Analytic approaches to difficult issues in early childhood research

Phil Sirinides
Consortium for Policy Research in Education
University of Pennsylvania

July, 2014
Several Difficult Issues

- Assessing kindergarten readiness in relation to previous experiences of arranged care and early learning.
- Examining market forces of supply and demand for quality child care
- Identifying factors associated with provider movement across quality levels of a QRIS (example: effect of TA)
- Effect of receiving high quality child care on a range of outcomes

Examples of innovative strategies
- For the first two, provide examples of strategic data collection
- Last two, recommend statistical methods (require certain data)

Note:
- All data presented are for illustration of methods only.
- Please do not cite without author permission
Kindergarten Readiness

- Coauthors on AERA paper and pending manuscript: Wang, A. & Blalock, T.
- Pennsylvania State Department of Education partnered with the U.S. Department of Education and Westat, Inc. to extend the Early Childhood Longitudinal Study, Kindergarten Class of 2010-11.
- The ECLS-K:2011 PA Oversample dataset expands and extends the data collection in Pennsylvania. The data includes additional state indicators on the care arrangements for individual children in the year prior to Kindergarten including the provider’s quality rating as determined by the state Quality Rating and Improvement System, Keystone STARS.
- The resultant dataset produces population estimates that comport with census and state data in terms of the size and demographic composition of PA children entering kindergarten in 2010.
Kindergarten Readiness (cont.)

Kindergarten Readiness of children up to 200% FPL by ECE experiences

<table>
<thead>
<tr>
<th></th>
<th>Academic Readiness</th>
<th></th>
<th>Executive Functioning</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Reading</td>
<td>Mathematics</td>
<td>Card Sort</td>
<td>Numbers</td>
</tr>
<tr>
<td>High quality care</td>
<td>35.6$^A$ (2.6)</td>
<td>28.2$^A$ (2.6)</td>
<td>4.0$^A$ (0.1)</td>
<td>92.4$^A$ (2.2)</td>
</tr>
<tr>
<td>Low quality / unrated</td>
<td>32.4$^A$ (1.6)</td>
<td>27.5$^A$ (1.3)</td>
<td>3.5$^B$ (0.1)</td>
<td>83.4$^B$ (1.5)</td>
</tr>
<tr>
<td>No center-based care</td>
<td>27.8$^B$ (1.1)</td>
<td>22.5$^B$ (1.2)</td>
<td>3.2$^C$ (0.1)</td>
<td>83.8$^B$ (2.1)</td>
</tr>
</tbody>
</table>

Note: Significant differences between least squares means at $p<.05$ indicated by superscripts within columns.
Supply and Demand for Quality CC

• Provider decisions about cost and quality are expected to be related to each other and to the market demand for both.
• Premise: As families gain access to ratings and choose high-quality services, the supply of higher quality care will rise to meet demand.
• However, evidence that in some states the quasi-public-private market for quality child care is not operating efficiently.
  • Constant churn of providers in and out of lowest QRIS levels.
  • Ceiling for participation and ceiling for movement
  • Inverse relationship between quality levels and volume
• This is possibly in part because of insufficient demand for high quality care.
• Examine quantitative data on the trends in provider quality and cost as well as qualitative data on provider and family decision making.
**Supply and Demand for Quality CC**

**TRENDS IN QRIS PARTICIPATION AND CHANGE IN THE COST OF CARE**

**CHILD CARE SELECTION PROCESS: FAMILY FOCUS GROUPS**

- Representing STAR level, urban/rural, region, type

- “Trust” most important but defined differently
  - Two different types of approaches emerged from reports about the search and selection process, overall child concerns, and perceptions of quality.
  - The co-occurrence of thematic differences suggests that it is difficult to make generalizable statements about all family’s selection process.
Example: Market Rate Trends

Note: MR rescaled and adjusted for care level, provider type, length, quality, risk, and rural status
Example: Market Rate Trends

Rural / Mix / Urban

Community Risk
Market Rate Trends: Quality
Focus Groups: Potential typology of child care selection

**Families of the first type**

- Characterized by an approach that is inexperienced, guided by personal connections, and affordability concerns.
- The search for child care was new and began without much information about available options or clear expectations about the services they wanted.
- Mostly relied on word-of-mouth references and looked for self-investment of people at the facility through attempts to have personal connections with staff.
- Most concerned with avoiding negative experiences with unprofessional staff and disruptive behavior from their and other children.
- Looking for homeliness and measured the quality of the program by the atmosphere and how their child behaved.

