Modeling Growth for NCLB Subgroups: Effects of Time-Varying Disability Classification

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Introduction

- Many students move within and out of disability classification over time.
- These changes in student classification lead to modeling choices for the representation of SWD status as time-invariant covariates (TICs) or time-variant covariates (TVC).
- **Purpose:** examine different approaches to modeling the time-varying nature of disability classification and describe how different models can lead to different substantive findings and interpretations.
Research Questions

1) For students across Grades 3 through 8, what is the reclassification rate between disability and without disability, and between disability categories?

2) How do different specifications of disability classification as time-invariant and time-varying covariates affect the estimated growth trajectories for students with disabilities?

3) Which of the four proposed models best fits the data?
Method

- Repeated Outcome Measures: Standardized state mathematics test scores
- Sample
  - 28,967 students in Grades 3-8 from 2008 to 2013
- SWD classifications as categorical indicators
  1) SLD: Specific Learning Disability
  2) CD: Communication Disorder
  3) ED: Emotional Disturbance
  4) OHI: Other Health Impairments
  5) ASD: Autism Spectrum Disorder
  6) All Other disabilities
Analyses

- **Comparison Models**
  - **Time-variant covariates (TVC)**
    1) **Model 1**: each repeated measure regressed on the corresponding grade level SWD covariates
    2) **Model 2**: TVC coefficients vary randomly between students such that a random effect for each SWD category is estimated for each student.
  - **Time-invariant covariates (TIC)**
    3) **Model 3**: growth trajectory factors (intercept, linear and quadratic slopes) regressed only on the initial Grade 3 SWD covariates
    4) **Model 4**: growth trajectory factors regressed on the SWD covariates for all grades
TVC

*For simplicity, not all SWD categories are represented, nor are all repeated outcome measures.

Model 1

Model 2
Analyses

- **Comparison Models**
  - **Time-variant covariates (TVC)**
    1. Model 1: each repeated measure regressed on the corresponding grade level SWD covariates
    2. Model 2: TVC coefficients vary randomly between students such that a random effect for each SWD category is estimated for each student.
  - **Time-invariant covariates (TIC)**
    3. Model 3: growth trajectory factors (intercept, linear and quadratic slopes) regressed only on the initial Grade 3 SWD covariates
    4. Model 4: growth trajectory factors regressed on the SWD covariates for all grades
TIC

*For simplicity, not all SWD categories are represented, nor are all repeated outcome measures.

Model 3

Model 4
Results

RQ1: What is the reclassification rate between disability and without disability?

<table>
<thead>
<tr>
<th>Grade 3</th>
<th>Grade 4</th>
<th>Grade 5</th>
<th>Grade 6</th>
<th>Grade 7</th>
<th>Grade 8</th>
<th>Ever SWD</th>
<th>Always SWD</th>
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<tbody>
<tr>
<td>10.6</td>
<td>11.9</td>
<td>11.8</td>
<td>10.9</td>
<td>10.4</td>
<td>9.9</td>
<td>17.3</td>
<td>4.9</td>
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</table>
Results

RQ1: What is the reclassification rate between disability and without disability, and between disability categories?
Results

RQ2: How do different specifications of SWD classification as TVC and TIC affect the estimated growth trajectories?
## Results

RQ3: Which of the four proposed models best fits the data?

<table>
<thead>
<tr>
<th>Fit Indices</th>
<th>Unconditional Model</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
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</thead>
<tbody>
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<td>1125752.16</td>
<td>1126468.28</td>
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### R²

<table>
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<tr>
<th>Endogenous variables</th>
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<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
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</thead>
<tbody>
<tr>
<td>Intercept</td>
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*Note: For Model 2, the variance of the repeated measures varied with disability classification which precludes the calculation of standardized coefficients and chi-square and related fit statistics.*
Discussion

- Movement of students within and out of disability classification over time.
- TIC preferred over TVC models due to small proportion of reclassified students.
- Limited generalizability.
- TVC models for different populations or TVC.
- Different approaches to analyzing differences between groups; e.g., effect sizes.