## Methods for Examining the Associations Between Quality of Early Care and Education and Child Outcomes

**Description**

Various methods are available to examine thresholds of quality in early care and education (ECE) programs. The method used can be a factor in the substantive interpretation of the resulting thresholds. This workshop demonstrated this issue through a discussion of the different, albeit complementary, methodological approaches used to examine thresholds in two studies. The first study involved a meta-analytic, regression-discontinuity approach to identify thresholds, while the second study relied on a nonparametric statistical modeling approach to identify thresholds. Both studies also implemented similar regression approaches to model the thresholds. Along with a discussion of the strengths and weaknesses of the various approaches, presenters discussed the situations in which each approach may be appropriate.

**Presenters**

Margaret (Peg) Burchinal, University of North Carolina at Chapel Hill
Greg Welch, University of Nebraska – Lincoln
Ji Hoon Ryoo, University of Nebraska – Lincoln

**Scribe**

Laura Rothenberg, Child Trends

1. **Documents in Session Folder**
   - "Identifying Thresholds of Quality in Early Child Care and Education: A Non-Parametric Approach;" Greg Welch, Ji Hoon Ryoo
   - "Methods for Testing for Threshold in Associations Between Child Care Quality and Child Outcomes;" Margaret Burchinal

2. **Summary of Presentations**
   - **Summary of Presentation #1:** Peg Burchinal
     - This project stemmed from other research that showed relationships between quality and outcomes at higher levels of quality. There were two examples of relationships in the literature. The first is that quality is positively related to outcomes until a certain threshold is reached, at which point outcomes level out. The second is that child outcomes remain stagnant until a certain level of quality is reached, at which point increases in quality are associated with higher outcomes.
     - The Q-DOT project used a quadratic model to estimate where the cut-point might be, using the assumption that there is a quadratic relationship between quality and outcomes throughout the range.

- o Q-DOT used a spline model and decided what the cut-points would be a priori. They did this because they had ideas grounded in theory of what the cut-points should be and wanted to test the hypotheses across multiple datasets.
- o The project did not force the model to be a continuous function. This led to some issues in examining those classrooms that were at the point where the function shifted (there were two sets of predicted values for those classrooms).
- o Eight studies were included in the model. The main measures used were the CLASS, the Woodcock-Johnson, and the Peabody Picture Vocabulary Test (PPVT). A meta-analysis was conducted to see if there were similar results across all of the datasets used.
- o In summary, there was some evidence for thresholds, particularly in the domain of instructional support.

- **Summary of Presentation #2:** Greg Welch
  - o Greg's presentation focused on methods and the analytic approaches rather than results. There is evidence that higher quality is associated with better developmental outcomes. The goals of this study were to determine whether there are specific thresholds of quality rather than a continuous linear relationship between quality and outcomes, and whether this relationship varies as a function of child age, teacher race/ethnicity, and income.
  - o A linear model is inappropriate for determining thresholds, because it assumes the same relationship between the independent and dependent variables across all the data points. This study focused on non-linear approaches and used data from Early Head Start and QUINCE.
  - o Two analytic approaches were used. The first was general additive modeling (GAM) which uses a non-parametric approach that examines the relationship between variables. This approach allows the data to drive the results. The second approach was the spline model, which divides the regression line, and allows it to have different slopes across the data points.
  - o Two approaches were used. In the first, we looked at the results empirically using the GAM model; the second was based on a priori knowledge. The GAM approach produces a smoothing plot that shows a curved line through the data, and this plot helps identify where the thresholds are. The spline approach took the thresholds identified in the GAM approach and tested them.
  - o The GAM approach is useful when you don't have any idea what you're looking for in the data. It doesn't yield inferential statements; another set of analyses (such as the spline approach or the piece-wise model) will have to be conducted.

3. **Summary of Discussion with Presenters and Participants**
   - The discussion focused on implications for policy from this research. Although the researchers were quick to point out that this research is relatively new, and needs further work (there are no "quick skips" to policy), policy is ahead of the research in this area. Researchers should encourage policy-makers to think about the relationship between quality and outcomes as a non-linear one.

- There are implications for policy in terms of QRIS systems, and focusing on moving programs into higher levels of quality might be more effective than moving a low-quality program up but still not into the "active range."