

Detecting Cohort Effects in Accelerated Longitudinal Designs Using Multilevel Models

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Introduction

- Accelerated longitudinal designs are a popular method for collecting data on a process that spans multiple years over a shorter time period (Bell, 1953)
- The trajectory is assumed to be invariant across cohorts, but this is not always testable
- Past research has proposed ways to control for cohort effects, but only when the underlying cohorts align with the covariate used to control for them (Estrada & Ferrer, 2019; Estrada et al., 2023; Sliwinski et al., 2010)

Research Question

- Can age-of-entry be used as a general approach for controlling for unobserved cohorts in multilevel models?

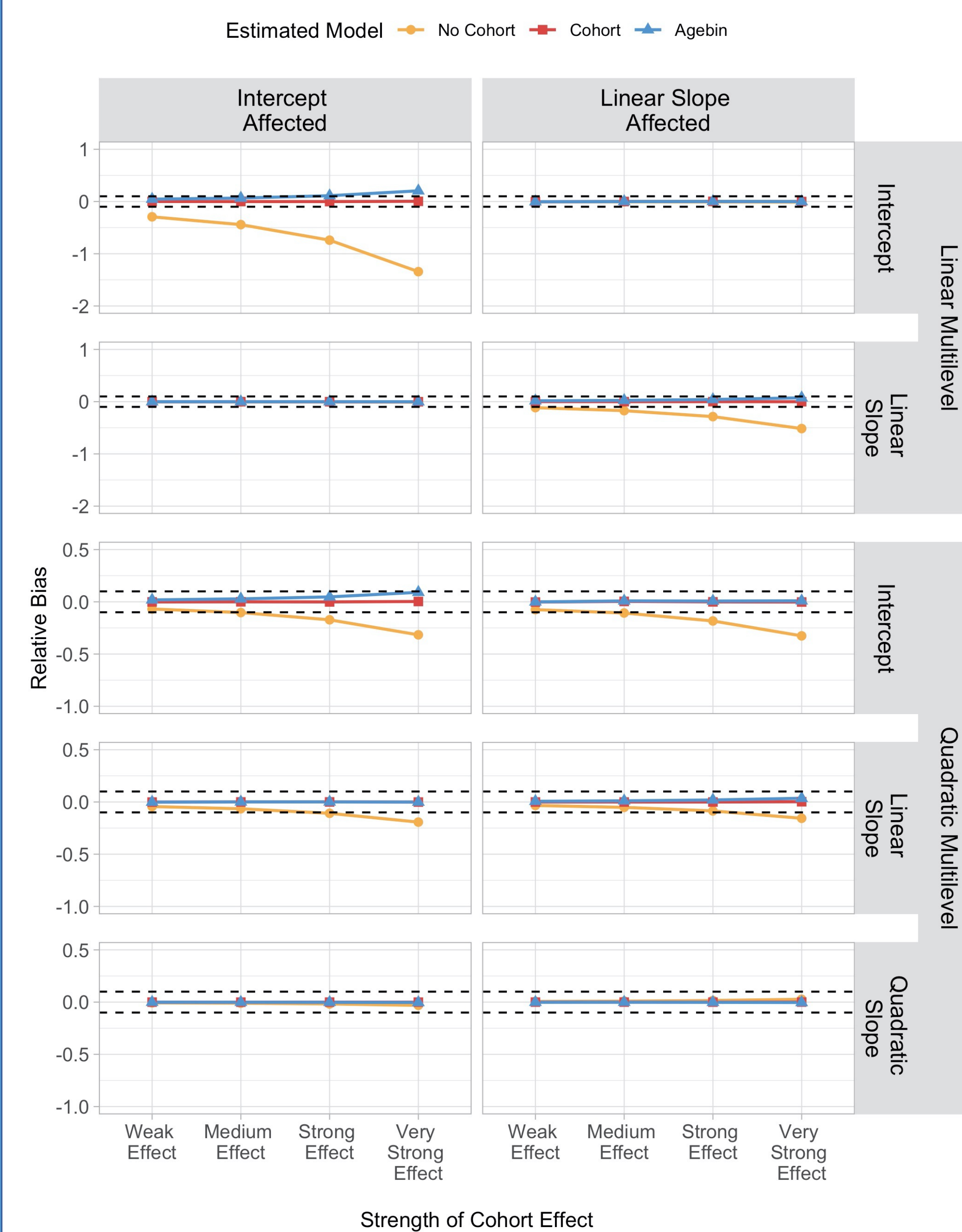
Simulation Conditions

- Model:** Linear or quadratic multilevel (MLM-L & MLM-Q)
- No. of cohorts:** 0, 3, 5
- Parameters:** Intercept (I); linear slope (L); quadratic slope (Q); I + L; I + L + Q
- Strength of effect:** weak, medium, strong, very strong
- Overlap between cohorts:** 0 years, 2 years, 4 years
- Sample size:** 125, 250, 500

