

Introduction

Research synthesis involves collecting, combining, and summarizing research for a specific study question to come to an overarching conclusion regarding the direction and magnitude of the effect.

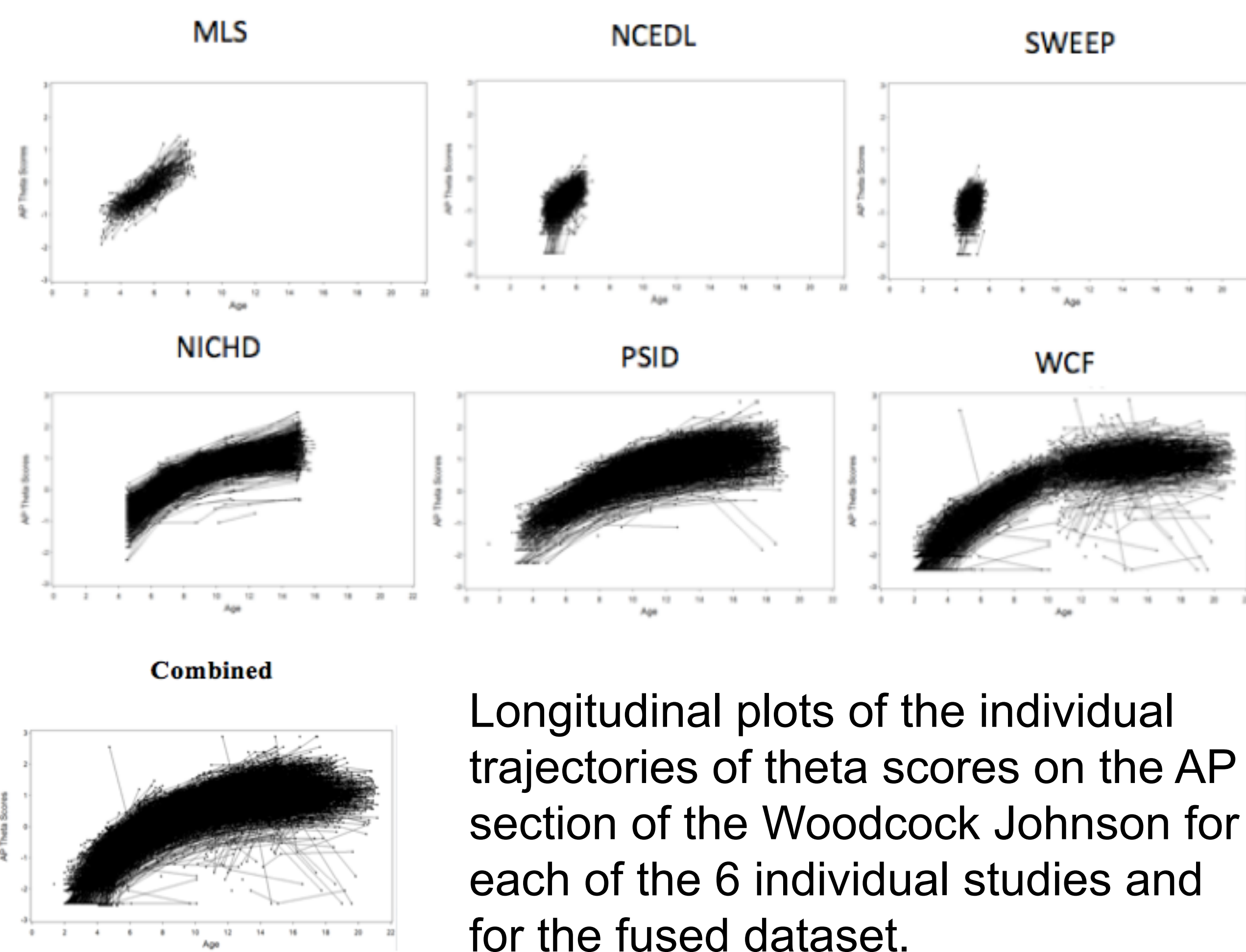
This study illustrates the use of two research synthesis methods: *data fusion* and *parallel analysis*.

Parallel analysis - each dataset from a number of studies is analyzed individually using the 'same' (as similar as possible) statistical model to answer the research question. The resulting parameter estimates are then analyzed using meta-analysis approaches.

Data fusion - each dataset from the various studies is combined into a single dataset and a statistical model is fit to the *fused* dataset to answer the research question of interest.

Methods

Data Six longitudinal studies measuring math ability



Measures

- Applied Problems (AP) subtest of the Woodcock-Johnson
- WJ-R (60 items) was used in the NICHD, PSID, and WCF
- WJ-III (63 items) was used in the NCEDL, SWEEP, and MLS
- 39 items appear on both versions

Methods Cont.

