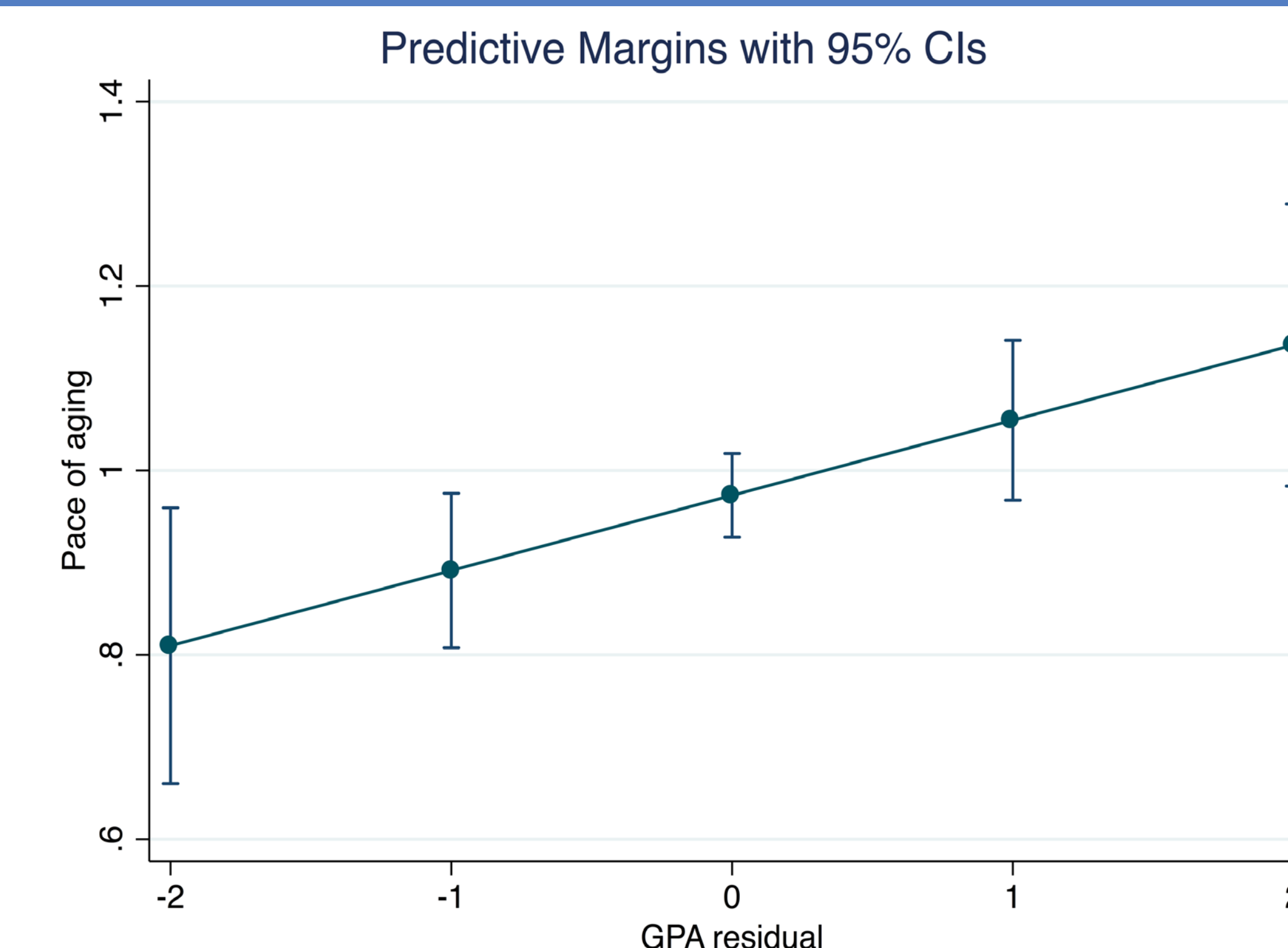


$$\text{Pace of epigenetic aging} = \frac{(Y15mAge - Y9mAge)}{(Y15cAge - Y9cAge)}$$

