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Identifying baseline and ceiling thresholds within the Qualistar Early Learning Quality Rating and Improvement System☆

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ABSTRACT

Increasingly, states are implementing quality rating and improvement systems (QRIS) as a means of improving the availability of high-quality child care and children's school readiness skills. A fundamental design decision under QRIS is where to set the thresholds on the quality measures used in the program assessment component of the QRIS. This study applied generalized additive modeling (GAM) on data from Colorado's QRIS in order to identify thresholds on several components of Colorado's QRIS, including the Early Childhood Environment Rating Scale-Revised (ECERS-R), classroom ratios, and staff credentials. We found evidence of baseline thresholds that needed to be surpassed before significant relationships between quality and outcomes could be observed. In addition, there were ceiling thresholds, such that beyond certain cut-points, gains in quality were associated with little to no improvements in outcomes. Based on this work, it appears that GAM can be used to empirically identify thresholds, but more research is needed to understand the applicability of the GAM-derived thresholds in other early care contexts and settings.

Introduction

In an effort to bolster children's school readiness skills and close the achievement gap between lower- and higher-income children, policymakers aim to improve the quality of child care settings. One popular policy strategy for improving child care quality is through the use of quality rating and improvement systems (QRIS). QRIS have been designed to serve as a state's overall early childhood education (ECE) accountability system and are largely hinged on a multidimensional assessment of child care program quality (Schaack, Tarrant, Boller, & Tout, 2012). Drawing on decades of research, states have constructed QRIS to measure and improve aspects of child care settings commonly associated with children's positive cognitive and social development (Zellman & Perlman, 2008).

Although the specific criteria for rating child care centers vary across states, QRIS indicators include structural quality indicators such as classroom ratios, staff education and specialized training, and their years of experience (Malone, Kirby, Caronongan, Tout, & Boller, 2011). Structural quality features are easily monitored and can be regulated by state child care licensing or other policy levers, but are believed to be only distally related to children's outcomes (NICHD Early Child Care Research Network (ECCRN), 2002). Structural quality is assumed to provide the conditions that facilitate the implementation of developmentally appropriate teaching and caregiving practices (e.g., process quality) that are associated with more favorable child outcomes.

In contrast, process quality variables are more directly related to children's outcomes and measure children's actual experiences within the early care and education settings (NICHD ECCRN, 2002). However, process quality indicators are more costly to measure because they require direct observations, and cannot be controlled by policy as easily. Due to costs, QRIS are primarily composed of structural quality indicators, but almost all include an assessment of the classroom environment that captures aspects of process quality in a global way (Malone et al., 2011). Currently, the most common measure of preschool-aged classrooms' global process quality used in states' QRIS is the Early Childhood Environment Rating Scale-Revised (ECERS-R; Harms, Clifford, & Cryer, 2005), with all but one state including the measure in their rating rubric

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(Malone et al., 2011). The ECERS-R assesses aspects of classrooms that include: their space and furnishings, the personal care routines children experience, how teachers' promote children's language and reasoning skills, the materials and activities in which children engage, the interactions between teachers and children, the overall daily schedule and routines, and how teachers communicate with parents and the center policies that support staff.

Within QRIS measurement approaches, state policymakers set thresholds on structural and process quality indicators used in their QRIS, which are then used to derive an overall quality or star rating for a program. Quality assessments and the thresholds set on them are designed to serve a number of functions that are expected to improve the overall quality of child care available in a state. QRIS-related coaches use quality ratings to guide on-site support activities with teachers and to target the content of professional development for teachers and administrators toward areas that assist in meeting higher quality levels (Smith, Schneider, & Kreader, 2010). In addition, many states place high stakes on quality ratings as a strategy for incentivizing improvement. For example, quality ratings are frequently used to allow or restrict a program access to additional services and funding streams, to award programs with different levels of reimbursement for children receiving child care subsidies, and to award bonuses to teaching staff (Schaack et al., 2012).

The thresholds set on quality measures play a central role in organizing QRIS and the services and benefits provided to child care programs, but the current literature has provided policymakers with very little empirical guidance about the existence of thresholds. Instead, QRIS evaluations to date have primarily focused on whether programs participating in the QRIS have made gains in quality as measured by the rating system or on QRIS implementation processes (Tout, Zaslow, Halle, & Forry, 2009; Zellman & Fiene, 2012).