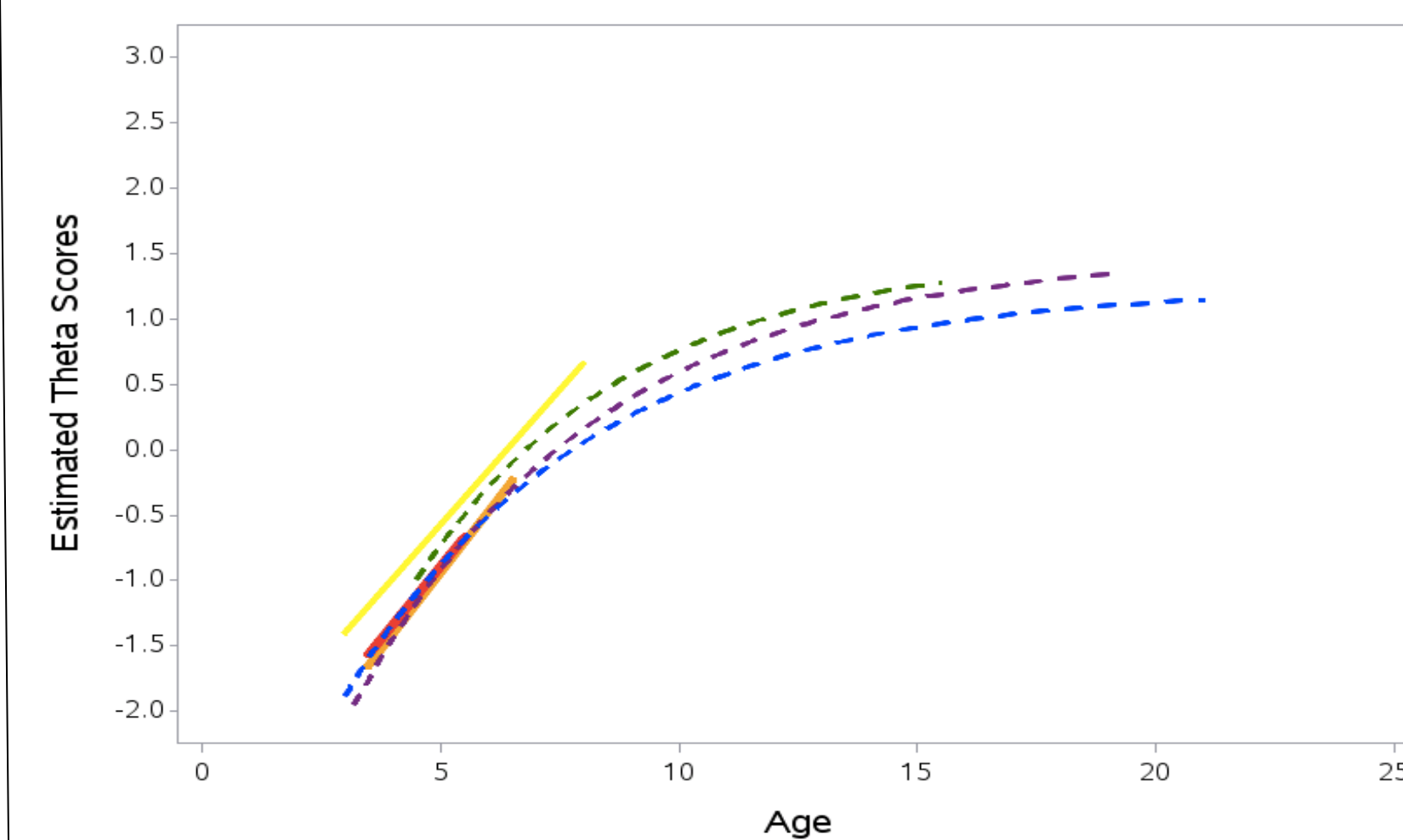
Analytic Techniques

- To link the two versions of the WJ, we fit a one-parameter logistic model (1PL) to the item-level data as if they form a single test (items not administered were considered missing).
- Then fit the linear growth model, the exponential model, and the Gompertz model to account for the individual changes in math ability.
- Longitudinal data from each study were analyzed individually (parallel analysis) and then as a combined dataset (data fusion).
- Covariates were then entered into the models as predictors: gender and SES.

Results

Parallel Analysis

- The same model was not preferred in all datasets.

