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Early Childhood Research Quarterly 21 (2006) 431–454

Early Childhood Research Quarterly

Children's school readiness in the ECLS-K: Predictions to academic, health, and social outcomes in first grade☆

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Received 7 August 2006; accepted 12 September 2006

Abstract

Two studies examine patterns of school readiness in children at school entry and how these patterns predict first-grade outcomes in a nationally representative sample of first-time kindergartners from the Early Childhood Longitudinal Study—Kindergarten Class of 1998–1999 ($N = 17{,}219$). In Study 1, cluster analyses revealed four profiles at kindergarten entry: comprehensive positive development (30%), social/emotional and health strengths (34%), social/emotional risk (13%), and health risk (22.5% of the sample). Study 2 results suggested that children with one of the two "risk" profiles were more likely to be from families with multiple socioeconomic disadvantages. In addition, all four profiles differentially predicted academic and social adjustment in early elementary school. Children with a risk profile performed the worst on all outcomes; children with a comprehensive positive development profile performed the best. The authors discuss the need for early identification of children who may be at risk for entering school with few school readiness strengths.

Keywords: School readiness; ECLS-K; Longitudinal; Cluster analysis; Cognitive achievement; Health; Social development

1. Profiles of school readiness: how the multiple dimensions of development fit together

Research has made it increasingly clear that children's school and later life success depends not only on children's cognitive skills, but also on their physical and mental health, emotional well-being, and ability to relate to others (Cavanaugh, Lippitt, & Moyo, 2000; Huffman, Mehlinger, & Kerivan, 2000; National Research Council and Institute of Medicine, 2000; Peth-Pierce, 2000; Raver, 2002). For example, in a national survey of 1448 kindergarten teachers carried out by the National Center for Education Statistics, teachers reported that being physically healthy, rested and well-nourished; being able to communicate needs, wants and thoughts; and being enthusiastic and curious in approaching new activities were the most essential qualities for children to be ready for kindergarten (National Center for Education Statistics, 1993). While recent research and policy have focused largely on the importance of cognitive skills and emergent literacy for later academic achievement (Kauerz, 2002; Snow, Burns, & Griffin, 1998),

☆ This research was supported in part by a grant from the National Institute for Child Health and Human Development (R01 HD046123-01) to Elizabeth C. Hair, Ph.D. and Tamara G. Halle, Ph.D. We are thankful to Martha Zaslow, Laurie Martin, and several anonymous reviewers for their helpful comments on earlier drafts of this paper.
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doi:10.1016/j.ecresq.2006.09.005

the other dimensions of readiness have received less attention. Recent reviews of the literature suggested that cognitive and social/emotional development in early childhood are closely linked (National Research Council and Institute of Medicine, 2000, 2001), and recent research has explored the connections between social behavior and literacy skills (e.g., Miles & Stipek, 2006). Even so, there has been little exploration of how children's cognitive, language, social, emotional, *and* health status interact with one another and collectively affect children's outcomes. Additionally, little empirical evidence has documented the ways in which these elements function *in combination* early in children's academic careers, and how these combinations might affect later outcomes.

The purpose of this research was to examine how the multiple dimensions of children's development function together at school entry, and how they collectively predicted academic and social adjustment at the end of first grade. We conducted two studies using a nationally representative cohort of 17,219 first-time kindergartners from the Early Childhood Longitudinal Study—Kindergarten Class of 1998–1999 (ECLS-K). The first study examined how different dimensions of development in the fall of kindergarten present themselves in terms of strengths and risks within individual children. We sought to determine whether distinct profiles of readiness emerged among this cohort of first-time kindergartners. In the second study, we used the school readiness profiles from the first study to predict to first-grade outcomes, controlling for background characteristics and characteristics of the kindergarten classroom. Thus, the present studies extended previous research in several ways: they (1) explored the nature of connections among multiple aspects of children's development, including health, cognition, and social/emotional domains, at kindergarten entry using a person-centered approach; (2) took into account a host of family background and kindergarten classroom characteristics in order to better isolate the effects of children's school readiness on later outcomes; and (3) presented nationally representative findings from a cohort of children with longitudinal data.

1.1. Children's school readiness

1.1.1. Conceptualizations

Readiness implies the mastery of certain basic skills or abilities that, in turn, permit a child to function successfully in a school setting, both academically and socially. As Meisels (1999) pointed out, the concept of children's school readiness has long been of interest to educators and has recently become of increasing interest to policymakers, but there has been difficulty in reaching consensus on what constitutes readiness in the child. One important concern is the notion that readiness is relative: "one child's readiness may be another child's long-ago accomplishment or another child's yet-to-be-achieved success" (Meisels, 1999, p. 44). A related concern is the inability to determine a single standard of school readiness. Precisely because performance is highly variable within and across children, establishing a single indicator of readiness would be problematic (Kagan, Moore, & Bradekamp, 1995).

In addition, there is debate among theorists regarding how school readiness develops. Some theorists believe that readiness is a function of maturity (i.e., children are ready to learn when they are ready), whereas others have characterized readiness as the mastery of certain skills, or as standards established within a community (i.e., a child deemed "ready" by one teacher or school may not be deemed "ready" by another). Graue (1992) conducted an ethnographic study of kindergartens in three different communities and found that community meanings of school readiness varied depending on community resources, shared beliefs about children and education, and kindergarten experiences of study participants.

However, consensus in the field has emerged around the concept that school readiness is multidimensional and is not only dependent upon the qualities that children bring to the learning experience, but also dependent upon the contexts in which learning occurs—contexts which include the home and school environments as well as the larger community. Indeed, a more comprehensive view of school readiness is one of an *interaction* between a child's inherent characteristics and past and present environmental and cultural contexts (Carlton & Winsler, 1999; May & Kundert, 1997; Meisels, 1999).

Many researchers (e.g., Forgione, 1998; Love, Aber, & Brooks-Gunn, 1999; Zaslow, Calkins, & Halle, 2000) regard a literature review conducted by members of the National Education Goals Panel (Kagan et al., 1995) as the guiding framework for articulating the multiple dimensions of school readiness. Consistent with other research, this panel adopted a multi-faceted approach to define the full concept of school readiness. The NEGP identified three components of school readiness: children's readiness for school (i.e., children's ability to participate in and learn from academic experiences), schools' readiness to receive children as they transition into educational settings, and community services and family supports that contribute to children's school readiness. While the present studies

focused on the first component of school readiness identified by the NEGP – readiness in the child – we acknowledge the contributions made by home and school environments to children's readiness for school and for continued school success. For example, factors such as the amount that parents read to their children (Bus, van Ijezndoorn, & Pelligrini, 1995; Halsall & Green, 1995), class size (Finn, 1998; Finn, Gerber, Achilles, & Boyd-Zaharias, 2001; Mayer, Mullens, Moore, & Ralph, 2000), the length of the kindergarten day (Cryan, Sheehan, Wiechel, & Bandy-Hedden, 1992; Finn & Pannozzo, 2004; Gullo, 2000) or teacher experience (Reynolds, 1995) may affect children's concurrent or subsequent school outcomes. In addition, children from more disadvantaged backgrounds (e.g., low-income and/or single-parent households) face negative cognitive and social outcomes, even before kindergarten (Entwisle & Alexander, 1999). Therefore, in the present studies, we examined how a large set of background characteristics were related to school readiness (e.g., the child's age, gender, race/ethnicity, and whether he or she was born with a low birth weight), as well as included a host of family background (e.g., whether the child's current mother was a teen mother at first birth, and the types of parents in the household) and kindergarten context variables in multivariate analyses in order to isolate the effects that children's developmental status at school entry may have on children's later outcomes in first grade.

1.1.2. NEGP dimensions

According to the NEGP framework, there are five dimensions of children's readiness for school: physical health, social/emotional development, approaches to learning, language, and cognitive development. It should be noted that while these dimensions are not orthogonal at kindergarten entry, each is theoretically and empirically distinct (Kagan et al., 1995). In characterizing children's school readiness, each of the five dimensions is necessary but not sufficient.

Physical well-being and motor development encompass characteristics such as rate of growth, physical fitness, chronic conditions such as diabetes, disability, malnutrition, fine motor skills, gross motor skills, and self-care abilities (Kagan et al., 1995). Social development includes the ability to form positive relationships with teachers and peers. Emotional development includes aspects of self-concept and self-efficacy, the ability to express feelings appropriately, and sensitivity to others' feelings. Approaches to learning include openness and curiosity to tasks and challenges, task persistence, imagination, attentiveness, and cognitive learning style (e.g., being better able to process information through listening vs. observing/reading).

Language development can be separated into two components: verbal language and emergent literacy. Verbal language includes listening, speaking, social uses of language (e.g., using social conventions and manners), and spoken vocabulary. Emergent literacy includes prerequisite skills for the development of reading and writing. Such skills include an interest in books and stories, print awareness (e.g., understanding that text represents spoken words), understanding that stories follow a standard sequence, and emergent writing (e.g., scribbling in a way that imitates writing). The fifth and final dimension of school readiness is cognition and general knowledge. This dimension encompasses knowledge of the properties of objects (e.g., color, weight, and movement); an understanding of the relationships between objects, events, or people (e.g., being able to determine how two objects are different); and the acquisition of the conventions of society or school-learned knowledge (e.g., knowing one's name and address, or being able to count by rote) (Kagan et al., 1995). In the present studies, we examined how each of these five components of children's readiness for school function in combination with one another within individual children.

