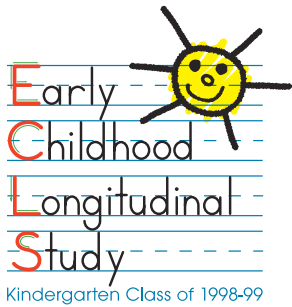


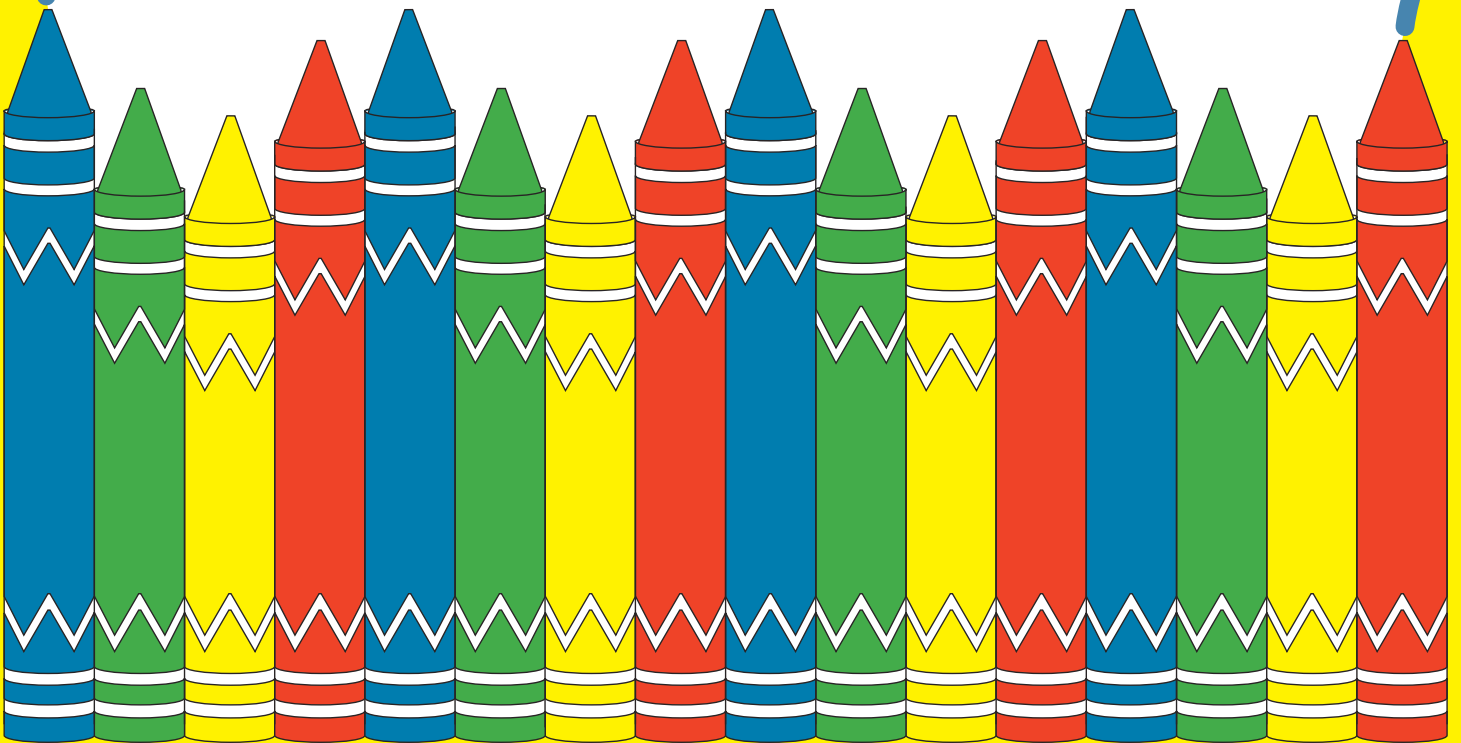


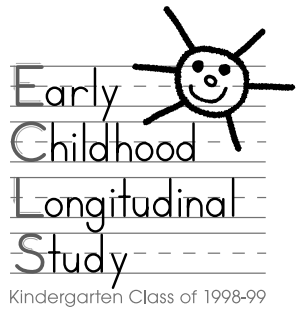
# From Kindergarten Through Third Grade

## Children's Beginning School Experiences



**U.S. Department of Education**  
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# From Kindergarten Through Third Grade

## Children's Beginning School Experiences

**August 2004**

Amy Rathburn  
Education Statistics  
Services Institute

Jerry West  
Institute of Education Sciences  
National Center for  
Education Statistics

Elvira Germino-Hausken  
*Project Officer*  
Institute of Education Sciences  
National Center for  
Education Statistics

U.S. Department of Education  
Rod Paige  
Secretary

Institute of Education Sciences  
Grover J. Whitehurst

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Jerry West  
(202) 502-7335  
[Jerry.West@ed.gov](mailto:Jerry.West@ed.gov)

# Executive Summary

Children begin kindergarten with many different levels of reading and mathematics skills and make significant gains in their reading and mathematics achievement over the first 2 years of school (West, Denton, and Germino Hausken 2000; West, Denton, and Reaney 2001; Denton and West 2002). The knowledge and skills children acquire in kindergarten and first grade can serve as a foundation for their later educational success. It is important to explore children's growth and development as they move from the beginning of kindergarten through the elementary school years.

This is the fourth report in a series that provides descriptive information about young children's school experiences, based on data from the Early Childhood Longitudinal Study, Kindergarten Class of 1998–99 (ECLS-K). Sponsored by the National Center for Education Statistics (NCES), part of the U.S. Department of Education's Institute of Education Sciences,<sup>1</sup> the ECLS-K selected a nationally representative sample of kindergartners in the fall of 1998 and is following these children through the spring of fifth grade. The study collects information directly from the children and their families, teachers, and schools. The full ECLS-K base-year sample is composed of 22,782 children who attended 1,277 schools with kindergarten programs during the 1998–99 school year.

The first ECLS-K report, *America's Kindergartners* (West, Denton, and Germino Hausken 2000), provided a national picture of the knowledge and skills of entering kindergartners. In the second report, *The Kindergarten Year* (West, Denton, and Reaney 2001), children's gains and status in reading and mathematics were explored during their first year of school. The third report in this series,

*Children's Reading and Mathematics Achievement in Kindergarten and First Grade* (Denton and West 2002), described children's reading and mathematics achievement in the spring of kindergarten and the spring of first grade.

This fourth report highlights children's gains in reading and mathematics over their first 4 years of school, from the start of kindergarten to the point when most of the children are finishing third grade.<sup>2</sup> The report also describes children's achievement in reading and mathematics at the end of third grade, both in terms of their overall achievement in the two subject areas and in terms of their specific reading and mathematics knowledge and skills. It examines whether differences in reading and mathematics achievement that were identified for certain groups of children in kindergarten and first grade persist 2 or 3 years later. Specifically, comparisons are made by children's sex, race/ethnicity, and the number of family risk factors.<sup>3</sup> Achievement is also compared for children with different early school experiences (i.e., attended full-day vs. half-day kindergarten programs, attended public vs. private vs. both school types from kindergarten through third grade).

Information on two new ECLS-K direct child assessments conducted in the spring of 2002 is included. In the third-grade year, children were administered a science assessment for the first time in

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<sup>2</sup>This report refers to data collected in the spring of 2002 as third-grade data and the sampled children as third-graders, although not all children in the analytic sample used for this report were enrolled in third grade. In the spring of 2002, about 89 percent of children in the analytic sample were in third grade, 10 percent were in second grade, and about 1 percent were enrolled in other grades (e.g., first or fourth grade). Analyses are limited to those children who were assessed in English in all rounds. Approximately 68 percent of Hispanic children and 78 percent of Asian/Pacific Islander children were assessed in English in the fall and spring of kindergarten and in the spring of first grade (Denton and West 2002).

<sup>3</sup>Family risk factors included living below the federal poverty level, primary home language was non-English, mother's highest education was less than a high school diploma/GED, and living in a single-parent household. Values range from 0–4, depending on the number of risk factors present.

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<sup>1</sup>Several other federal agencies provide support for this study, including the Economic Research Service of the U.S. Department of Agriculture, the Head Start Bureau of the Administration on Children, Youth, and Families of the U.S. Department of Health and Human Services, the National Institute for Child Health and Human Development, and the Office of Special Education Programs, the Office of English Language Acquisition, and the Policy and Programs Studies Service within the U.S. Department of Education.





place of the general knowledge assessment, which was used in the kindergarten and first-grade years. In addition, third-graders completed a self-description questionnaire (SDQ) on their perceptions of their competence and interests in reading, mathematics, and school in general. They also rated their popularity with peers and competence in peer relationships, and reported on any internalizing and externalizing problem behaviors that they might exhibit. The SDQ questionnaire provides the first direct information from the ECLS-K children about how they feel about their school experiences.

The purposes of this report are to describe the academic gains children have made from kindergarten through third grade, their achievement status at the end of third grade, and their perceptions about their school experiences. Two types of analyses were used to achieve these purposes. In addition to comparing the overall mean estimates and scores for different groups of children (i.e., bivariate analyses), more complex multivariate analyses (i.e., ordinary least squares regression) were conducted to describe the relationships of different child, family, and early school experience characteristics (e.g., race/ethnicity, number of risk factors, kindergarten program type) with children's achievement and perceptions, while controlling for the other characteristics. One of the limitations of mean comparisons is that they describe children's achievement gains and status for different groups of children without taking into account other factors that may also be related to achievement differences. For instance, family risk factors are related to children's achievement (West, Denton, and Reaney 2001), though the average number of these factors varies by children's race/ethnicity (Zill and West 2001). Bivariate results are included in the report to describe overall, unadjusted mean values for subgroups in the population. Findings from the regression analyses follow the bivariate results within each section of the report and further explain whether bivariate differences hold when other risk factors are taken into account.

This is a descriptive report. Readers should not draw causal inferences from the regression results in this report, since apparent relationships can change based on the particular independent variables examined. The small set of independent variables used in this report's regression analyses were included with the specific purpose of clarifying the

descriptive results observed in the multiple bivariate comparisons.

## Research Questions

The report uses data from the ECLS-K to address the following questions:

- What knowledge and skills do children demonstrate in the spring of third grade? How have these changed since they first started school? Do children's knowledge and skills and the gains they have made over time differ by certain child, family, and school characteristics?
- How do third-graders perceive themselves and their relations with other children? Is their academic achievement at the end of third grade related to their perceptions?

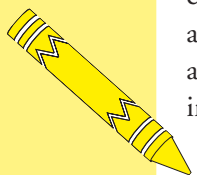
The findings in this report are based on children in the ECLS-K sample who entered kindergarten for the first time in 1998 and were administered the direct cognitive assessments in English in fall 1998, spring 1999, spring 2000, and spring 2002.<sup>4</sup> Comparisons in the text are tested for statistical significance to ensure that the differences are larger than might be expected due to sampling variation. All differences described are significant at the .05 level. Due to the large sample size, many differences (no matter how substantively minor) are statistically significant. In this report, as in earlier reports in this series, "substantive differences" are defined as mean score differences of one-quarter of a standard deviation or more, and percentage differences of 5 points or greater for specific proficiency levels, unless otherwise noted.

## Changes Over Time for the ECLS-K Children

Over the first 4 years of school, young children may encounter different early learning experiences. From the start of kindergarten to the end of third grade, many children had changed schools at least one time (table 2).<sup>5</sup> For instance,

<sup>4</sup>Estimates in this report are weighted by the ECLS-K Longitudinal full-sample child weight, C1\_5FC0.

<sup>5</sup>It is possible that a few students may have switched from one school to another in second grade, then switched back again to the original school at the start of third grade. Since data were not collected in second grade, it is not possible to identify when such instances occurred.



in the spring of 2002, about half of the children remained in the same school they had attended in kindergarten, 39 percent had made one school change, and 10 percent had changed schools two or more times since the start of kindergarten. Some children also changed the type of school they attended. Eighty-one percent of the children had attended public schools for the duration of the study, and 9 percent always attended private schools. Ten percent changed the type of school they attended at least once between kindergarten and the end of third grade. Also, in the spring of 2002, about 89 percent of first-time kindergartners were in third grade, 10 percent were in second grade, and about 1 percent were enrolled in other grades (e.g., first or fourth grade) (data not shown in tables).

### **Overall Gains in Reading and Mathematics Knowledge and Skills From Kindergarten to Third Grade**

The ECLS-K reading and mathematics assessments were designed to reflect children's knowledge and skills in both subjects over the duration of the study. The reading assessment captured information on children's basic literacy skills, vocabulary, and comprehension. The mathematics assessment measured children's conceptual understanding of numbers, shapes, patterns, mathematical operations, and processes for problemsolving. From the start of kindergarten to the end of third grade, children's reading scale scores, a measure of their overall reading achievement, increased an average of 81 points, and their mathematics scale scores increased about 63 points (tables A-4 and A-5). Children's spring third-grade reading scale scores were about 8.4 standard deviations higher than their fall kindergarten scores, and their spring third-grade mathematics scale scores were about 7.3 standard deviations higher than their fall kindergarten scores. Thus, one standard deviation in the reading score amounts to a 9.6 point difference in the reading scale score, and one standard deviation in the mathematics score amounts to an 8.6 point difference in the mathematics scale score. It is important to note that the data points represented in the figures and tables in this report cover different time spans (i.e., the kindergarten school year, the full calendar year between spring of kindergarten and spring of first grade, and 2 full calendar years between spring

of first grade and spring of third grade). Thus, increases in achievement over time must be interpreted relative to the amount of time between assessments. Between the start of kindergarten and the end of third grade, the reading and mathematics achievement gaps across certain groups of children widened (tables A-4 through A-6). Black children had made smaller gains in reading and mathematics by the end of third grade than White, Hispanic, and Asian/Pacific Islander children.<sup>6</sup> As the number of children's family risk factors (e.g., living in a single-parent household, living below the federal poverty level) increased, children tended to gain less in both subject areas than children with fewer family risk factors (figures A and B). Children's gains in their first 4 years of school did not differ substantively, however, by their sex, the type of kindergarten program they attended (i.e., half-day or full-day), or the type of school they attended (i.e., public school all 4 years, private school all 4 years, both public and private school attendance).

### **Overall Reading, Mathematics, and Science Knowledge and Skills in Third Grade**

Consistent with the patterns of differences found in children's achievement gains, children's reading, mathematics, and science status in third grade varied by their race/ethnicity and their number of family risk factors (tables A-4 through A-6, A-8). After controlling for the other child, family, and school characteristics, Black third-graders had lower achievement scores than White, Hispanic, and Asian/Pacific Islander children in all three subjects, and Hispanic third-graders had lower overall achievement scores in science compared with White children (figure C). Those with more family risk factors had lower mean achievement scores in all subjects than those with fewer family risk factors. In addition, third-graders who had always attended private schools from kindergarten through third grade had higher reading achievement scores than those who had always attended public schools. Children's third-grade achievement did not differ substantively by their sex.

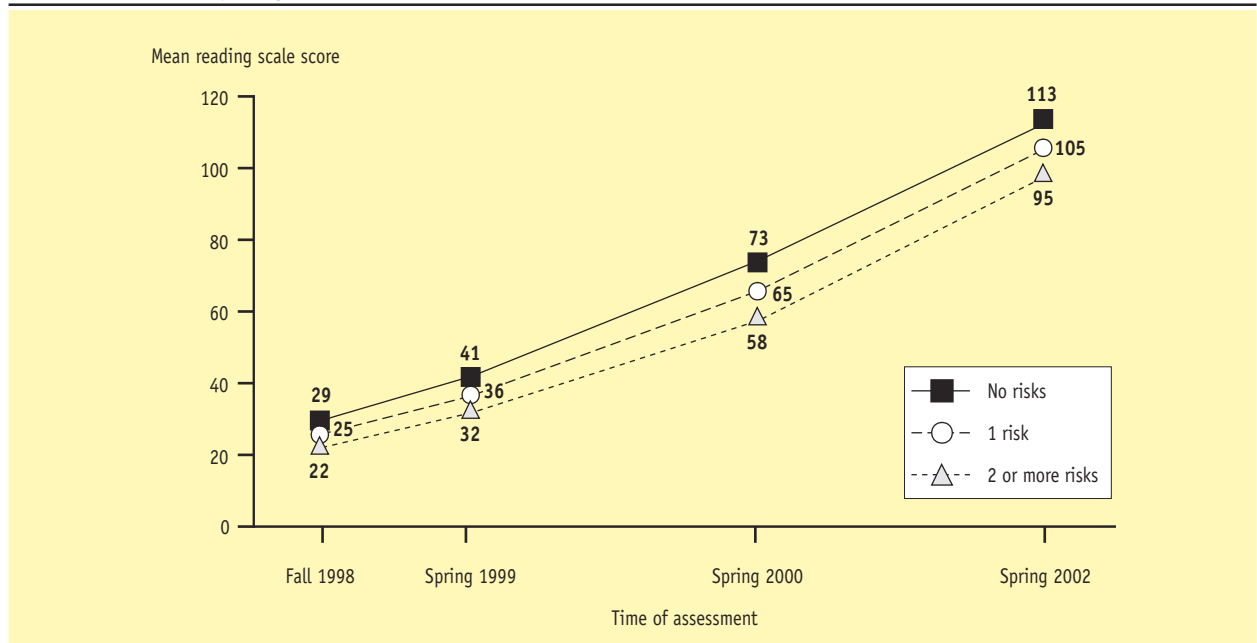
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<sup>6</sup>White refers to White, non-Hispanic; Black refers to Black, non-Hispanic; and Other refers to Other, non-Hispanic (i.e., American Indian, Alaska Native, or multi-racial) for the remainder of the report.