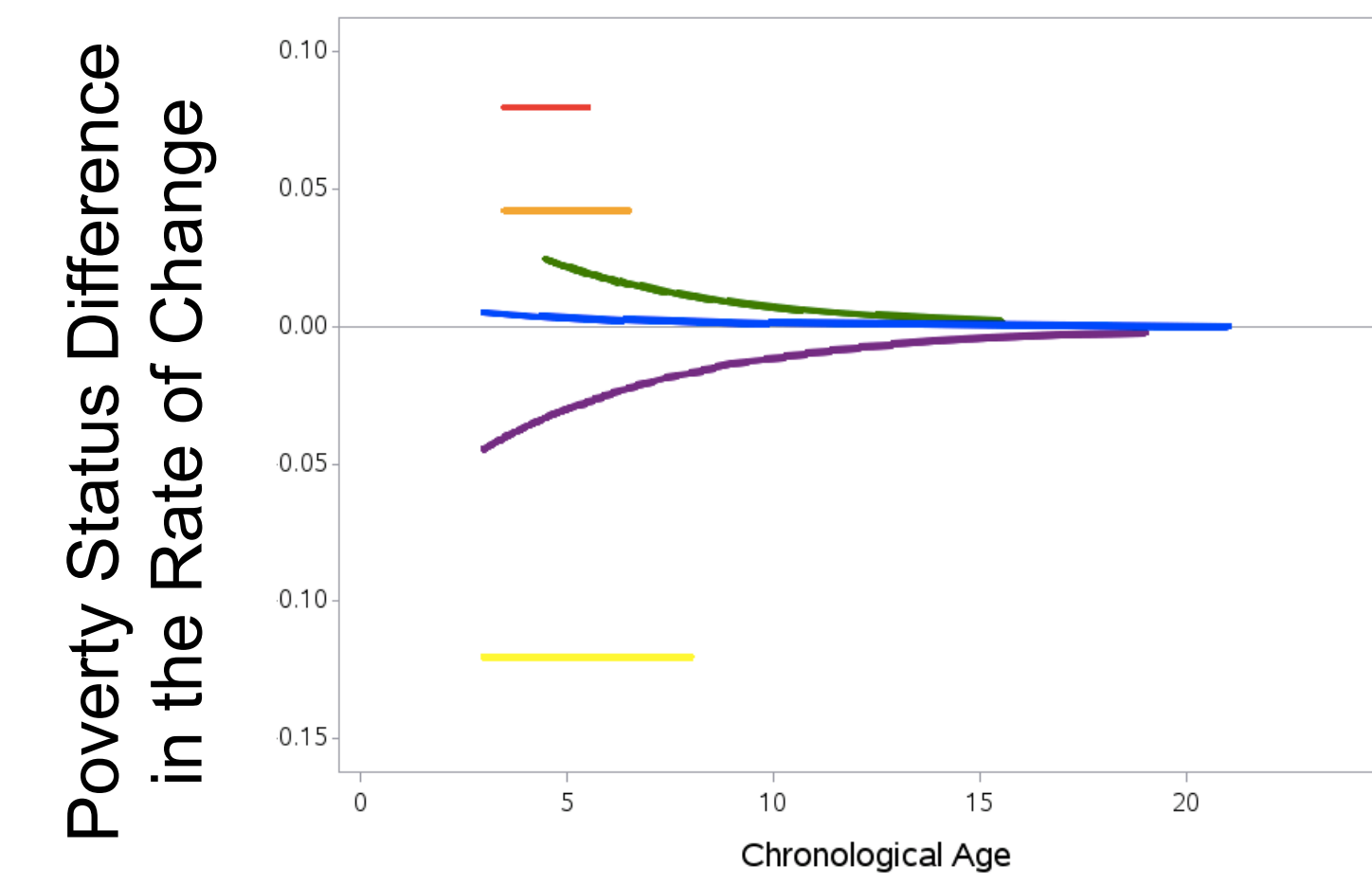
