Changes in School Readiness of America's Entering Kindergarteners, 1998-2010

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Abstract

This chapter documents changes in school readiness among entering kindergarteners across the years 1998–2010, a period characterized by dramatic changes to the early childhood landscape. I use a broad definition of school readiness that includes not only academic skills such as reading and math knowledge but also social and emotional skills and physical health. The most striking changes over time are large increases in children's math and literacy proficiency. These gains were even larger among low-income and black children, suggesting that early income and race-based achievement gaps have narrowed over time. However, this chapter also documents some concerning trends over time. Children's self-control and their approaches toward learning got worse across this period. Children were also more likely to be obese or overweight in 2010 than in 1998. These increases were largest among low-income and minority children, so racial/ethnic and income-based gaps in obesity have gotten larger. Taken together, the evidence suggests that children's school readiness has improved in some ways and declined in others across the years considered. Implications for policy and practice are discussed.

Keywords: early childhood; school readiness; children's development; kindergarten achievement; achievement gaps

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Over the past few decades, a large body of evidence has demonstrated that early childhood is a crucial period of development. This period is a particularly malleable time in the life course, and in many ways it sets the stage for what will follow. Indeed, children's skills and abilities in early childhood are predictive of outcomes well into the future, including school achievement, college attendance, home ownership, earnings, and retirement savings (Shonkoff & Phillips, 2000; Heckman, 2006; Chetty et al., 2011). For these reasons, the skills that children have when they enter the kindergarten classroom can have important consequences for their long-term development.

However, by the time children arrive in kindergarten, large skill gaps based on race/ethnicity and income have already developed. At kindergarten entry, white children demonstrate significantly better skills in literacy and math than black or Hispanic children (Reardon, Robinson-Cimpian, & Weathers, 2015). The highest income children outperform the lowest income children by an even wider margin. Income-based achievement gaps have grown considerably over the past fifty years, and achievement gaps between the highest and lowest income children are now nearly twice as large as those based on race or ethnicity (Reardon, 2011). Gaps that develop early in life tend to persist as children proceed through school, as children who lag initially tend to remain behind (Fryer & Levitt, 2004; Reardon, 2011).

Although differences between students based on race/ethnicity and income are often framed as "achievement gaps," there are also important gaps in student behavioral skills at kindergarten entry. For instance, black and Hispanic children exhibit poorer attention skills than white children, and black children also exhibit disproportionately higher levels of disruptive behavior. Low-income children are more likely to exhibit conduct and hyperactivity problems than higher-income children (Duncan & Magnuson, 2011; Waldfogel & Washbrook, 2011). These differences in behavior can have negative consequences for low-income and minority students, because non-academic skills affect school success both directly and indirectly (Heckman, 2006).

The persistence of early skill gaps, and the growing understanding of the importance of early childhood in the life course, has led to a sharp recent increase in public support for early childhood education (Barnett et al., 2016). Given this substantial recent investment, it is useful to examine whether and how much children's school readiness has improved across this period. The present chapter aims to address this question through three key tasks: 1) providing a comprehensive definition, both theoretical and operational, of school readiness; 2) documenting changes in school readiness across two nationally representative samples of entering kindergarteners in the US from 1998 to 2010; and 3) highlighting how race/ethnicity and income-based gaps in school readiness have changed across the same period. In providing this descriptive snapshot of how kindergarten readiness has changed over time, I draw on both extant research and original analysis. Importantly, I do not aim to identify the underlying causes of changes over time. However, in the final section I provide some context for the changes documented and speculate on potential causes.

Defining "school readiness"

School readiness is a complex and multidimensional concept that teachers, parents, researchers, and policymakers have debated about how best to define and measure for decades (Meisels, 1998; Carlton & Winsler, 1999; Blair, 2002; Mashburn & Pianta, 2006). A growing body of literature argues that school readiness occurs not just as a function of children's skills and knowledge, but as an interplay between children, schools, parents, and communities. With the acknowledgement that parents, schools, and communities play an important role in determining whether children thrive in school, this chapter focuses exclusively on the skills and knowledge that children bring to the classroom, and how those skills have changed over a 12-year period from 1998-2010. The chapter will focus on the following five broad domains of kindergarten readiness, first outlined in the 1995 National Education Goals Panel (Kagan, Moore, & Bredekamp, 1995):

1. Social and emotional development
2. Approaches toward learning
3. Language and literacy
4. Cognition and general knowledge (including math and science)
5. Physical well-being and development

These domains have served as a template for state standards across the country (Scott-Little, Kagan, & Frelow, 2006) as well as the recently adopted Head Start Early Learning Standards (U.S. Dept. of Health & Human Services, 2015). Importantly, they do not cover *all* areas in which we might want children to excel. For instance, parents, educators, or society at large may place high value on such things as art, music, creativity, or morality (Snow & Van Hemel, 2008). Further, these skills should not be thought of as a prerequisite for success in kindergarten. In fact, often the children that could benefit most from educational instruction are those that might be deemed "not ready" by a score on a specific assessment (Meisels, 1998). Despite these limitations, documenting changes over time along these domains at school entry allows for an examination of how children's skills and attributes have changed across a period characterized by intense interest and investment in early childhood.

To summarize recent changes in school readiness, this chapter synthesizes findings from three recent articles, all of which use data from two kindergarten cohorts of the Early Childhood Longitudinal Study (ECLS-K) (Bassok & Latham 2017; Reardon & Portilla 2016; Bassok, Finch, Latham, Reardon, & Waldfogel, 2017). The two ECLS-K studies used multi-stage sampling designs to achieve nationally representative samples of children entering kindergarten in 1998 and 2010, respectively. Both studies include information about all five of the school readiness domains outlined above (Hair et al., 2006), collected in the fall of the kindergarten year. The similarity in both study design and assessments used in the two ECLS-K cohorts provides an opportunity to examine how the skills of kindergarteners across the nation have changed across this 12-year period.

Documenting changes in school readiness from 1998-2010

In the following sections, I describe each of the five domains of school readiness in more detail. I explain why each is important, outline the measures that are available in the ECLS-K, and describe how kindergarteners compare on each of these domains across the two cohorts. The results across all five domains are summarized in Tables 1-4. Table 1 presents changes over time in *levels* of student outcomes for all students. Tables 2 and 3 show changes over time in levels separately by race/ethnicity and by income. Table 4 shows changes over time in race/ethnicity and income-based *gaps*. I include the same outcomes across tables where possible, but in some cases identical measures were not available due to differences across studies.