1.1.2.1. The predictive power of the dimensions of children's school readiness. Past research has demonstrated that children's early cognitive and language development predict to later academic outcomes such as report card marks, test scores, and grade retention. For example, low IQ at age five predicts grade retention in early elementary school (Blair, 2001). Scores on tests of cognitive and pre-reading skills in kindergarten predict reading scores, teacher ratings of school adjustment, self-perceptions of competence, and grade retention in fourth grade (Reynolds & Bezruczko, 1993). Language production and IQ at age three predict achievement in reading, language, and math through the third grade (Walker, Greenwood, Hart, & Carta, 1994).

Less research has been conducted on early social and emotional development and its prediction to later academic outcomes and school adjustment (La Paro & Pianta, 2000; Tramontana, Hooper, & Selzer, 1988). Nevertheless, the existing research suggests a pattern whereby early measures of positive social/emotional development predict positive outcomes, and early measures of negative social/emotional development predict less optimal outcomes. Specifically, a high level of externalizing behavior in kindergarten has been found to predict grade retention in early elementary school (Blair, 2001). Children with a larger number of friends early in their kindergarten year have a more favorable opinion of school at the end of the year; in addition, early peer rejection is associated with less favorable perceptions of school and

higher levels of school avoidance (Ladd, 1990). Taken together, these studies suggest that aspects of cognitive, language, and social/emotional development as measured at kindergarten entry remain important for outcomes throughout the elementary school years.

Studies examining the relationship between approaches to learning and later academic outcomes are still fairly limited. Most extant studies look at approaches to learning in first grade, rather than at kindergarten entry. For example, teacher ratings of children's interest, participation, and attention span in the first grade are related to reading and math outcomes in the second and fourth grades (Alexander, Entwisle, & Dauber, 1993), and poor cooperation and self-control have been found to predict grade retention in early elementary school (McKee & Bain, 1997). An aspect of development labeled "cognitive self-control" (i.e., the ability to purposefully control one's behavior) in the first grade has been found to predict scores on tests of reading and math in the fifth grade (Kurdek & Sinclair, 2000).

Likewise, very little research has been conducted on the prediction of later academic outcomes from physical health in early childhood. Nevertheless, the available research indicates that health is an important component of children's success in school. Byrd and Weitzman (1994) found that specific health problems – speech defects, deafness, low birth weight, and enuresis (bed wetting) – were associated with repeating kindergarten or first grade. Middle ear infections are also associated with poor school performance (Roberts, Burchinal, & Campbell, 1994). In addition, children with chronic health conditions or disabilities are more likely than their healthier peers to miss days of school (Cook, Schaller, & Krischer, 1985; Fowler, Johnson, & Atkinson, 1985; Weitzman, 1986) and to have poor academic performance (Fowler et al., 1985; Hack et al., 2002).

1.2. Motivation for the current studies

Despite the previous research linking children's early cognitive, language, and social/emotional development to later developmental and school outcomes, and the less extensive but nevertheless promising research on approaches to learning and health as predictors of later outcomes, there is virtually no literature on how these dimensions of children's school readiness manifest or function *in combination* within individuals. While some of these dimensions have been examined either individually or in combination (Abbott-Shim, Lambert, & McCarty, 2003; Blair, 2002; Konold & Pianta, 2005; NICHD Early Child Care Research Network, 2003), few studies have taken a person-centered approach to examining multiple aspects of school readiness. In particular, physical well-being and motor development have not been included in previous studies. For example, one of the very few studies that took a person-centered approach examined social/emotional and cognitive behavior but not physical well-being and motor development (Konold & Pianta, 2005). In addition Konold and Pianta (2005) only examined one achievement outcome and did not examine multiple cognitive and social school readiness outcomes.

Our first study addresses one gap in the children's school readiness literature by applying a person-centered analytic approach to explore the nature of connections among multiple aspects of children's development, including children's early health status. To our knowledge, our study is the first to include health with a person-centered approach to examining school readiness.

In addition, previous research has not addressed how particular patterns of school readiness skills collectively predict to later academic and social adjustment. Our second study addresses this issue using profiles of school readiness identified at the beginning of kindergarten to predict multiple outcomes at the end of first grade.

2. Study 1

2.1. Overview and hypotheses

The first study examined the patterns of children's school readiness within a nationally representative sample of first-time kindergartners. Our hypothesis was that distinct profiles of children's school readiness would be present in this nationally representative sample of kindergartners. While it was likely that there is no one profile of a "ready" child (Lewit & Schuurmann Baker, 1995), we anticipated that children's school readiness would include multiple aspects of development that were linked together in different ways for different children. However, we expected to find that children would fall into one of a limited set of profiles of readiness. Specifically, we posited that there would be a group of children who were performing well in all dimensions of development at kindergarten entry, but some children would be performing well in only some of the developmental areas at kindergarten entry.

We further explore the notion that readiness is a relative construct (Kagan et al., 1995; Konold & Pianta, 2005; Meisels, 1999) by examining different threshold criteria. Specifically, we created indices for each dimension of development using both "liberal" and "conservative" criteria.[1]

2.2. Method

2.2.1. Dataset

The present studies examined profiles of school readiness using data from The Early Childhood Longitudinal Study—Kindergarten Class of 1998–1999 (ECLS-K), a large, nationally representative dataset of U.S. kindergarteners from the fall of 1998. Sponsored by the National Center for Education Statistics (NCES), the ECLS-K followed approximately 22,000 kindergarteners from kindergarten entry in 1998 through elementary school (Westat, 2000). Data rounds are currently available for the fall of kindergarten, spring kindergarten, spring first grade, and spring third grade; spring fifth grade data have recently being collected. Data on each child came from direct child assessments as well as parent, teacher, and school administrator interviews. The ECLS-K oversampled Asian and Pacific Islander children to ensure sample sizes large enough to permit subgroup analyses.

2.2.1.1. Sample. The sample for the first study, identifying profiles of school readiness at kindergarten entry, included all first-time kindergarteners ($N = 17{,}219$). The sample was limited to first-time kindergarteners in order to focus on school readiness characteristics of children entering the formal school setting for the first time.

2.2.1.2. Participants. The average age of first-time kindergartners in 1998 at the start of the kindergarten year was 5.68 years. Approximately one-half the sample was male (51%). Our sample is diverse in terms of racial/ethnic background, family type, parental education, and family income (see column 1 in Table 1). Slightly more than one-half of the kindergartners in the sample attended an all-day program (54%), and the majority of kindergartners attended public schools (84%).

2.2.2. Measures

We chose to use the National Education Goals Panel (Kagan et al., 1995) framework to identify important domains of readiness in the child for this study. The five key dimensions of school readiness in this framework are: (1) physical health; (2) social/emotional development; (3) approaches to learning; (4) language development; and (5) cognitive development. Multiple indicators for each key component of school readiness were chosen from ECLS-K data collected during the fall of the kindergarten year. The appropriateness of indicators in each domain was based on availability, face validity, and diversity of reporters. Variables were considered for inclusion if they represented a skill that entering kindergarteners could reasonably have mastered or be "in progress" of mastering. For example, the skill of "child understands a story read to him/her" was included as an indicator of language and literacy development, but not "uses different strategies to read unfamiliar words," as this was not considered a developmentally appropriate expectation at kindergarten entry. Furthermore, an effort was made to choose indicators from multiple data sources, including direct child assessments, parent interviews, and teacher questionnaires in order to triangulate information and thus obtain a more accurate picture of each child's development. Table 2 lists the constructs that comprised each of the five domains of readiness, and notes indicators for each construct. We stress that these indicators do not represent a definitive measure of school readiness, but rather, represent our operationalization of this complex and multidimensional construct, based on available measures in the current data source.

2.2.3. Analysis plan

Data were analyzed in several steps. First, two dichotomous coding schemes for school readiness indicators were examined (i.e., conservative and liberal). From these, conservative and liberal indices for school readiness indicators were created. Finally, cluster analysis was used to examine how the indices of the different dimensions of development function in combination within children.

[1] Rationale for creating the cutpoints for "liberal" and "conservative" categories are detailed in the methods section. We acknowledge that different threshold criteria may be used to analyze these same data (Konold & Pianta, 2005; Wertheimer et al., 2003).