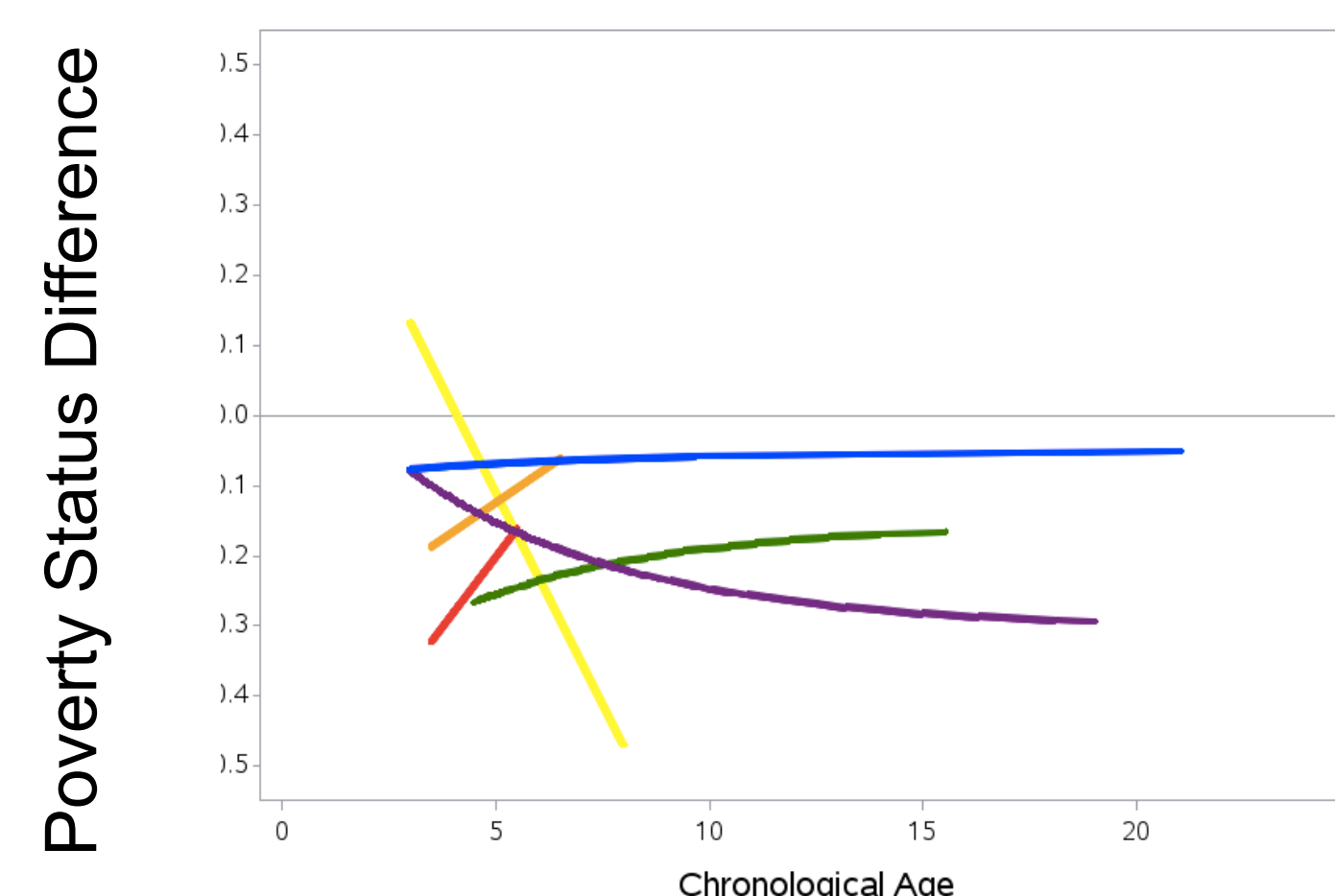
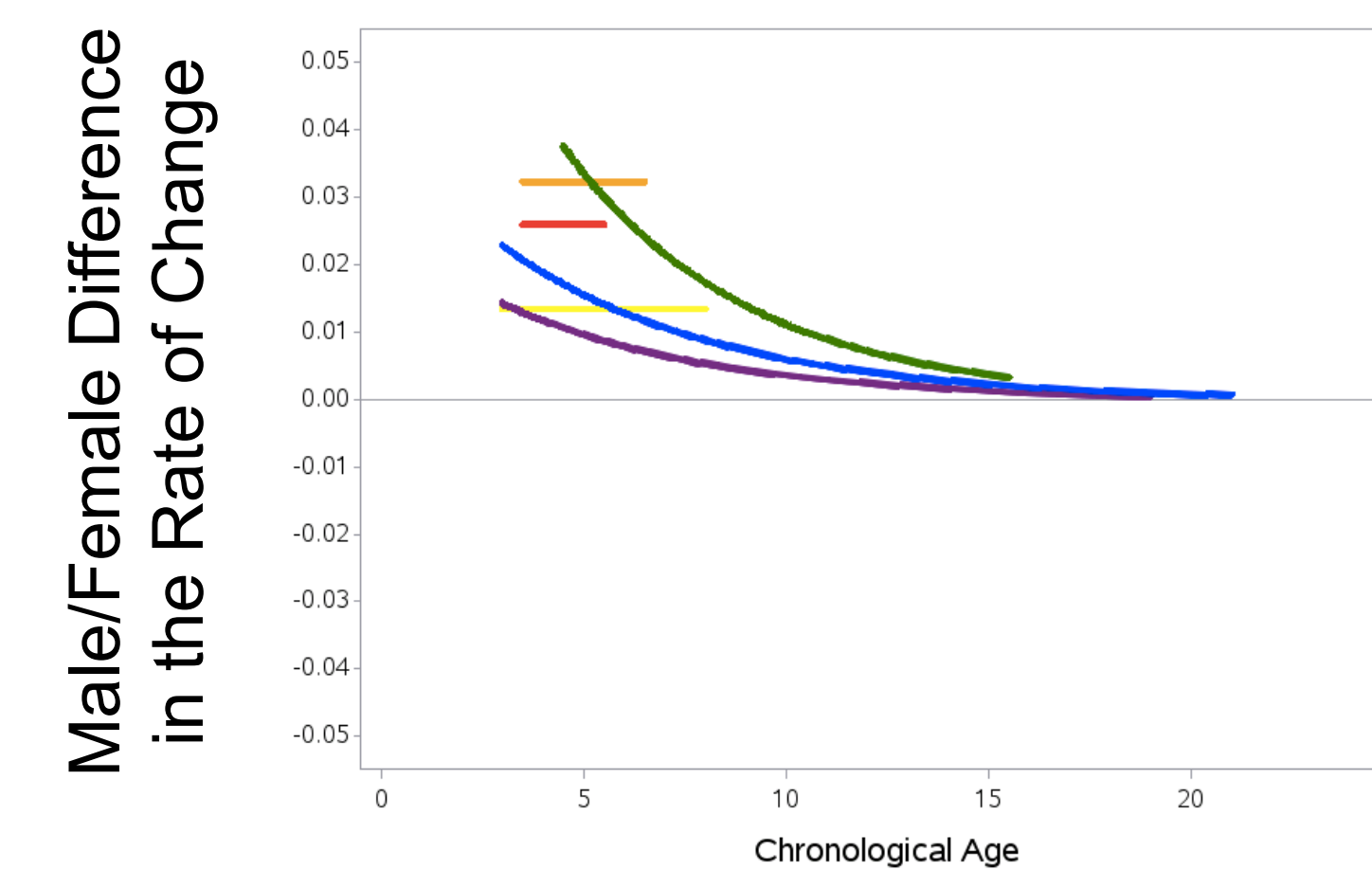