Changes in social and emotional development from 1998-2010

Definition and importance of social and emotional development

While there is broad consensus among parents, teachers, and researchers that social and emotional development is important for young children, this term is difficult to define and to measure. It encompasses a wide range of skills, many of which are internal and thus not directly observable. Important components of social and emotional learning include social competence, self-regulation, and maladjustment. Social competence reflects how a child interacts with and gets along with others. This may include the ability to communicate needs and wants effectively, and be sensitive to the needs of others. Self-regulation is the ability to manage and channel powerful emotions constructively, and to focus attention. Maladjustment includes symptoms that interfere with a child's ability to function either at home or among peers. These symptoms may affect a child internally or be expressed externally (Snow & Van Hemel, 2008).

Social and emotional development plays a crucial role in how children develop relationships with the peers and adults in their lives, both of which are critical for success in school. Children who enjoy positive relationships with other students and with teachers are likely to enjoy school more and to learn more easily. Social and emotional skills are particularly important for children making the transition to school, and kindergarten teachers consistently rate these skills as more important for kindergarten readiness than knowledge of academic content (Lin, Lawrence, & Gorrell, 2003; Abry, Latham, Bassok, & LoCasale-Crouch, 2014). Children with greater social and emotional skills participate more in class, are more accepted by classmates and teachers, and receive more positive feedback from teachers (Domitrovich, Cortes, & Greenberg, 2007). Those who are unable to regulate their emotions are likely to experience higher levels of stress in the classroom, which can negatively affect their ability to learn (Blair & Diamond, 2008).

Social and emotional skills early in childhood can also have consequences that last beyond kindergarten. Negative child behavior in kindergarten is associated with conduct problems, learning problems, increased shyness, and higher anxiety through eighth grade (Hamre & Pianta, 2001). Young children who lack friendships are at risk for poor emotion regulation later in life (Vandell, Nenide, & Van Winkle, 2006). By contrast, children with better social and communication skills in kindergarten had better employment outcomes, less criminal

activity and substance use, and better mental health as young adults (Moffitt et al., 2011; Jones, Greenberg, & Crowley, 2015).

Social and emotional skills also have direct implications for children's academic success. Children who enter school without the ability to pay attention, listen to instructions, and demonstrate self-control are more likely to struggle in elementary and middle school (McClelland et al, 2007; Turney & McLanahan, 2015). Children who exhibit problem behaviors in early childhood are less likely to graduate high school (McLeod & Kaiser, 2004), and attention span at age 4 is even predictive of college completion rates (McClelland et al., 2013).

Measures of social and emotional development

In the fall of kindergarten, children's behavior was assessed using an adapted form of the Social Skills Rating System (Gresham & Elliott, 1990). This assessment has been widely used to measure the social and emotional skills of young children (e.g. Duncan et al., 2007; Claessens et al., 2009). Teachers were asked to rate the frequency of student behaviors on a 1-4 scale from *never* to *very often*. These items were combined into four subscales: self-control, interpersonal skills, externalizing problem behavior, and internalizing problem behavior.

The self-control subscale contains items relating to children's ability to respect others' property, control temper, accept peer ideas, and respond appropriately to peer pressure. The interpersonal behavior scale measures whether children are able to form and maintain friendships, get along with people who are different, comfort or help other children, express feelings, ideas, and opinions in positive ways, and show sensitivity to others. For each of these two subscales, higher scores are an indication of more positive behavior.

The externalizing problem behavior scale is a measure of how often a child argues, fights, gets angry, acts impulsively, or disturbs classroom activities. The internalizing problem behavior measures anxiety, loneliness, low self-esteem, and sadness. For each of these two subscales, higher scores are indicative of *worse* behavior. Split half reliabilities for all four of the subscales are high, ranging between .76 and .92. across both cohorts (Tourangeau et al. 2001; Tourangeau et al., 2015).

Changes in levels of social and emotional skills

Bassok & Latham (2017) examined changes from 1998-2010 across the four measures of social and emotional development described above. Teacher responses to these items were highly skewed, in that teachers reported that most children were well-behaved. For that reason, they constructed indicators of "poor" behavior. Specifically, they examined changes in the percentage of children who exhibited *low* levels of self-control and interpersonal behavior (i.e. 1 standard deviation [SD] below the 1998 mean) and *high* levels of internalizing and externalizing behavior (i.e. 1 SD *above* the 1998 mean). These results are reported in Table 1. Bassok and Latham document a small but statistically significant increase in the percentage of children who exhibited poor self-control (16.7% in 2010

compared with 15.3% in 1998), indicating worse behavior in the more recent cohort. By contrast, they document a decrease in the percentage of children who exhibited high internalizing behavior (9.1% in 2010 compared with 11.7% in 1998), indicating *better* behavior in the more recent cohort. They found no evidence of changes over time in poor interpersonal behavior or high externalizing problem behavior (Bassok & Latham, 2017). Overall, they do not find much evidence that children's behavior either improved or declined substantially on these measures across the 12-year period.

Changes in race/ethnicity and income-based gaps in social and emotional skills

Table 4 shows changes in gaps over time on the four measures from Bassok and Latham (2017) using the same approach of Reardon and Portilla (2016), focusing on the white-black, white-Hispanic, and 90/10 gaps (i.e. the gap between children at the 90th and 10th income percentiles).

In 1998, there were large differences between white and black children across these measures. Black children were about 10 percentage points more likely to be rated as having poor self-control, and about 9 and 8 percentage points more likely to exhibit poor interpersonal or high externalizing behavior, respectively. Across the period considered, the gap in interpersonal behavior declined modestly, by 1.8 percentage points, but gaps in self-control and externalizing behavior were largely unchanged.

The gaps between white and Hispanic children on these measures were considerably smaller in both cohorts. In 1998, Hispanic children were 3.2 percentage points more likely to demonstrate poor interpersonal behavior than white children, and 1.6 percentage points more likely to demonstrate high internalizing behavior. Although the white-Hispanic gap in self-control was just .9 percentage points in 1998, this grew significantly to 3.4 percentage points in 2010. This change reflects a relative increase in poor self-control among Hispanic children (Table 2).

There were also large gaps between children at the 90th and 10th income percentile on all four of the measures considered. For instance, lower-income children were about 9 percentage points more likely to demonstrate poor self-control and 8 percentage points more likely to demonstrate poor externalizing behavior. These gaps did not change significantly across the period considered. By contrast, gaps in both interpersonal behavior and internalizing behavior declined over time (Table 4). These declines were primarily driven by relative declines in poor behavior among low-income children (Table 3).