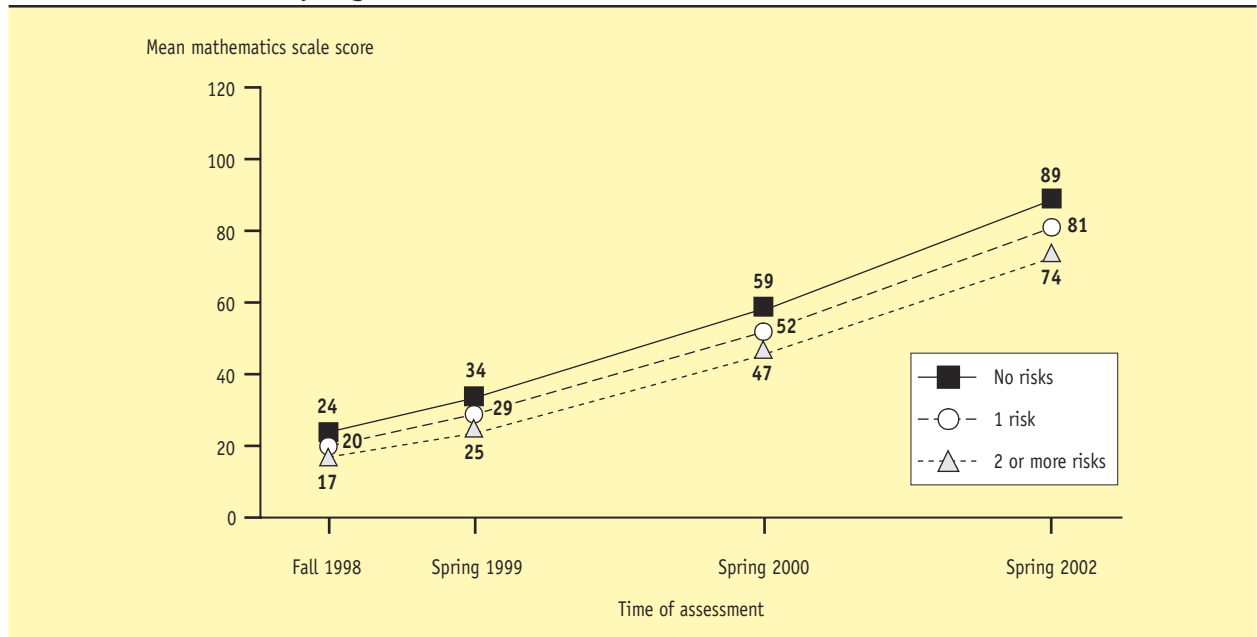
**Figure A. Mean reading scale scores for fall 1998 first-time kindergartners, by time of assessment and number of family risk factors: Fall 1998, spring 1999, spring 2000, and spring 2002**



NOTE: Family risk factors included living below the federal poverty level, primary home language was non-English, mother's highest education was less than a high school diploma/GED, and living in a single-parent household. Values range from 0 to 4. Estimates reflect the sample of children assessed in English in all assessment years. The ECLS-K assessment was not administered in 2001, when most of the children were in second grade.

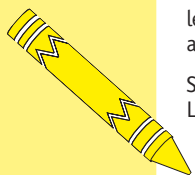
SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99 (ECLS-K), Longitudinal Kindergarten–First Grade Public-Use Data File and Third Grade Restricted-Use Data File, fall 1998, spring 1999, spring 2000, and spring 2002.

**Figure B. Mean mathematics scale scores for fall 1998 first-time kindergartners, by time of assessment and number of family risk factors: Fall 1998, spring 1999, spring 2000, and spring 2002**

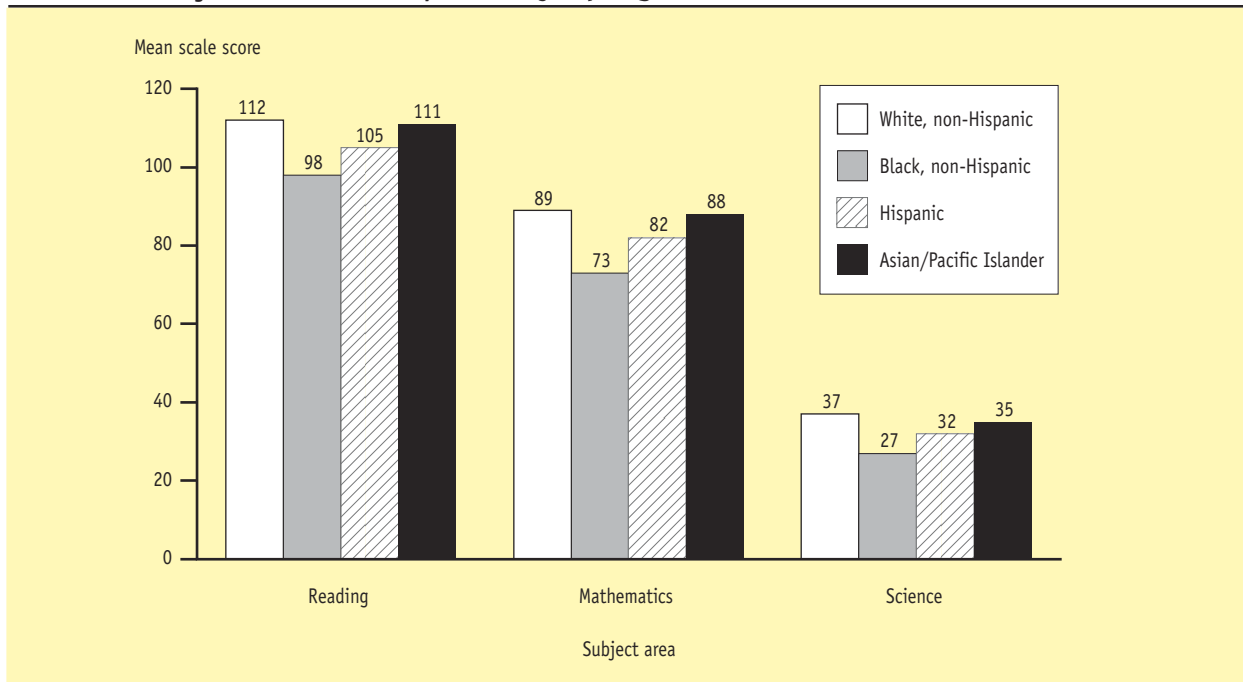


NOTE: Family risk factors included living below the federal poverty level, primary home language was non-English, mother's highest education was less than a high school diploma/GED, and living in a single-parent household. Values range from 0 to 4. Estimates reflect the sample of children assessed in English in all assessment years. The ECLS-K assessment was not administered in 2001, when most of the children were in second grade.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99 (ECLS-K), Longitudinal Kindergarten–First Grade Public-Use Data File and Third Grade Restricted-Use Data File, fall 1998, spring 1999, spring 2000, and spring 2002.



**Figure C. Mean scale scores for fall 1998 first-time kindergartners in spring of third grade, by subject area and race/ethnicity: Spring 2002**



NOTE: Estimates reflect the sample of children assessed in English in all assessment years. Although most of the children in the sample were in third grade in the spring of 2002, 10 percent were in second grade, and about 1 percent were enrolled in other grades.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99 (ECLS-K), Third Grade Restricted-Use Data File, spring 2002.

### Specific Reading and Mathematics Knowledge and Skills in Third Grade

In addition to assessing children’s overall reading and mathematics achievement, the ECLS-K provides more specific information on the knowledge and skills that children have acquired in both subjects by the end of third grade (tables A-9 through A-12). By the end of third grade, almost all children could identify the ending sounds of words, name sight words, and recognize words in context. They could also demonstrate mathematics concepts of ordinality (e.g., identify ordinal positions of objects) and solve simple addition and subtraction problems. Seventy-eight percent could make literal inferences based on text (e.g., recognize the comparison being made in a simile) and solve simple multiplication and division problems. Forty-six percent were able to use cues to derive meaning from text (e.g., use background knowledge combined with sentence cues to understand the use of homonyms) and 42 percent demonstrated an understanding of place value in integers to the hundreds place. Twenty-nine percent were able to make interpretations beyond what was stated in text

(e.g., make connections between problems in a narrative and similar life problems) and 16 percent could use rate and measurement to solve word problems.

Many of the patterns of differences in children’s overall achievement gains and third-grade status were also present when children’s proficiency in specific reading and mathematics knowledge and skills was examined (tables A-10 and A-12). After controlling for the other child, family, and early school experience characteristics, Black third-graders were less likely to be proficient in more advanced reading levels (i.e., making literal inferences, deriving meaning from text, and making interpretations beyond text) and mathematics levels (i.e., multiplication and division, place value, and rate and measurement) than White, Asian/Pacific Islander, and Hispanic children. Children with more family risk factors were also less likely to be proficient in these skills than their peers with fewer family risk factors. Hispanic third-graders were less likely to be proficient in deriving meaning from text and making interpretations beyond text than White third-graders, and were less likely than White and Asian/Pacific Islander children to demonstrate mas-







tery of in place value and rate and measurement skills. In addition, children who attended public school from kindergarten through third grade were less likely to demonstrate some of the more advanced reading and mathematics skills and knowledge than those who had attended private schools for some or all of their first 4 years of school (figures D and E). Finally, although overall reading and mathematics achievement status did not differ substantively by children's sex, girls were more likely to demonstrate proficiency in most of the advanced reading skills than boys, and were less likely to exhibit proficiency in most of the advanced mathematics skills than boys.

### Children's Perceptions About Themselves and Their School Experiences

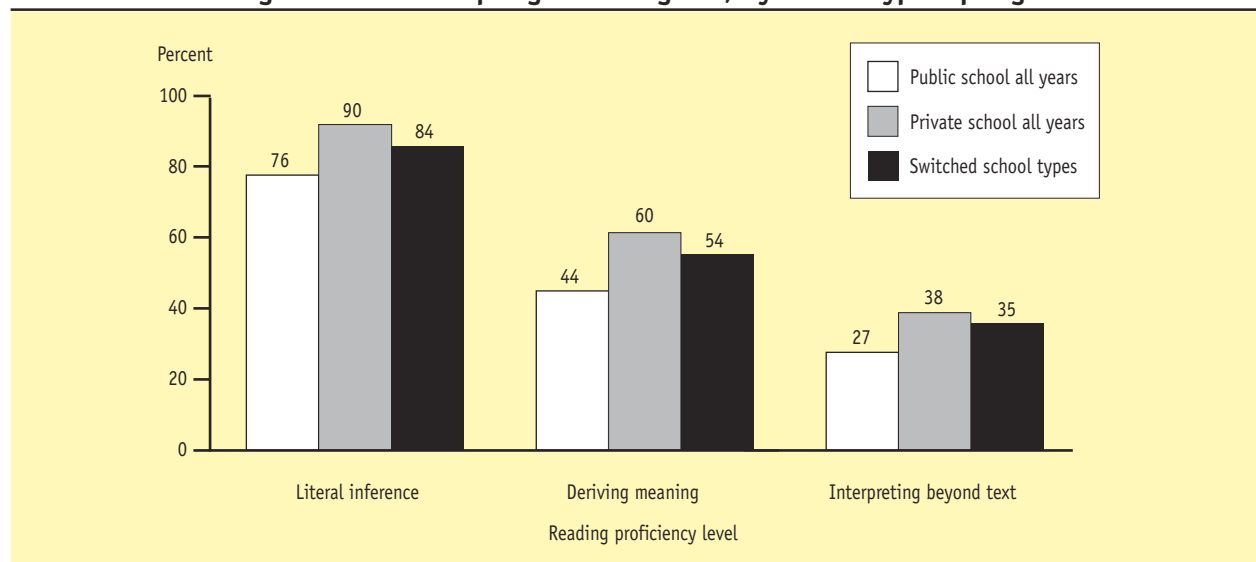
At the end of third grade, children were asked about their perceptions of their competence and interest in reading, mathematics, and school in general, and about their peer relationships and problem behaviors that they may exhibit (details on the measure used to assess children's perceptions are provided in appendix B). On average, children indicated that they were generally interested in and enjoyed school, and that they did not perceive their schoolwork to be too difficult (table A-13). Girls

tended to have greater interest and perceived competence in reading than boys, a finding that persisted after controlling for children's race/ethnicity, number of family risk factors, and their early school experiences (tables A-13 and A-14).

On average, children also responded positively regarding their peer relationships, with most indicating that they generally made friends easily and got along well with their peers (tables A-13 and A-14). Black third-graders were more likely to feel this way than Asian/Pacific Islander children, after controlling for other child, family, and school experience factors. Children tended to indicate that they only occasionally exhibited externalizing (e.g., fighting and arguing) or internalizing (e.g., anxiety, sadness, loneliness) problem behaviors. Boys indicated a higher likelihood of exhibiting externalizing behaviors than girls. Black third-graders reported more of both types of problem behaviors than White, Hispanic, and Asian/Pacific Islander third-graders. In addition, as the number of family risk factors increased for third-graders, they were more likely to report internalizing and externalizing problem behaviors (figure F, tables A-13 and A-14).

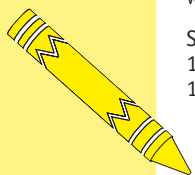
Third-graders' perceptions about their interest and competence in reading and mathematics were

**Figure D. Percent of fall 1998 first-time kindergartners demonstrating specific reading knowledge and skills in spring of third grade, by school type: Spring 2002**

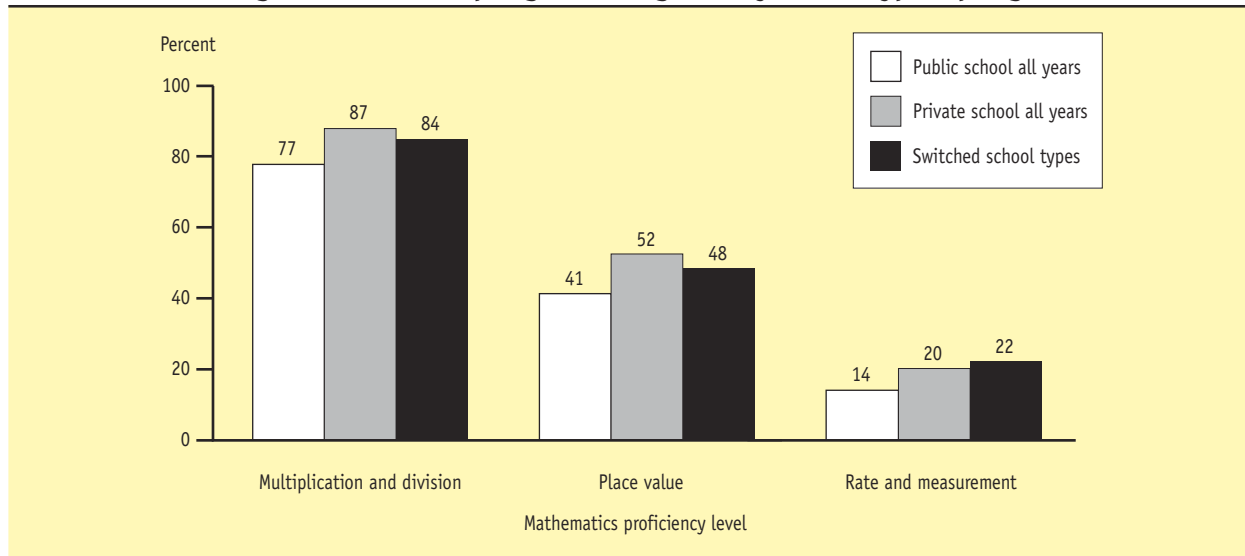


NOTE: Estimates reflect the sample of children assessed in English in all assessment years. Although most of the children in the sample were in third grade in the spring of 2002, 10 percent were in second grade, and about 1 percent were enrolled in other grades.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99 (ECLS-K), Longitudinal Kindergarten-First Grade Public-Use Data File and Third Grade Restricted-Use Data File, fall 1998, spring 1999, spring 2000, and spring 2002.



