

# ASPE RESEARCH BRIEF

OFFICE OF THE ASSISTANT SECRETARY FOR PLANNING AND EVALUATION  
OFFICE OF HUMAN SERVICES POLICY - U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES

## EXAMINING THE PREDICTIVE POWER OF CHILDREN'S SCHOOL READINESS SKILLS

### *Introduction*

Parents and policy makers believe that children who start kindergarten with stronger cognitive and social skills are more likely to succeed in school. Research indicates that children enter school with a range of skills across five essential school readiness domains (i.e., language, cognition, social-emotional, approaches to learning, and health), but extant research has not systematically examined how skills in all five areas combine to predict school outcomes. Some evidence suggests that skills within in a domain (e.g., math) tend to be good predictors of the continued acquisition of those skills (Duncan et al., 2007). In addition, there is some evidence that skills in one area are important for later school outcomes in another area. For example, it is widely believed that children with stronger attention and social skills at school entry show faster acquisition of academic skills because they can sit and listen in the classroom (Blair & Diamond, 2008). In addition to the question of whether it is possible to have significant prediction across as well as within developmental domains from school entry through later schooling, another question is whether there are a set of skills at school entry that allow more disadvantaged children to catch up with more advantaged peers. There is growing interest in these questions at the federal, state and local levels, as educators and policymakers try to address how to support children's school success and monitor their overall development in a meaningful way. Currently, there is little research that examines trajectories of growth within and across multiple school readiness domains.

The purpose of this brief is to explore the relative strength of association between skills at school entry and later developmental outcomes both within and across domains of development. We highlight findings from a recently completed project supported by the Assistant Secretary for Planning and Evaluation within the U.S. Department of Health and Human Services aimed at providing an empirical exploration of differential prediction of outcomes in later elementary school from school entry skills considered individually and collectively. (See side bar for an overview of the project.)

### ABOUT THIS RESEARCH BRIEF

*In 2009, the Office of the Assistant Secretary for Planning and Evaluation (ASPE) of the U.S. Department of Health and Human Services funded Child Trends to conduct a review of the literature as well as plan and execute secondary data analyses to examine whether there is evidence of thresholds of school readiness which, when attained, predict skill acquisition in later schooling. This brief presents some of the key findings from this multi-year project entitled *In the Running for Successful Outcomes: Early Education, Care and Comprehensive Services*. More information about the project is provided at the end of this brief. Staff in ASPE's Division of Children and Youth Policy oversaw the project.*

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## **Methodology**

### **The Data**

The data sets utilized for secondary analysis were the National Institute of Child Health and Human Development's Study of Early Child Care and Youth Development (NICHD SECCYD) and the Early Childhood Longitudinal Study – Kindergarten Class of 1998-99 (ECLS-K).

The NICHD SECCYD is a comprehensive longitudinal study initiated by The National Institute of Child Health and Human Development (NICHD) in 1989 to answer many questions about the relationship between child care experiences and children's developmental outcomes. Conducted by a network of investigators, the study followed a diverse sample of about 1,400 children and their families from birth through adolescence. NICHD SECCYD data includes longitudinal direct assessments of children's language, academic and attention skills and teacher ratings of child outcomes collected from 2 to 15 years of age.

The ECLS-K data provide information on a nationally-representative sample of approximately 20,000 children who were in kindergarten in fall of 1998 and whose development and experiences were followed from kindergarten through eighth grade. ECLS-K data include longitudinal direct child assessments of academic skills and teacher ratings of attention and social skills from fall of the kindergarten year through the spring of eighth grade. For these analyses, the sample was restricted to children who were first-time kindergartners and who had completed the direct assessments in English.

To the extent possible, comparable measures were chosen across the two datasets for school readiness skills, and academic and social outcomes. Both data sets included the following school readiness variables: direct assessments of language or general knowledge, reading, and math; teacher ratings of approaches to learning, social skills, and behavior problems; and parent ratings of health. The NICHD SECCYD also included a direct assessment of attention at entry to school. The school-age outcomes in both data sets included direct assessments of reading and math and teacher ratings of social skill and behavior problems, collected from entry to school through eighth grade for the ECLS-B and through tenth grade for the NICHD SECCYD. Similarly, a consistent set of child and family characteristics (e.g., race/ethnicity, child age, maternal education, poverty status or family income, marital status, etc.) were identified across the two datasets and these were entered as controls in the analyses.

### **Analytic methods used to examine differential prediction to outcomes**

Three sets of longitudinal analyses of each of the four school-age outcomes (i.e., reading, math, social skills and behavior problems) were conducted. In the first analysis, the individual school readiness variables were entered as linear and nonlinear (quadratic) predictors of school-age outcomes. Using this variable-centered approach, the school readiness skills were first considered separately to look at the predictive power of each school readiness variable to each later school-age outcome and then again considered together to identify which school readiness skills provided the best prediction of which school-age outcome. The latter approach of including all school readiness variables in a single analysis addressed questions about differential prediction by allowing an examination of the relative contribution of each of the five school readiness domains in predicting school-age skills in reading, math, social skills, and behavior problems.