Changes in approaches toward learning from 1998-2010

Definition and importance of approaches toward learning

Approaches toward learning influence the way children both think about and act upon opportunities to learn. Although this domain is closely related to social and emotional learning, it is conceptually distinct. Specifically, it reflects a range of attitudes, habits, and

learning styles, rather than a set of skills. Children with positive approaches toward learning can attend to relevant tasks and persist in the face of difficulty, as well as use strategy to solve problems and show flexibility when strategies don't work out. They are curious, creative, and cooperative when engaging in learning activities (Fantuzzo, Perry, & McDermott, 2004).

Although this is generally the least well-researched of the five domains considered, it has recently gained attention as a crucial component of children's ability to succeed in school. Positive approaches toward learning have been found to be uniquely associated with early academic success, above and beyond cognitive ability and social engagement (McWayne, Fantuzzo, & McDermott, 2004; Yen, Konold, & McDermott, 2004). Children with positive approaches toward learning earn better grades, see faster growth in math and reading ability, and have reduced risk of academic failure (Schaefer & McDermott, 1999; Fantuzzo, Perry, & McDermott, 2004; DiPerna, Lei, and Reid, 2007; Li-Grining et al., 2010). These positive dispositions may be particularly beneficial among low-income children, who often face additional barriers to academic success (Fantuzzo et al., 2007).

Measures of approaches toward learning

The ECLS datasets contain a broad measure of approaches to learning that was adapted from the Social Skills Rating System (Gresham & Elliott, 1990). To assess each child, teachers rated six items on a 1-4 scale from *never* to *very often.* Teachers were asked about each child's attentiveness, task persistence, eagerness to learn, learning independence, flexibility, and organization. Their responses were averaged to construct a single score for each child. The split half reliabilities of this measure were .89 in 1998 and .91 in 2010.

Changes in levels of approaches toward learning

Bassok and Latham (2017) examined changes over time in teacher-reported approaches to learning. These distributions were skewed in that teachers rated most children quite high on this measure. For this reason, the authors dichotomized the measure, constructing an indicator for "poor" approaches to learning (i.e. 1 SD below the 1998 mean). They find that kindergarteners in 2010 exhibited poorer approaches to learning than in 1998. Specifically, the percentage of children who had poor approaches to learning increased from 17.4 to 22.8 percent across this period (Table 1).

Changes in race/ethnicity and income-based gaps in approaches toward learning

In Table 4, I document changes in gaps over time in approaches to learning on an identical measure to Bassok and Latham (2017). Black and Hispanic children were about 11 and 6 percentage points more likely to demonstrate poor approaches toward learning than were white children in 1998. Lower-income children were almost 18 percentage points more likely to demonstrate poor approaches toward learning than were higher-income children. Both race/ethnicity and income-based gaps declined modestly across the period considered, but importantly, this was driven by disproportionate increases in poor approaches to learning among white and higher-income children (Tables 2 and 3).

Reardon and Portilla also document gaps in approaches toward learning and find evidence that gaps have declined over time. To maintain consistency in how this domain is measured across summary tables, I do not report those results here.

Changes in language and literacy skills from 1998-2010

Definition and importance of language and literacy skills

Language development allows children to interact and communicate with others, and represent their thoughts and experiences. It is a complex process that involves a wide variety of skills. Two important and distinct components of language development are verbal language and literacy. For children to develop verbal language they must be able to identify and discriminate between different sounds. They must develop a vocabulary of sounds and words, as well as an understanding of grammar. They must also learn how language can be used socially, to give and receive information, and to communicate wants and needs (Kagan et al., 1995). To develop literacy, children must learn the names and sounds of the letters, and learn that words can be broken down into parts and analyzed ("phonological awareness"). They must understand the conventions of print, understand that writing can be used for various purposes, and that reading can provide new and interesting information (Snow & Van Hemel, 2008).

Children with strong early language skills are often successful academically, as development of language and literacy allows children to learn more quickly both inside and out of the classroom. Vocabulary, phonological awareness, and knowledge of letter names and sounds are strongly predictive of reading ability both in kindergarten and in elementary school (Senechal and LeFevre, 2002; Roth, Speece, & Cooper, 2002; Poe, Burchinal, & Roberts, 2004; Schatschneider et al., 2004; Melby-Lervåg, Lyster, & Hulme, 2012; Hulme et al., 2012).

Literacy ability at kindergarten entry is also predictive of long-term outcomes. Children with strong early literacy skills demonstrate stronger reading ability and earn better grades throughout schooling, and are more likely to graduate high school (Duncan et al., 2007; Claessens, Duncan, & Engel, 2009; Watts, Duncan, Siegler, & Davis-Kean, 2014; Magnuson, Duncan, Lee, & Metzger, 2016). They also attend college at higher rates, and have higher earnings as adults (Chetty et al., 2011).

Measures of language and literacy

Children's language and literacy ability was directly measured in the fall of the kindergarten year. This assessment was conducted in two stages. First, children were given a routing test, to roughly determine their ability. Based on how they scored, they were administered either an easy, intermediate, or difficult test in the second stage. The purpose of the two-stage assessment was to maximize accuracy of measurement while minimizing burden on the child. The assessments contained both multiple choice and open-ended items, and included measures of basic skills such as print familiarity, letter recognition,

beginning and ending sounds, rhyming sounds, and word recognition, vocabulary, and reading comprehension (Tourangeau et al., 2001; Tourangeau et al., 2015). These direct assessments allow for comparisons of students within the same cohort, so they may be used to compare achievement gaps over time. Unfortunately, the direct assessments are measured on different scales across cohorts and have not been equated. As a result, they cannot be used to estimate differences in *levels* of student language proficiency over time.

To assess changes in levels of proficiency, children's skills were also assessed by their teachers. Specifically, teachers were asked to rate each child on the following items, on a 1-5 scale from *not yet* to *proficient*:

- Uses complex sentence structures
- Understands and interprets stories read to him/her
- Easily names all upper and lowercase letters
- Predicts what will happen next in stories
- Reads simple books independently
- Demonstrates early writing behaviors
- Understands conventions of print

Unlike the direct assessments, these teacher-reported measures can be compared over time. When combined, these measures provide a broad picture of children's language and literacy skills at kindergarten entry. The reliabilities for these teacher-reported measures were .87 in 1998 and .93 in 2010.

Changes in levels of language and literacy skills

Bassok and Latham (2017) documented changes from 1998-2010 on teacher-reported measures of language and literacy. Comparing the average of the 7 teacher-reported skills described above, they find that student skills increased substantially over time, about .23 SD. More concretely, the authors estimate that students in 2010 entered kindergarten having already learned about 15% of the literacy skills they would acquire across the kindergarten year in 1998. Although this measure is useful for comparisons across time, the scale used is not readily interpretable at either time point. For this reason, these results are omitted from Table 1.