Table 1
Average characteristics of first-time kindergarten children in the ECLS-K by school readiness profile (weighted)

	Total	Comprehensive positive development profile, mean (%)	Social/emotional and health strengths profile, mean (%)	Social/emotional risk profile, mean (%)	Health risk profile, mean (%)	Significance
Individual characteristics						
M, age (years)	5.68 (.01)	5.76 (.01)[a,b,c]	5.68 (.01)[a,d]	5.66 (.01)[b,e]	5.62 (.01)[c,d,e]	$F = 234321.47^{***}$
Gender, % female	49.2% (.00)	55.3% (.01)[a,b,c]	52.4% (.01)[a,e,f]	38.9% (.01)[b,e,f]	43.2% (.01)[c,d,e]	$F = 41065.96^{***}$
Race/ethnicity						
Non-Hispanic White	57.7%	71.0%	54.8%	47.9%	51.1%	χ^2 ($N = 17195$) $= 273.95^{***}$
Non-Hispanic Black	15.5%	11.6%	13.5%	23.9%	18.2%	
Hispanic	19.2%	10.8%	22.7%	19.3%	24.4%	
Other	7.7%	6.6%	9.0%	9.0%	6.3%	
Low birth weight	7.9% (.00)	5.7% (.00)[a,b,c]	7.4% (.00)[a,d,f]	10.4% (.01)[b,f]	9.7% (.01)[c,d]	$F = 127479.55^{***}$
Has disability	11.7% (.32)	6.8% (.46)[a,b,c]	2.4% (.44)[a,d,f]	18.0% (.86)[b,e,f]	27.4% (1.35)[c,d,e]	$F = 409.70^{***}$
Family characteristics						
Family type						
2 biological/adoptive parents	65.9%	76.3%	68.2%	46.9%	60.9%	χ^2 ($N = 17219$) $= 300.53^{***}$
1 biological/1 step parent	8.7%	6.2%	7.8%	14.2%	9.6%	
1 biological parent or other	25.5%	17.5%	24.0%	38.9%	29.5%	
M, number of siblings in household	1.45 (.02)	1.29 (.02)[a,b,c]	1.50 (.02)[a]	1.52 (.04)[b]	1.53 (.02)[c]	$F = 2189.98^{***}$
M, total number in household	4.52 (.02)	4.31 (.02)[a,b,c]	4.58 (.03)[a]	4.65 (.06)[b]	4.60 (.03)[c]	$F = 14932.03^{***}$
Mother's race/ethnicity						
Non-Hispanic White	61.0%	73.7%	58.5%	51.8%	54.4%	χ^2 ($N = 16830$) $= 242.33^{***}$
Non-Hispanic Black	15.4%	11.5%	13.4%	24.4%	17.8%	
Hispanic	17.2%	9.2%	20.7%	16.8%	22.7%	
Other	6.3%	5.6%	7.4%	7.1%	5.2%	
Father's race/ethnicity						
Non-Hispanic White	67.3%	78.6%	64.0%	60.5%	59.8%	χ^2 ($N = 13001$) $= 183.48^{***}$
Non-Hispanic Black	9.5%	7.8%	8.3%	13.7%	11.7%	
Hispanic	17.0%	8.6%	20.2%	18.5%	23.3%	
Other	6.2%	5.0%	7.6%	7.3%	5.2%	
Mother's educational attainment						
Less than high school	14.5%	4.8%	15.5%	21.7%	21.1%	χ^2 ($N = 16950$) $= 521.46^{***}$
High school diploma/GED	31.2%	23.7%	31.8%	38.6%	35.4%	
Vocational degree/some coll.	32.1%	34.4%	33.6%	28.6%	28.6%	
College graduate or higher	22.1%	37.2%	19.2%	11.1%	11.1%	
Father's educational attainment						
Less than high school	14.2%	5.4%	15.9%	21.5%	20.0%	χ^2 ($N = 13859$) $= 461.03^{***}$
High school diploma/GED	32.6%	25.5%	32.9%	40.1%	38.0%	
Vocational degree	25.8%	26.5%	26.5%	23.9%	24.6%	
College graduate or higher	27.4%	42.6%	24.6%	14.6%	17.3%	

M, mother's current age (years)	32.9 (.10)	34.3 (.14)[a,b,c]	32.7 (.13)[a,d,f]	31.5 (.19)[b,e,f]	32.3 (.13)[c,d,e]	$F = 33838.12^{***}$
M, father's current age (years)	35.9 (.10)	37.1 (.14)[a,b,c]	35.7 (.16)[a,f]	34.4 (.19)[b,e,f]	35.3 (.15)[c,e]	$F = 39849.56^{***}$
M, bio mother's age at first birth	23.4 (.11)	25.4 (.16)[a,b,c]	23.2 (.12)[a,d,f]	21.4 (.14)[b,e,f]	22.2 (.12)[c,d,e]	$F = 14258.81^{***}$
Mother was a teen mother	27.7% (.80)	15.1% (.76)[a,b,c]	27.8% (1.01)[a,d,f]	41.8% (1.32)[b,e,f]	35.5% (1.51)[c,d,e]	$F = 416.23^{***}$
Mother married at first birth	69.6% (.97)	81.3% (.90)[a,b,c]	70.5% (1.18)[a,d,f]	52.6% (1.74)[b,e,f]	63.1% (1.20)[c,d,e]	$F = 2409.78^{***}$
Mother's language to child						
Never speaks non-English	79.4%	86.6%	75.0%	79.7%	76.4%	χ^2 ($N = 16863$) = 129.90^{***}
Sometimes speaks non-English	6.4%	5.5%	6.7%	7.0%	6.7%	
Often speaks non-English	4.1%	2.7%	4.8%	3.8%	4.9%	
Very often speaks non-English	10.2%	5.3%	13.5%	9.5%	12.1%	
Father's language to child						
Never speaks non-English	80.6%	88.3%	76.6%	79.9%	76.4%	χ^2 ($N = 13487$) = 106.34^{***}
Sometimes speaks non-English	6.0%	4.9%	5.9%	6.8%	7.3%	
Often speaks non-English	4.0%	2.5%	4.7%	3.8%	4.9%	
Very often speaks non-English	9.4%	4.3%	12.8%	9.5%	11.4%	
English spoken in home	88.0% (.75)	94.5% (.59)[a,b,c]	70.5% (1.18)[a,f]	88.5% (.98)[b,e,f]	85.1% (1.02)[c,e]	$F = 6761.30^{***}$
Family income						
1st quintile	19.2%	6.4%	20.0%	31.0%	26.7%	χ^2 ($N = 17219$) = 613.71^{***}
2nd quintile	20.0%	14.2%	20.1%	24.4%	24.7%	
3rd quintile	20.3%	19.0%	21.6%	20.0%	20.1%	
4th quintile	20.1%	25.9%	20.3%	15.1%	15.6%	
5th quintile	20.4%	34.6%	18.0%	9.5%	12.9%	
Sample size (unweighted)	17,219	5,229	5,845	2,280	3,865	

[a] Comprehensive positive development profile compared with social/emotional and health strengths profile.
[b] Comprehensive positive development profile compared with social/emotional risk profile.
[c] Comprehensive positive development profile compared with health risk profile.
[d] Social/emotional and health strengths profile compared with health risk profile.
[e] Social/emotional risk profile compared with health risk profile.
[f] Social/emotional and health strengths profile compared with social/emotional risk profile.
*** $p < .001$.

Table 2
Constructs and data sources of the five dimensions of school readiness used in this study, fall kindergarten data

Construct	Data source	Response coding	
		"Liberal"	"Conservative"
Physical well-being and motor development			
1. Overall rating of health, with no limiting condition	2 parent report items	A rating of "excellent," "very good," or "good" health, combined with the absence of a limiting condition	A rating of "excellent,"or "very good" health, combined with the absence of a limiting condition
2. Healthy weight (not overweight or underweight)	2 direct assessment items	Between the 5th and 95th percentile for age and sex using the CDC guidelines for Body Mass Index, which uses a combination of height and weight measurements, in relation to child age	Between the 10th and 85th percentile for age and sex using the CDC guidelines for Body Mass Index, which uses a combination of height and weight measurements, in relation to child age
3. Fine motor skills (e.g., able to draw a person)	7 direct assessment items	A rating of 4 out of 9 "points" for the sum of items	A rating of 6 out of 9 "points" for the sum of 7 items
4. Gross motor skills (e.g., able to walk backwards)	4 direct assessment items	A rating of 4 out of 8 "points" for the sum of 4 items	A rating of 6 out of 8 "points" for the sum of 4 items
Social and emotional development			
1. Self-control (e.g., frequency child has temper tantrums-reverse coded)	5 parent report items	An average rating of "sometimes," "often," or "very often"	An average rating of "often," or "very often"
2. Social interaction (e.g., ease in joining play)	3 parent report items	An average rating of "sometimes," "often," or "very often"	An average rating of "often," or "very often"
3. Impulsive/overactive (e.g., is hyperactive-reverse coded)	2 parent report items	An average rating of "sometimes," "often," or "very often"	An average rating of "often," or "very often"
4. Sad/lonely (e.g., acts sad or depressed-reverse coded)	4 parent report items	An average rating of "sometimes," "often," or "very often"	An average rating of "often," or "very often"
5. Self-control (e.g., respecting property rights)	4 teacher report items	An average rating of "sometimes," "often," or "very often"	An average rating of "often," or "very often"
6. Interpersonal (e.g., expressing feelings)	5 teacher report items	An average rating of "sometimes," "often," or "very often"	An average rating of "often," or "very often"
7. Externalizing problem behaviors (e.g., frequency child disturbs ongoing activities-reverse coded)	5 teacher report items	An average rating of "sometimes," "often," or "very often"	An average rating of "often," or "very often"
8. Internalizing problem behaviors (e.g., worries-reverse coded)	4 teacher report items	An average rating of "sometimes," "often," or "very often"	An average rating of "often," or "very often"
Language development			
1. Letter recognition	1 direct assessment item	Proficiency score > .4	Proficiency score > .7
2. Beginning sounds	1 direct assessment item	Proficiency score > .4	Proficiency score > .7
3. Conventions of print (e.g., stories are read from left to right in English)	3 direct assessment items	At least one of three forms of familiarity with print	All three forms of familiarity with print
4. Story knowledge (child understands and interprets a story read to him/her)	1 teacher report item	A rating of "in progress," "intermediate," or "proficient"	A rating of "intermediate," or "proficient"
5. Alphabet (child names all upper- and lower-case letters)	1 teacher report item	A rating of "in progress," "intermediate," or "proficient"	A rating of "intermediate," or "proficient"
6. Early reading (child reads simple books independently)	1 teacher report item	A rating of "in progress," "intermediate," or "proficient"	A rating of "intermediate," or "proficient"