In the second analysis, a priori cut points in the individual school readiness variables were created using a piecewise regression that addressed whether the school readiness variable predicted academic and social development differently for children above and below the cut point on the school readiness

variable. The cut point of one standard deviation below the mean was selected a priori to distinguish those in the “low” versus “normal” range on each school readiness variable. One standard deviation was chosen because it is widely used to distinguish children deemed at-risk for problems on many standardized assessments. Thus, for the piecewise analysis, two groups were created for each school readiness variable:

- Children in the “low range” on a school readiness skill (i.e., those who scored more than one standard deviation below the mean on the school readiness variable), and
- Children in the “normal range” on a school readiness skill (i.e., those who scored at or above one standard deviation below the mean on the school readiness variable).<sup>1</sup>

Again, these analyses were conducted first for each school readiness variable alone and then using all school readiness variables together as predictors of school-age outcomes. The latter approach also addressed the differential prediction question while also exploring whether prediction from school readiness variables was stronger or weaker depending on initial skill levels.

The third analysis involved a person-centered approach to explore whether combinations of school readiness variables differentially predicted school-age outcomes. Latent profiles created the combinations of school readiness skills that were most prevalent in the samples. In this case, the research question of interest was whether starting school with a certain range or profile of skills (for instance, starting school with high cognitive skills but low social skills, or vice versa) predicts differential developmental trajectories for children. In other words, latent growth curve analysis allowed for an examination of whether children who showed qualitatively different patterns of school readiness skills (as determined by the latent profile analysis) had different trajectories of performance on academic and social outcomes during elementary school.

## **Findings**

### **Are there combinations of school readiness skills that differentially predict later learning or social skills?**

This question was addressed using the latent profile approach. In latent profile analysis of both the NICHD SECCYD and ECLS-K datasets, four profiles, or “classes,” of children emerged. Each dataset included a group of children who had strong school readiness skills across the board, a group of children performing at about the mean on all or most school readiness domains, and a group of children performing significantly below the mean across all or most school readiness domains. None of the profiles were characterized by children who were higher on some school readiness domains and lower on others.<sup>2</sup> Furthermore, the longitudinal analyses of school-age academic and social outcomes generally indicated that the group of children with the strongest school entry skills tended to have the highest levels of school-age skill over time, and the group of children with lowest school entry skills tended to have the lowest level of school-age skills over time. That is, children who entered kindergarten with a profile of overall strengths in school readiness skills maintained their relative position of advantage to their peers over time. Thus, these analyses did not suggest that there were combinations of school readiness skills that predicted later learning and social skills differently.

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<sup>1</sup> One standard deviation above the mean was used for behavior problems.

<sup>2</sup>For the ECLS-K dataset, there was one profile that was characterized by children who had particular strengths in reading and math at kindergarten entry compared to other domains, but these children were still performing above the mean on other domains and, furthermore, this profile only represented 1% of the sample.

## **Which school readiness skills are the best predictors of school-age academic and social skills? Is there one school readiness skill that is a strong predictor of all of the later school-age outcomes?**

Analyses found that school readiness variables provided differential prediction of school-age academic and social outcomes. Across all longitudinal analyses, the variable-centered analyses revealed two general findings:

- School readiness skills within a given domain were always the strongest predictor of those skills during the school years. For example, entry-level math skills provided the best prediction of children’s subsequent math skills and entry-level social skills provided the best prediction of children’s subsequent social skills. To some extent, this was likely due to the use of the same measures over time within a given domain, but the consistency of this finding suggests it is more than just an artifact of measurement.
- No one school readiness skill provided the next best prediction of all school-age outcomes. In the analyses that included all of the school readiness domains, the language or general knowledge skills at entry to school tended to provide the second best prediction of school-age reading and math skills. For example, while math skills at school entry provided the best prediction of subsequent math skills, language skills or general knowledge at school entry were the next best predictors of school-age math skills. Similarly, attention and approaches to learning were the second best predictors of school-age social skills and behavior problems after social skills at school entry. In sum, it appears that content-related skills (i.e., language and general knowledge) were the best predictors of subsequent academic skills while process skills (i.e., attention skills and approaches to learning) were the best predictors of subsequent social skills.

## **Is there evidence of catching up in academic, social, and/or behavioral skills over the school years?**

There was very modest evidence of catch-up in that those at the lower levels of initial performance had a slightly faster *rate* of growth in the acquisition of academic skills, although no true catch-up in absolute *levels* of performance. This rate of growth difference showed that the effects of early skills are probabilistic, not deterministic; children with lower school entry skills were likely to show lower achievement later in school, but children with entry skills lower than one standard deviation below the mean (i.e., those in the “low range”) showed a greater rate of improvement over time than their peers with higher skills at school entry. Similarly, latent profile analysis showed that children most at risk at school entry grew faster in several domains over time, but never performed as well as the children who entered school with a stronger range of skills.

Although there was not strong evidence of “catch up” in terms of absolute level of performance, this evidence of a reduction in the gap between children who started school with higher and lower skills suggested that school itself is likely a critically important intervention for the most at-risk children.