Bassok and Latham also consider changes over time in the percentage of students who demonstrate high and low proficiency across the 7 language and literacy skills. They classify a child as "high proficiency" in literacy if the child was rated as proficient (i.e. 4 or 5 on a 1-5 scale) on at least half of the 7 skills considered. Similarly, they classified a student as "low proficiency" if the child was rated not proficient (i.e. 1 or 2 on a 1-5 scale) on at least half of skills considered. Improvements along these measures over time are reported in Table 1. The percentage of students classified as high proficiency in language and literacy increased from 21.4 to 25.6% from 1998-2010, while the percentage of students classified as low proficiency dropped 8.5 percentage points, from 57.2 to 48.7%.

Changes in race/ethnicity and income-based gaps in language and literacy

Both Reardon and Portilla (2016) and Bassok and Latham (2017) examine whether gaps in student literacy skills have changed over time. Both sets of results are included in Table 4. Reardon and Portilla examined these changes using direct assessments. They document that the white-black gap in language and literacy was approximately .4 SD in 1998. This gap shrunk marginally from 1998-2010, but the decline over time was not significant. Similarly, Bassok and Latham found that when considering teacher-reported outcomes, the white-black gap narrowed over time. For instance, both black and white children were more likely to be proficient in 2010 when compared with 1998, but black children improved by 7.8 percentage points over this time, compared with a 4.1 percentage point improvement among white children (Table 2). Similarly, the percentage of black students who demonstrated low proficiency in literacy *declined* disproportionately across this period, about 10 percentage points (from 63.5 to 54.0%) compared with a 6 percentage point decline among white children (from 47.1 to 41.0%).

Reardon and Portilla were not able to estimate changes over time to the Hispanic-white literacy gap using direct assessments due to changes over time in how these assessments were conducted among Spanish speakers. However, Bassok and Latham examined changes to this gap using teacher-reported outcomes, and found modest evidence that gaps between Hispanic and white children at kindergarten entry had narrowed (Table 4). Specifically, they found that Hispanic children were disproportionately less likely to be classified as low proficiency in 2010. This result was driven by relative gains among Hispanic children. Over this time, the percentage of Hispanic children who demonstrated low proficiency declined by 9.8 percentage points, compared with a 6.1 percentage point decline among white children (Table 2). By contrast, Hispanic children were not differentially likely to be classified as high proficiency in 2010.

Reardon and Portilla also examined changes over time in income-based achievement gaps, comparing students in the 90th percentile of the income distribution to those in the 10th percentile. These estimates are reported in Table 4. They document that in 1998, higher-income children had much stronger language and literacy skills, about 1.26 SD higher than lower-income children. By 2010, this gap had declined modestly to 1.06 SD, but it still reflects a vast gap in skills between the highest and lowest income children. Similarly, in Table 4 I document 90/10 gaps using the teacher-reported measures from Bassok and Latham (2017) and find large gaps that declined modestly over time.

Changes in cognition and general knowledge from 1998-2010

Definition and importance of cognition and general knowledge

Cognition and general knowledge is a broad domain that includes knowledge of specific topics including math, social studies, science, as well as more specific cognitive skills such as attention, executive function, and memory. This domain is generally the one most associated with success in schooling, as it contains a broad array of skills that are valuable to student learning (Kagan et al., 1995).

In this domain, mathematics ability often garners the most attention. At the earliest stages, math education overlaps with language and literacy. For instance, children must learn the language and grammar of counting. They must learn the names of shapes and words denoting quantity, such as "more" and "less." Some math knowledge is dependent on rote memory. This includes number sense (counting, performing simple addition and subtraction) and spatial sense (recognizing shapes and their basic properties). Other knowledge is dependent upon processes of thinking, such as pattern recognition or the ability to compare different objects and classify/sort based on size or other characteristics. Many of these skills develop as a byproduct of everyday activities, but learning can also be accelerated through specific instruction (Ginsburg, Lee, & Boyd, 2008).

Early math skills are foundational to success in school, and math ability at kindergarten entry is strongly linked to success in kindergarten and in the elementary grades (La Paro & Pianta, 2000). Reflecting this, math standards are included in every set of state early learning standards in the U.S. (Scott-Little et al., 2006). These skills are also predictive of academic achievement in high school as well as college attendance and degree attainment (Duncan et al., 2007; Claessens et al., 2009; Chetty et al., 2011; Ritchie & Bates, 2013). Student growth in math knowledge from preschool through first grade is even more strongly predictive of later achievement (Watts et al., 2014).

The consequences of poor math skills also extend beyond the classroom. Adults who exhibit poor math skills have less accurate perceptions of health risks, show poorer judgement when making medical decisions, and have poorer health outcomes overall (Reyna & Brainerd, 2007). They are also more likely to make poor financial decisions (Agarwal & Mazumder, 2013).

Measures of cognition and general knowledge

Among the different components of this domain, the ECLS-K datasets only contain comparable measures of children's math knowledge at kindergarten entry. Similar to the language and literacy assessment, students were assessed in mathematical thinking using a two-stage design. Children were first administered a broad test of ability, and were routed into either an easy, intermediate, or difficult assessment in the second stage to assess their ability more precisely. The math assessment measured the three broad areas of conceptual knowledge, procedural knowledge, and problem solving. Specifically, the assessment contained items relating to number sense, number properties, operations, geometry, spatial sense, data analysis, statistics, probability, patterns, algebra, and functions. Children could use manipulatives to answer some of the items (Tourangeau et al., 2001; Tourangeau et al., 2015). As with the language and literacy measures described above, these direct assessments only allow for comparisons of students within the same cohort, because they are measured on different scales across cohorts that have not been equated. For this reason, they can be used to estimate changes in *gaps* over time, but not changes in levels of proficiency.

To assess changes in levels of math proficiency, children's skills were also assessed by their teachers. Specifically, teachers were asked to rate each child on the following items, on a 1-5 scale from *not yet* to *proficient*:

- Sorts math materials by various rules and attributes
- Orders groups of objects (by height, color, etc.)
- Understands relative quantities
- Solves problems using numbers
- Understands graphing activities
- Uses instruments accurately for measuring
- Uses a variety of strategies to solve math problems

Unlike the direct assessments, these teacher-reported measures can be compared over time. When combined, they provide a broad measure of the math skills that children display at kindergarten entry. The reliabilities of these teacher-reported measures were .92 in 1998 and .95 in 2010.