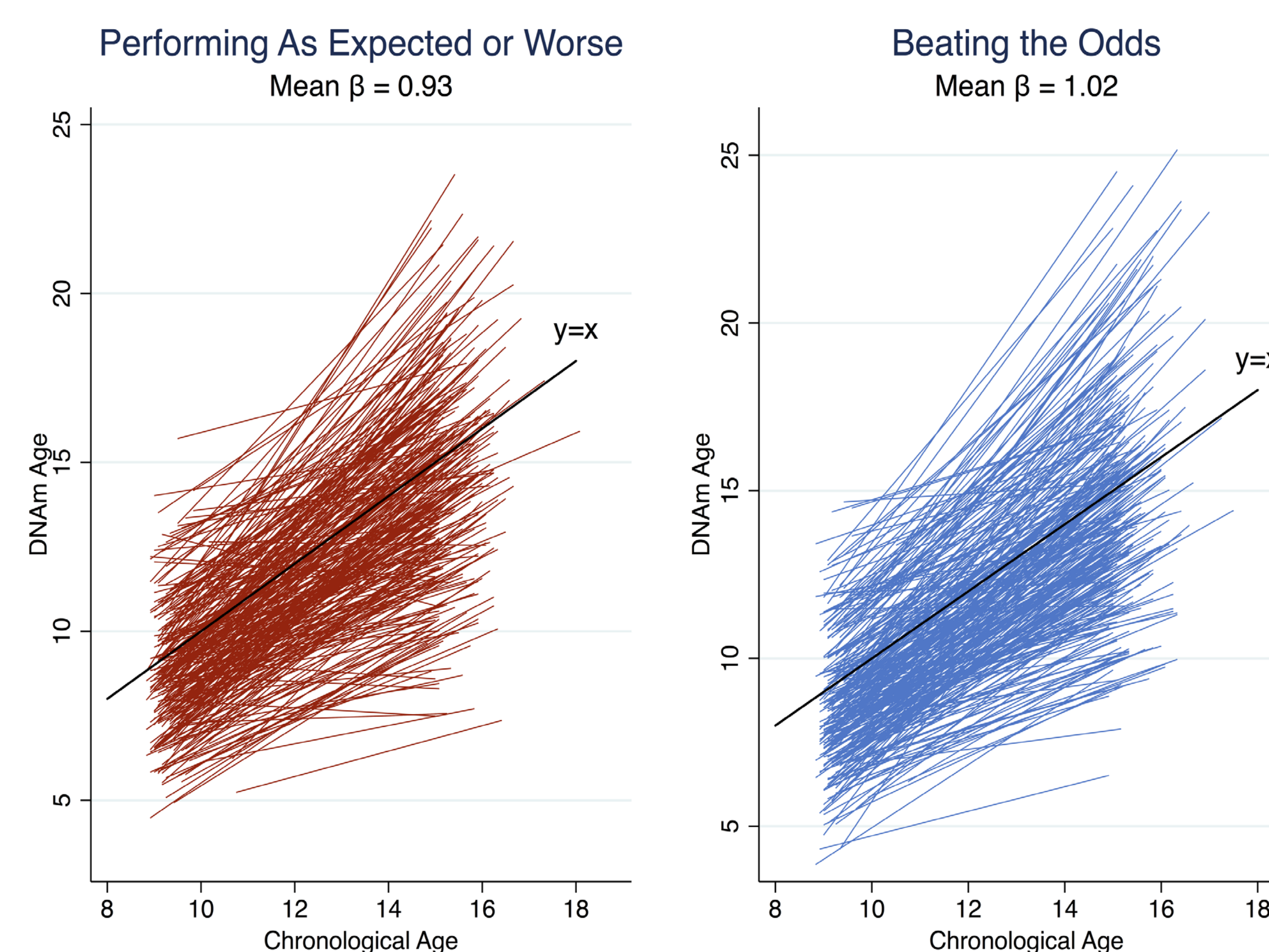
1. Low cross-sectional correlation between cAge and mAge, and no cross-sectional association with academic achievement.