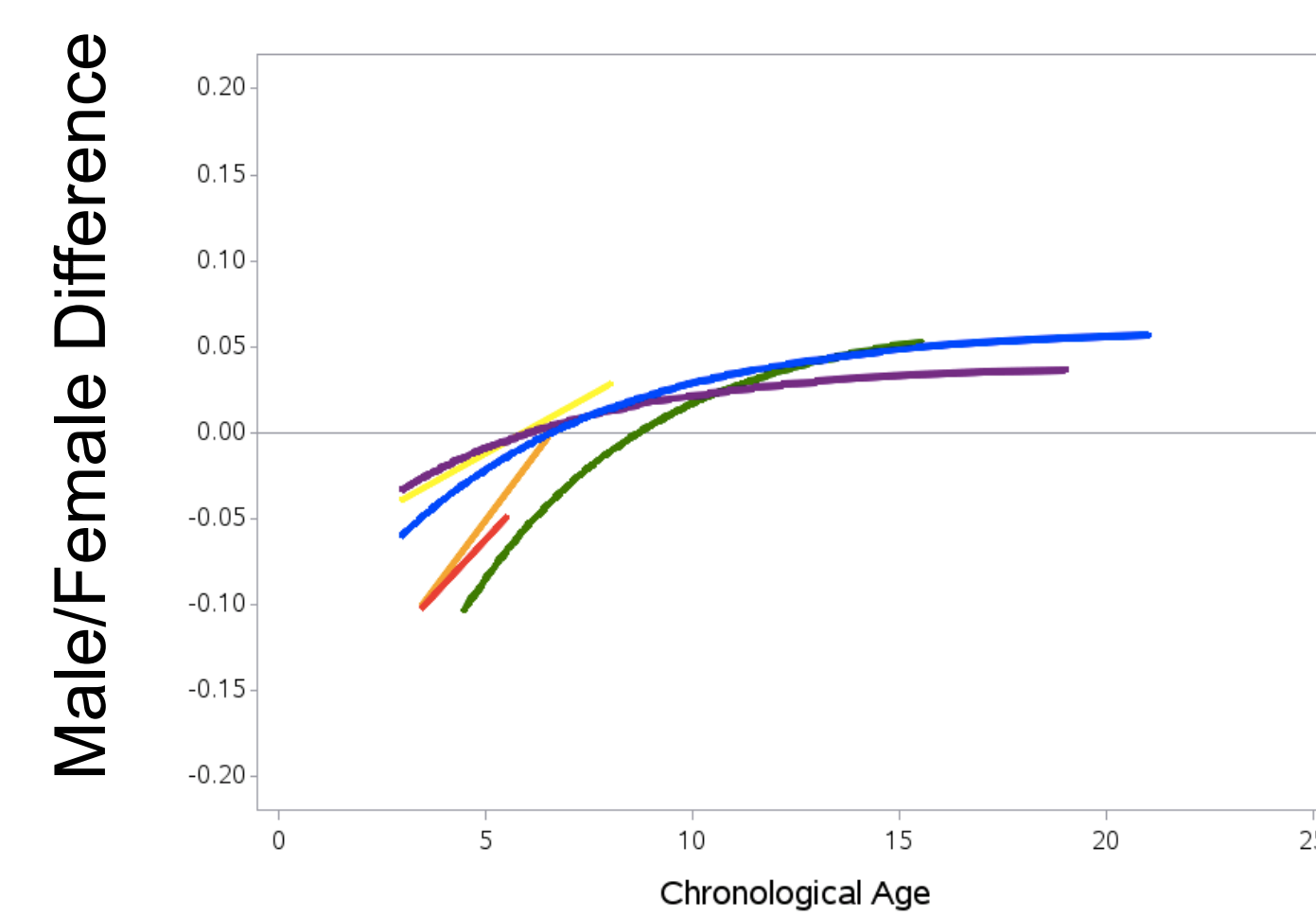