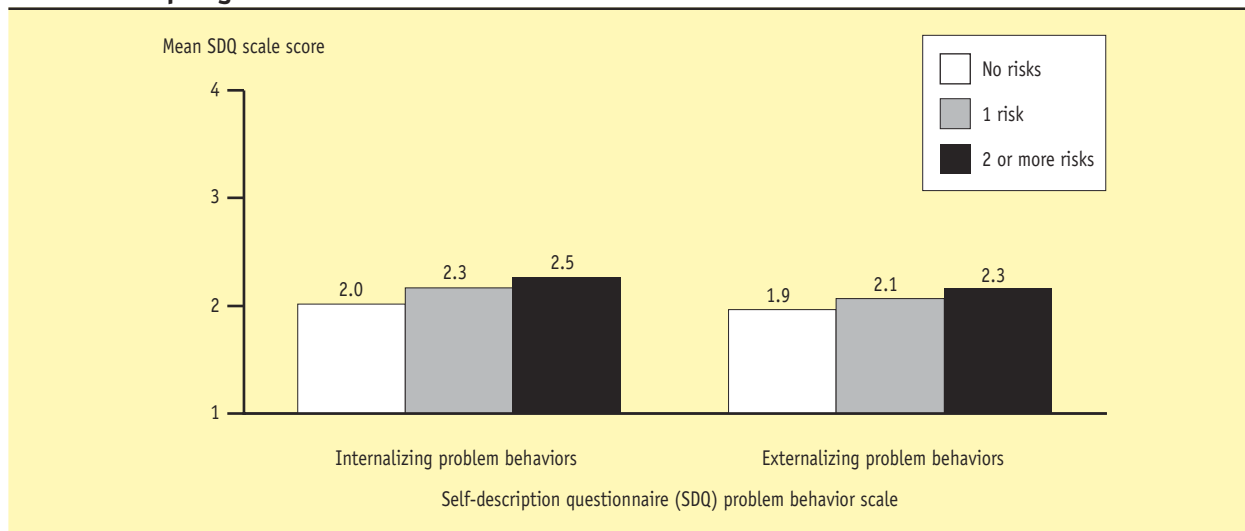
**Figure E. Percent of fall 1998 first-time kindergartners demonstrating specific mathematics knowledge and skills in spring of third grade, by school type: Spring 2002**



NOTE: Estimates reflect the sample of children assessed in English in all assessment years. Although most of the children in the sample were in third grade in the spring of 2002, 10 percent were in second grade, and about 1 percent were enrolled in other grades.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99 (ECLS-K), Longitudinal Kindergarten-First Grade Public-Use Data File and Third Grade Restricted-Use Data File, fall 1998, spring 1999, spring 2000, and spring 2002.

**Figure F. Mean scale scores for fall 1998 first-time kindergartners' perceptions of problem behaviors they exhibit in spring of third grade, by number of family risk factors: Spring 2002**



NOTE: Family risk factors included living below the federal poverty level, primary home language was non-English, mother's highest education was less than a high school diploma/GED, and living in a single-parent household. Values range from 0 to 4. Scale scores on children's perceptions come from a self-description questionnaire (SDQ). Scores on the SDQ scales ranged from 1 "not at all true" to 4 "very true." Estimates reflect the sample of children assessed in English in all assessment years. Although most of the children in the sample were in third grade in the spring of 2002, 10 percent were in second grade, and about 1 percent were enrolled in other grades.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99 (ECLS-K), Longitudinal Kindergarten-First Grade Public-Use Data File and Third Grade Restricted-Use Data File, fall 1998, spring 1999, and spring 2002.





also associated with their achievement at the end of the school year (tables A-15 and A-16). Those scoring in the highest third on the reading assessment in spring of 2002 expressed greater interest and competency in reading than children scoring in the lower two-thirds. The same pattern of relationships between perceptions and achievement occurred in mathematics. The relationship between children's perceptions and achievement were subject-specific, in that there was no relationship between achievement in one subject area and perceived interest and competence in a different subject area.

## Conclusion

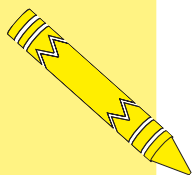
In summary, the findings from this report are consistent with patterns identified in earlier ECLS-K reports on children's achievement in kindergarten and first grade (Denton and West 2002; West, Denton, and Reaney 2001; West, Denton, and Germino Hausken 2000). The knowledge and skills children demonstrated at the end of third grade continued to differ in relation to their race/ethnicity and number of family risk factors. In addition, this report found that the achievement gaps between disadvantaged and more advantaged children identified at the beginning of school (West, Denton, and Germino Hausken 2000) grew wider over the first 4 years of school attendance.

In the first months of school, private school kindergartners demonstrated higher achievement status in reading and mathematics than public school kindergartners (West, Denton, and Germino Hausken 2000). These unadjusted mean differences were also found in third grade between children who attended public schools for all 4 years and those who attended private schools for part or all of the time, and were also found in terms of children's science achievement. However, when other factors (e.g., race/ethnicity and number of risk factors) were

taken into account, some of the substantive school-type achievement differences did not persist. Also, the achievement gap between public and private school children did not widen substantively over the first 4 years of school, even between those children who always attended the same types of school from kindergarten through third grade.

In earlier ECLS-K reports, findings also indicated that public school children who attended full-day (vs. half-day) kindergarten programs had higher overall achievement at the end of kindergarten in reading and mathematics, after controlling for other characteristics, and were more likely to demonstrate advanced reading skills at the end of the kindergarten year (Walston and West 2004; Denton, West, and Walston 2003). When overall kindergarten achievement was compared for full-day and half-day children from both public and private schools, however, differences in reading and mathematics achievement were not detected (West, Denton, and Reaney 2001). Findings from this report also indicate no substantive differences in reading, science, and mathematics achievement at the end of third grade related to the type of kindergarten program children had attended.

New information collected directly from children at the end of third grade indicates that, on average, they generally enjoyed reading, mathematics, and school in general, and felt competent in their schoolwork in these areas. Children's academic performance in reading and mathematics was positively related to their perceptions of their competence in the corresponding subject area. Third-graders perceived that it was easy for them to make and maintain friendships, and that they only occasionally exhibited internalizing and externalizing problem behaviors in school. However, disadvantaged children were more likely than more advantaged children to indicate that they exhibited problem behaviors.



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We wish to recognize the 20,000 parents and children who participated during the first 4 years of the study. We would like to thank the teachers and administrators of the more than 3,800 schools we visited across the United States for allowing us to work with their children and parents, and for providing us with information about their students and schools. We are especially appreciative of the assistance we received from the Chief State School Officers, district superintendents and staff, and private school officials.

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We wish to acknowledge the support that we have received from the Head Start Bureau of the Administration on Children, Youth, and Families of the U.S. Department of Health and Human Services; the Economic Research Service of the U.S. Department of Agriculture; the National Institute for Child Health and Human Development; and the U.S. Department of Education's Office of Special Education Programs, Office of English Language Acquisition, and Policy and Program Studies Service.

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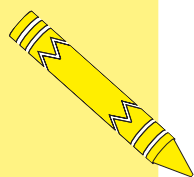


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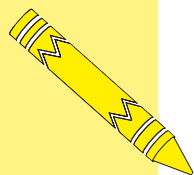


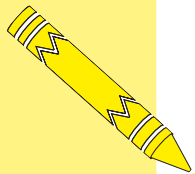
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# I. Introduction

Children begin kindergarten with many different levels of reading and mathematics skills and make significant gains in their reading and mathematics achievement over the first 2 years of school (West, Denton, and Germino Hausken 2000; West, Denton, and Reaney 2001; Denton and West 2002). The knowledge and skills children acquire in kindergarten and first grade can serve as a foundation for their later educational success. It is important to explore children's growth and development as they move from the beginning of kindergarten through the elementary school years.

This is the fourth report in a series that provides descriptive information about young children's school experiences, based on data from the Early Childhood Longitudinal Study, Kindergarten Class of 1998–99 (ECLS-K). The ECLS-K is a multi-source, multimethod study that focuses on children's early education, beginning with kindergarten. The ECLS-K includes measures of children's health and socioemotional status, cognitive achievement, and their family, classroom, school, and community environments.

Sponsored by the National Center for Education Statistics (NCES), part of the U.S. Department of Education's Institute of Education Sciences,<sup>7</sup> the ECLS-K selected a nationally representative sample of kindergartners in the fall of 1998 and is following these children through the spring of fifth grade. The study collects information directly from the children and their families, teachers, and schools. The full ECLS-K base-year sample is composed of 22,782 children who attended 1,277 schools with kindergarten programs during the 1998–99 school year.

The first ECLS-K report, *America's Kindergartners* (West, Denton, and Germino Hausken 2000),

provided a national picture of the knowledge and skills of beginning kindergartners. It revealed that while first-time kindergartners were similar in many ways, differences existed in their knowledge and skills in relation to their age at school entry, race/ethnicity, health status, home educational experiences, and child care histories. Some of these types of differences found at school entry were consistent with the differences noted in other national studies of older children (e.g., National Assessment of Educational Progress (NAEP)) (Grigg et al. 2003; Braswell et al. 2001).

The second report, *The Kindergarten Year* (West, Denton, and Reaney 2001), showed that children considered at risk for school failure acquired many of the basic skills in reading and mathematics during their first year of school that they did not have when they began kindergarten. Consequently, by the spring of kindergarten, the majority of these children knew their letters, numbers, and shapes; about half made the connection between letter and sound at the beginning of words; and almost three-quarters understood the mathematical concept of relative size (e.g., out of two objects, they could identify which object was longer). However, these children generally fell behind their more advantaged classmates in higher level knowledge and skills. Specifically, across the kindergarten year, the gap between disadvantaged children and other children widened in more advanced reading (e.g., recognizing words by sight) and mathematics skills (e.g., adding and subtracting).

The third report in this series, *Children's Reading and Mathematics Achievement in Kindergarten and First Grade* (Denton and West 2002), focused on the status of children's reading and mathematics achievement in the spring of kindergarten and the spring of first grade. It found that some of the differences in children's reading and mathematics skills in relation to their race/ethnicity, federal poverty status, and school type that were present as they entered school had persisted through the spring of first grade. Differences also began to emerge in first grade that were not present during the kindergarten year, with girls more likely to be reading and boys more likely to demonstrate advanced mathematics

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<sup>7</sup>Several other federal agencies provide support for this study, including the Economic Research Service of the U.S. Department of Agriculture, the Head Start Bureau of the Administration on Children, Youth, and Families of the U.S. Department of Health and Human Services, the National Institute for Child Health and Human Development, and the Office of Special Education Programs, the Office of English Language Acquisition, and the Policy and Programs Studies Service within the U.S. Department of Education.





proficiency. In contrast, some differences present in the kindergarten year began to wane in first grade, as Hispanic children's scores tended to move toward the national mean from the start of kindergarten to the end of first grade.

This fourth report in the series highlights children's gains in reading and mathematics over their first 4 years of school, from the start of kindergarten to the point when most of the children are finishing third grade.<sup>8</sup> The report also describes children's achievement in reading and mathematics at the end of third grade, both in terms of their overall achievement in the two subject areas and in terms of their specific reading and mathematics knowledge and skills. It examines whether differences in reading and mathematics achievement that were identified for certain groups of children in kindergarten and first grade persist 2 or 3 years later. Achievement is also compared for children with different early school experiences (i.e., attending full-day vs. half-day kindergarten programs, attending public vs. private schools from kindergarten through third grade) to explore whether such experiences are associated with later achievement.

Information on two new ECLS-K direct child assessments conducted in the spring of 2002 is included. In the third-grade year, children were administered cognitive assessments in science for the first time in place of the general knowledge assessments, which were used in the kindergarten and first-grade years. In addition, third-graders completed a questionnaire about their perceptions of their school experiences and their relations with other students. Prior to third grade, information about children's social skills and socioemotional development came from the reports of their parents and teachers. More information on these two new instruments is provided in the Measures section of the Introduction.

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<sup>8</sup>This report refers to data collected in the spring of 2002 as third-grade data and the sampled children as third-graders, although not all children in the analytic sample used for this report were enrolled in third grade. In the spring of 2002, about 89 percent of the children in the analytic sample were in third grade, 10 percent were in second grade, and about 1 percent were enrolled in other grades (e.g., first or fourth grade).

## Research Questions

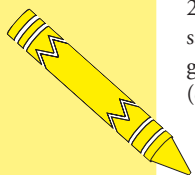
The report uses data from the ECLS-K to address the following questions:

- What knowledge and skills do children demonstrate in the spring of third grade? How have these changed since they first started school? Do children's knowledge and skills and the gains they have made over time differ by certain child, family, and school characteristics?
- How do third-graders perceive themselves and their relations with other children? Is their academic achievement at the end of third grade related to their perceptions?

## Organization of the Report

The findings in this report are organized in two sections, which coincide with the two sets of research questions identified above. First, information on children's achievement and growth in various subject areas is presented. Within this section, children's knowledge and skills are presented in terms of their overall achievement in reading and mathematics and in terms of the acquisition of specific skills in the two subjects. The second section describes children's perceptions about themselves and their relationships with others on six different dimensions, including children's perceptions about their competence and interest in (1) reading, (2) mathematics, and (3) school in general and their perceptions about their (4) peer relationships and any (5) internalizing or (6) externalizing behaviors that they may exhibit. Both sections describe the population of children overall and in relation to characteristics of the children, their families, and their early school experiences. Following the main sections of the report, appendix A includes the tables of estimates and standard errors cited in the report and appendix B provides methodology details and other technical notes relevant to the report.

The purposes of this report are to describe the academic gains children have made from kindergarten through third grade, their achievement status at the end of third grade, and their perceptions about their school experiences. Two types of analyses were used to answer the research questions. First, bivariate analyses (i.e., *t*-tests) that compare the overall unadjusted mean scores for different groups



of children were conducted. Second, ordinary least squares (OLS) regression analyses were used in order to describe the relationships of different child, family, and early school experience characteristics (e.g., race/ethnicity, number of risk factors, kindergarten program type) with children's achievement and perceptions, after controlling for other characteristics. One of the limitations of bivariate statistics is that they describe children's achievement gains and status for different groups of children without taking into account the influence of other factors that may also be related to achievement differences. For instance, family risk factors are related to children's achievement (West, Denton, and Reaney 2001), though the average number of these risk factors varies by children's race/ethnicity (Zill and West 2001). Thus, it is possible that lower achievement scores for some minority children may be attributed to their number of family risk factors, which are not controlled for in bivariate analyses. Bivariate results are included in the report to describe overall, unadjusted mean values for subgroups in the population. Findings from the regression analyses follow the bivariate analyses results within each section of the report and address this question: Do the differences found in the mean comparisons persist after controlling for other child, family, and school characteristics?

This is a descriptive report. Readers should not draw causal inferences from the regression results in this report, since apparent relationships can change based on the particular independent variables examined. The small set of independent variables used in this report's regression analyses were included with the specific purpose of clarifying the descriptive results observed in the multiple bivariate comparisons.

## Measures

Information in this report was collected through direct, one-on-one child assessments and parent interviews. Below is a brief description of some of the measures and characteristics used from these information sources. The variables used for the analyses in this report come from the ECLS-K Third Grade restricted-use data file, unless otherwise noted. More detailed information on the measures can be found in the Appendix B: Methodology and Technical Notes of this report or in the Early Child-

hood Longitudinal Study, Kindergarten Class of 1998–99 User's Manuals (NCES 2001, NCES 2002, NCES 2003a).

## Children's Cognitive Knowledge and Skills

The ECLS-K cognitive assessment batteries were developed with the goal of assessing children's cognitive status in kindergarten, first grade, and third grade, and to provide a means of measuring growth since kindergarten entry. In kindergarten and first grade, the same reading and mathematics assessment battery was used in all rounds of data collection. For third grade, a new reading and mathematics battery was developed since children's academic skills could be expected to have advanced beyond the levels covered by the kindergarten-first grade assessment. Some of the kindergarten-first grade items were retained in the third-grade assessment to support the development of a longitudinal score scale (Pollack et al. forthcoming). In addition to calculating overall achievement scores for reading, mathematics, and science in third-grade, proficiency scores were created for specific reading and mathematics skills.<sup>9</sup> These proficiency scores represent a progression of skills. No proficiency levels were developed for the science assessment, however, since the items did not follow a hierarchical pattern. This report includes information from the assessments administered in the fall and spring of kindergarten (fall 1998 and spring 1999), the spring of first grade (spring 2000), and the spring of third grade (spring 2002).<sup>10</sup>

**Reading Knowledge and Skills.** The ECLS-K kindergarten and first-grade reading assessment included questions designed to measure basic skills (letter recognition, beginning and ending sounds), vocabulary (receptive vocabulary, as in "point to the picture of the cat"), and comprehension (listening comprehension, words in context). In third grade, the assessment included items designed to measure phonemic awareness, single word decoding,

<sup>9</sup>For information on reliability of the scores, see Pollack et al. (forthcoming).

<sup>10</sup>Details on the administration of the cognitive assessments are provided in the Methodology and Technical Notes section of this report (appendix B).





vocabulary, and passage comprehension. It also included some of the more difficult test items from the kindergarten-first-grade battery, such as identifying sight words and reading words in context in order to link the kindergarten and first-grade assessment and the third-grade assessment for scaling purposes.