## **Summary**

The In the Running project investigated whether certain school readiness skills are more important than others for school success. Latent profile analysis, piecewise analysis, and regression analysis found that no one school readiness skill emerged as the strongest predictor of subsequent academic skills and behavior. Instead, the skill levels within each domain provided the best prediction of subsequent skills in that same domain. Additionally, early process skills such as attention and approaches to learning

predicted to later behavioral outcomes better than cognitive skills did, while early content skills like language and general knowledge were better predictors of later cognitive achievement than were early process skills. However, there was some evidence of partial catch-up for those children entering school with lower achievement levels or skills.

In the Running's findings indicated that children who entered school with both strong process skills and strong content skills were more likely to experience success in terms of both behavior and academic skills during their school years. While the latent profile analysis indicated that children in profiles with higher school readiness skills tended to show higher academic and behavior skills levels during the school years, there was no one skill or profile of skills that led to later school success: development across all domains was needed for children to succeed.

While the secondary data analysis did not uncover strong evidence of school readiness thresholds needed to achieve later school success, the differential prediction to outcomes over time based on skill level at school entry still suggests important policy and practice implications. The fact that there was a slightly faster rate of acquisition of skills for children in the "low" range than for the children in the "normal" range again stresses the importance of getting each child to the highest level of school readiness skills possible to prime for later growth.

### **Implications for policy and practice**

Historically, there has been very little research focused on the trajectories and predictive power of kindergarten entry skills. Yet, despite the lack of empirical work to determine adequate school readiness levels within particular skill domains, many decisions are being made within states and school districts about determining children's school readiness. The In the Running project is exploratory and only a first step in looking at this important topic from a systematic, empirical standpoint. However, this initial research suggests implications for policy and practice.

Some of these implications are suggested by the project's findings that different school readiness skills contribute differently to later development with within-domain skills predicting better than across-domain skills for a particular developmental outcome. The fact that there was differential prediction from entry skills to later skills, and no single school readiness skill emerged as the strongest predictor of subsequent academic and behavioral skills, emphasizes that there is no one magic bullet for school success. Rather, a focus on all of the school readiness skills is needed. In particular, it is important to note that the higher-order content skills such as language and general knowledge seem to be important along with the more basic reading and math skills for predicting later academic outcomes, and that process skills such as attention and approaches to learning were important along with social skills for predicting later behavioral outcomes. This underscores that children need to develop a constellation of skills at school entry to have a better chance of being successful in elementary school and beyond. Consequently, programs serving young children should focus on developing a broad range of skills in all children.

The school readiness assessments used by many states and school districts to determine whether children are ready to enter kindergarten may also benefit from this broader view of child development. Readiness assessments that rely on documentation of children's skills and abilities over time instead at a single time point may better gauge children's skills and abilities, and more accurately assess the abilities of children with special needs. These "authentic" assessments may help to identify children in need of specific supports by collecting data on each child across a variety of cognitive, social-emotional, and

behavioral variables and using this baseline data to tailor instruction specific to each child's needs, in this way supporting children's growth across all domains as they enter and progress through school.

## **ABOUT THIS RESEARCH BRIEF AND AKNOWLEDGEMENTS**

The findings described in this brief are the product of the ASPE-funded project entitled *In the Running for Successful Outcomes: Early Education, Care, and Comprehensive Services* (Contract # HHSP23320095631WC). The *In the Running* project examined the evidence for thresholds of school readiness within and across domains (including language, reading, math, attention, socioemotional, and health) which, when attained, predict skill acquisition in later schooling. Research questions included: Are there particular school readiness skills or a level of development that children need to attain in early childhood in order to meet later measures of success? Do outcomes in elementary or later schooling depend on the school readiness skills and competencies in various domains at entry to school? Through secondary data analysis, the project tested the extent to which associations between trajectories of school-age skills can be predicted from school readiness skills (both within and across domains) and whether those associations are linear or nonlinear. It also examined whether identified thresholds replicate across datasets.

Key project tasks included a review of the research literature and a multi-method approach to the secondary analysis of two large-scale, longitudinal datasets: the Early Childhood Longitudinal Survey-Kindergarten 1998-1999 cohort (ECLS-K) and the NICHD Study of Early Child Care and Youth Development (SECCYD). A panel of experts in the field was convened and consulted on technical aspects of the project and on the implications of findings for early childhood programs.

The project team, led by Tamara Halle at Child Trends, also included Beth Hair (NORC; co-Principal Investigator), Peg Burchinal (UNC-Chapel Hill; Expert Advisor) and Marty Zaslow (SRCD and Child Trends; Expert Advisor). The Technical Expert Panel was comprised of Linda Espinosa (University of Missouri-Columbia, Retired), Sue Hegland (Iowa State University), Stephanie Jones (Harvard Graduate School of Education), and Katherine Magnuson (University of Wisconsin-Madison). Amy Madigan and Laura Radel were the Project Officers at ASPE for this project. The contents of this brief are solely the responsibility of the authors and do not necessarily represent the official views of the Office of the Assistant Secretary for Planning and Evaluation, or the U.S. Department of Health and Human Services.

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