- Linear growth model fit best for the NCEDL, SWEEP, and MLS studies.
- Exponential growth model fit best for the NICHD, PSID, and WCF studies.

← Predicted mean trajectories for the 6 studies.
MLS, NCEDL, SWEEP, NICHD, PSID, WCF

Socioeconomic and Gender Effects

- Gender and SES were included as covariates in the model that best fit each dataset. In the linear model they were included as predictors of the intercept and slope and as predictors of math ability at age 5 and the amount of change from age 5 to the asymptotic level in the exponential model.

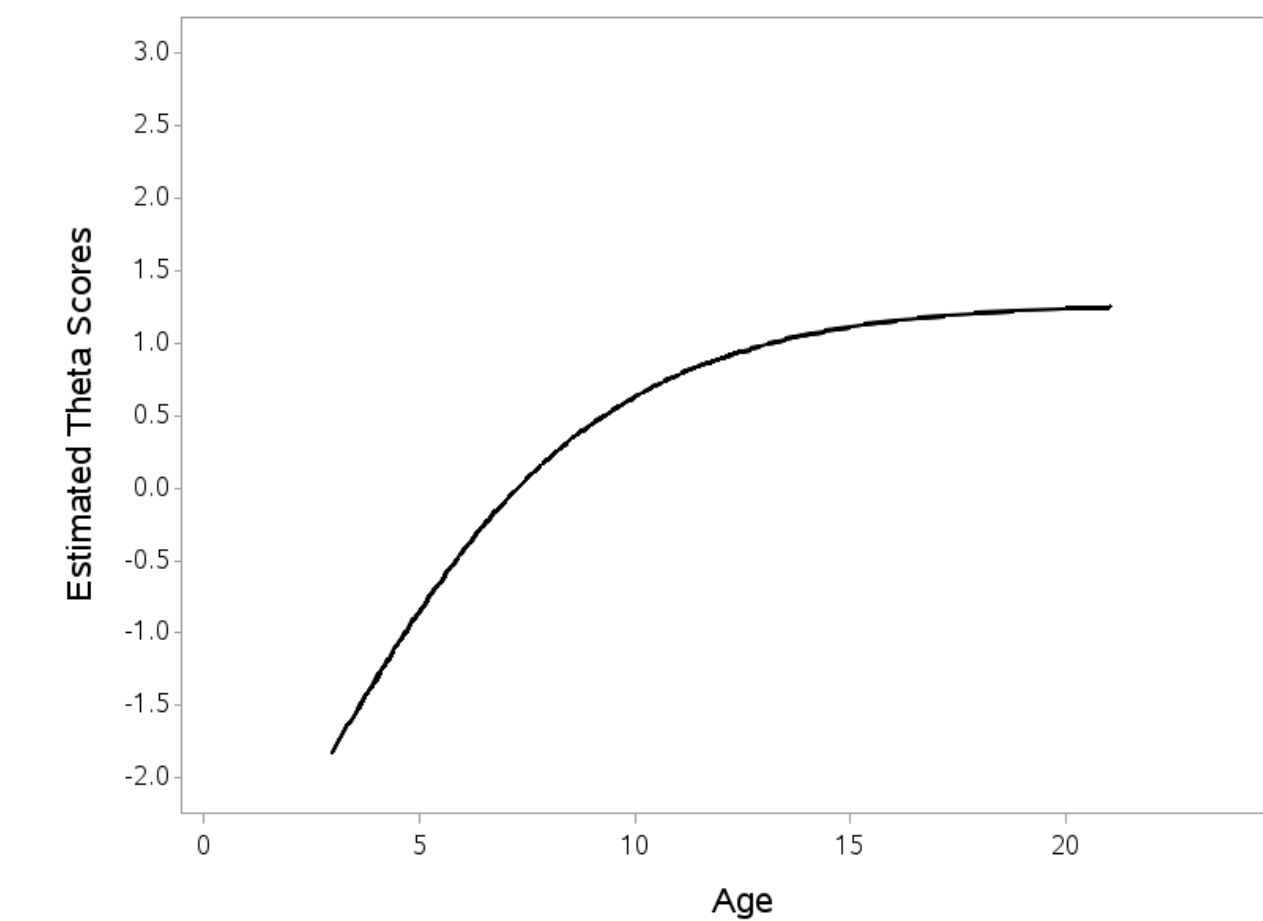


Results Cont.