In addition to an overall reading achievement score<sup>11</sup> at each time point, the reading assessments contained eight proficiency levels. This report focuses on the six highest proficiency levels that reflect a progression of knowledge and skills at the third grade level, including (from easiest to most difficult): (1) understanding the letter-sound relationship at the end of words (identifying the letter that represents the sound at the end of a word); (2) recognizing words by sight (reading simple words aloud); (3) understanding words in context (listening comprehension and reading simple text passages); (4) making inferences using cues that were directly stated with key words in text (literal inference); (5) identifying clues used to make inferences (deriving meaning); and (6) demonstrating understanding of author's craft and making connections between a problem in the narrative and similar life problems (interpreting beyond text).<sup>12</sup>

**Mathematics Knowledge and Skills.** The ECLS-K kindergarten and first-grade mathematics assessment was designed to measure skills in conceptual knowledge, procedural knowledge, and problemsolving. Approximately one-half of the mathematics assessment consisted of questions on number sense and number properties and operations. The remainder of the assessment included questions in measurement; geometry and spatial sense; data analysis, statistics, and probability; and patterns, algebra, and functions. In third grade, the

mathematics assessment addressed these same content areas, with the easier forms focusing on number sense, properties and operations and the more difficult forms focusing on measurement, algebra, and geometry. Also, a greater emphasis on problemsolving was included in third grade compared with the kindergarten and first-grade battery (Pollack et al. forthcoming). Similar to the reading assessment, a subset of items from the first-grade assessment was included in the third-grade assessment in order to link the kindergarten and first-grade assessment and the third-grade assessment for scaling purposes.

In addition to an overall mathematics achievement score at each time point, the mathematics assessment contained seven proficiency levels. This report focuses on the five highest proficiency levels that reflect a progression of knowledge and skills at the third-grade level, including (from easiest to most difficult): (1) ordinality (number sequence, reading 2-digit numerals, identifying ordinal position of an object, solving simple word problems); (2) solving simple addition and subtraction items (sums up to 10 and relationships of numbers in sequence); (3) solving simple multiplication and division problems and recognizing more complex number patterns; (4) demonstrating understanding of place value in integers to the hundreds place; and (5) using knowledge of measurement and rate to solve word problems.<sup>13</sup>

**Science Knowledge and Skills.** In the first 2 years of the ECLS-K, children were administered a general knowledge assessment that measured their knowledge of the social and physical worlds. In third grade, the general knowledge assessment was replaced by a science assessment. Due to time constraints and to the widely different content coverage of social studies in schools across the United States, social studies was not assessed directly in the ECLS-K.

The third-grade science battery placed equal emphasis on life science, earth and space science, and physical science. Similar to the kindergarten and first-grade general knowledge assessment, chil-

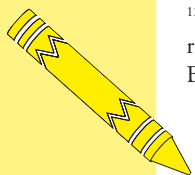
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<sup>11</sup>The overall achievement score in each subject area is an Item Response Theory (IRT) scale score. Children's IRT scale score values are a reflection of the number of items they would have answered correctly on the assessment if they had been administered all items in the battery. More information on the development of the assessment scores is available in the *Early Childhood Longitudinal Study, Kindergarten Class of 1998–99 (ECLS-K): Psychometric Report for the Third Grade* (Pollack et al. forthcoming).

<sup>12</sup>The two reading proficiency levels excluded from this report include Letter Recognition (level 1) and Identifying Beginning Sounds (level 2).

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<sup>13</sup>The two mathematics proficiency levels excluded from this report include Counting, Numbers, and Shapes (level 1) and Relative Size (level 2).



dren were asked to demonstrate understanding of the physical and natural world, make inferences, and understand relationships. In the third grade, they were also required to interpret scientific data, form hypotheses, and develop plans to investigate a given question. Scores on the kindergarten and first-grade general knowledge assessment battery are not linked and are not on the same scale with the third-grade science battery, however, since the two assessments covered different content.

### Self-Description Questionnaire (SDQ)

In earlier rounds of data collection, parents and teachers provided information about children's social skills, approaches to learning, and problem behaviors. In the third-grade year, children provided information for the first time in the ECLS-K study about themselves by completing a short self-description questionnaire (SDQ). On the SDQ, children rated their perceptions of their competence and their interests in reading, mathematics, and school in general. They also rated their popularity with peers and competence in peer relationships and reported on any problem behaviors that they might exhibit.

Children were read a series of behavioral statements about their perception of themselves and asked to respond on a scale from 1 to 4, including "not at all true," "a little bit true," "mostly true," and "very true." Responses were then used to create six scales: (1) reading scale, (2) mathematics scale, (3) school scale, (4) peer scale, (5) externalizing problem behavior (anger/distractibility) scale, and (6) internalizing problem behavior (sad/lonely/anxious) scale. Children's scale scores on each of the SDQ scales represent the mean rating of the items included in the scale. The reading and mathematics scales covered items related to children's grades, the difficulty of work in the subject area, and their interest in and enjoyment in the subject area.<sup>14</sup> The more general school scale reflected how well third-graders perceived themselves to be doing in all school subjects and how well they enjoyed school in general. The peer scale captured how easily they found it to make friends and to get along with children, as well as their perception of their popularity.

<sup>14</sup>Due to copyright agreements, the exact wording of the SDQ items for each scale cannot be included in this report.

The final two scales were based on responses to items that characterize externalizing and internalizing problem behaviors. For instance, the externalizing problem behavior scale was based on responses to items about fighting and arguing with other children, disturbing others, and problems with distractibility. The internalizing problem behavior scale focused on behaviors such as feeling ashamed of mistakes, worrying about school and friendships, and expressing that they often feel sad and/or lonely.

### Child, Family, and School Experience Characteristics

This report builds on findings of the ECLS-K program's earlier reports, with the main purpose to continue to examine whether differences by certain child, family, and school characteristics found in earlier reports persist, desist, widen, or narrow. Those characteristics associated with differences in children's achievement found in earlier reports (and which are explored here) are: (1) child's sex; (2) race/ethnicity; (3) number of family risk factors; (4) kindergarten program type (full/half day); and (5) school type across the first 4 years of the study.

**Family Risk Index.** Previous research has found significant differences in the academic and socioemotional skills of entering kindergartners between children from high-risk families and those with fewer family risk factors (Zill and West 2001; West, Denton, and Reaney 2001). For instance, children with one risk factor (e.g., single-parent household, primary home language other than English) had lower achievement scores in reading, mathematics, and general knowledge than children with no factors, and those with 2 or more risk factors lagged behind their peers with only one risk factor. In addition, kindergarten teachers reported that children with one or more family risk factors were more likely to fight with their classmates than children with no family risk factors. These findings indicate the need to examine children's achievement not only in relation to whether they are at risk or not at risk but also in terms of the number of risk factors they experience in their homes.

For this report, a family risk factor composite variable was created, based on children's household federal poverty status, family type, mother's highest education level, and primary home language, as







collected in the kindergarten year.<sup>15</sup> Risk factors identified in previous education research include coming from a low-income family or single-parent household, having parents who did not complete high school, and having parents who speak a language other than English in the home (Croninger and Lee 2001; Natriello, McDill, and Pallas 1990; Zill and West 2001). Previous research has found associations among these family background characteristics and poor educational outcomes, including low achievement scores, grade repetition, and dropping out of high school. In this report, children receive one point on the index for each of the following risk factors: single-parent household, below federal poverty level,<sup>16</sup> primary home language other than English, and mother's highest education level less than a high school diploma or its equivalent, for a possible range of 0 to 4 points. For the bivariate comparisons in this report, children are grouped into three categories: no risk factors, one risk factor, or two or more risk factors, following the grouping categories for risk factors used in earlier ECLS-K reports (West, Denton, and Reaney 2001; Zill and West 2001). In the regression analyses, the continuous number of risk factors was used. The variables used to create the risk factor index come from the ECLS-K Longitudinal Kindergarten—First Grade public-use data file.

Table A-3 (in appendix) provides the distribution of risk index values for children with different characteristics, showing that certain groups of children are more likely to be at risk than other groups. For instance, three-quarters of White, non-Hispanic children had no family risk factors in kindergarten, compared with about one-third of Black, non-Hispanic children, 40 percent of Hispanic children, and almost half of Asian/Pacific Islander children.<sup>17</sup>

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<sup>15</sup>Previous ECLS-K reports on children's achievement have used a similar risk factor index (Zill and West 2001; West, Denton, and Reaney 2001), using family receipt of welfare assistance in place of federal poverty status.

<sup>16</sup>The federal poverty level status composite variable is derived from household income and the total number of household members. Federal poverty thresholds are used to define households below the poverty level. For instance, in 1998 if a household contained 4 members, and the household income was lower than \$16,655, then the household was considered to be in poverty.

Furthermore, of those children who had always attended private schools, 82 percent had zero risk factors, compared with 58 percent of children who had always attended public schools. Some risk factors are also associated with each other. For instance, 55 percent of children in poverty live in single-parent households, compared with 17 percent of children who are at or above the poverty threshold (data not shown in tables).<sup>18</sup>

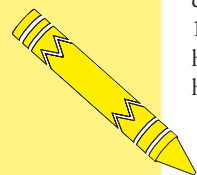
**Kindergarten Program Type in 1998–99.** In the base year, 45 percent of children attended half-day kindergarten and 55 percent attended full-day kindergarten programs (West, Denton, and Reaney 2001). Earlier analyses of the ECLS-K data have shown that full-day kindergartners in public schools made greater gains in reading and mathematics over the kindergarten year than half-day kindergartners, even after accounting for differences associated with children's sex, race/ethnicity, federal poverty status, fall achievement level, class size, the amount of time spent in subject-area instruction, and the presence of an instructional aide in the classroom (Walston and West 2004; Denton, West and Walston 2003). This report explores whether children who attended full-day kindergarten programs continue to demonstrate higher achievement in reading and mathematics in relation to their peers who attended half-day kindergartens. The variable used to identify children's kindergarten program type comes from the ECLS-K Longitudinal Kindergarten—First Grade public-use data file.

A recent ECLS-K study showed that there were differences in children's likelihood of attending full- or half-day kindergartens related to characteristics of children (Walston and West 2004). For example, Black kindergartners were more likely than White, Asian, or Hispanic children to attend full-day kin-

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<sup>17</sup>The percentages of Hispanic and Asian/Pacific Islanders with no family risk factors based on the analytic sample for this report (40 and 47 percent, respectively) are an overestimate of the population (28 percent of Hispanic and 37 percent of Asian/Pacific Islander) because the analytic sample excludes children who were not administered the assessments in English at all time points in the study. Standard errors of 1.4 (population Hispanic) and 2.2 (population Asian/Pacific Islander).

<sup>18</sup>Standard errors of 1.9 (below poverty threshold) and 0.7 (at or above poverty threshold).



dergarten programs, and children living below the federal poverty threshold were also more likely to be enrolled in full-day kindergarten programs than those from more affluent families. Furthermore, private schools are more likely to offer full-day kindergarten programs than public schools.

#### **School Type Across All Waves of the Study.**

Previous research has indicated that private school children have higher average achievement scores than children in public school settings (West, Denton, and Reaney 2001; Denton and West 2002; Braswell et al. 2001). In this report, children are categorized into 3 groups; those who attended public school all 4 years (i.e., kindergarten through third grade), those who attended private school all 4 years, and those who attended both public and private schools between the start of kindergarten and the end of third grade. Children's likelihood of attending certain types of schools over the course of the study was associated with their individual and family characteristics. As noted earlier, children with no risk factors were more likely to attend private schools from kindergarten through third grade. Also, 11 percent of White children and 10 percent of Asian/Pacific Islander children attended private schools for all 4 years, compared with 4 percent of Black children (data not in tables).<sup>19</sup> The variables used to create the school type composite for this report come from the ECLS-K Longitudinal Kindergarten—First Grade public-use data file and the ECLS-K Third Grade restricted-use data file.

Differences in third-graders' achievement in relation to the type of school they attend should be interpreted with caution, as children also demonstrated differences in achievement by their school type in the fall of kindergarten, when schools had little opportunity to have an effect on children's performance (West, Denton, and Reaney 2001). In addition, it is possible that a few students may have switched from one school to another in second grade, then switched back again to the original school at the start of third grade. Since data were not collected in second grade, it is not possible to identify when such instances occurred.

## **Analytic Sample**

The findings in this report are based on 10,500 public and private school children who entered kindergarten for the first time in fall of 1998 and were administered the English version of the ECLS-K cognitive assessments in the fall of 1998, spring of 1999, spring of 2000, and spring of 2002.<sup>20</sup> Estimates in this report may not exactly match those of previous ECLS-K reports on young children's achievement (West, Denton, and Germino Hausken 2000; West, Denton, and Reaney 2001; Denton and West 2002). This report uses data for respondents assessed in the fall and spring of kindergarten, spring of first grade, and spring of third grade, so a different weight was used to produce estimates than was used in earlier reports. The weight in this report is stricter in its response requirements compared to some other reported analyses and, thus, utilizes a slightly smaller sample of children due to attrition. In addition, the ECLS-K IRT-scale scores are recalibrated after each round of data collection. The assessment score variables used in this report all come from the ECLS-K Third Grade restricted-use data file, which includes the recalibrated scores for all rounds of data collection. Further, this report is based on all first-time kindergartners' performance in their fourth year of school, not only those who were in third grade in the spring of 2002. Therefore, this report includes some children who were excluded from the earlier ECLS-K report, *Children's Reading and Mathematics Achievement in Kindergarten and First Grade* (Denton and West 2002), because they did not progress to first grade in the spring of 2000.

This report focuses on those children who were assessed in English at all points in time. Prior to administering the English reading and mathematics assessment in kindergarten and first grade, children's English language proficiency was evaluated. Children whose home language was other than English (as determined by school records) were administered the Oral Language Development Scale (OLDS) (for more information, see the *ECLS-K Base-Year User's Manual*, National Center for Education Statistics 2001). If children demonstrated sufficient proficiency in English for the ECLS-K

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<sup>19</sup>Standard errors of 0.8 (White), 1.1 (Black), and 1.9 (Asian/Pacific Islander).

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<sup>20</sup>Estimates in this report are weighted by the ECLS-K longitudinal full-sample child weight, C1\_5FC0.





direct child assessment, they received the English reading and mathematics battery. Approximately 68 percent of Hispanic children and 78 percent of Asian/Pacific Islander children were assessed in English in the fall and spring of kindergarten and in the spring of first grade (Denton and West 2002).<sup>21</sup> In the fall of kindergarten, 1,567 children were not administered the English battery because of their performance on the OLDS. By spring of first grade, this number was down to 350.<sup>22</sup> In the third-grade year, the OLDS was not administered and all children were assessed in English.<sup>23</sup>

Table 1 provides a comparison of the population of children represented by the sample used in this report and the full ECLS-K population of first-time kindergartners. The analytic sample used in this report has a larger percentage of White<sup>24</sup> children (64 percent) and a smaller percentage of Hispanic children (13 percent) than the full ECLS-K sample of first-time kindergartners (59 and 18 percent, respectively), and the percentage of children with no risk factors is higher for the analytic sample than the full sample (62 percent vs. 58 percent). Differences between the racial/ethnic and the risk factor index distributions of the analytic sample and the ECLS-K population distributions are due, in part, to the exclusion of children who were not administered the assessments in English at all time points in the study.

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<sup>21</sup>In an earlier ECLS-K report (Denton and West 2002), analyses were conducted to explore how including children who initially could not take the battery in English but were screened in by spring of first grade would impact achievement estimates. Significant reading *t*-score differences overall and by specific racial/ethnic group were not detected between the analytic sample of children assessed in English at all time points and the total sample, including those who were screened into the English assessment over time.

<sup>22</sup>This information is based on the *ECLS-K Longitudinal Kindergarten-First Grade Public-Use Electronic Code Book* (NCES 2002-148) variable CPSOLDS (Round in which child passed English OLDS).

<sup>23</sup>The OLDS was not administered in the spring of third grade due to the small number of children to whom it would apply and the associated costs of administering it to them.

<sup>24</sup>White refers to White, non-Hispanic; Black refers to Black, non-Hispanic; and Other refers to Other, non-Hispanic (i.e., American Indian, Alaska Native, or multiracial) for the remainder of this report.

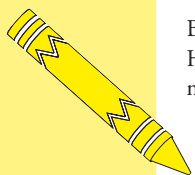
Comparisons in the text of this report are tested for statistical significance to ensure that the differences are larger than might be expected, due to sampling variation. All differences described are statistically significant at the .05 level. Due to the large sample size, many differences (no matter how substantively minor) are statistically significant. Therefore, in this report, following the criteria established in earlier reports in this series, we define “substantive differences” as effect size differences of one-quarter of a standard deviation or more for mean scores, and percentage differences of 5 points or greater for specific proficiency levels, unless otherwise noted. Based on the criteria set in this report, group differences are only reported as being substantive if they have at least a small effect size (Cohen 1988). Because of the multitude of possible bivariate comparisons, the statistically significant results that meet the specified criteria for substantive importance are discussed in the text, but not noted in the tables. However, in the regression analyses, all statistically significant coefficients are noted, with an additional notation for those that also meet the specified criteria for substantive importance.

## Changes Over Time for the ECLS-K Children

Over the first 4 years of school, young children may encounter different learning experiences. From the start of kindergarten to the end of third grade, many children had changed schools at least one time (table 2).<sup>25</sup> For instance, in the spring of 2002, about half of the children remained in the same school they had attended in kindergarten, 39 percent had made one school change, and 10 percent had changed schools two or more times since the start of kindergarten. Some children also changed the type of school they attended. In the spring of 2002, 88 percent of the children were enrolled in public schools and 12 percent attended private schools. Eighty-one percent of the children had attended public schools for the duration of the study,

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<sup>25</sup>It is possible that a few students may have switched from one school to another in second grade, then switched back again to the original school at the start of third grade. Since data were not collected in second grade, it is not possible to identify when such instances occurred.