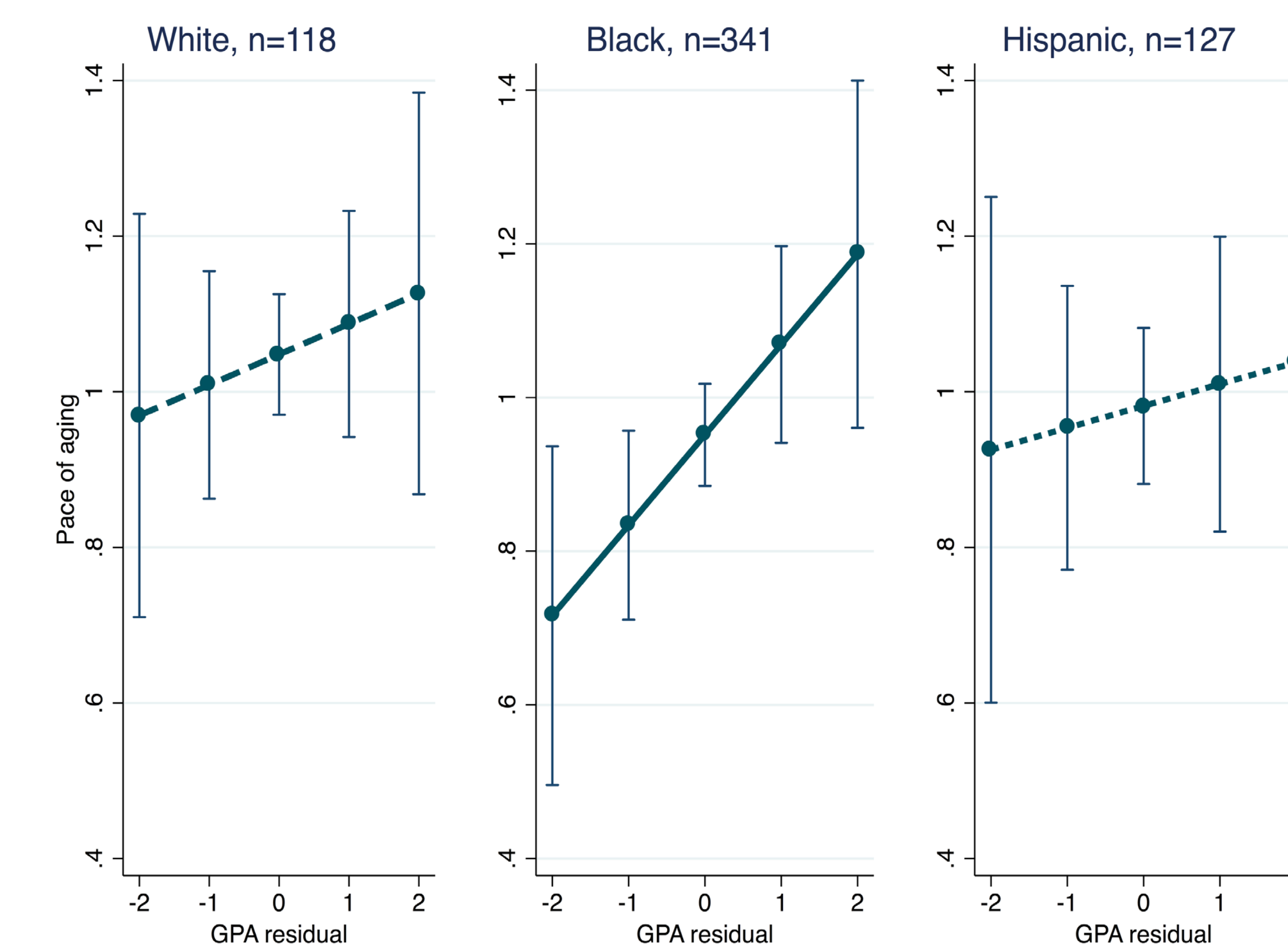
3. The pace of methylation aging is accelerated for adolescents performing better than expected in school.



2. Faster methylation aging among adolescents who are beating the odds of academic achievement given disadvantage.



4. Methylation age acceleration associated with academic achievement concentrated among black adolescents.



Conclusions and Next Steps

We find evidence of accelerated methylation aging among adolescents who perform better than expected in school given exposure to disadvantage at birth. This is the first documentation of such a pattern at this early stage of the life course. The findings are consistent with a biological wear and tear interpretation, but may also reflect advanced development. Exploring race/ethnic differences with greater sample sizes is an important next step.

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Acknowledgements

4 – Sasson 2016 *Demography*.
5 – Miller et al. 2009 *PNAS*.
6 – Gaydos et al. 2018 *PNAS*.
Fragile Families is funded by Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD): R01 HD076592, R01HD36916, R01HD39135, and R01HD40421; National Institute of Mental Health (NIMH): R01MH103761; Consortium of private foundations