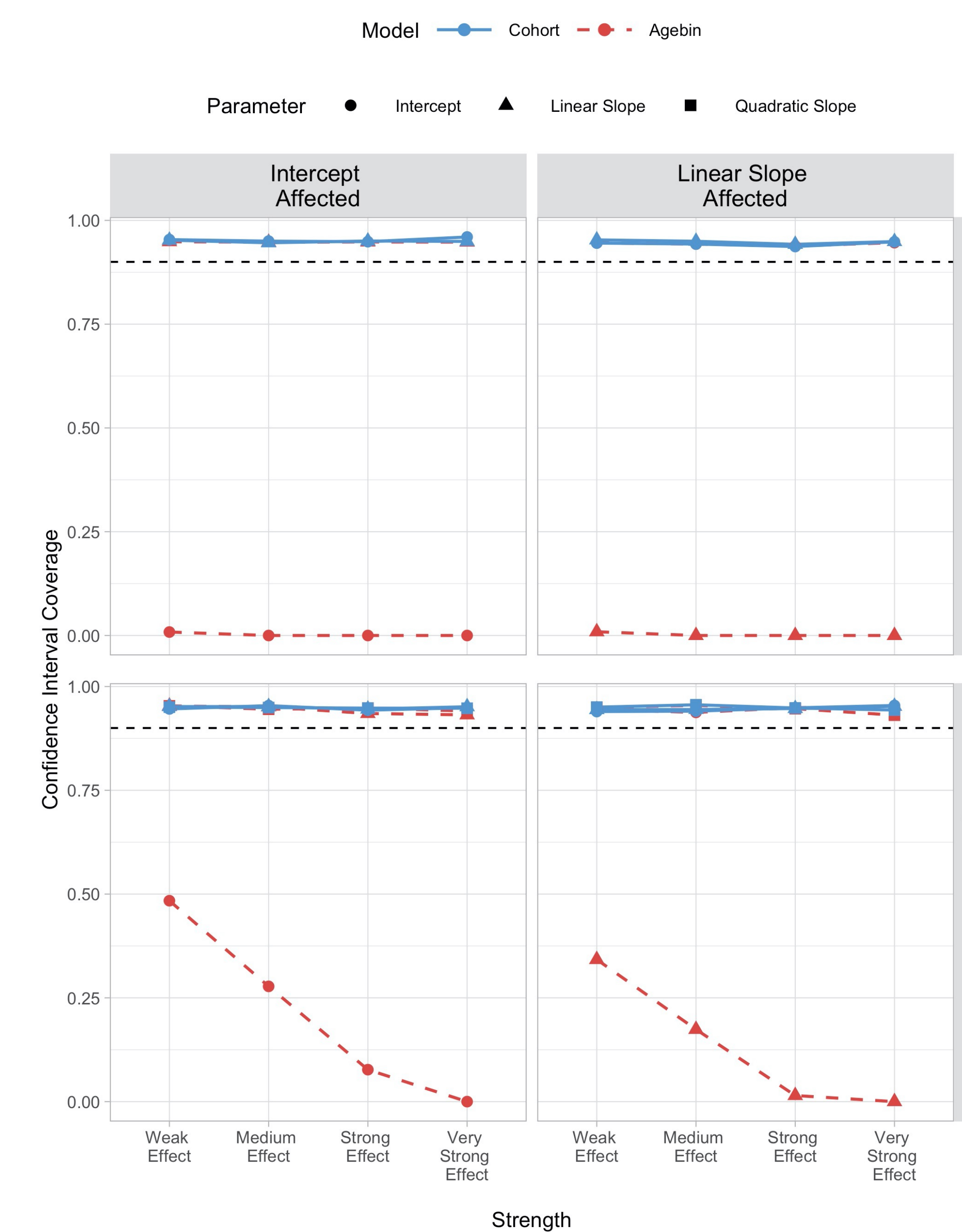
Simulation Overview

- Simulated data spanned 15 years, and each participant provided 3 timepoints
- Three analytic models were fit to the simulated dataset:
 - No cohort model:** Does not account for cohort effects
 - Cohort model:** Uses true cohort membership as a predictor of the intercept and slope
 - Agebin model:** Uses rounded age-at-entry as a proxy for cohort membership