**Families of the second type**

- Had a clearer sense of the care arrangement that they wanted and were less concerned/de-emphasized cost.
- More attentive to program features such as drop-in policies, opportunities for their child to be outdoors, family-style meals, mixed age groupings, and continuity of staffing.
- Relied less on word of mouth and discussed shopping around before making a decision; references to the state QRIS were mentioned most often but only as one of several sources of information.
- More often considered a whole center rather than an individual care giver, and talked more about provider policies.
- Tended to make comparisons to their own negative experiences in other facilities suggesting that they had learned through trial and error.
Participation in QRIS, and effect of TA on move-up

Table 1: Odds of Moving up a STAR Level after TA in FY 2009-2010

<table>
<thead>
<tr>
<th>Provider Type</th>
<th># Received TA</th>
<th>% Move Up</th>
<th># Did not Receive TA</th>
<th>% Move Up</th>
<th>Odds Ratio</th>
<th>95% Confidence Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td>505</td>
<td>50.5%</td>
<td>2255</td>
<td>32.2%</td>
<td>2.2*</td>
<td>(1.8, 2.6)</td>
</tr>
<tr>
<td>Completed</td>
<td>317</td>
<td>54.6%</td>
<td>2255</td>
<td>32.2%</td>
<td>2.5*</td>
<td>(2.0, 3.2)</td>
</tr>
<tr>
<td>Still active</td>
<td>188</td>
<td>43.6%</td>
<td>2255</td>
<td>32.2%</td>
<td>1.6*</td>
<td>(1.2, 2.2)</td>
</tr>
<tr>
<td>Provider Type</td>
<td># Received TA</td>
<td>% Move Up</td>
<td># Did not Receive TA</td>
<td>% Move Up</td>
<td>Odds Ratio</td>
<td>95% Confidence Limits</td>
</tr>
<tr>
<td>Family</td>
<td>57</td>
<td>70.2%</td>
<td>450</td>
<td>35.8%</td>
<td>4.2*</td>
<td>(2.3, 7.7)</td>
</tr>
<tr>
<td>Group</td>
<td>28</td>
<td>53.6%</td>
<td>192</td>
<td>19.3%</td>
<td>4.8*</td>
<td>(2.1, 11.0)</td>
</tr>
<tr>
<td>Center</td>
<td>420</td>
<td>47.6%</td>
<td>1613</td>
<td>32.7%</td>
<td>1.9*</td>
<td>(1.5, 2.3)</td>
</tr>
<tr>
<td>STAR Level</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Start with STARS</td>
<td>19</td>
<td>94.7%</td>
<td>292</td>
<td>88.7%</td>
<td>2.3</td>
<td>(0.3, 17.7)</td>
</tr>
<tr>
<td>STAR 1</td>
<td>178</td>
<td>66.3%</td>
<td>1161</td>
<td>25.3%</td>
<td>5.8*</td>
<td>(4.1, 8.1)</td>
</tr>
<tr>
<td>STAR 2</td>
<td>216</td>
<td>41.7%</td>
<td>557</td>
<td>18.5%</td>
<td>3.2*</td>
<td>(2.2, 4.4)</td>
</tr>
<tr>
<td>STAR 3</td>
<td>92</td>
<td>31.5%</td>
<td>245</td>
<td>28.6%</td>
<td>1.2</td>
<td>(0.7, 1.9)</td>
</tr>
</tbody>
</table>

Note: * Provider Type and STAR Level statistics include providers that completed TA and who were still active at the end of the fiscal year. ` STAR Level represents STAR rating at the time TA is requested. * p < 0.01.

Source: http://www.ocdelresearch.org/Research%20Briefs/OCDEL%20Research%20Brief%204%20Revised.pdf
Participation in QRIS, and effect of TA on move-up

• Important questions
  • What is the probability of event X occurring over some interval of time, given condition Y
  • X: participate in QRIS, exit QRIS, Move-up, meet TA goals, etc.
  • Y: financial supports, technical assistance, director quals, etc.
• Event History Analysis
  • causal inferences with low ambiguity about causal ordering.
  • combine information for those who did and did not experience events
  • incorporate explanatory variables which vary over time.
Effect of quality care on child outcomes

• Correlation and causation
  • In an experiment with random assignment, treatment is exogenous and standard methods give an unbiased estimate of the average treatment effect as the group mean difference.
  • If we do not have randomization, treatment may be endogenous and standard methods give a biased estimate.
• We want to know the effect of X (quality child care) on Y (child outcomes)
  • Instrumental variable technique - find a determinant of quality care that is unrelated to child outcomes (i.e. a variable Z related to X, but not ε (model error))
  • Z must be related to X, and related to Y only through X
  • This variable Z is called an instrumental variable (very rare to find)
• Strong assumptions (SUTVA, exclusion criteria, exogeneity, relevance, monotonicity, large sample)
Effect of quality care on child outcomes

• Examples:

<table>
<thead>
<tr>
<th>Y (outcome)</th>
<th>X (predictor)</th>
<th>Z (IV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth weight</td>
<td>Maternal smoking</td>
<td>State cigarette taxes</td>
</tr>
<tr>
<td>Health</td>
<td>Heart surgery</td>
<td>Proximity to hospital</td>
</tr>
<tr>
<td>Test scores</td>
<td>Class size</td>
<td>Threshold of max size</td>
</tr>
</tbody>
</table>

• Natural experiment
  • We want to find a determinant of receiving quality care that is unrelated to child outcomes.
  • Use distance to quality as an IV.
  • Reasonable proposition: Child outcomes are unrelated to proximity to child care except through the provider.

• Basics: Two-stage least squares estimation
  • Regress $X$ on $Z$ to get estimates $\hat{X}$ of $X$
  • Regress $Y$ on $\hat{X}$ to get an estimate of $\beta_1$
  • There are more complex procedures.
Analytic approaches to difficult issues in early childhood research

Phil Sirinides
Consortium for Policy Research in Education
University of Pennsylvania

July, 2014