**Table 1. Percentage distribution of fall 1998 first-time kindergartners in the analytic report sample and the full ECLS-K sample, by child's sex, race/ethnicity, and number of family risk factors: Fall 1998**

Selected child and family characteristics	Analytic report sample	Full ECLS-K sample
Sex		
Male	51	51
Female	49	49
Race/ethnicity		
White, non-Hispanic	64	59
Black, non-Hispanic	16	15
Hispanic	13	18
Asian/Pacific Islander	3	3
Other, non-Hispanic	4	4
Number of family risk factors <sup>1</sup>		
No risks	62	58
One risk	23	23
Two or more risks	15	19

<sup>1</sup>Family risk factors included living below the federal poverty level, primary home language was non-English, mother's highest education was less than a high school diploma/GED, and living in a single-parent household. Values range from 0 to 4.

NOTE: Detail may not sum to totals because of rounding. Estimates for the analytic report sample reflect the sample of children assessed in English in all assessment years.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99 (ECLS-K), Longitudinal Kindergarten-First Grade Public-Use Data File and Third Grade Restricted-Use Data File, fall 1998 and spring 2002.

and 9 percent always attended private schools. Ten percent changed the type of school they attended at least once between kindergarten and the end of third grade. In the spring of 2002, 89 percent of first-time kindergartners were in third grade, 10 percent were in second grade, and about 1 percent were enrolled in other grades (e.g., first or fourth grade) (not shown in tables).

## Limitations

This report provides a detailed description of children's achievement gains over the first 4 years of school and their achievement status and their perceptions of competence at the end of third grade. However, there are limitations of the data and analyses used in this report. For instance, children's reported perceptions of their interests and competence may be affected by response bias if the children feel the need to provide socially desirable answers on the SDQ. Steps were taken in the study to reduce children's concerns, including helpful hints to the children to not worry about anyone seeing or hearing their answers (see Appendix B: Measures

and Technical Notes); however, it is not possible to estimate the degree to which such bias may occur.

As noted earlier, the analytic sample used in this report excludes children who were unable to be assessed in English in the first 2 years of the study due to limited English proficiency. At the end of third grade, no children were excluded from the assessments due to language proficiency. However, since children who were previously excluded from the cognitive assessments do not have reading and mathematics scores for all rounds, they were not included in this report.

In addition, many of the differences detected in children's third-grade achievement were already present in the first month or two of kindergarten, when children were just beginning their school experiences. As an example, private school kindergartners demonstrated higher achievement in reading, mathematics, and general knowledge in the fall of kindergarten than children who attended public schools (West, Denton, and Reaney 2001). Initial differences should be recognized when examining differences in achievement status in the early school grades.





**Table 2. Percentage distribution of fall 1998 first-time kindergartners in the ECLS-K sample over the first 4 years of school, by selected family and school characteristics: Fall 1998, spring 1999, spring 2000, and spring 2002**

Selected family and school characteristics	Fall 1998	Spring 1999	Spring 2000	Spring 2002
Total	100	100	100	100
Family type				
Two-parent/other	77	77	78	78
Single parent	23	23	22	2
Federal poverty status <sup>1</sup>				
Living below poverty level	—	18	17	17
Living at or above poverty level	—	82	83	83
School mobility				
Enrolled in fall kindergarten school	100	97	72	51
One school change	†	3	28	39
Two or more school changes	†	†	1	10
School type				
Public school all years	—	84	82	81
Private school all years	—	16	12	9
Switched from public to private school	†	†	2	3
Switched from private to public school	†	†	4	6
Multiple changes in school type	†	†	†	1

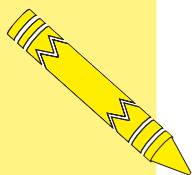
† Not applicable.

— Not available (Data were not collected on this variable in the fall of kindergarten).

<sup>1</sup>Poverty is a function of household size and household income. Based on 1998 Census information, a household of four with a total income below \$16,655 was considered to be below the federal poverty level.

NOTE: Detail may not sum to totals because of rounding. Estimates reflect the sample of children assessed in English in all assessment years. The ECLS-K assessment was not administered in 2001, when most of the children were in second grade.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99 (ECLS-K), Longitudinal Kindergarten-First Grade Public-Use Data File and Third Grade Restricted-Use Data File, fall 1998, spring 1999, spring 2000, and spring 2002.



## II. Children's Cognitive Knowledge and Skills

*What knowledge and skills do children demonstrate in the spring of third grade? How have these changed since they first started school? Do children's knowledge and skills and the gains they have made over time differ by certain child, family, and school characteristics?*

Although the ECLS-K is the first National Center for Education Statistics (NCES) study to conduct direct assessments of children's cognitive achievement in their first years of school, other NCES surveys have assessed children's reading, mathematics, and science skills as early as fourth grade. The 2003 National Assessment of Educational Progress (NAEP) reading and mathematics assessments found that fourth-graders' achievement scores in both subject areas differed in terms of children's sex, race/ethnicity, eligibility for free or reduced-price lunch, and the type of school they attended (NCES 2003b; NCES 2003c). In reading, fourth-grade girls had higher average scores than fourth-grade boys (NCES 2003c). White and Asian/Pacific Islander fourth-graders outperformed their Black, Hispanic, and American Indian/Alaska Native counterparts in reading and mathematics. Also, low-income fourth-graders (those who were eligible for free or reduced-price lunch programs) had lower average scores in both subject areas than those who were not eligible for such assistance. In addition, children attending private schools outperformed their peers in public schools in both subject areas in fourth grade (NCES 2003b; NCES 2003c).

The first part of this section examines how children's achievement in reading and mathematics changes from the start of kindergarten to the end of their fourth year of schooling, when most children are enrolled in third grade. Second, children's overall achievement status in reading, mathematics, and science at the end of third grade is described. Third, information is provided on the specific sets of reading and mathematics knowledge and skills that children demonstrate at the end of third grade. Differences in children's achievement are described overall and in relation to characteristics of the children, their families, and their early school experiences.

### Overall Gains in Reading and Mathematics Knowledge and Skills From Kindergarten to Third Grade

The design of the ECLS-K reading and mathematics assessments permits the examination of long-term gains that children make over their first 4 years of formal schooling, from the start of kindergarten to the end of third grade (figures 1 and 2). The science assessment was not administered until the third-grade year; thus, it is not possible to calculate gain scores for children's science achievement or to describe the acquisition of these skills across time.

Children's gains in reading and mathematics were calculated by subtracting children's fall kindergarten overall achievement scale score in each subject area from their corresponding spring third-grade overall achievement scale score. From the start of kindergarten to the end of third grade, on average, children's reading scale scores increased an average of 81 points, and their mathematics scale scores increased about 63 points (tables A-4 and A-5). In the fall of kindergarten, the standard deviations for the reading and mathematics overall achievement scale scores were 9.63 and 8.67 points, respectively.<sup>26</sup> Thus, children's spring third-grade reading scale scores were about 8.4 standard deviations higher than their fall kindergarten scores, and their spring third-grade mathematics scale scores were about 7.3 standard deviations higher than their fall kindergarten scores.

It is important to note that the data points represented in the figures and tables in this report cover different time spans (i.e., the kindergarten school year, the full calendar year between spring of kindergarten and spring of first grade, and 2 full calendar years between spring of first grade and spring of third grade). Thus, increases in achievement over time must

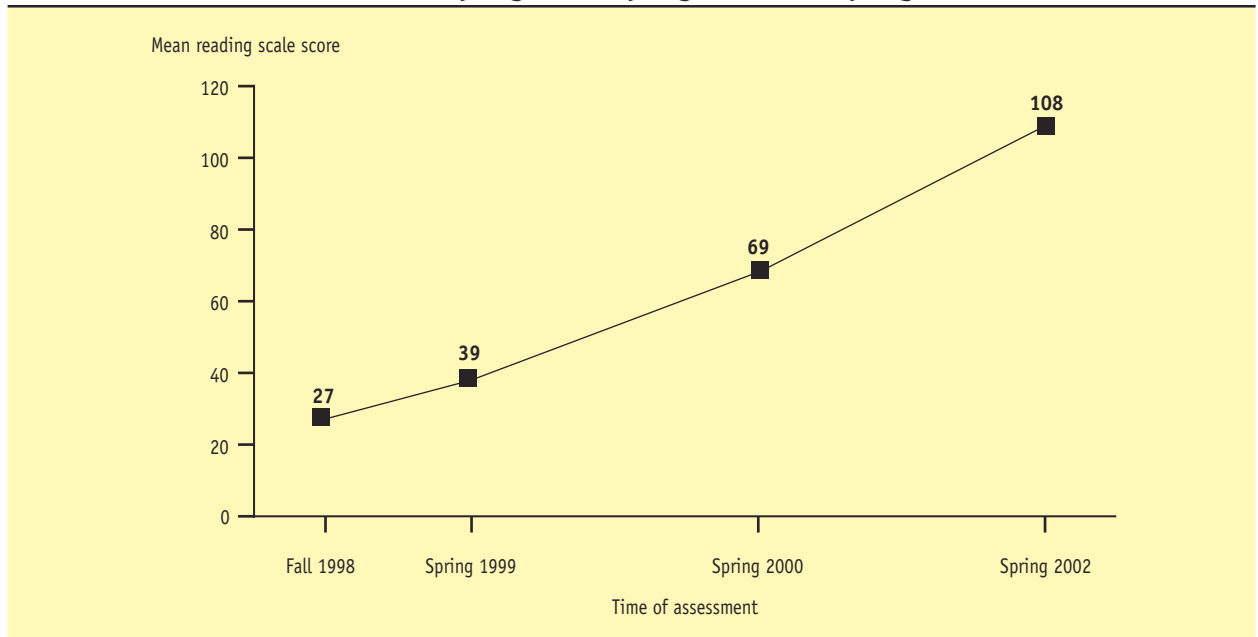
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<sup>26</sup>In the fall of kindergarten, children's reading scale scores ranged from 12 to 114 and their mathematics scale scores ranged from 6 to 64.





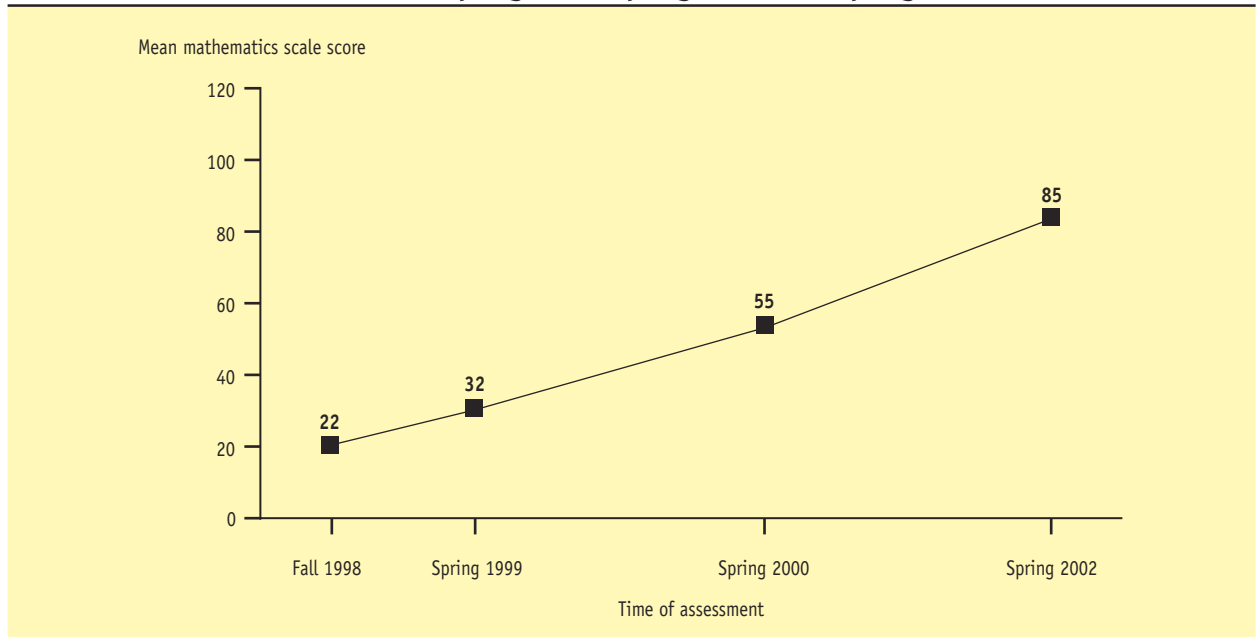
**Figure 1. Mean reading scale scores for fall 1998 first-time kindergartners, by time of assessment: Fall 1998, spring 1999, spring 2000, and spring 2002**



NOTE: Estimates reflect the sample of children assessed in English in all assessment years. The ECLS-K assessment was not administered in 2001, when most of the children were in second grade.

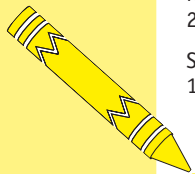
SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99 (ECLS-K), Third Grade Restricted-Use Data File, fall 1998, spring 1999, spring 2000, and spring 2002.

**Figure 2. Mean mathematics scale scores for fall 1998 first-time kindergartners, by time of assessment: Fall 1998, spring 1999, spring 2000, and spring 2002**



NOTE: Estimates reflect the sample of children assessed in English in all assessment years. The ECLS-K assessment was not administered in 2001, when most of the children were in second grade.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99 (ECLS-K), Third Grade Restricted-Use Data File, fall 1998, spring 1999, spring 2000, and spring 2002.



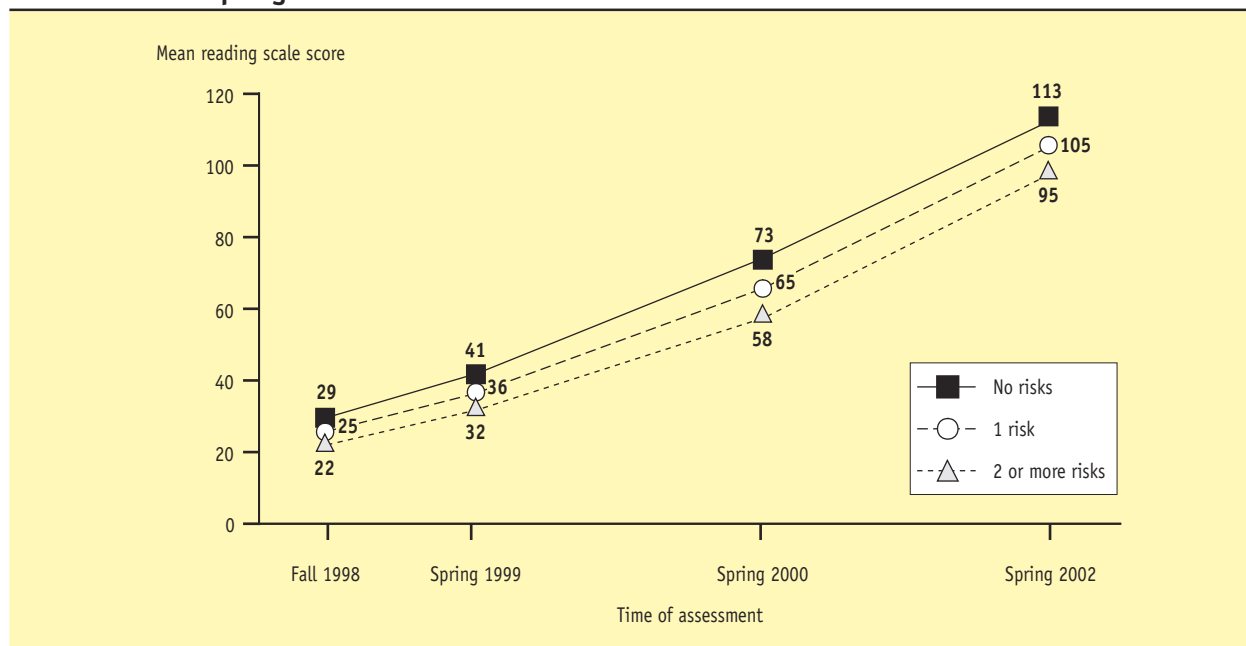
be interpreted relative to the amount of time between assessments. For instance, over the 12-month period from spring of kindergarten to spring of first grade, children averaged a gain of 30 points in reading (a gain of 3.1 standard deviations), compared with an average annual gain of 19.5 points over the 24-month period from spring of first grade to spring of third grade (average gain of 2.0 standard deviations each year). Similarly, for mathematics, a gain of 23 points from spring of kindergarten to spring of first grade was 8 points greater than the average annual gain from spring of first grade to spring of third grade (for a difference of 0.9 standard deviations).