In the 2010 cohort (but not 1998) the ECLS-K also assessed children on two tasks related to executive function. To assess working memory, children were required to repeat increasingly long sequences of numbers in reverse order. To assess cognitive flexibility, children were required to sort a series of cards into different trays according to different rules (Tourangeau et al., 2015).

Changes in levels of cognition and general knowledge

Bassok and Latham (2017) compared teacher-reported math skills at kindergarten entry over time. They averaged ratings across the 7 math skills described above, and document substantial increases on this measure across the period considered. They find that kindergarteners were a full quarter of a standard deviation more proficient at kindergarten entry in 2010 compared with 1998. They estimate that students in 2010 entered kindergarten having already learned about 17% of the math skills they would have acquired across the kindergarten year in 1998. Although this measure is useful for comparisons across time, the scale is not readily interpretable at either time point. For this reason, these results are omitted from Table 1.

Bassok and Latham also considered the proportion of students that demonstrated high and low proficiency in math. They classify a child as "high proficiency" in math if the child was rated proficient (i.e. 4 or 5 on a 1-5 scale) on at least half of the 7 skills considered. Similarly, they classified a student as "low proficiency" if the child was rated not proficient (i.e. 1 or 2 on a 1-5 scale) on at least half of skills considered. On these measures, they also document substantial improvements in math skills over time (Table 1). The percentage of students classified as high proficiency in math increased from 19.1 to 25.8%, while the percentage of students classified as low proficiency dropped from 56.7 to 50%.

Changes in race/ethnicity and income-based gaps in cognition and general knowledge

Both Reardon and Portilla (2016) and Bassok and Latham (2017) explored changes in math achievement gaps over time. These results are included in Table 4. Reardon and Portilla examined this question using direct student assessments. They found that in 1998, the white-black achievement gap in math was .62 SD, reflecting a large difference in skills between white and black children. By 2010, this gap had declined by about .08 SD, but remained quite large. Bassok and Latham documented similar changes in gaps over time using teacher-reported outcomes. For instance, in 1998, black children were 13.2 percentage points less likely to be classified as high proficiency than were white children. By 2010, this gap had declined to 9.5 percentage points. This change was driven by relative gains among black children, who were 9.6 percentage points more likely to be rated highly proficient in 2010, compared with a 7.1 percentage point increase among white children (Table 2). Similarly, the percentage of black children who demonstrated low proficiency declined by about 12 percentage points over time (from 67.5-55.4%), compared with an approximately 6 percentage point decline among white children (from 47.9-41.6%). Reardon and Portilla estimated that the white-Hispanic gap on a direct math assessment was .78 SD in 1998, even larger than the white-black gap (Table 4). They found that the gap declined significantly over time, by about .11 SD, but that the gap remained quite large in 2010. Bassok and Latham, found that the white-Hispanic gap in low math proficiency declined significantly, but found no evidence that the gap in high math proficiency has narrowed.

Reardon and Portilla also examined changes over time in the 90/10 math achievement gap. They documented a large difference between students at the top and bottom of the income distribution in 1998, about 1.3 SD. This gap declined modestly over time, to 1.17 SD in 1998, but remained about twice as large as the white-black gap and 1.5 times as large as the white-Hispanic gap in 2010. In Table 4, I also document 90/10 gaps using the teacher-reported measures from Bassok and Latham (2017) and like Reardon and Portilla, I find that these gaps are quite large in 1998. Over time, I find that the 90/10 gap in low math proficiency decreased by about 10 percentage points (more than 25% of the initial gap). This decline was driven by disproportionate gains among the lowest-income children (Table 3.) By contrast, the 90/10 gap in high math proficiency did not decrease over time.

Finally, in 2010 I document large gaps across two measures of executive function. Black and Hispanic children performed about .5 and .4 SD lower on tasks of working memory and cognitive flexibility, respectively. Low-income children performed about .8 and .5 SD lower on these tasks. These measures were collected only for the 2010 cohort, so it is not possible to examine whether and how these gaps changed across cohorts.

Changes in physical well-being and development from 1998-2010

Definition and importance of physical well-being and development

This domain encompasses children's physical development and abilities, including rate of growth, physical fitness, and body physiology. It also includes gross motor skills, such as the ability to run, walk or jump, as well as fine motor skills, which require dexterity and

precision. Children's health in early childhood is influenced by their health at birth, so this domain can also include birth outcomes such as preterm status or low birthweight.

Physical well-being plays a crucial role in student learning. Children who are healthy are able to freely focus on school, without discomfort or special arrangements. By contrast, children who have health problems may develop a sense of isolation or lack of belonging, which can make it difficult to adapt to the school environment. Health problems can also lead children to miss days of school, directly affecting their ability to learn and succeed (Kagan, Moore, & Bredekamp, 1995). Indeed, virtually all kindergarten teachers rate good health as essential for success in kindergarten (Piotrkowski, Botsko, & Matthews, 2000).

Health in early childhood also has implications that last well beyond kindergarten. Children born preterm or at a low birthweight are at risk for many long-term health issues, such as deficits in motor development, hearing, vision, cognition, behavior, and physical growth (Behrman & Butler, 2007; Figlio, Guryan, Karbownik, & Roth, 2014). Children who are overweight or obese are considerably more likely to be overweight or obese into adulthood, and are at increased risk for diabetes, cardiovascular disease, and premature death (Kelly et al., 2013). Across a wide variety of studies, childhood health has been linked not only to adult health outcomes but also to academic and occupational attainment, income, and wealth (Delaney & Smith, 2012).

Measures of physical well-being and development

As a broad measure of health, parents were asked to rate their child's health on a 1-5 scale from *poor* to *excellent*. Children were also measured and weighed in the fall of kindergarten. These can be combined to calculate each child's body mass index (BMI - calculated as weight in kilograms divided by height in meters), a common metric used to determine fitness. For children aged five years old, a healthy BMI is between 14-17. Children this age are classified as underweight if their BMI is below 14. They are classified as overweight or obese if their BMI is over 17 or 18, respectively (National Center for Health Statistics, 2009). Unfortunately, although measures of gross and fine motor development were collected in the original ECLS-K, they were not collected for the more recent cohort.

In addition to direct measures of well-being and development, the ECLS-K includes parent reports of children's health at birth. Specifically, parents reported children's birthweight and whether they were born preterm. Children were classified as low birthweight if they were born weighing less than 2500 grams. (Wardlaw, 2004). They were classified as preterm if they were born before 37 weeks (World Health Organization, 2016).