7. Early writing (child demonstrates early writing behaviors)	1 teacher report item	A rating of "in progress," "intermediate," or "proficient"	A rating of "intermediate," or "proficient"
8. Conventions of print (child demonstrates an understanding of conventions of print)	1 teacher report item	A rating of "in progress," "intermediate," or "proficient"	A rating of "intermediate," or "proficient"
Cognition and general knowledge			
1. Count/number/shape	1 direct assessment item	Proficiency score > .4	Proficiency score > .7
2. Relative size	1 direct assessment item	Proficiency score > .4	Proficiency score > .7
3. Classification and comparisons (Child sorts, classifies, and compares)	1 teacher report item	A rating of "in progress," "intermediate," or "proficient"	A rating of "intermediate," or "proficient"
4. Ordering objects (child orders a group of objects)	1 teacher report item	A rating of "in progress," "intermediate," or "proficient"	A rating of "intermediate," or "proficient"
5. Understanding quantities (child shows understanding of relationship between quantities)	1 teacher report item	A rating of "in progress," "intermediate," or "proficient"	A rating of "intermediate," or "proficient"
6. Using numbers (child solves problems involving numbers)	1 teacher report item	A rating of "in progress," "intermediate," or "proficient"	A rating of "intermediate," or "proficient"
7. Solving math problems (child uses a variety of strategies to solve math problems)	1 teacher report item	A rating of "in progress," "intermediate," or "proficient"	A rating of "intermediate," or "proficient"
8. Classifying natural kinds (child classifies and compares living and non-living things)	1 teacher report item	A rating of "in progress," "intermediate," or "proficient"	A rating of "intermediate," or "proficient"
9. Measurement (child uses instruments accurately for measuring)	1 teacher report item	A rating of "in progress," "intermediate," or "proficient"	A rating of "intermediate," or "proficient"
10. Using senses (child uses his/her senses to explore and observe)	1 teacher report item	A rating of "in progress," "intermediate," or "proficient"	A rating of "intermediate," or "proficient"
11. Forming explanations (child forms explanations based on observations and explorations)	1 teacher report item	A rating of "in progress," "intermediate," or "proficient"	A rating of "intermediate," or "proficient"
Approaches to learning			
1. Approaches to learning scale (e.g., eagerness to learn)	6 parent report items	An average rating of "sometimes," "often," or "very often"	An average rating of "often," or "very often"
2. Approaches to learning scale (e.g., persists in completing tasks)	6 teacher report items	An average rating of "sometimes," "often," or "very often"	An average rating of "often," or "very often"

2.2.3.1. Dichotomous coding of each indicator. The number of variables we wanted to include in our analyses could not be accommodated individually within the cluster methodology. We therefore needed to create composites within domains of development, which required the use of a common metric across the various indicators within each dimension of children's school readiness. Given that using different aggregation and cut-points may result in different analytic results (Konold & Pianta, 2005; Wertheimer, Croan, Moore, & Hair, 2003), two sets of cut-points were utilized in the analyses, the first "liberal" and the second "conservative." Both the liberal and conservative cut-points are described below.[2]

For direct assessments of language and cognitive development, we followed a similar procedure to that used by Magnuson et al. (2005) to establish the threshold for our cut-points. Specifically, for the liberal cut-point, we identified the lower quartile (bottom 25%) value for each of the four direct assessment scores (i.e., letter recognition; beginning sounds; count, number, and shape; and relative size), and then took the mean of these values as the criteria for the cut-point for each individual direct assessment. This cut-point was determined to be a proficiency probability score of 40%. Therefore, those at or above the mean of the lower quartile, or a score of at least 40% of a directly-assessed skill such as letter recognition, were categorized as "on track" according to the liberal cut-point. For the conservative cut-point, we identified the median value for each of the four direct assessments, and then took the mean of these values to determine the conservative cut-point. This cut-point was determined to be a proficiency probability score of 70%. Thus, children needed to demonstrate at least 70% of a directly-assessed skill such as letter recognition in order to be categorized as "on track" according to the conservative cut-point.

For parent and teacher reports of children's social/emotional and approaches to learning skills, the "on track" distinction for the liberal cut-points included children identified as "in progress," "intermediate," and "proficient," but not "not yet" or "beginning" the skill in question. Some parent and teacher reports of children's behaviors were rated according to the frequency of the behavior. In these cases, children identified as "sometimes," "often," and "very often" were included in the "on track" measure, whereas children who "never" exhibited the behavior were categorized as "not on track." In contrast, for the conservative cut-points based on parent and teacher report, the response of "in progress" or "sometimes" was not included in the "on track" conservative measure. Thus, the difference between our liberal and conservative cut-points was where we placed children who were either "in progress" or "sometimes" exhibiting a particular behavior or skill.

For the school readiness dimension of physical well-being and motor development, the measures were diverse scales and therefore our cut-points ranged accordingly. For the child's body mass index (BMI), we followed the Centers for Disease Control and Prevention's weight guidelines for age and sex of the child to identify underweight and overweight children. Specifically, for the liberal cut-point, the children's BMI needed to be between 5 and 95% for their age and sex to be considered "on track."[3] For the conservative cut-point, the children's BMI needed to be between 10 and 85% for their age and sex. The distinction between the liberal and conservative cut-points for BMI is whether children identified as "overweight" or "underweight", or as "at risk for overweight" or "at risk for underweight" were included in the "not on track" categories. For the child's fine and gross motor skills, scores ranged from 0 to 9 and 0 to 8, respectively, depending on the number of skills they completed. For the liberal cut-points, we defined "on track" as having four or more points on each of the assessments, and for the conservative cut-point, as having six or more points on each of the assessments. For the parent rating of overall health, we included children who were rated as having "excellent," "very good," or "good" overall health with no limiting condition or disability as "on track" for our liberal cut-point. For the conservative cut-point, we included children who were rated as having "excellent" or "very good" overall health with no limiting condition or disability as "on track."

2.2.3.2. Indices summing indicator scores within each domain. From the appropriate indicator variables, we constructed indices to represent developmental progress in each domain of readiness using both the conservative and liberal cut-points, resulting in two sets of indices. Preliminary analyses revealed very little variability on the measure of approaches to learning (both parent and teacher reports) for the liberal cut-point, with 99% of children rated as "on track" for approaches to learning. For this reason, we excluded indicators of approaches to learning

[2] A table detailing the specific items and cut-points is available from the first author.

[3] See www.cdc.gov/nccdphp/dnpa/bmi/bmi-for-age.htm for an explanation of CDC guidelines on children's BMI. CDC website also includes a table of BMI percentiles for age and sex.

from our analyses of profiles of school readiness, but included them, where appropriate, as outcomes measures in Study 2.

For the remaining four domains (physical well-being and motor development, social/emotional development, language, and cognition and general knowledge), the number of indicators for which a child received an "on track" distinction was summed and then standardized. For example, children who were "on track" on three out of four constructs within physical and motor development received an index score of three for this domain. The index for physical well-being and motor development ranged from 0 to 4; the social/emotional development index ranged from 0 to 8; the language development index ranged from 0 to 8; and the cognition and general knowledge index ranged from 0 to 11. Because not all children had complete information across all of the measures of school readiness, we used a "75% rule" to calculate adjusted scores for children with missing data. Specifically, for children with complete information on between 75% and 99% of the items in an index, an adjusted score was calculated for that index; children with less than 75% of information for an index were not given scores on that index. In order to compare indices across domains of readiness and use indices within the cluster analysis, we standardized the means of the four school readiness indices because the ranges of our measures varied from 0–4 to 0–11 (Afifi & Clark, 1990; Aldenderfer & Blashfield, 1984).

2.2.3.3. Identifying clusters of school readiness at kindergarten entry. School readiness indices were used to identify groups of students with common school readiness profiles using *k*-means cluster analysis procedures in SAS (*fastclus*; *candisc*). We conducted cluster analyses once using the conservative indices and once using the liberal indices. Cluster analysis is a person-oriented approach that allows researchers to examine how characteristics such as the dimensions of school readiness co-occur within individuals (Aldenderfer & Blashfield, 1984; Milligan, 1996). To ensure that the groupings of our clusters made both theoretical and statistical sense, we randomly split our sample of first-time kindergartners in half and ran separate cluster analyses on each split-half sample before testing for a similar result in the full sample. With the *k*-means cluster analysis method, the number of clusters must be identified. This method used an iterative process that assigned each observation to the "closest" cluster. This process continued until the observations remained stable within a given cluster. The *k*-means method is also recommended for large sample sizes as in the present study (Afifi & Clark, 1990; Milligan, 1996).

2.3. Results

To address our hypothesis that there would be distinct patterns of school readiness in this nationally representative sample of first-time kindergartners, we conducted cluster analyses on measures of four of the five dimensions of school readiness for both the liberal and conservative indices. We tested various numbers of potential clusters (i.e., two, three, four, and five) and found four cluster groups to have the best conceptual and statistical fit. Significant correlations around .90 between cluster solutions across the two random half-samples indicated good replication of the cluster solution. Cluster analyses on the random split-half and full samples for the liberal and conservative indices resulted in very similar cluster types emerging.