**Bivariate comparisons.** The gains that children made in reading and mathematics from the start of kindergarten to the end of the third-grade year differed for some groups of children (tables A-4 and A-5).<sup>27</sup> For instance, when comparing the overall, unadjusted mean scores for children from different racial/ethnic groups, Black children made smaller gains in reading and mathematics than White, Hispanic, and Asian/Pacific Islander children over the first 4 years of school. In addition, White children made greater gains in both subjects than other, non-Hispanic children over the first 4 years of school.<sup>28</sup> Children with fewer risk factors made greater progress in both subject areas than children with more family risk factors (figures 3 and 4). Children’s

<sup>27</sup> The fall kindergarten to spring third-grade reading scale gains ranged from 16 to 125 points, with a mean of 81 points and a standard deviation (SD) of 16.8 points, and the mathematics scale gains ranged from 17 to 104 points, with a mean of 63 points and an SD of 13.7 points. Thus, differences in group mean gains were substantive if they were statistically significant and greater than or equal to an effect size of 4.2 points in reading and 3.4 points in mathematics.

<sup>28</sup> Although many differences between the “other, non-Hispanic” children and the other subgroups of children are substantively significant, they are not noted in the later text of this report since the “other, non-Hispanic” group is composed of children from varying racial/ethnic backgrounds, and thus, the findings are more difficult to interpret.

**Figure 3. Mean reading scale scores for fall 1998 first-time kindergartners, by time of assessment and number of family risk factors: Fall 1998, spring 1999, spring 2000, and spring 2002**



NOTE: Family risk factors included living below the federal poverty level, primary home language was non-English, mother’s highest education was less than a high school diploma/GED, and living in a single-parent household. Values range from 0 to 4. Estimates reflect the sample of children assessed in English in all assessment years. The ECLS-K assessment was not administered in 2001, when most of the children were in second grade.

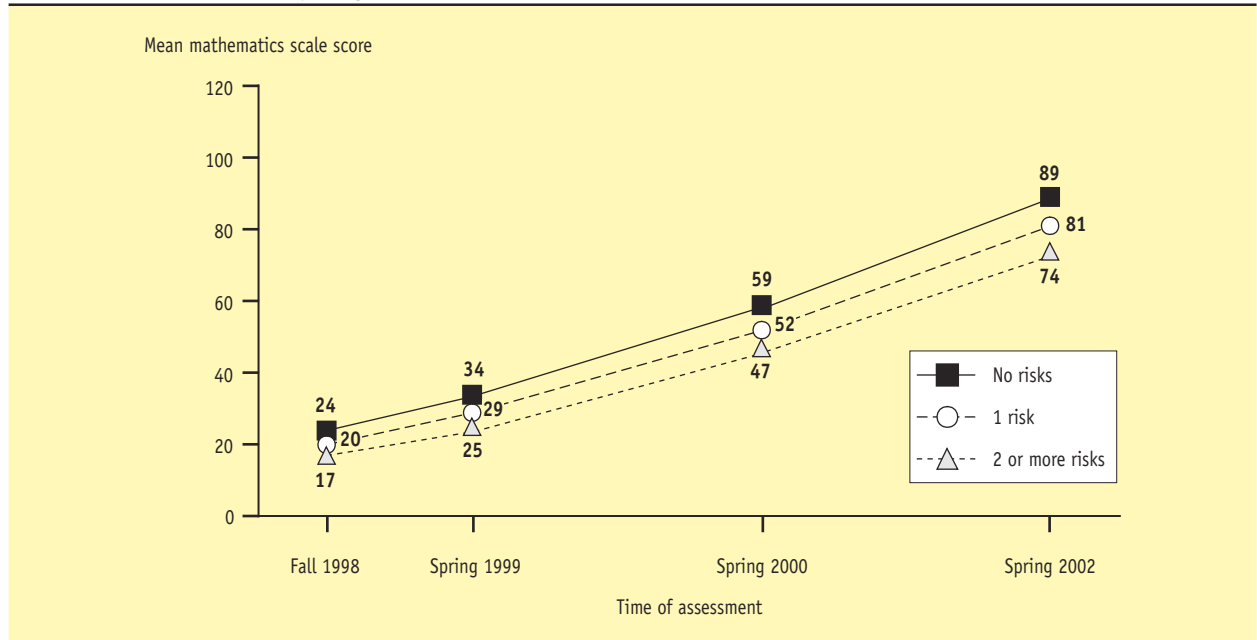
SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99 (ECLS-K), Longitudinal Kindergarten-First Grade Public-Use Data File and Third Grade Restricted-Use Data File, fall 1998, spring 1999, spring 2000, and spring 2002.







**Figure 4. Mean mathematics scale scores for fall 1998 first-time kindergartners, by time of assessment and number of family risk factors: Fall 1998, spring 1999, spring 2000, and spring 2002**



NOTE: Family risk factors included living below the federal poverty level, primary home language was non-English, mother's highest education was less than a high school diploma/GED, and living in a single-parent household. Values range from 0 to 4. Estimates reflect the sample of children assessed in English in all assessment years. The ECLS-K assessment was not administered in 2001, when most of the children were in second grade.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998-99 (ECLS-K), Longitudinal Kindergarten-First Grade Public-Use Data File and Third Grade Restricted-Use Data File, fall 1998, spring 1999, spring 2000, and spring 2002.

reading and mathematics gains over the first 4 years of school did not differ substantively, however, by their sex or the type of school or kindergarten program they attended.

**Regression analyses.** In order to describe children's gains in reading and mathematics in relation to each of the described child, family, and early school experience variables, regression analyses were conducted to examine each relationship while controlling for the other variables. The dependent variable in the first two regression analyses (i.e., reading and mathematics gain scores) were calculated by subtracting children's fall kindergarten scale score in each subject area from their corresponding spring third-grade scale score. The results of these analyses are thus presented in terms of the amount of learning children demonstrate during the first 4 years of school, as opposed to children's status at the end of the third grade adjusted by their fall status, as would be the case with an alternative approach (i.e., a covariance model).<sup>29</sup>

<sup>29</sup>More information on the use of gain scores is provided in appendix B: Methodology and Technical Notes.

The regression analyses of children's gains in reading and mathematics from the start of kindergarten to the end of third grade (table A-6) showed the same patterns of differences between groups of children as were detected in the bivariate analyses. Black children demonstrated gains that were about 6 to 7 points lower in reading and 8 to 9 points lower in mathematics than White, Hispanic, and Asian/Pacific Islander children, after accounting for the other selected characteristics (i.e., sex, number of family risk factors, kindergarten program type, and types of schools attended). Also, the number of family risk factors was negatively related to children's reading gains (effect size = 0.22 standard deviations (SD)) and mathematics achievement gains (effect size = .018 SD). For each risk factor, children's gains in reading decreased by about 4 points and their mathematics gains decreased by about 2 points. Thus, although race/ethnicity was related to the number of family risk factors (Zill and West 2001), each of the two characteristics was also independently related to children's gains in reading and mathematics over the first 4 years of school.

At the start of kindergarten, Black children and those with more family risk factors had lower mean achievement scores in reading and mathematics than White, Hispanic, and Asian/Pacific Islander children and children with fewer risk factors (West, Denton, and Reaney 2001). The findings in this section indicate that the achievement gap between Black children and other racial/ethnic groups, and between children with no risk factors and those with multiple risk factors, grew wider from the start of kindergarten to the end of third grade.

## Overall Reading, Mathematics, and Science Knowledge and Skills in Third Grade

In addition to describing the achievement that children made in reading and mathematics over their first 4 years of school, children's third-grade achievement status in these subject areas was explored in relation to characteristics of the children, their families, and their early school experiences. This section also includes information about children's achievement in science, since the ECLS-K included a science assessment in the third-grade year.<sup>30</sup>

### Child and Family Characteristics

**Bivariate comparisons.** At the end of third grade, children's reading, mathematics, and science knowledge and skills differed in relation to children's race/ethnicity and number of family risk factors (tables A-4, A-5, A-7 and figure 5).<sup>31</sup> White and Asian/Pacific Islander children had higher reading, mathematics, and science scale scores than Black and Hispanic children, and Hispanic children obtained higher scale scores in all three subject areas

than Black children (figure 5). Also, the fewer the risk factors present, the better children performed on the reading, mathematics, and science assessments in third grade. No substantive differences were found between girls' and boys' overall reading, mathematics, or science knowledge and skills.

**Regression analyses.** In order to describe children's overall reading, mathematics, and science achievement at the end of third grade in relation to each of the described child, family, and early school experience variables, regression analyses were conducted that examine each relationship while controlling for the other characteristics (table A-8). Results of the three regression analyses (i.e., reading, mathematics, and science) indicated that Black third-graders had lower achievement scores in all three subject areas compared with White, Hispanic, and Asian/Pacific Islander third-graders, after accounting for the other selected characteristics (i.e., sex, number of family risk factors, kindergarten program type, types of schools attended). Black third-graders' reading scores were about 9 points lower than White third-graders, 6 points lower than Hispanic third-graders, and about 10 points less than Asian Pacific Islander third-graders. In mathematics, Black third-graders scored about 12 points lower than White third-graders, 9 points lower than Hispanic third-graders, and about 14 points lower than Asian/Pacific Islander children. Black children's third-grade science scores were about 8 points lower than White children, 5 points lower than Hispanic children, and 7 points lower than Asian/Pacific Islander children. Consistent with the bivariate findings, children with one or more family risk factors also demonstrated lower achievement scores in all three subject areas than children with no family risk factors. For each family risk factor, children's reading scores decreased by about 6 points, their mathematics scores decreased by about 5 points, and their science scores decreased by about 3 points. On the other hand, although the bivariate results indicated that Hispanic children had lower achievement scores at the end of third grade in all three subjects than White and Asian/Pacific Islander third-graders, the regression findings indicated that Hispanic children's achievement was substantively lower than White children's achievement only in science (a 3 point difference), after controlling for the other factors.

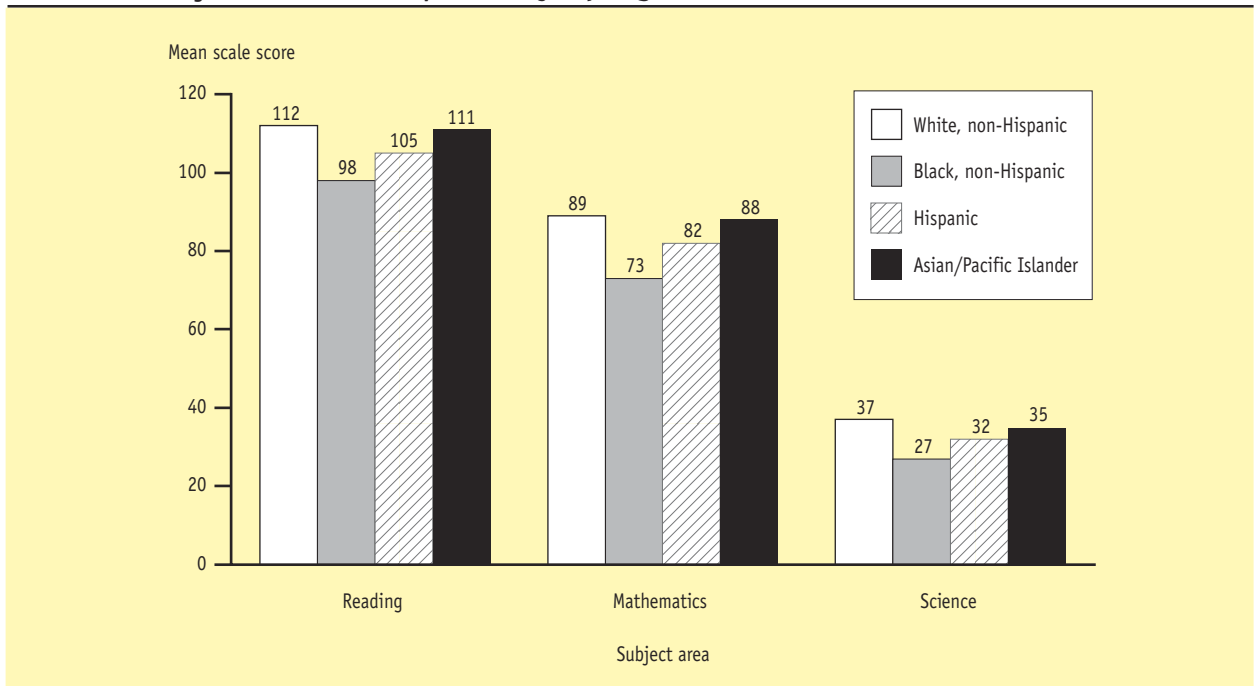
<sup>30</sup>In the spring of third grade, reading scale scores ranged from 42 to 149 points, with a standard deviation (SD) of 19.9 points, mathematics scale scores ranged from 33 to 120 points, SD of 17.8 points, and the science scale scores ranged from 11 to 59 points, SD of 9.6 points. Thus, differences in group mean scale scores were substantive if they were statistically significant and greater than or equal to an effect size of 5.0 points in reading, 4.5 points in mathematics, and 2.4 points in science.

<sup>31</sup>Tables A-4 and A-5 also provide information on the mean achievement scores for children at the start and end of kindergarten and the end of first grade, although comparisons are only made for third-grade data.





**Figure 5. Mean scale scores for fall 1998 first-time kindergartners in spring of third grade, by subject area and race/ethnicity: Spring 2002**



NOTE: Estimates reflect the sample of children assessed in English in all assessment years. Although most of the children in the sample were in third grade in the spring of 2002, 10 percent were in second grade, and about 1 percent were enrolled in other grades.

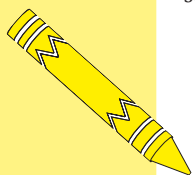
SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99 (ECLS-K), Third Grade Restricted-Use Data File, spring 2002.

## Early School Experiences

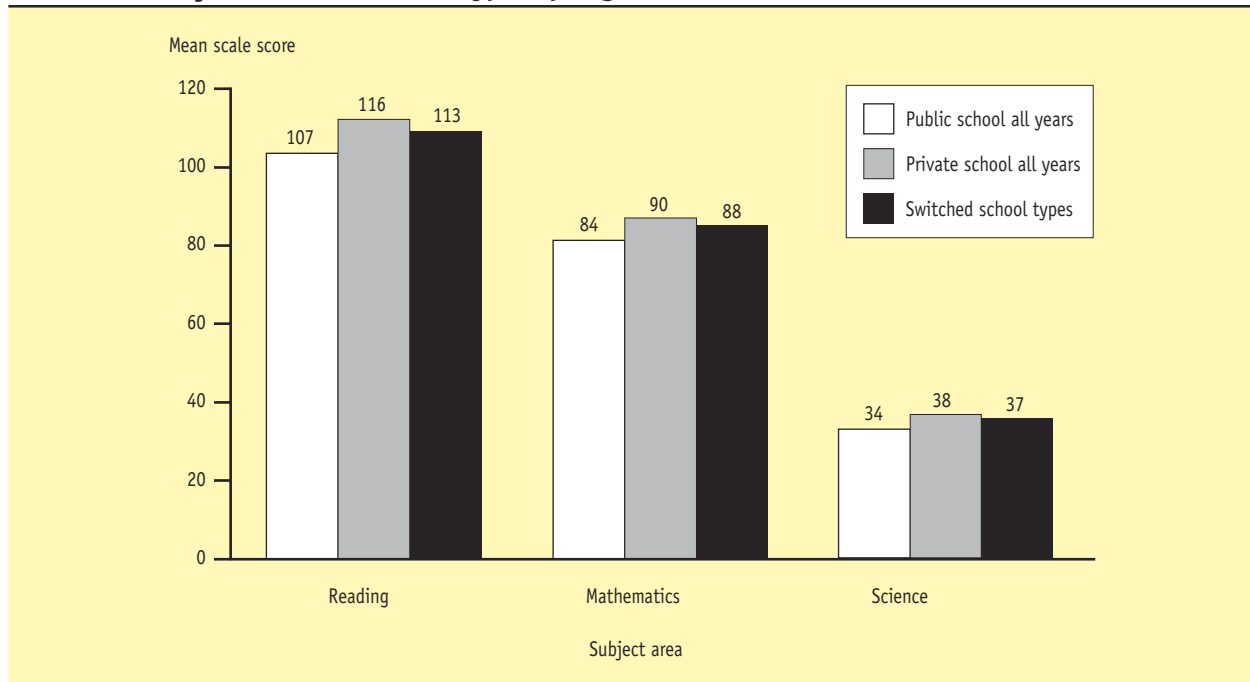
**Bivariate comparisons.** Children’s achievement scores in reading, mathematics, and science in third grade were also related to some of their early school experiences (tables A-4, A-5, and A-7). Third-graders’ reading, mathematics, and science achievement scores were related to the types of schools they attended (figure 6). Children who attended public schools for the first 4 years of school had lower scale scores in reading and science than children who had always attended private schools or those who had attended both public and private schools. In addition, those who attended public schools the whole time had lower mathematics scale scores than those who attended private school the whole time. As noted previously, differences related to school type should be interpreted with caution since children also demonstrated differences in achievement by their school type at the start of kindergarten, when schools have had little opportunity to have an effect

on children’s performance (West, Denton, and Reaney 2001).

**Regression analyses.** After accounting for the other described characteristics (i.e., sex, race/ethnicity, number of family risk factors, and kindergarten program type), there were no substantive differences in children’s achievement in mathematics or science related to the types of schools they attended from kindergarten through third grade (table A-8). In reading, children who had always attended private schools had achievement scores that were about 5 points higher than those who had always attended public school. Thus, although the bivariate results showed that children who attended private schools for part or all of their first 4 years of school generally had higher reading, mathematics, and science achievement than children who had attended only public schools, many of these school type differences could be attributed to other factors, such as race/ethnicity or family risk factors.