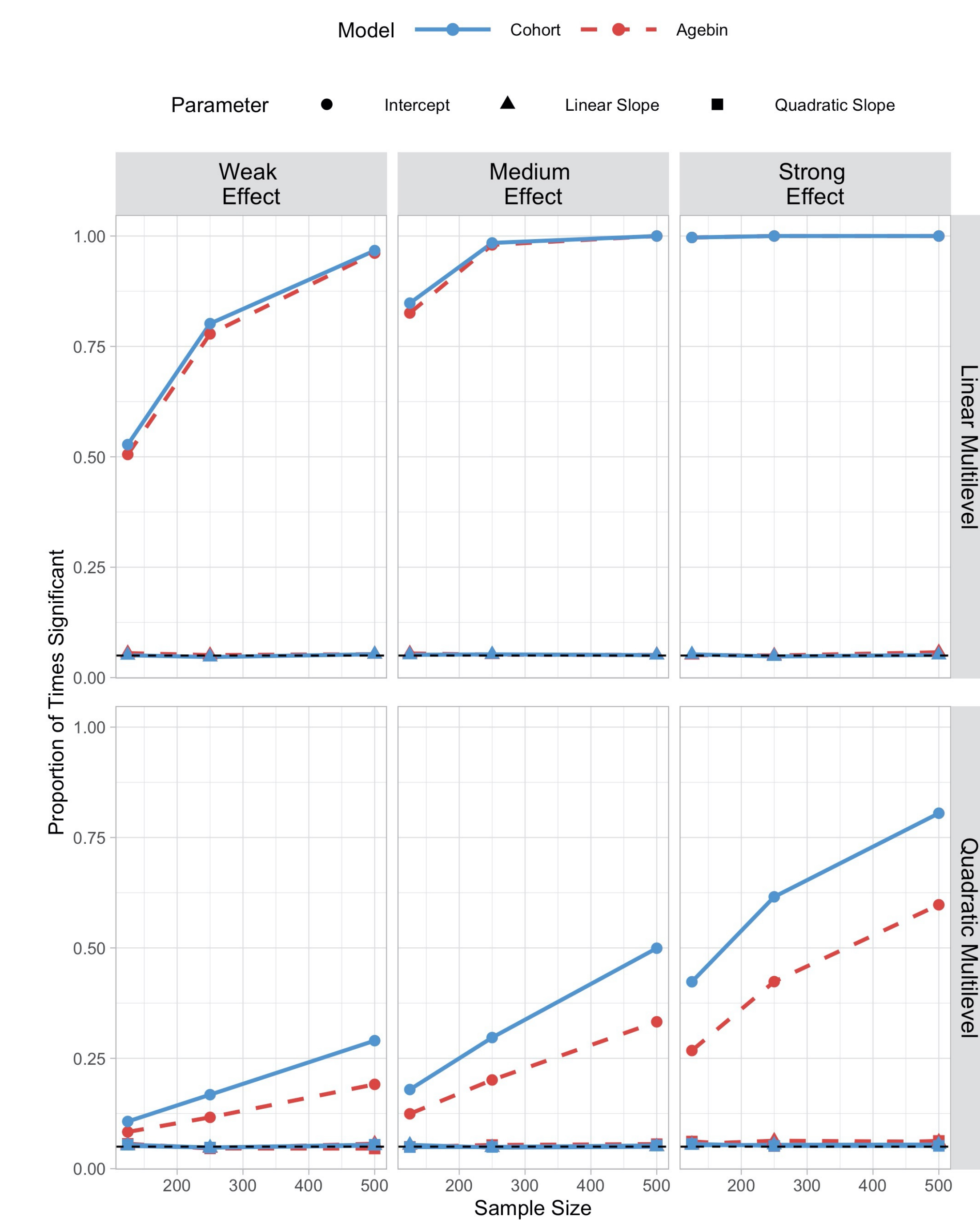
Relative Bias



Confidence Interval Coverage



Cohort Effect Detection



*Results for bias and coverage are only shown for N = 250; Detection results are only shown for when Intercept is affected

Conclusion

A proxy variable, such as rounded age at entry, can adequately detect and control for cohort effects in linear and quadratic multilevel models

- This proxy variable works to detect and control for cohort effects even though it does not align with true cohort membership
- Not accounting for cohort effects can lead to bias in model parameters, even if they are invariant across cohorts
- Larger sample sizes and measurements taken every other year improve the ability to detect cohort effects
- Model complexity plays a role: Cohort effects were harder to detect in the MLM-Q than the MLM-L

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