Four distinct profiles emerged from our cluster analyses, representing four school readiness profiles. Fig. 1 shows the mean standardized scores on the four indices of school readiness for each of the four profiles for both the liberal and conservative indices. By comparing how the profiles differ among each other on any given dimension, and also across dimensions, we are able to characterize the school readiness profiles with regard to their particular strengths and limitations in school readiness skills.

The analyses indicated that using the liberal and conservative cutoffs resulted in similar profiles. Differences between the profiles using these cutoffs occurred in the distribution of children across profiles rather than the configuration of the profiles. The first profile, "comprehensive positive development," consisted of children who scored above the mean on all four dimensions of school readiness. Specifically, 30.37% of the sample ($n = 5229$) had this profile using the liberal indices, whereas 16.28% of the sample ($n = 2803$) had this profile using the conservative indices (see Fig. 1). The second profile, "social/emotional and health strengths," consisted of students who scored above average in the dimensions of health and physical well-being and social/emotional well-being but scored below average in the dimensions of language and cognition. For this profile, scores on language and cognition were less than one-half of a standard deviation below the mean. Using the liberal indices, 33.95% of the sample ($n = 5845$) had this profile, whereas using the conservative indices, 37.15% of the sample ($n = 6396$) had this profile. The next profile, "social/emotional risk," included children who scored below average on all four dimensions of readiness, but were distinguished by being significantly below the

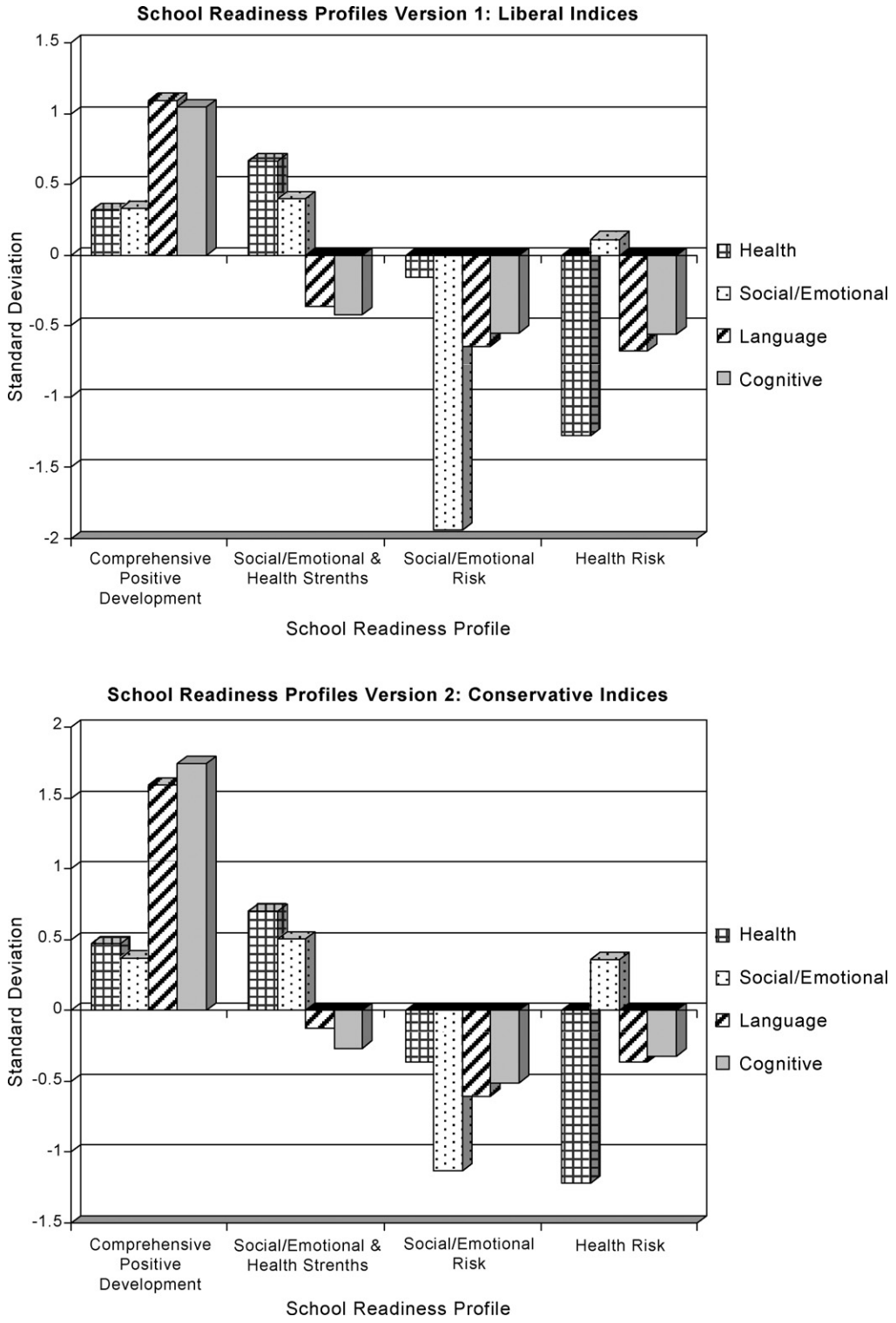

Fig. 1. Standardized means for the four school readiness profiles according to the liberal indices and conservative indices.

mean on social/emotional well-being at the beginning of kindergarten. For the liberal indices, 13.24% of the sample ($n = 2280$) had this school readiness profile; they were two standard deviations below the mean on social/emotional development at kindergarten entry. For the conservative indices, 27.19% of the sample ($n = 4681$) were characterized by social/emotional risk; however, social/emotional well-being at the beginning of kindergarten was only a little more than one standard deviation below the mean. The fourth and final profile, "health risk," consisted of children who were distinguished by being more than one standard deviation below the mean in the area of health and physical well-being as well as below the mean on both language and cognition. For the liberal indices, 22.45% of the sample ($n = 3865$) had a health risk profile, and for the conservative indices, 19.39% of the sample ($n = 3339$) had a health risk profile.

2.4. Discussion

This study supports our hypothesis that different profiles of school readiness exist at kindergarten entry. In particular, we found a group of children who had strengths in all dimensions of school readiness. In addition, we found another group of children with strengths in health and social/emotional development, but with weaker language and cognition skills at the start of kindergarten. Furthermore, we found that a substantial proportion of a nationally representative sample of children were at risk in their health and/or social/emotional development, in addition to having below-average language and cognition skills. Because children's health and social/emotional status are considered by kindergarten teachers to be essential qualities of children's school readiness (National Center for Education Statistics, 1993), we consider the "health risk" and "social/emotional risk" profiles that emerged from our cluster analyses to represent children who have entered school with limited school readiness skills.

Furthermore, we found that similar profiles of school readiness emerge, regardless of the stringency of criteria used to assess readiness. The main difference between the liberal and conservative versions of the school readiness profiles was the distribution of children across the profiles. We found that using the liberal indices resulted in 35% of the sample being characterized with limited school readiness skills at kindergarten entry (i.e., across the "social/emotional risk" and "health risk" profiles). Using the conservative indices, 45% of the sample was characterized with limited school readiness skills. While it is disheartening to imagine that between 35% and 45% of first-time kindergartners could be ill-prepared for school, there is at least one study that provides corroborating evidence for the estimates produced from our liberal indices. Although there are concerns about response rate (and thus, representativeness of the sample), a study of teachers conducted by the Carnegie Foundation for the Advancement of Teaching reported that teachers believe that approximately 35% of U.S. children are not ready for school (Boyer, 1991 as cited in Meisels, 1999).

The intent of Study 1 was to examine whether children met either lenient or stringent criteria across multiple dimensions of readiness at kindergarten entry. However, information on children who are exceeding expectations may be obscured within our cut-points. By using the full range of responses or a different threshold for each variable within a dimension, analyses may uncover, for example, that our comprehensive positive development profile includes a group of children who were excelling in all dimensions, as well as a group of children who just met the criteria within all dimensions. Future analyses using the full range of scores may be able to determine in greater detail the relative competencies of children within each profile at kindergarten entry and its importance for later development (Konold & Pianta, 2005).

We also acknowledge that there are other ways to determine what constitutes children's school readiness. Specifically, researchers could choose a different set of indicators for each dimension of development, or choose to use a different set of criteria for representing different skills within a developmental domain. We feel a strength of our study is the use of multiple aspects of children's development within each developmental domain, as well as the use of multiple informants, to determine our measures of developmental status at kindergarten entry.

3. Study 2

3.1. Overview and hypotheses

The purpose of the second study was to explore the characteristics of children who fall into the four school readiness profiles that emerged from our nationally representative sample of first-time kindergartners, and to determine whether profile membership predicted differential academic and social outcomes throughout the early years of schooling. As

cluster analyses of the "liberal" and "conservative" indices produced similar school readiness profiles, in the second study we examined the profiles based on the "liberal" indices because they were designed to identify children who are at least "in progress" on a skill as having a strength in that given developmental area. In addition, the distribution of children falling within "risk" profiles using the liberal indices was more in keeping with estimates from another study.