Changes in levels of physical well-being and development

Bassok et al. (2017) document changes in physical well-being at kindergarten entry across the period considered. These results are reported in Table 1. To evaluate whether there has been a change in major health impairments over time, Bassok et al. compare the percentage of children whose parents reported that they were in "fair" or "poor" health (i.e. 1 or 2 on a

scale 1-5). They find no change across cohorts on this broad measure, as about 3% of parents reported that their children's health was "fair" or "poor" in both cohorts. However, they find evidence that children's fitness has decreased over time. Although the percentage of entering kindergarteners who were underweight decreased from 7.3 to 6%, the percentage of children who were overweight increased 2 percentage points from 25.9 to 27.9%. The percentage of children who were obese increased by roughly the same amount, from 14.1 to 16.2%.

Across the same period, there was a significant increase in both the percentage of children who were born preterm and in the incidence of children born with a low birthweight. In 2010, 9.3% of children were low birthweight, up from 7.7% in 1998. There was also a large increase in the percentage of children who were born preterm, from 10.8% to 14.4%.

Changes in race/ethnicity and income-based gaps in physical well-being and development

Bassok et al. (2017) also examined how gaps in physical well-being have changed over time. In 1998, black and Hispanic children were about 3 percentage points more likely to be in "fair" or "poor" health than were white children (Table 4). These gaps did not change significantly from 1998-2010. The gap between children at the 10th percentile and the 90th percentile was slightly larger, about 4.7 percentage points. This gap also did not change significantly over time.

By contrast, Bassok et al. document large changes over time to gaps in overweight and obesity. In 1998, black children were approximately 4 and 2 percentage points more likely to be overweight and obese, respectively, than were white children. They were 7 and 6 percentage points more likely to be overweight and obese in 2010. The gap in overweight between white and Hispanic children also grew by about 2 percentage points across this period, to over 9 percentage points. The growth of these gaps was driven by disproportionate increases in BMI among black and Hispanic children, as white children were slightly more likely to be overweight/obese in 2010 than in 1998 (Table 2).

Changes in overweight/obesity gaps between children in the 10th and 90th percentile were even more striking. In 1998, low-income children were 6.5 percentage points more likely to be overweight than high-income children, but that gap increased to 13.2 percentage points by 2010 (Table 4). Similarly, the gap for obesity increased from 5.5 to 9.9 percentage points across the 12-year period. The growth in these gaps was a combination of increased rates of overweight/obesity among the lowest income children and *decreased* rates of obesity among the highest income children (Table 3).

Bassok et al. also examine differences by race/ethnicity and income in birth outcomes. These results are included in Table 4. They find that black children were substantially more likely to be born at a low birthweight across both cohorts, but this gap did not change significantly over time (approximately 7.5 percentage points in both cohorts). Similarly, low-income children were about 3.5 percentage points more likely to be born at a low birthweight across both cohorts. They do not find significant gaps based on race/ethnicity or income in terms of preterm birth.

Summary and conclusions

This chapter aimed to summarize changes across five major domains of kindergarten readiness spanning two large nationally representative cohorts of children entering kindergarten in 1998 and 2010. Across the five domains considered, there is evidence that student skills and attributes changed substantially in this relatively brief, 12-year period.

The most striking changes documented across the two cohorts are improvements in student math and literacy skills over time. Children entering kindergarten in 2010 arrived with stronger skills across a broad array of topics in these areas. Bassok and Latham estimate that children arrived having already learned an average of 15-17% of the skills they would learn across the kindergarten year in 1998. These changes mean that students are entering kindergarten with a different set of skills than in the past. The evidence also suggests that improvements in math and literacy have been largest among traditionally disadvantaged groups (i.e. minority and low SES students). Whether considering direct assessments or teacher ratings of student skills, gaps based on race/ethnicity and income have narrowed across the period considered.

What is likely to account for these improvements over time? Bassok and Latham (2017) found little evidence that they were driven by increased access to preschool. Importantly, they were not able to account for changes in the quality of early child care, which may be more relevant. For instance, state spending on preschool nearly doubled between 2002 and 2015 to over $6.2 billion (Barnett et al., 2016). Although the percentage of children who attend center-based care has not increased across this period, the number of children who attend state-sponsored preschool has risen dramatically (U.S. Census Bureau, 2015; Bassok & Latham, 2017). In many cases, state-sponsored preschool providers face more stringent quality requirements than private centers or individual care providers. Many of these programs are also targeted toward disadvantaged children who would otherwise not have access to high quality care (Barnett, 2010).

Increases in children's skills may also be driven by increased attention paid to math and literacy in the home environment. Parents now invest more heavily in the pre-kindergarten years than in previous decades (Kornrich & Furstenberg, 2013). Children have greater access to books and educational games, and spend more time interacting with their parents, both at home and through educational outings. Further, these increases in parental investments have disproportionately occurred among the lowest-income parents (Bassok, Finch, Lee, Reardon, & Waldfogel, 2016). These trends are consistent with the improvements over time and disproportionate improvements among low-income and minority children documented here.

Despite this encouraging evidence, achievement gaps remain quite large. For instance, Hill, Bloom, Black, and Lipsey (2008) estimate that children's average learning across the kindergarten year constitutes approximately a 1.5 SD improvement in literacy and a 1.15 SD improvement in math. Using these benchmarks, black children in 2010 entered kindergarten about 1/5 of a grade behind white children in literacy and ½ a grade behind

in math. Hispanic children fared even worse, entering kindergarten about 1/3 a grade behind white children in literacy and 2/3 of a grade behind in math. Most strikingly, children at the 10th percentile entered kindergarten about 2/3 of a grade behind children at the 90th percentile in literacy, and more than a full grade behind in math. Although the 90/10 gaps in both literacy and math declined by about 10% from 1998 to 2010, if these gaps were to continue to close at the same rate, it would take another 60-110 years for them to be eliminated (Reardon & Portilla, 2016).

When considering changes over time in social and emotional learning, the evidence is mixed. Although children in the more recent cohort were somewhat less likely to exhibit negative internalizing behavior, they were *more* likely to exhibit poor self-control. The white-black gap in interpersonal behavior declined across this period, but the white-Hispanic gap in self-control *expanded*. All of these differences over time were relatively small, and it's not clear that they are substantively meaningful. However, it *is* clear that student approaches to learning have gotten worse over time. Although race/ethnicity and income-based gaps on this measure have narrowed, this is due to disproportionately large decreases among white and higher income children.

