City Connects: Building an Argument for Effects on Student Achievement with a Quasi-Experimental Design

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Objective

• RCTs are the gold standard, but often impractical in education research
• City Connects: randomization at school and child level has not been possible
• Alternative approach: use a number of rigorous quasi-experimental designs to provide evidence of intervention effects?
• Seek evidence supporting causal argument through:
  – Multilevel regression with propensity score adjustment
  – Unconditional interrupted time series
  – Comparative regression discontinuity
  – School-level fixed effects models
**Study 1: HLM with Propensity Score Adjustment**

<table>
<thead>
<tr>
<th>Effect Size</th>
<th>Grade 3</th>
<th>Grade 4</th>
<th>Grade 5</th>
<th>Grade 6</th>
<th>Grade 7</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>State Achievement Test (MCAS)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ELA</td>
<td>-.06</td>
<td>.02</td>
<td>.04</td>
<td>.14*</td>
<td>.15*</td>
</tr>
<tr>
<td>Mathematics</td>
<td>.07</td>
<td>-.04</td>
<td>-.05</td>
<td>.14*</td>
<td>.21*</td>
</tr>
<tr>
<td><strong>Report Card</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reading</td>
<td>.11</td>
<td>.09</td>
<td>.16</td>
<td>.10</td>
<td>.09</td>
</tr>
<tr>
<td>Mathematics</td>
<td>.01</td>
<td>.00</td>
<td>.16*</td>
<td>.06</td>
<td>.02</td>
</tr>
</tbody>
</table>

* p<.05

- Two-level regression models
- Clustering variable was most recent school attended
- Propensity score weights applied at student level (treatment and control groups statistically equivalent at baseline)
- City Connects had positive impact on middle school MCAS, 5th grade math
Study 2: Unconditional Interrupted Time Series

- Multi-level time series models with City Connects interruption at Grade 2 and 3
- Examined differences on the status of growth and rate of growth after launch of City Connects
- Effect size for change in the Math Report Card score growth rate was .46 for both Grade 2 and 3
Study 3: Comparative Regression Discontinuity

- Birth date captured discontinuity-based effects
- Continuity assumption verified via comparison group
- Effect sizes for Grades 3-5 MCAS ELA and Math standardized raw scores = .20 to .28
- Increase in odds of achievement at proficient level or higher = 37% to 43%
### Study 4: Within-School Fixed Effects Models

<table>
<thead>
<tr>
<th></th>
<th>Grade 5 Math Effect Size</th>
<th>Grade 5 Reading Effect Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ever in CCNX</td>
<td>.21</td>
<td>.16</td>
</tr>
<tr>
<td>1 year CCNX</td>
<td>.17</td>
<td>.12</td>
</tr>
<tr>
<td>2+ years CCNX</td>
<td>.21</td>
<td>.17</td>
</tr>
</tbody>
</table>

- First-generation immigrant students in 8 schools that experienced change in intervention status
- Within-school models estimated differences in SAT-9 scores: students who attended during treatment years vs. students who attended same school in non-treatment years
- Children who received treatment scored significantly higher than those who did not
- 2+ years treatment with highest scores at 5th grade