We hypothesized that key child and family demographic characteristics would differ across the identified readiness profiles. For instance, we expected that children with a "comprehensive positive development" profile would be from more advantaged backgrounds, whereas children with limited school readiness skills would be from more disadvantaged backgrounds (Entwisle & Alexander, 1999). For example, Ellwein, Walsh, Eads, & Miller (1991) demonstrated that results of school readiness tests (primarily with measures in language and cognitive development) utilized by nine Virginia school districts varied predictably by demographic characteristics; boys, children from families of racial/ethnic minority backgrounds, children with lower socioeconomic status, and younger children scored consistently lower than their counterparts. Given that children in disadvantaged neighborhoods are exposed to a wide range of psychosocial stressors, it is not surprising that they may be at greater risk for developing social and emotional difficulties, which may lead to difficulty adjusting to school (Raver, 2002).

It was also expected that the profiles of readiness would predict to key first-grade outcomes. We hypothesized that children with a "comprehensive positive development" profile would perform the best at the end of first grade on direct assessments of math and reading, as well as teacher ratings of the child's work ethic, social adjustment, and parent ratings of general health.

3.2. Method

3.2.1. Sample

Study 2 was limited to those children with a school readiness profile and to those with valid longitudinal sampling weights ($N = 13{,}397$). Use of longitudinal weights and clustering variables is required to produce estimates representative of the 1998–1999 U.S. kindergarten cohort. Invalid sampling variables typically result from sample attrition or missing one of the required survey components. Because regression samples are further limited to children with non-missing outcome variables, samples vary by outcome variable.

3.2.2. Measures

3.2.2.1. Background characteristics. Both individual and family background characteristics were used to distinguish the four school readiness profiles. Measures of individual characteristics refer to the study child and include information on the child's age, gender, race/ethnicity, whether he or she was born with a low birth weight (i.e., weighing less than 5.5 pounds), and whether he or she has been diagnosed by a professional as having a disability (learning, activity, mobility, speech, hearing, vision or received therapy services before the school year began). Family background characteristics included whether the child's current mother was a teen mother at first birth, the types of parents in the household, and household socioeconomic status (SES).

3.2.2.2. Kindergarten-year experiences. To control for children's kindergarten-year experience when examining first-grade outcomes, five variables representing characteristics of the child's school or classroom as measured during the kindergarten year were included in analyses. These variables included whether the child attended a full- or half-day kindergarten class; whether the child attended a public or private school; the size of the kindergarten class; the amount of kindergarten teaching experience the child's teacher held; and whether or not the child's teacher had at least the median amount of coursework in early childhood education, elementary education, and child development, based on the full sample of teachers surveyed.

3.2.2.3. Child outcomes in first grade. To determine child outcomes, three direct child assessments, one teacher-report and one parent-report measure were used from the spring of first grade.[4] Five total measures were chosen as

[4] The outcomes were measured during the spring of the 1999–2000 school year. During this term, most but not all of the children of the sample were in first grade. Those children not in the "modal grade for year" represented children either retained or promoted.

developmental indicators in elementary school, in parallel to the five key components of school readiness for entering kindergarteners representing health, social/emotional development, approaches to learning, language, and cognition.

To measure physical and motor well-being, parents rated children's general health on a 5-point Likert scale from "poor" to "excellent." The variable ranges from 1 to 5. To measure children's social and emotional development, we examined the teacher rating of children's self-control. This rating was based on a scale composed of four items: respecting property rights of others, controlling temper, accepting peer ideas for group activities, and responding appropriately to peer pressure. The variable ranged from 0 to 4. The split-half reliability for the teacher rating of children's self-control was .80. Children's approaches to learning was measured using a teacher rating of whether a child works to his or her best ability. The response categories were "never," "seldom," "usually," and "always." The variable ranged from 0 to 4. The split-half reliability for the teacher rating of children's approaches to learning was .89. Children's language skills were measured via direct assessment of reading ability, and scored using Item Response Theory (IRT).[5] The variable ranged from 0 to 149. The overall reliability of the reading assessment was .97. Similarly, children's mathematics skills were also measured using IRT scores of a mathematics direct assessment. This variable ranged from 0 to 121. The reliability of the math assessment was .94.

3.2.3. Analysis plan

3.2.3.1. Demographic characteristics of each school readiness profile. We conducted bivariate analyses, including chi-square and Generalized Linear Model analyses, to test whether the characteristics of children differed by school readiness profile membership. We also conducted multivariate logistic regression analyses to examine how a set of background characteristics predicted profile membership.

3.2.3.2. The relationship between school readiness profiles and later outcomes. We conducted OLS regressions to examine the extent to which school readiness profile membership at the beginning of kindergarten predicted children's outcomes at the end of first grade, controlling for background characteristics and kindergarten-year experiences. To control for sample clustering and the stratified sample design of the ECLS-K, differences in descriptive characteristics and multivariate models were run in SAS-callable SUDAAN, which adjusts standard errors and the significance of estimates (Shah, Barnwell, & Beiler, 1997). All means, frequencies, and multivariate results are weighted and all *N*s are unweighted.

For these analyses comparing children with different school readiness profiles, we used the social/emotional and health strengths profile as our reference group. Effect sizes are calculated comparing first grade child outcomes for children in this group with children in other profiles at kindergarten entry. As can be seen by comparing the four profiles in Fig. 1 from Study 1, the social/emotional and health strengths profile had levels of performance on language and cognition skills below the mean, as did the health risk and social/emotional risk profiles. These latter groups differ primarily in the dimensions of health and social/emotional development. Furthermore, the social/emotional and health strengths profile differed from the comprehensive positive development profile primarily on language and cognition skills.

3.3. Results

3.3.1. School readiness profile demographic characteristics

Table 1 presents average characteristics for the full sample of first-time kindergartners and for kindergartners by school readiness profile membership. We found significant differences for most background characteristics by profile membership. All significant differences shown on Table 1 are at the $p < .001$ level. Note, however, that although significant, the size of difference in age between profiles is small and varies by one-half month to $1\frac{1}{2}$ months (5.62–5.76 years).

Kindergarteners with a comprehensive positive development profile were most likely to have individual and family background characteristics deemed more economically and socially advantaged than children with other profiles.

[5] Item Response Theory uses the pattern of right, wrong, and omitted responses to the items actually administered in a test and the difficulty, discriminating ability, and "guess-ability" of each item to estimate the score the child would have achieved if all of the items of the test had been administered (see p. 3-2 of the ECLS-K Users Guide).

Kindergarteners with a comprehensive positive development profile were more likely than kindergartners in the other readiness profiles to be female, non-Hispanic White, and were less likely to have been born at a low birth weight. Their family backgrounds were also more economically advantaged. Kindergartners with a comprehensive positive development profile were more likely than other kindergartners to have two parents (biological or adoptive) at home, lower average household size, and more likely to be living in households where English is spoken in the home. Children with this profile were also more likely than other children to have parents who were older, had higher levels of education and income, and were married at the mother's first birth.

In addition to the differences between the comprehensive positive development profile and the other three profiles, each remaining profile had certain socio-demographic features that distinguished it from the others. For example, children with a social/emotional and health strengths profile were the least likely to live in a household where English was spoken at home. Children with a social/emotional risk profile were distinguished by being the least likely to live in a household with two biological/adoptive parents.

It is noteworthy that children with a health risk profile were more likely than other children to possess some form of a limiting condition or disability at kindergarten entry. Almost 30% of the children in this profile had some form of limiting condition. Nevertheless, children with disabilities were present in the other three profiles as well: almost 20% of children with a social/emotional risk profile, 2% of those with a social/emotional and health strengths profile, and almost 7% of those with a comprehensive positive development profile had a disability (see Table 1). To test whether the presence of a limiting condition or disability was the only major distinguishing health feature of the health risk profile, we examined the other measures of physical well-being and motor development across the profiles (in analyses not presented). We found that children with a health risk profile were also less likely to be of normal weight and to possess adequate fine and gross motor skills than children with the other profiles. These analyses confirm that this profile is not solely comprised of children with disabilities, but represents children with a variety of health-related issues.

In addition, the social/emotional risk profile and the health risk profile shared many characteristics. Children with these profiles were more likely than children from the two "strengths" profiles to be from economically disadvantaged households. Children with these profiles had parents with the least education, families with the lowest incomes, and had mothers who were more likely to have been teenagers and/or unmarried at their first birth. In addition, the children were more likely to be male and to be born at a low birth weight.

To further explore the relationship between school readiness profile membership and background characteristics, we conducted multivariate regression models to examine how background characteristics function as simultaneous predictors of school readiness profiles. For the multivariate regression models, we limited our set of covariates to seven due to issues related to multicollinearity. For instance, family income and parental educational attainment were too closely related to be in the same regression models; we therefore used a single measure of household socioeconomic status (SES) in the analyses. This is a variable from the dataset that combines information from multiple sources, including parent education and income, to determine a household SES. Table 3 presents logistic regression results predicting membership in each of the four school readiness profiles. These multivariate analyses validate bivariate analyses indicating that children from more disadvantaged backgrounds were more likely to fall within one of the two "risk" profiles and children from more advantaged backgrounds were more likely to have a comprehensive positive development profile.

3.3.2. School readiness profiles and later outcomes

We tested the extent to which school readiness profile membership at the beginning of kindergarten predicted children's outcomes at the end of first grade, controlling for background characteristics and kindergarten-year experiences. The categorical variable for school readiness profile (with the social/emotional and health strengths profile as the reference group) and demographic and school control variables were regressed upon school achievement and social adjustment outcomes measured in first grade. Table 4 presents the results from these analyses.