The trends in student approaches toward learning are troubling. This may be an indication that additional focus on academic instruction has led to declines in other important skills, or that classrooms are not as engaging for students as they had been in the past. However, the interpretation of these trends is complicated by the fact that these outcomes were assessed by kindergarten teachers, and kindergarten classrooms changed dramatically across the 12-year period. Kindergarteners now experience substantially more teacher-directed whole class instruction, and less time devoted to child-selected activities (Bassok, Latham, & Rorem, 2016). In this more structured environment, it may be that children cannot demonstrate their approaches toward learning in the same way.

Finally, this chapter documented some negative trends in children's health. Chief among these is that both the rates of childhood overweight and obesity have increased about 2 percentage points across this period. These increases have disproportionately occurred among low-income, black, and Hispanic children. Most strikingly, the 90/10 overweight and obesity gaps nearly *doubled* across this period such that in 2010 the lowest-income children were over 1.5 times more likely to be overweight than the highest-income children, and more than twice as likely to be obese. Given that overweight children are far more likely to continue to be overweight throughout their lives (Kelly et al., 2013), this early gap in weight is likely to lead to lifetime health disparities.

The percentage of children born preterm and low birthweight also increased substantially over this period. This trend may indicate that the health of children and mothers has declined, but it may also reflect better access to health insurance and health care. For instance, the State Children's Health Insurance Program (CHIP) extended health insurance to young children from low-income families. However, this would not explain why the 90/10 gap on these measures has not declined over time. Another possibility is that increases in low birthweight and preterm births may instead reflect advances in medical care, such that preterm and low birthweight infants are now more likely to survive.

Implications for policy and practice

The increases in student skills suggest that investments in early childhood may be effective, and early childhood education continues to be a strong focus among policymakers. In addition to state investments in preschool, federal initiatives such as Preschool Development Grants and the Race to the Top – Early Learning Challenge initiative have awarded over $2 billion to states since 2011, to expand and improve the quality of the early child care sector (U.S. Department of Education, 2016). These initiatives have bolstered the use of both kindergarten readiness assessments and early childhood quality rating systems. Applicants are also required to demonstrate an explicit focus on promoting school readiness for children with high needs.

Changes to student skills at kindergarten entry have important implications for instruction in the kindergarten classroom. Although in the past, many kindergarten teachers expected that children would learn these skills in kindergarten (Abry et al., 2015), teachers increasingly expect children to arrive in kindergarten with exposure to language and literacy (Bassok, Latham, & Rorem, 2016). Despite this, recent work suggests that kindergarten teachers spend most of their time teaching material that children have already mastered (Engel, Claessens, Watts, & Farkas, 2015). Further, the authors find that children learn most when exposed to novel material. This points to the importance of understanding the skills children bring to the classroom, and tailoring classroom instruction to meet these needs. However, teachers need help meeting children where they are, and the recent trend toward implementing widespread kindergarten readiness assessments may help them to do so.

Overall, the changes documented in this chapter are encouraging in some ways and discouraging in others. They suggest that recent investments in early childhood may have been successful at improving children's academic skills. However, it is crucial to understand that success in school relies on a broad array of skills, beyond just ability in language and math. As the early childhood period continues to garner attention from researchers, practitioners, and policymakers, it is important to pay attention to all aspects of school readiness, and to make sure that improvements in one area don't crowd out improvements in others.

Table 1. Changes in school readiness at kindergarten entry, 1998-2010

Domain	1998	2010	Change
Social and emotional development			
% poor self-control	15.3	16.7	1.4 ***
% poor interpersonal behavior	16.9	16.1	-0.8
% high externalizing behavior	13.3	12.8	-0.5
% high internalizing behavior	11.7	9.1	-2.6 ***
Approaches toward learning			
% poor approaches toward learning	17.4	22.8	5.4 ***
Language and literacy			
Teacher-reported literacy skills			
% high proficiency	21.4	25.6	4.2 ***
% low proficiency	57.2	48.7	-8.5 ***
Cognition & general knowledge			
Teacher-reported math skills			
% high proficiency	19.1	25.8	6.7 ***
% low proficiency	56.7	50.0	-6.7 ***
Physical well-being & development			
% "fair or "poor" health	2.8	2.9	0.1
% underweight (BMI < 14)	7.3	6.0	-1.3 ***
% overweight (BMI ≥ 17)	25.9	27.9	2.0 ***
% obese (BMI ≥ 18)	14.1	16.2	2.1 ***
% low birthweight (< 2500g)	7.7	9.3	1.6 ***
% preterm birth (< 37 weeks)	10.8	14.4	3.6 ***

Source. Bassok & Latham (2017), Bassok, Finch, Latham, Reardon, & Waldfogel (2017)
Note. Estimates are weighted to be nationally representative.
+ p<.10 * p<.05 ** p<.01 *** p<.001

Table 2. Changes in school readiness at kindergarten entry 1998-2010, by race/ethnicity

	White children			Black children			Hispanic children		
Domain	1998	2010	Change	1998	2010	Change	1998	2010	Change
Social and emotional development									
% poor self-control	13.2	13.8	0.6	23.5	24.5	1.0	14.1	17.2	3.1 **
% poor interpersonal behavior	14.3	13.2	-1.1	23.5	20.7	-2.8 +	17.5	16.9	-0.6
% high externalizing behavior	11.9	10.9	-1.0	19.7	19.1	-0.6	11.7	11.1	-0.6
% high internalizing behavior	11.1	8.2	-2.9 ***	12.0	9.0	-3.0 **	12.6	10.1	-2.5 **
Approaches toward learning									
% poor approaches toward learning	14.0	18.9	4.9 ***	24.8	28.4	3.6 **	20.3	24.2	3.9 **
Language and literacy									
Teacher-reported literacy skills									
% high proficiency	27.7	31.8	4.1 ***	14.5	22.3	7.8 ***	12.2	16.7	4.5 ***
% low proficiency	47.1	41.0	-6.1 ***	63.5	54.0	-9.5 ***	70.7	60.9	-9.8 ***
Cognition & general knowledge									
Teacher-reported math skills									
% high proficiency	24.3	31.4	7.1 ***	13.2	22.8	9.6 ***	10.7	17.8	7.1 ***
% low proficiency	47.9	41.6	-6.3 ***	67.5	55.4	-12.1 ***	70.1	60.1	-10.0 ***
Physical well-being & development									
% "fair or "poor" health	1.7	1.7	0.0	4.8	4.1	-0.7	4.6	5.3	0.7
% underweight (BMI < 14)	7.6	6.3	-1.3 **	7.1	6.7	-0.4	5.2	4.0	-1.2 +
% overweight (BMI ≥ 17)	23.9	24.7	0.8	27.9	31.6	3.7 *	31.4	34.0	2.6 *
% obese (BMI ≥ 18)	12.5	13.6	1.1 +	14.6	19.6	5.0 **	18.6	20.6	2.0 *
% low birthweight (< 2500g)	6.2	8.0	1.8 ***	14.0	15.5	1.5	7.6	8.9	1.3
% preterm birth (< 37 weeks)	11.3	15.1	3.8 ***	12.2	16.4	4.2 ***	8.7	11.9	3.2 ***

Source. Bassok & Latham (2017), Bassok, Finch, Latham, Reardon, & Waldfogel (2017), and author's calculations from two cohorts of the ECLS-K.