Data Fusion

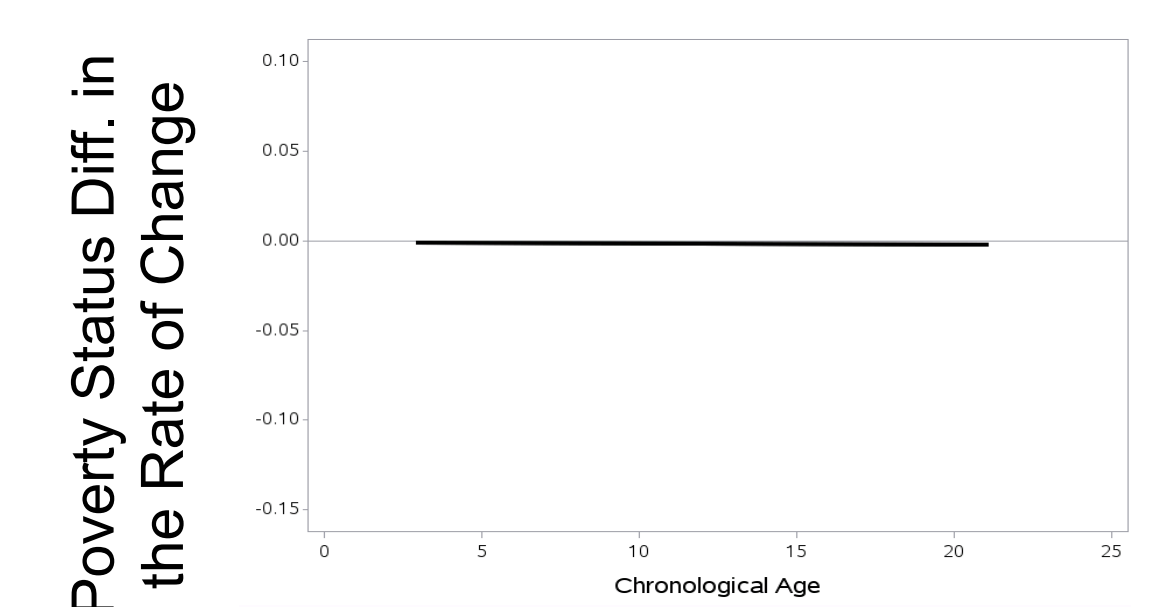
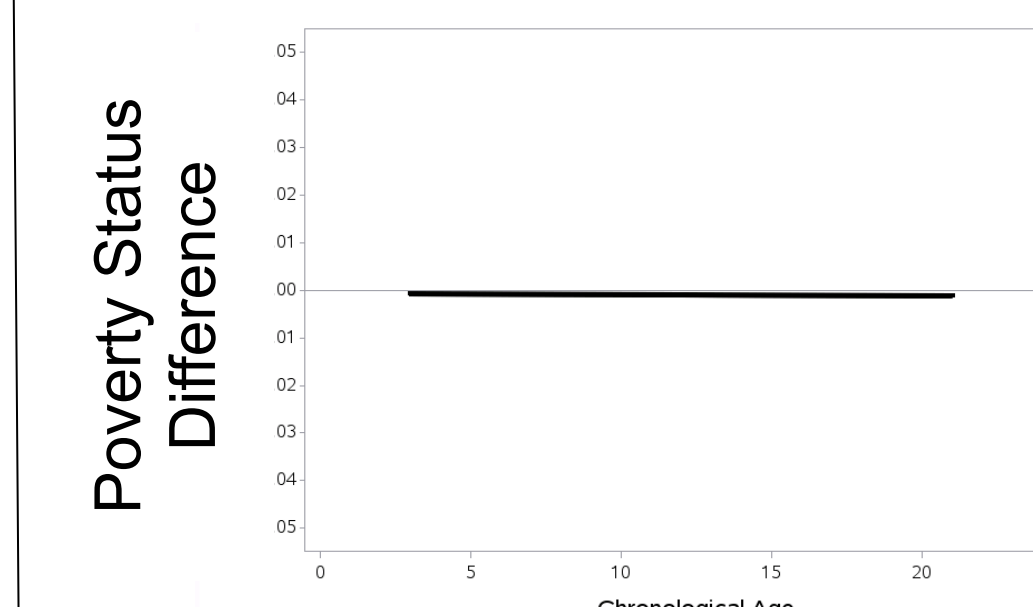
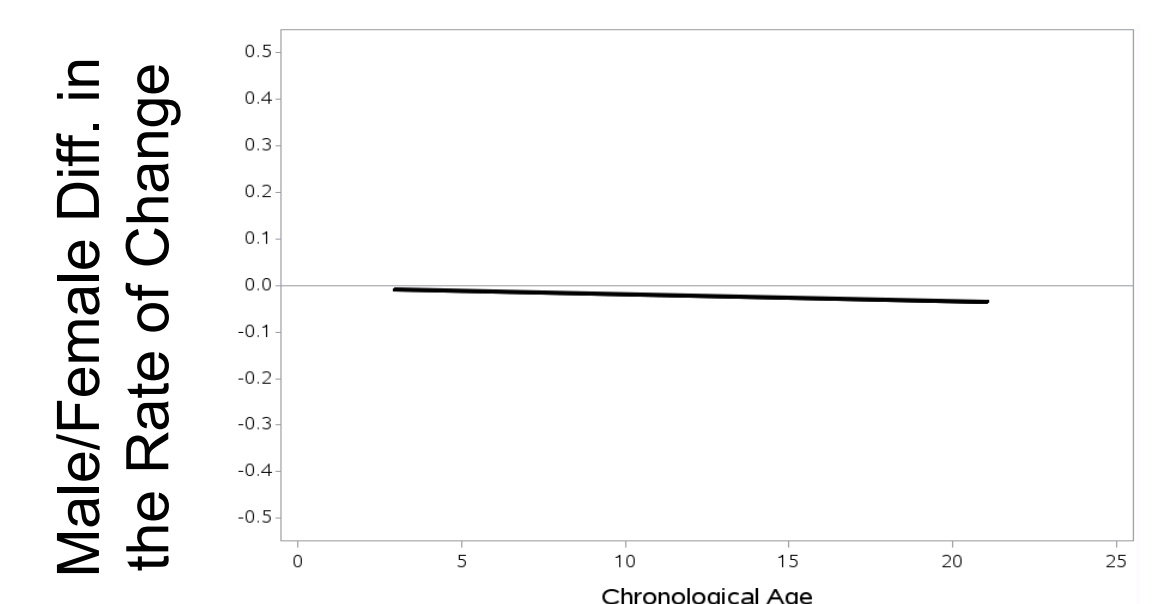
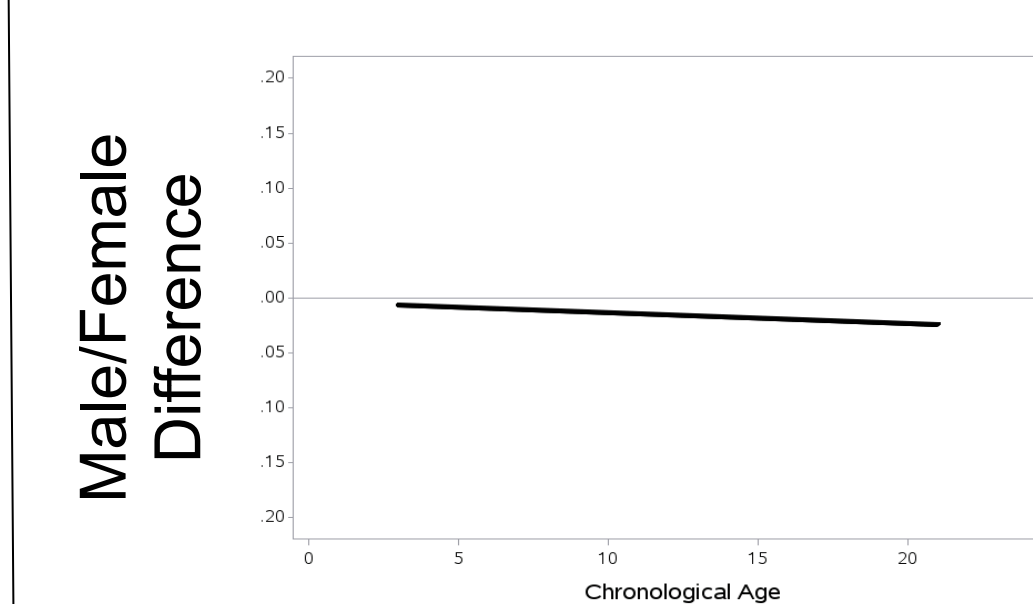
- The Gompertz model fit the fused dataset best
- Fit better than the linear and the exponential model

Predicted mean trajectory → for the fused dataset



Socioeconomic and Gender Effects

- Gender was a significant predictor of the amount of change from the lower asymptote to the upper asymptote with males showing more overall change than females.
- Males and females did not significantly differ in the timing at which their maximum growth rate occurred.
- Low-income students did not significantly differ from higher-income students in the amount of change from the lower to the upper asymptote or in the time at which their maximum growth rate occurred.



Conclusion

More complex (and more appropriate) models can be fit using the fused dataset for *data fusion* than could otherwise be fit using data from any one of the six individual datasets for *parallel analysis*.

References

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