In general, we found that the comprehensive positive development profile performed the best across most of the outcomes. Children with the health risk and social/emotional risk profiles performed worse than the children with the social/emotional and health strengths profile on all measures. Depending on the outcome measure, children with the health risk or social/emotional risk profile scored the lowest of all four profiles. The rest of this section discusses the findings by outcome measure, reporting effect sizes.

Table 3
Logistic regression results predicting membership in the school readiness profiles from background characteristics (weighted)

Characteristic	Comprehensive positive development profile		Social/emotional and health strengths profile		Social/emotional risk profile		Health risk profile	
	OR	(Significance)	OR	(Significance)	OR	(Significance)	OR	(Significance)
Child assessment age (years)	2.60	***	.98		.74	***	.46	***
Mother was a teen mother	.69	***	.98		1.20	**	1.20	***
Gender								
Female	1.56	***	1.22	***	.59	***	.70	***
Child's race/ethnicity								
(White)	(1.00)		(1.00)		(1.00)		(1.00)	
Black	.93		.90		1.23	*	1.03	
Hispanic	.62	***	1.35	***	.84		1.14	
Other	.73	**	1.38	***	1.28	**	.77	***
Family type								
(2 biological/adoptive parents)	(1.00)		(1.00)		(1.00)		(1.00)	
1 biological/1 step parent	.74	***	.80	***	2.20	***	1.06	
1 biological or other parent type	.77	***	.86	***	1.79	***	1.04	
Household SES (1-5)	1.51	***	.95	**	.78	***	.80	***
Low birth weight	.67	***	.92		1.25	*	1.34	***
n	5,229		5,845		2,280		3,865	

Note that *n* for these models is 17,219.
* $p < .05$.
** $p < .01$.
*** $p < .001$.

For a measure of approaches to learning, we used the teacher's assessment of how often the child works to the best of his/her ability. Holding all background characteristics constant, children with the health risk and social/emotional risk profiles were assessed at lower frequencies of working at their best ability than children with the social/emotional and health strengths profile (i.e., the comparison group). Specifically, children with the health risk profile were rated one-quarter of a standard deviation below children with the social/emotional and health strengths profile (ES = −.24). Similarly, children with the social/emotional risk profile were rated one-half of a standard deviation below the comparison group (ES = −.50). Conversely, teachers of children with the comprehensive positive development profile reported higher levels of the child working at best ability, holding background characteristics constant (ES = .21). Using the response categories for this particular measure, children with the comprehensive positive development profile were rated between "usually" to "always" performing at the best of their ability, whereas, the children with the health risk and social/emotional risk profiles were only rated as "seldom" to "usually" performing at the best of their ability.

For measures of cognitive and language development, we used math and reading IRT scores from the end of first grade. Net of the set of background characteristics, children with the comprehensive positive development profile performed the best on both the math and reading assessments (see Table 4). This profile scored about one-half of a standard deviation better than the comparison group on the reading measures (ES = .55) and on the math measures (ES = .42). In contrast, children with the health risk profile and social/emotional risk profile performed about one-half of a standard deviation below the comparison group on both math and reading assessments (math: ES = −.53 and −.42, respectively; reading: ES = −.40 for both), net of other characteristics.

For a measure of social and emotional development, we examined the first-grade teachers' ratings of each child's level of self-control. After controlling for other variables, children with health risk or social/emotional risk profiles had lower self-control ratings than the comparison group. Children with a health risk profile were one-fifth of a standard deviation below the comparison group on this measure (ES = −.19), while children with a social/emotional risk profile were about two-thirds of a standard deviation below the comparison group (ES = −.65).

For a measure of physical well-being, we examined parent's ratings of each child's general health. After controlling for other variables, children with health risk or social/emotional risk profiles had lower general ratings of health, compared to the social/emotional and health strengths profile. Children with a health risk profile were more than a

Table 4
OLS regression models predicting spring first grade outcomes from the school readiness profiles (weighted)

Profile/Characteristic	Model 1: freq. child works at best ability		Model 2: IRT math score		Model 3: IRT reading score		Model 4: teacher rating of self-control		Model 5: parent rating of child health	
	Beta	(S.E.)	Beta	(S.E.)	Beta	(S.E.)	Beta	(S.E.)	Beta	(S.E.)
School readiness profile										
1 (Comprehensive positive development)	.14	(.02)***	3.37	(.21)***	6.54	(.34)***	.01	(.02)	.01	(.02)
2 (Social/emotional and health strengths)										
3 (Social/emotional risk)	−.32	(.03)***	−3.37	(.37)***	−4.73	(.52)***	−.38	(.03)***	−.09	(.03)**
4 (Health risk)	−.15	(.02)***	−4.21	(.26)***	−4.75	(.36)***	−.11	(.02)***	−.21	(.03)***
Child age	.13	(.02)***	3.80	(.28)***	3.55	(.48)***	.11	(.02)***	−.06	(.03)
Gender										
Female	.20	(.01)***	−1.00	(.17)***	1.58	(.28)***	.18	(.01)***	.03	(.02)
Child's race/ethnicity										
(White)										
Black	−.06	(.02)**	−3.63	(.32)***	−1.98	(.54)***	−.11	(.03)***	−.17	(.04)***
Hispanic	.02	(.02)	−1.76	(.32)***	−1.20	(.48)*	−.01	(.02)	−.17	(.03)***
Other	.05	(.03)*	−1.89	(.52)***	−.80	(1.12)	−.01	(.03)	−.20	(.05)***
School type										
Private	.00	(.03)	.34	(.30)	1.39	(.59)*	−.06	(.03)*	.07	(.02)**
Kindergarten program type (full day)										
Half day	.01	(.02)	−.27	(.28)	−.45	(.44)	.04	(.02)*	.00	(.02)
Kindergarten class size	.00	(.00)	.02	(.03)	.01	(.04)	.00	(.00)	.00	(.00)
Kindergarten teaching experience										
0 to <3 years	−.02	(.02)	−.50	(.25)*	−1.05	(.45)*	.00	(.02)	−.04	(.02)
3 to <6 years	−.02	(.02)	−.44	(.25)	−.81	(.38)*	.01	(.02)	−.02	(.02)
(6+ years)										
Teacher preparation										
Median education coursework (coursework below median)	−.03	(.01)*	−.02	(.23)	.00	(.35)	−.01	(.02)	.03	(.02)
Family type										
2 biological/adoptive parents)										
1 biological/1 step parent	−.06	(.03)*	−.53	(.36)	−1.04	(.54)	−.16	(.03)***	−.05	(.05)
1 biological or other parent type	−.10	(.02)***	−.60	(.23)**	−1.56	(.41)***	−.14	(.03)***	−.07	(.03)**
Household SES (1–5)	.03	(.01)***	1.45	(.09)***	2.09	(.14)***	.02	(.01)***	.08	(.01)***
Teen mother	−.03	(.02)	−.49	(.29)	−1.00	(.43)*	−.02	(.02)	.01	(.03)
Low birth weight	−.04	(.03)	−.68	(.33)*	−1.14	(.46)*	.03	(.03)	−.02	(.04)
N	12,134		13,354		13,140		12,093		12,348	
R squared	13.7%		32.2%		28.6%		12.8%		7.3%	

* $p < .05$.
** $p < .01$.
*** $p < .001$.

quarter of a standard deviation below the comparison group (ES = −.28) and children with the social/emotional risk profile were about one-tenth of a standard deviation below the comparison group (ES = −.12) on the measure of general health.

To summarize findings by school readiness profile membership, children who entered kindergarten with a comprehensive positive development profile were performing the best on the math and reading assessments and teacher's ratings of works to the child's best ability at the end of first grade, even after controlling for differences based on socio-demographic background characteristics, characteristics of the child, and characteristics of the kindergarten-year experience. There were no differences between the comprehensive development profile and the social/emotional and health strengths profile on the measures of self-control and general health. Children with a social/emotional risk profile were performing poorly on the math and reading assessments. They also were rated the lowest by their teachers on self-control and works to their best ability. The children with a health risk profile were also performing poorly on the math and reading assessments and were rated the lowest by their parents on the measure of general health.

3.3.3. Discussion

In Study 2, we explored whether family socio-demographic and child characteristics are associated with the four different profiles of school readiness. As expected, we found that children from more advantaged backgrounds, such as children from intact families with higher incomes, were more likely to have strengths in all dimensions of school readiness, whereas children from more disadvantaged backgrounds, such as those born at a low birth weight or to a teenage mother, were more likely to be at-risk in some developmental domains at school entry. These results are consistent with previous research, which finds that children with socio-demographic risk factors perform at lower levels on academic skills, especially at kindergarten entry, compared to children with few risk factors (Denton & West, 2002; National Research Council and Institute of Medicine, 2000).

As noted above, all profiles had at least one socio-demographic characteristic that distinguished it from the other profiles. For example, it appears that children for whom English is not the primary home language are more likely to be in the social/emotional and health strengths profile. It is possible that, as their English language skills improve, children with this profile will be able to excel in all aspects of development. Nevertheless, children with this profile are performing better than those with the two "risk" profiles on math and reading outcomes in first grade.

We found that the four profiles of school readiness differentially predict to the children's academic and social adjustment at the end of first grade net of child, family, and kindergarten-year characteristics. Based on this study's findings, we can conclude that having developmental strengths across the board at kindergarten entry is the best predictor for later school success, even after controlling for family, child, and kindergarten classroom characteristics. The children who are most likely to experience continued difficulties in early elementary school are those performing poorly on most of the dimensions of development at kindergarten entry, and who are especially at-risk in terms of health and social/emotional skills. The effect sizes associated with these differences are rather striking.