Note. Estimates are weighted to be nationally representative. + p<.10 * p<.05 ** p<.01 *** p<.001

Table 3. Changes in school readiness at kindergarten entry 1998-2010, by income

	90th income %ile			10th income %ile		
Domain	1998	2010	Change	1998	2010	Change
Social and emotional development						
% poor self-control	11.0	12.1	1.1	20.0	20.9	0.9
% poor interpersonal behavior	11.1	13.3	2.2	23.5	19.2	-4.3 **
% high externalizing behavior	9.2	7.7	-1.5	16.8	15.9	-0.9
% high internalizing behavior	10.4	7.0	-3.4 +	15.1	9.0	-6.1 ***
Approaches toward learning						
% poor approaches toward learning	9.7	14.2	4.5 +	27.5	29.8	2.3
Language and literacy						
Teacher-reported literacy skills						
% high proficiency	37.3	41.9	4.6 +	8.3	12.4	4.1 ***
% low proficiency	36.3	30.7	-5.6 *	76.2	62.1	-14.1 ***
Cognition & general knowledge						
Teacher-reported math skills						
% high proficiency	32.9	40.4	7.5 **	8.1	16.7	8.6 ***
% low proficiency	37.4	31.0	-6.4 *	76.2	59.8	-16.4 ***
Physical well-being & development						
% "fair or "poor" health	0.9	0.8	-0.1	5.5	4.9	-0.6
% underweight (BMI < 14)	6.7	5.8	-0.9	6.7	5.4	-1.3 *
% overweight (BMI ≥ 17)	21.8	18.6	-3.2 *	28.3	31.8	3.5 **
% obese (BMI ≥ 18)	10.3	9.0	-1.3	15.8	18.9	3.1 *
% low birthweight (< 2500g)	5.5	7.7	2.2 *	8.7	11.2	2.5
% preterm birth (< 37 weeks)	10.3	15.1	4.8 **	9.5	15.2	5.7 ***

Source. Bassok, Finch, Latham, Reardon, & Waldfogel (2017) and author's calculations from two cohorts of the ECLS-K.

Note. Estimates are weighted to be nationally representative.

+ p<.10 * p<.05 ** p<.01 *** p<.001

Table 4. Changes in school readiness gaps at kindergarten entry, 1998-2010

	White-black gap				White-Hispanic gap				90/10 income gap			
Domain	1998	2010	Change		1998	2010	Change		1998	2010	Change	
Social and emotional development												
% poor self-control	-10.3	-10.7	-0.4		-0.9	-3.4	-2.5	***	-8.9	-8.8	0.1	
% poor interpersonal behavior	-9.2	-7.5	1.8	*	-3.2	-3.7	-0.5		-12.4	-5.9	6.5	***
% high externalizing behavior	-7.8	-8.2	-0.5		0.3	-0.2	-0.4		-7.6	-8.2	-0.5	
% high internalizing behavior	-1.0	-0.8	0.2		-1.6	-1.9	-0.3		-4.7	-2.0	2.7	*
Approaches toward learning												
% poor approaches toward learning	-10.8	-9.5	1.3	+	-6.3	-5.3	1.0		-17.8	-15.6	2.3	+
Language and literacy development												
Teacher-reported literacy skills												
% high proficiency	13.2	9.5	-3.7	***	15.5	15.2	-0.3		29.0	29.5	0.5	
% low proficiency	-16.4	-13.0	3.4	***	-23.6	-19.9	3.7	***	-39.9	-31.4	8.5	***
Direct literacy assessments†	0.39	0.32	-0.07		-	0.56	N/A		1.26	1.06	-0.21	***
Cognition & general knowledge												
Teacher-reported math skills												
% high proficiency	11.1	8.5	-2.6	**	13.7	13.6	-0.1		24.8	23.7	-1.1	
% low proficiency	-19.7	-13.7	5.9	***	-22.3	-18.5	3.8	***	-38.8	-28.8	10.0	***
Direct math assessments†	0.62	0.55	-0.08	+	0.78	0.67	-0.11	*	1.30	1.17	-0.13	***
Executive function												
Working memory†	-	0.53	N/A		-	0.51	N/A		-	0.80	N/A	
Cognitive flexibility†	-	0.41	N/A		-	0.39	N/A		-	0.46	N/A	
Physical well-being & development												
% "fair or "poor" health	-3.1	-2.4	0.7		-2.9	-3.6	-0.7		-4.7	-4.1	0.6	
% underweight (BMI < 14)	0.5	-0.4	-0.9	*	2.4	2.3	-0.1		0.0	0.4	0.4	
% overweight (BMI ≥ 17)	-4.0	-7.0	-3.0	***	-7.5	-9.3	-1.8	**	-6.5	-13.2	-6.7	***
% obese (BMI ≥ 18)	-2.2	-5.9	-3.7	***	-6.1	-7.0	-0.9		-5.5	-9.9	-4.4	***
% low birthweight (< 2500g)	-7.7	-7.5	0.2		-1.4	-1.0	0.4		-3.3	-3.5	-0.2	
% preterm birth (< 37 weeks)	-0.9	-1.3	-0.4		2.5	3.2	0.7		0.9	-0.1	-1.0	

Source. Reardon & Portilla (2016), Bassok, Finch, Latham, Reardon, & Waldfogel (2017). Executive function estimates are author's calculations from the 2010 ECLS-K cohort.

Note. Estimates are weighted to be nationally representative. White-black and white-Hispanic gaps are calculated by subtracting scores for black and Hispanic students, respectively, from scores for white students. 90/10 income gap is calculated by subtracting scores for children in the 10th income percentile from children in the 90th income percentile.

† Denotes gaps that are reported in population standard deviation units.

+ p<.10 * p<.05 ** p<.01 *** p<.001

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