**Figure 6. Mean scale scores for fall 1998 first-time kindergartners in spring of third grade, by subject area and school type: Spring 2002**



NOTE: Estimates reflect the sample of children assessed in English in all assessment years. Although most of the children in the sample were in third grade in the spring of 2002, 10 percent were in second grade, and about 1 percent were enrolled in other grades.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99 (ECLS-K), Longitudinal Kindergarten-First Grade Public-Use Data File and Third Grade Restricted-Use Data File, fall 1998, spring 1999, spring 2000, and spring 2002.

## Specific Reading and Mathematics Knowledge and Skills in Third Grade

In addition to overall reading and mathematics achievement scores, the ECLS-K includes proficiency level scores for both subject areas that provide more specific information on the knowledge and skills that children have acquired by the end of third grade.<sup>32</sup> This section highlights differences in children’s achievement status in specific knowledge and skills relative to child and family characteristics and early education experiences.

<sup>32</sup>Information on the percent of children reaching each proficiency level at the end of first grade is also provided in this report, although comparisons are only made for third-grade data. For a more detailed analysis of children’s reading and mathematics knowledge and skills in kindergarten and first grade, refer to *America’s Kindergartners* (West, Denton, and Germino Hausken 2000), *The Kindergarten Year* (West, Denton, and Reaney 2001), and *Children’s Reading and Mathematics Achievement in Kindergarten and First Grade* (Denton and West 2002).

## Reading

By the end of third grade, almost all children had mastered identifying ending sounds (100 percent), sight words (99 percent), and words in context (95 percent) (figure 7, table A-9). About three-quarters of the children could make literal inferences based on cues stated in text, 46 percent were able to use identifying clues to derive meaning in text, and 29 percent demonstrated the ability to make interpretations beyond text. The next two parts of this section compare third-graders’ proficiency in making literal inferences, deriving meaning from text, and making interpretations beyond text, in terms of children’s characteristics and their early school experiences. Subgroup comparisons were not made for ending sounds, sight words, and words in context mastery since almost all children were proficient in these skills in the spring of third grade.

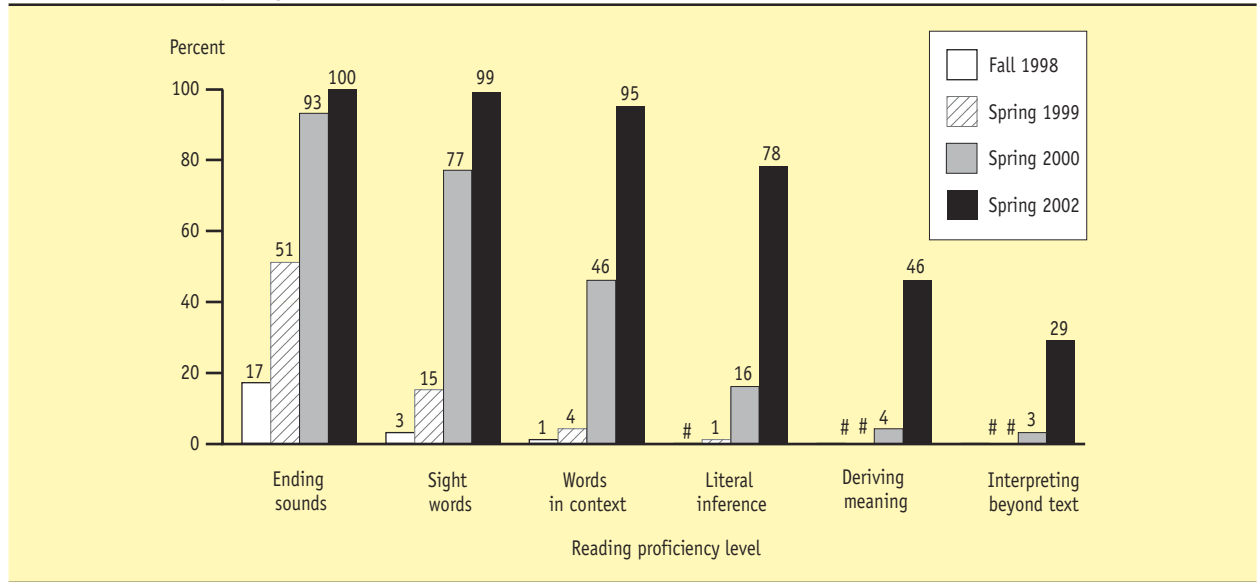
## Child and Family Characteristics

**Bivariate comparisons.** Third-graders’ proficiency in specific reading knowledge and skills





**Figure 7. Percent of fall 1998 first-time kindergartners demonstrating specific reading knowledge and skills, by time of assessment: Fall 1998, spring 1999, spring 2000, and spring 2002**

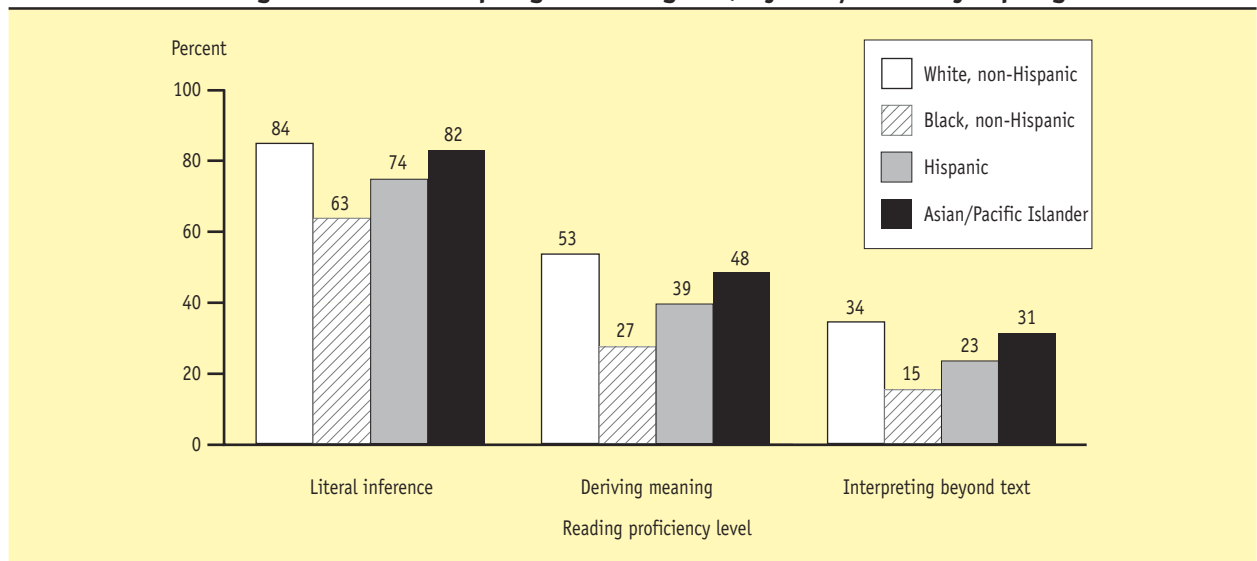


# Rounds to zero.

NOTE: Estimates reflect the sample of children assessed in English in all assessment years. The ECLS-K assessment was not administered in 2001, when most of the children were in second grade.

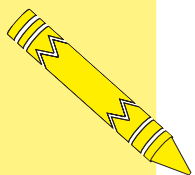
SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99 (ECLS-K), Third Grade Restricted-Use Data File, fall 1998, spring 1999, spring 2000, and spring 2002.

**Figure 8. Percent of fall 1998 first-time kindergartners demonstrating specific reading knowledge and skills in spring of third grade, by race/ethnicity: Spring 2002**



NOTE: Estimates reflect the sample of children assessed in English in all assessment years. Although most of the children in the sample were in third grade in the spring of 2002, 10 percent were in second grade, and about 1 percent were enrolled in other grades.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99 (ECLS-K), Third Grade Restricted-Use Data File, spring 2002.



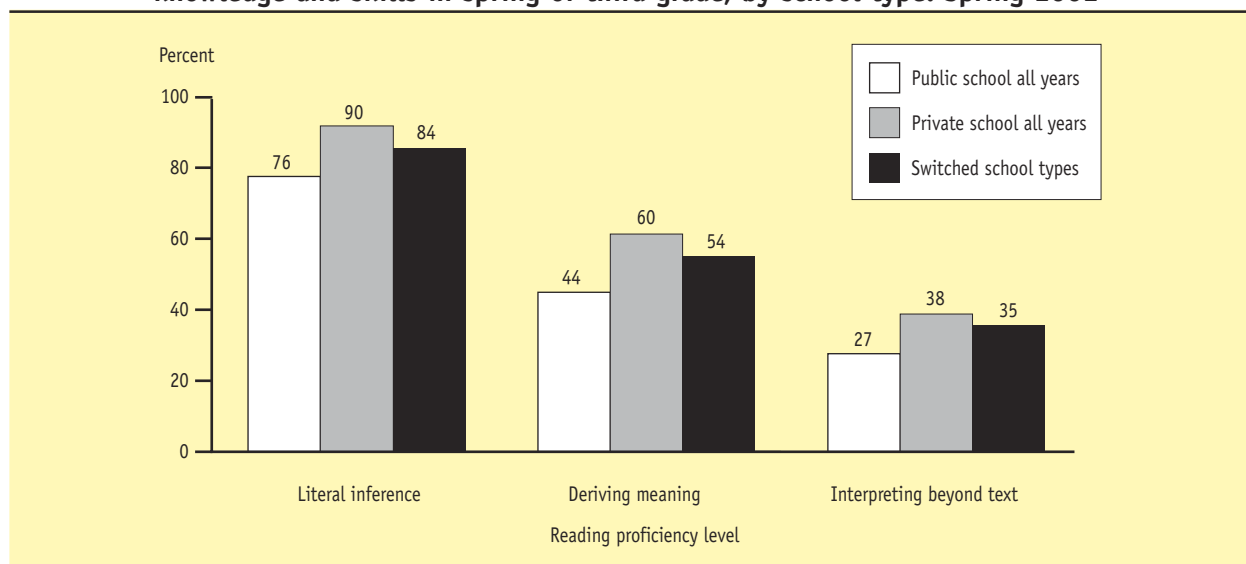
differed in relation to their sex, race/ethnicity, and number of family risk factors (table A-9). By the end of third grade, girls were more likely to be proficient in making literal inferences and deriving meaning from text than boys.<sup>33</sup> Black children were less likely to demonstrate proficiency in making literal inferences, deriving meaning from text, and making interpretations beyond text than White, Asian/Pacific Islander, and Hispanic children (figure 8). Also, Hispanic third-graders were less likely to be proficient in these three areas than White and Asian/Pacific Islander children. For instance, 53 percent of White and 48 percent of Asian/Pacific Islander third-graders could derive meaning based on textual clues and background knowledge, compared to 39 percent of Hispanic and 27 percent of Black third-graders. In addition, children with more family risk factors were less likely to be proficient in these three areas than those with fewer risk factors. As an example, 85 percent of children with no risk factors were able to make inferences based

on cues stated in text, compared with 73 percent of children with one risk factor and 57 percent of children with 2 or more risk factors.

**Regression analyses.** Many of the differences found in the bivariate comparisons persisted after taking into account children's sex, race/ethnicity, number of family risk factors, and early school experiences, with the exception of some differences between Hispanic, White, and Asian/Pacific Islander children's attainment of specific reading skills (table A-10). For instance, 5 to 6 percent fewer third-grade boys were proficient in literal inference or deriving meaning, compared to girls, after controlling for the other factors. When compared to White third-graders, 12 to 13 percent fewer Black third-graders were proficient in literal inference and interpreting beyond text, and 18 percent fewer were able to derive meaning from text. Also, 6 to 7 percent fewer Hispanic third-graders could derive meaning or interpret beyond text compared with White children. On the other hand, no differences were detected between the percentage of Hispanic third-graders who were proficient in making literal inferences and the percentages of White and Asian/Pacific Islander children demonstrating such skills.

<sup>33</sup>When reporting on differences in the percentage of children proficient in specific skills and knowledge, a difference of 5 percentage points is substantively important.

**Figure 9. Percent of fall 1998 first-time kindergartners demonstrating specific reading knowledge and skills in spring of third grade, by school type: Spring 2002**



NOTE: Estimates reflect the sample of children assessed in English in all assessment years. Although most of the children in the sample were in third grade in the spring of 2002, 10 percent were in second grade, and about 1 percent were enrolled in other grades.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998-99 (ECLS-K), Longitudinal Kindergarten-First Grade Public-Use Data File and Third Grade Restricted-Use Data File, fall 1998, spring 1999, spring 2000, and spring 2002.





Also, no differences were detected between the likelihood of Hispanic and Asian/Pacific Islander children to derive meaning based on textual cues after controlling for the other factors. Thus, some of the differences between the performance of Hispanic children and those from other racial/ethnic groups may be attributed to other factors, such as family risk factors.

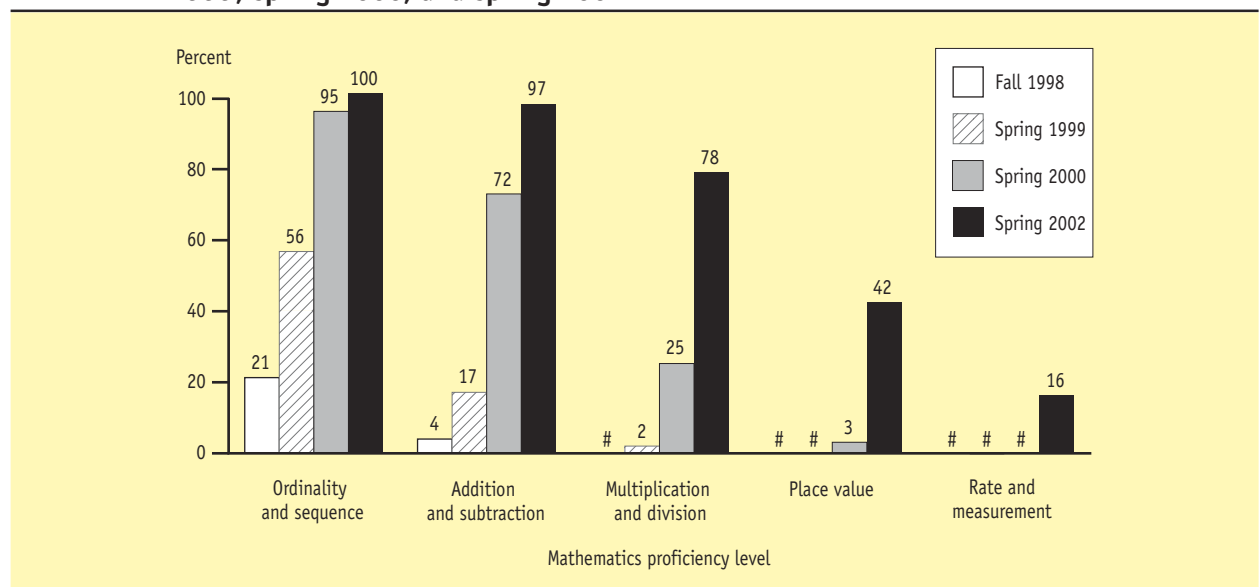
### Early School Experiences

**Bivariate comparisons.** Children’s reading proficiency in specific knowledge and skills also differed in third grade by the types of schools they attended (table A-9). Children enrolled in private schools from kindergarten through third grade were more likely to be able to make literal inferences or derive meaning from text than those who attended only public schools or those who switched school types during the study, and those who had switched school types were more likely to be proficient in these areas than children who attended public schools for all 4 years (figure 9). In addition, 27 percent of public school children were able to make interpretations beyond text, compared with 38 percent of children who al-

ways had attended private schools and 35 percent of children who changed school types in the first 4 years of school. No differences were detected in children’s reading proficiency in relation to the type of kindergarten program they had attended.

**Regression analyses.** After controlling for children’s sex, race/ethnicity, number of family risk factors, and kindergarten program type, children who had attended public schools in kindergarten through third grade were still less likely than children who had always attended private schools to reach the top three proficiency levels (i.e., literal inference, deriving meaning, and interpreting beyond text) had 8, 10, and 6 percent fewer students from the public school only group than from the private school only group) (table A-10). Further, children who had always attended public schools were less likely to be proficient at deriving meaning and interpreting beyond the text than those children who had changed school types. However, there were no substantive differences in the percentage of children who demonstrated the ability to make literal inferences between those who had attended private school for all 4 years and those who had

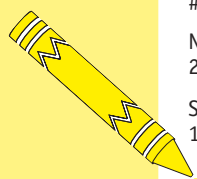
**Figure 10. Percent of fall 1998 first-time kindergartners demonstrating specific mathematics knowledge and skills, by time of assessment: Fall 1998, spring 1999, spring 2000, and spring 2002**



# Rounds to zero.

NOTE: Estimates reflect the sample of children assessed in English in all assessment years. The ECLS-K assessment was not administered in 2001, when most of the children were in second grade.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99 (ECLS-K), Third Grade Restricted-Use Data File, fall 1998, spring 1999, spring 2000, and spring 2002.



only attended private schools for a portion of the time, after accounting for the other factors. Also, children who had always attended public school were not substantively less likely to be proficient at literal inferences than those who had attended both public and private schools.