4. General discussion

The present studies provide information on how the multiple dimensions of development co-occur within individuals at kindergarten entry, and how these aspects of development collectively predict to later academic and social adjustment. In Study 1, we found that the dimensions of school readiness co-occur within individual children in four distinct patterns and that different threshold criterion produced similar profile patterns. Cluster analyses revealed four profiles at kindergarten entry within this nationally representative sample of first-time kindergartners: comprehensive positive development, social/emotional and health strengths, social/emotional risk, and health risk. In Study 2, we found that children with one of the two "risk" profiles were more likely to be from families with multiple socioeconomic disadvantages. In addition, all four profiles differentially predict academic and social adjustment in early elementary school. Children with a risk profile performed the worst on all outcomes; children with a comprehensive positive development profile performed the best.

A strength of the present studies is the inclusion of physical well-being and motor development measures within the examination of children's school readiness. Although chronic illness in elementary school has been cross-sectionally associated with school achievement and absence (Brown, Grubb, Wicker, & O'Tuel, 1985; Cook et al., 1985; Fowler et al., 1985; Wolfe, 1985), little is known about the longitudinal prediction from health status in early childhood to later academic outcomes and school adjustment. The present studies include multiple measures of children's physical

development such as height, weight, gross and fine motor skills, disabilities, and a general rating of health. The emergence of a health risk profile among this nationally representative sample highlights physical well-being and motor development as an important component of school readiness.

The results of the present study confirm that language and cognitive skills, although important components of school readiness, are not the only relevant factors that predict later school success. Below-average language and cognition skills *in combination with* severely poor health or a lack of social skills at the beginning of kindergarten predicts the lowest scores on math and reading assessments at the end of first grade. Furthermore, below-average language and cognition skills *in combination with* severely limited social/emotional skills at the beginning of kindergarten predict the lowest ratings on self-control and classroom motivation at the end of first grade. These results suggest that assessments of children's readiness for school should encompass not only children's cognitive and literacy abilities, but also their health and their social and emotional well-being. Furthermore, these results suggest that a focus on interventions to bolster early health and social/emotional development is needed along with interventions targeting language and cognition. Currently, substantial research is focusing on interventions for social/emotional development, with new research centers funded to focus specifically on this topic (Raver, 2002). Interventions and policy initiatives to improve children's early health also exist, including programs to enhance prenatal care, secure a medical home for children, provide full immunizations, conduct early screenings for disabilities, and enhance infant and toddler nutrition. Efforts to inform the public and other key constituents on the importance of the *multiple* dimensions of school readiness are also needed.

The findings of these studies suggest that communities would be wise to invest in early childhood care and education programs and community-based parenting programs that emphasize supporting children's health and social/emotional well-being. Indeed, in recent years, many states across the country have begun to invest in community-based programs and services for families with children ages zero to five with the aim of improving school readiness of all children (see, for example, statewide initiatives in North Carolina, South Carolina, Rhode Island, and California). Strategies that have been adopted by particular states include strengthening all kinds of early childhood care and education (ECCE) programs (e.g., child care centers, family child care homes, Head Start programs, etc.), developing effective processes for transitioning from ECCE settings to formal schooling, promoting health screenings, and/or providing supports for parents such as parenting classes, literacy classes, and job placement services. A common characteristic of these community-based initiatives is that they target multiple aspects of children's development, and they also attempt to strengthen family and community supports for school readiness. Another common characteristic of these initiatives is their focus on *all* children in the community/state, not just those at highest risk (although it is often understood that high-risk populations need more intensive or extensive services).

Study 2's findings show that the children with the two "risk" profiles had multiple socio-demographic risk factors among their background characteristics (e.g., low income, single and/or teen parent, minority, etc.), while children with strengths across all dimensions of school readiness were generally from more advantaged backgrounds (e.g., less likely to be of a minority background, of a low birth weight, or a child of a single or teen parent). These findings suggest that targeted interventions aimed at children who share particular background risk factors may be efficient and worthwhile efforts to help children develop school readiness skills. Targeting both prevention programs (e.g., immunizations, nutrition) and early intervention programs (e.g., nurse home visits during the perinatal period) to specific populations may enhance the health-related outcomes of children, and may, in turn, enhance their developmental trajectories. One example of an early intervention program for which there is evidence of improved outcomes for children, including health outcomes, is the "Nurse Home Visiting Program." This model educates young, low-income, first-time mothers about the importance of prenatal care and teaches parenting skills and knowledge of developmental milestones to these young parents. Nurse visits start before the child is born and continue through the child's second birthday. Evaluations of this model find that children have improved birth outcomes and child health through age two (Olds et al., 1999). Furthermore, the fact that children at risk in at least two dimensions of school readiness were all more likely to be children born to women who were teenagers at their first birth might suggest that programs to prevent teen pregnancy in the first place should be strengthened.

In addition to early intervention prior to school entry, strategies need to be identified to support children who enter school with fewer developmental strengths. Researchers have suggested that the most important school readiness practice is to individualize instruction to the child's needs (May & Kundert, 1997). Some of these strategies already exist for reading and math (e.g., small group or pull-out instruction for these subjects) and for health (e.g., onsite school nurse, occupational therapist or physical therapist; required physical education classes), but not all children who need

these services may have access to them. In addition, fewer supports are usually available within public schools for children with limited social and emotional skills (e.g., professional onsite social skills training). School success has also been associated with schools that emphasize collaboration across grade levels, value the family-school connection, and utilize flexible and appropriate instruction (Mantzicopoulos, 2003).

The present study is one of the few to examine the profiles of school readiness in a nationally representative sample of entering kindergarteners using a person-centered approach. To our knowledge, this study is the first to include early health status as a component of school readiness profiles. Future studies of school readiness should attempt to replicate the profiles of school readiness that we have found in children entering kindergarten. While our four profiles of children make conceptual and practical sense, our findings bear further confirmation in other datasets and samples.

The socio-demographic characteristics that distinguished the profiles suggest that a deeper examination is needed of cultural variation in the expectations for – and the assessment of – school readiness. It is possible that, for children from language-minority or immigrant backgrounds, the social and emotional components of development are more important indicators of school readiness than are language and literacy skills. This would be consistent with our finding that more non-English speakers had a profile that included social/emotional and health strengths, but weaker cognitive and language skills at kindergarten entry. In addition, it is also possible that the assessments used in the ECLS-K did not adequately capture the skills and competencies of children who differed linguistically or culturally from the norm.[6] Indeed, many of the assessments of developmental skills currently available for use with English-language learners at kindergarten entry and throughout the early years of schooling have various limitations, including not meeting technical standards for reliability or validity, or containing culturally unfamiliar or inappropriate materials (NAEYC, 2005). The National Association for the Education of Young Children (NAEYC) recommends the development of new screenings and assessments for young English-language learners (NAEYC, 2005).

The relationships that emerged between the school readiness profiles and early elementary school outcomes generally make sense, but there are other factors that could contribute to these associations. For instance, the quality of the student's kindergarten year experience was significantly related to a child's math and reading assessment scores in first grade, even after controlling for other demographic characteristics and taking into account a child's school readiness profile (see Table 4). This finding suggests that there may be characteristics about the school and/or learning environment that could interact with a child's school readiness profile to affect the child's academic performance. For example, future research could explore the degree to which teachers' approach to teaching kindergarten moderates the relationship between school readiness profiles and later child outcomes. Previous research has indicated that an academically-focused kindergarten experience can benefit children's approaches to learning by fostering greater persistence towards goals and preference for challenge, yet an overly academically-focused kindergarten can also slow academic progress, especially for boys (Elkind, 1987; Marcon, 2002), and is associated with poor socioemotional outcomes such as negative affect and increased dependence (Stipek et al., 1998). An individualized, child-initiated learning experience in preschool is believed to meet the child's developmental needs (Elkind, 1996, 2000; Marcon, 1993, 2002), and may be associated with long-term gains in IQ (Miller & Bizzell, 1984). Collectively, these previous findings suggest that all children may benefit more from individualized and less academically-focused instruction in kindergarten, but it may be that children with particular school readiness profiles will respond better to teachers who use an individualized and less academically-focused approach in their classrooms. In addition, further research should explore how characteristics of the school and classrooms across the early elementary years might moderate the relationship between children's initial readiness and their subsequent academic and social outcomes. For example, researchers could examine how or whether school resources and services for children with one of the "risk" profiles (e.g., free and reduced lunch programs, on-site nurse, programs for limited English proficiency, etc.) might serve as possible moderators for school success.

Furthermore, the implications for school readiness should be examined into later elementary and secondary school. Extending analyses of school readiness profiles to include trajectories of growth in language, math, and social skills through elementary school would provide a strong foundation for the importance of school readiness, and specifically, for having strengths in particular components of development. For example, we would want to examine the possibility

[6] Children who did not pass an English language screener were not administered a reading assessment in the ECLS-K. Spanish-speaking children who did not pass the English language screener were administered a Spanish version of the math assessment and assessments of fine and gross motor skills.

that if trajectories were followed into later schooling, children with the social/emotional and health strengths profile would "catch up" academically to the children with the comprehensive positive development profile. It is possible that being physically healthy and having social skills at kindergarten entry will allow these children to obtain the language and cognition skills needed for later strong academic achievement, but that more time is needed to observe this pattern.

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