The paucity of research on thresholds appears to stem from the field's heavy reliance on linear methods, which has largely produced a body of evidence suggesting that the better the quality, the better the child outcomes (Loeb, Fuller, Kagan, & Carrol, 2004; Vandell, 2004). While it is reasonable to expect that higher process quality is related to better child outcomes, and that higher structural quality is related to better process quality, it is also reasonable to expect that there may be a minimum level of quality that needs to be reached before better outcomes are manifested. Correspondingly, there may also be a point at which higher quality is only marginally related to improvements in outcomes. Identification of these baseline and ceiling thresholds, respectively, can help policymakers and funders make decisions about how to invest their limited dollars. For example, policymakers may elect to initially invest funding toward helping programs meet at least a minimum threshold in which better outcomes are realized, or elect to limit the funding toward programs that have reached ceiling thresholds on the measures used in the QRIS where minimal returns on investment would be expected.

The purpose of this study is to examine whether there are baseline and ceiling thresholds on the multiple quality measures included within one state's QRIS. Namely, we examine whether there are thresholds within (a) the ECERS-R in relation to children's cognitive and social outcomes; and (b) teachers' credentials and classroom ratios in relation to the ECERS-R.

Previous research on thresholds in childcare quality indicators

Recently, a small body of research has begun to explore whether there are non-linear relationships between process quality measures and children's developmental outcomes that could inform the existence of potentially meaningful thresholds (Zaslow et al., 2010). In a study of public pre-kindergarten programs, Burchinal, Kainz, and Cai (2011) used both linear and quadratic terms and found evidence of a significant curvilinear relationship between the Classroom Scoring Assessment System (CLASS; Pianta, La Paro, & Hamre, 2004), and children's social and academic achievement. Improvements to children's outcomes were observed only once quality reached a certain threshold, with the associations between literacy skills and quality strongest within the upper ranges of the quality scores.

Burchinal, Vandergrift, Pianta, and Mashburn (2010) used piecewise regression to identify specific thresholds on the CLASS relative to children's academic, language, and social skills. They found evidence of threshold effects on both instructional quality and emotional climate subscales, such that instructional quality was more strongly related to expressive language, reading, and math skills in moderate-to-high quality classrooms than in low-quality classrooms. Emotional climate was also more positively predictive of social competence and more negatively predictive of behavioral problems in high-quality classrooms than in low-to-moderate quality classrooms.

Using data from the Early Childhood Longitudinal Study-Birth Cohort, Setodji, Le, and Schaack (2013) identified thresholds on the 7-point Infant Toddler Environment Rating Scale (ITERS) relative to toddlers' cognitive development. Departing from piecewise regression techniques in which the analyst determines *a priori* the thresholds to test, Setodji et al. (2013) used generalized additive modeling (GAM) to identify thresholds that were informed by the empirical relationship between the ITERS and the Bayley's Scale of Mental Development. They found that the relationship between ITERS and cognitive development was significantly positive within the ITERS score range of 3.8 and 4.6, but null outside of this range.

Hypothesized thresholds in quality indicators

Expected thresholds on the ECERS-R. Based on the construction of the ECERS-R and its underlying theories of development and learning, we hypothesize that there may be different thresholds for children's cognitive outcomes than for children's socio-emotional outcomes. With respect to cognitive outcomes, our hypotheses regarding thresholds are informed by various theories about children's development. Constructivist theories of learning contend that children develop conceptual knowledge through their active exploration and manipulation of their environments. Through this exploration, children are provided with opportunities to differentiate elements of their environment and build categorical knowledge (Piaget, 1952). Social constructivist theories of development also argue that social interaction is at the heart of the learning process (Vygotsky, 1979). Within the context of child care, teachers of young children serve as important social learning partners and work within individual children's zones of proximal development to scaffold their experiences and help children attend to the environment, differentiate elements, problem solve, and hear and practice using language. Attachment theory posits that in order for children to actively explore their worlds and engage with adults in learning, they must have trust and security in their teachers, which occurs as a result of responsive and positive caregiving (Howes & Spieker, 2008).

The ECERS-R was designed to reflect these prominent developmental theories. While there are some items that focus on positive child–teacher interactions that promote secure teacher attachments and on interactions that facilitate more academic-oriented learning at the lower end of the ECERS-R scale, the majority of items clustered at the low- and mid-range of the ECERS-R focus on ensuring that the daily schedule and physical environment is structured in a manner that allows children adequate time and access to a variety of learning materials for exploration (Moore, 1994). In contrast, items clustered at the higher end of the ECERS-R tend to