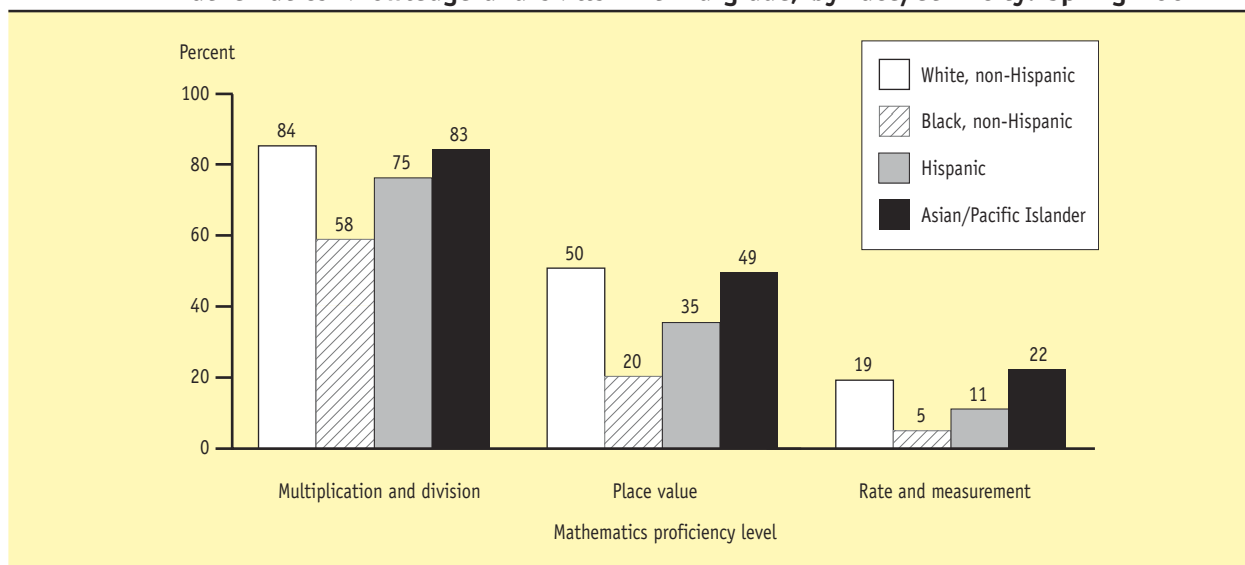
### Mathematics

By the end of third grade, all children had mastered ordinality and sequence skills and 97 percent were proficient in solving simple addition and subtraction problems (figure 10, table A-11). Seventy-eight percent of the children could solve simple multiplication and division problems, 42 percent demonstrated an understanding of place value in integers to the hundreds place, and 16 percent were able to use knowledge of rate and measurement to solve word problems. The next two parts of this section focus on differences in third-graders' proficiency in multiplication and division, place value, and rate and measurement relative to children's characteristics and their early school experiences. Subgroup comparisons were not made for ordinality and sequence skills or simple addition and subtraction problemsolving since almost all children were proficient in these skills in the spring of third grade.

### Child and Family Characteristics

**Bivariate comparisons.** Consistent with the patterns found in reading, third-graders' proficiency in specific mathematics knowledge and skills varied by their sex, race/ethnicity, and number of family risk factors (table A-11). Boys were more likely than girls to demonstrate an understanding of place value concepts and knowledge of rate and measurement to solve word problems. Black third-graders were less likely to demonstrate proficiency in multiplication and division, place value, and rate and measurement than White, Hispanic, and Asian/Pacific Islander third-graders, and the percentage of Hispanic children reaching each of these proficiency levels was lower than the percentage of White and Asian/Pacific Islander children reaching these respective levels (figure 11). For instance, in third grade about half of White and Asian/Pacific Islander children were proficient in understanding place value, compared with 35 percent of Hispanic children and 20 percent of Black children in third grade. Also, children from homes with more risk factors were less likely to have reached each of the three proficiency levels than children with fewer risk factors. As an example, about one-fifth of children with no risk factors were proficient at using rate and

**Figure 11. Percent of fall 1998 first-time kindergartners demonstrating specific mathematics knowledge and skills in third grade, by race/ethnicity: Spring 2002**



NOTE: Estimates reflect the sample of children assessed in English in all assessment years. Although most of the children in the sample were in third grade in the spring of 2002, 10 percent were in second grade, and about 1 percent were enrolled in other grades.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998-99 (ECLS-K), Third Grade Restricted-Use Data File, spring 2002.







measurement knowledge to solve word problems, compared with 11 percent of children with one family risk and 5 percent of children with 2 or more risk factors.

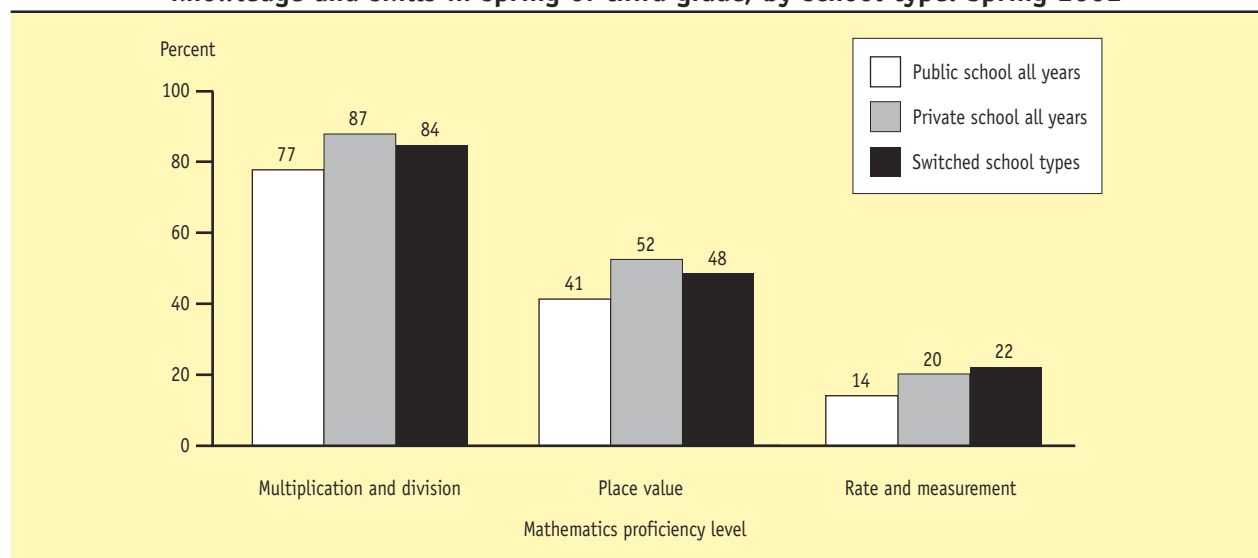
**Regression analyses.** All but one of the differences in specific math proficiency levels persisted after controlling for the other described factors (table A-12). For instance, 7 to 8 percent fewer third-grade girls were proficient in place value and rate and measurement, compared to boys. Also, when compared to White third-graders, a smaller percentage of Black third-graders were proficient in multiplication and division, place value, and rate and measurement (20, 23, and 11 percent fewer, respectively). In addition, for each family risk factor, the percent of third-graders proficient in multiplication and division and place value decreased by 8 to 9 percent, and the percent proficient in rate and measurement decreased by 5 percent. However, after taking into account children's sex, number of family risk factors, and early school experiences, the percentage of Hispanic third-graders proficient in multiplication and division did not differ substantively from the percentage of White children demonstrating such skills and knowledge.

## Early School Experiences

**Bivariate comparisons.** Children's performance in specific mathematics knowledge and skills also differed by their school type (table A-11). Children who had attended public schools for all 4 years were less likely to be proficient in multiplication and division, place value, and rate and measurement than children who had attended private schools for all or some of the time between kindergarten and third grade (figure 12). For instance, 14 percent of children who had always attended public schools were able to use rate and measurement to solve word problems, compared with 22 percent of children who had attended both public and private schools, and 20 percent who had always attended private schools.

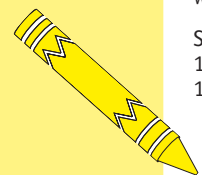
**Regression analyses.** After controlling for children's sex, race/ethnicity, number of family risk factors, and kindergarten program type, some of the differences in specific mathematics knowledge and skills attributed to school type did not persist (table A-12). For instance, compared to children who had always attended private schools, 5 percent fewer children who had always attended public

**Figure 12. Percent of fall 1998 first-time kindergartners demonstrating specific mathematics knowledge and skills in spring of third grade, by school type: Spring 2002**



NOTE: Estimates reflect the sample of children assessed in English in all assessment years. Although most of the children in the sample were in third grade in the spring of 2002, 10 percent were in second grade, and about 1 percent were enrolled in other grades.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99 (ECLS-K), Longitudinal Kindergarten-First Grade Public-Use Data File and Third Grade Restricted-Use Data File, fall 1998, spring 1999, spring 2000, and spring 2002.



schools reached the multiplication/division and place value proficiency levels. However, children who had always attended public schools were not substantively less likely to reach these two levels than children who had attended both public and private schools. On the other hand, 5 percent fewer children who had exclusively attended public school were able to use rate and measurement to solve word problems, compared with those who attended both public and private schools, but children who only attended public schools were not less likely to demonstrate this skill than children who attended private school for all 4 years.

## Summary of Findings

### Overall Gains in Reading and Mathematics Skills and Knowledge From Kindergarten to Third Grade

- Children gained an average of 81 points in reading (range 16 to 125 points) and 63 points in mathematics (range 17 to 104 points) from the beginning of kindergarten to the end of third grade.
- Black children made smaller gains in reading and mathematics from the start of kindergarten to the end of third grade than White, Hispanic, and Asian/Pacific Islander children, even after controlling for sex, number of family risk factors, school types, and kindergarten program type.
- As the number of children's family risk factors (i.e., single-parent household, below federal poverty level, primary home language other than English, and mother's highest education level less than a high school diploma or its equivalent) increased, children made smaller gains in both subjects, after controlling for the other child, family, and school characteristics.
- Children's reading and mathematics gains did not differ substantively by their sex, kindergarten program type (i.e., half-day or full-day), or the type of schools in which they were enrolled (i.e., public school all 4 years, private school all 4 years, mixture of public and private school attendance).

### Overall Reading, Mathematics, and Science Knowledge and Skills in Third Grade

- In the spring of third grade, children's mean reading score was 113 (range 42 to 149), their mean mathematics score was 89 (range 33 to 120), and their mean science score was 35 (range 11 to 59).
- Black third-graders had lower overall achievement scores in reading, mathematics, and science than White, Hispanic, and Asian/Pacific Islander children, even after controlling for sex, number of family risk factors, school types, and kindergarten program type.
- In bivariate comparisons, Hispanic children had lower achievement in all three subject areas than White and Asian/Pacific Islander third-graders. However, after controlling for children's sex, number of family risk factors, school type, and kindergarten program type, Hispanic third-graders only had substantively lower achievement in science than White children.
- In all three subjects, those with more family risk factors had lower achievement scores at the end of third grade than those with fewer family risk factors, after controlling for the other child, family, and school characteristics.
- In bivariate comparisons, children who attended public schools from kindergarten through third grade had lower achievement scores in reading and science than those who had attended private schools for some or all of the time, and they had lower mathematics scores than those who attended private schools the whole time. However, after controlling for the other factors (i.e., sex, race/ethnicity, number of family risk factors, and kindergarten program type) the only substantive school-type difference that persisted was that third-graders who had attended private schools all of their first 4 years of school had higher reading achievement than children who had always attended public school. Differences in third-graders' achievement in relation to the type of school they attend should be interpreted with caution, as children also demonstrated differences in achievement by their school type in the fall of kindergarten, when





schools had little opportunity to have an effect on children's performance (West, Denton, and Reaney 2001).

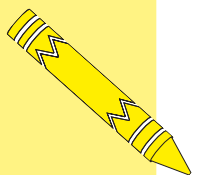
- Third-grade reading, mathematics, and science achievement did not differ substantively by children's sex or kindergarten program type.

### **Specific Reading and Mathematics Knowledge and Skills in Third Grade**

- Almost all children were proficient in identifying ending sounds of words, naming sight words, and recognizing words in context, and had mastered concepts of ordinality and simple addition and subtraction. About three-quarters could make literal inferences based on text and solve simple multiplication and division problems. Forty-six percent were able to use cues to derive meaning from text and 42 percent understood place value concepts. Twenty-nine percent were able to make interpretations beyond what was stated in text and 16 percent could use rate and measurement to solve word problems.
- Girls were more likely than boys to demonstrate the ability to make literal inferences and derive meaning from text in reading. On the other hand, boys were more likely than girls to demonstrate an understanding of place value concepts and knowledge of rate and measurement to solve word problems, even after controlling for the other child, family, and school characteristics.
- In bivariate comparisons, Black and Hispanic third-graders were less likely than White and Asian/Pacific Islander children to reach the three highest reading proficiency levels (i.e., making literal inferences, deriving meaning from text, and making interpretations beyond text) and the three highest mathematics proficiency levels (i.e., multiplication and division, place value, and rate and measurement). Black third-graders were also less likely to reach

each of these proficiency levels than Hispanic children.

- After controlling for the other characteristics, however, Hispanic children were not substantively less likely than White or Asian/Pacific Islander children to make literal inferences, and were not substantively less likely than Asian/Pacific Islander children to be able to derive meaning based on textual cues. In addition, the percentage of Hispanic third-graders reaching the multiplication/division proficiency level did not differ substantively from the percentage of White children reaching the same level, after accounting for the other factors.
- Children with more family risk factors were less likely to have reached the three highest reading and mathematics proficiency levels than their peers with fewer family risk factors, overall and after taking into account the other characteristics.
- In bivariate comparisons, children who attended public school from kindergarten through third grade were less likely than those who had attended private schools for some or all of their first 4 years of school to demonstrate proficiency in making literal inferences and deriving meaning from text in reading and proficiency in multiplication and division, place value, and rate and measurement in mathematics.
- After controlling for the other factors (e.g., number of family risk factors), some of the differences associated with school type did not persist. For example, children who had exclusively attended public schools were no longer substantively less likely to make literal inferences than those who had attended both public and private schools. Also, those who attended public schools for all 4 years were no longer substantively less likely to be proficient in using rate and measurement to solve word problems than children who had exclusively attended private schools.



# III. Children’s Perceptions About Themselves and Their School Experiences

*How do third-graders perceive themselves and their relations with other children? Is their academic achievement at the end of third grade related to their perceptions?*

In the early school years, children begin to develop perceptions about their competence and interest in school and their relationships with others. Children’s ratings of their academic competence begin to correspond with objective measures of their cognitive performance about the time that they enter second or third grade (Chapman and Tunmer 2003; Guay, Marsh, and Boivin 2003; Wigfield et al. 1997).

In the first 2 years of the ECLS-K (i.e., kindergarten and first grade), parents and teachers responded to questions about children’s socioemotional development. For the first time in the third-grade year, the children were asked to report on this by completing a self-description questionnaire (SDQ), which included 42 items related to their perceptions about their school abilities and interests, their peer relationships, and their perceptions about any problem behaviors they might exhibit. Trained assessors read each statement to the child, then provided time for children to mark their answer in a booklet.<sup>34</sup> Children responded to each behavioral statement on a scale from 1 to 4, including the response categories of “not at all true,” “a little bit true,” “mostly true,” and “very true.” Children’s responses were used to develop six scales that describe children’s perceptions about their competence and interest in (1) reading, (2) mathematics, and (3) school in general and their perceptions about their (4) peer relationships and any (5) internalizing or (6) externalizing behaviors that they may exhibit. Scale scores were based on the mean value calculated from the items that composed each

scale.<sup>35</sup> This section describes the children’s perceptions overall and in relation to characteristics of the children themselves, their families, and their early school experiences on each of the six scales. For each scale, bivariate and regression analyses were conducted.

## Children’s Perceptions in Third Grade

### Reading, Mathematics, and General School SDQ Scales

In general, few group differences were found in terms of children’s perceptions about their abilities and interests in reading, mathematics, and school in general (table A-13). On average, children indicated that items on the reading, mathematics, and “all school subjects” scale were “mostly true” for them, based on average scale scores of 3.3, 3.2, and 2.9, respectively. These scores indicate that, on average, children generally were interested in and enjoyed reading, mathematics, and school in general, and that they did not perceive the academic work to be too difficult for them in these areas. In the bivariate analyses, girls felt more positively about their interests and competence in reading than boys

<sup>34</sup>More details on the SDQ administration procedures are provided in Appendix B: Methodology and Technical Notes.

<sup>35</sup>The standard deviations for each of the SDQ scale scores are as follows: reading scale = 0.67, mathematics scale = 0.81, all subjects = 0.66, peer relationships = 0.65, internalizing problem behaviors = 0.73, and externalizing problem behaviors = 0.70. Thus, differences in group mean scale scores were substantive if they were statistically significant and greater than or equal to an effect size of 0.17 points on the reading scale, 0.20 on the mathematics scale, 0.17 on the all subjects scale, 0.16 on the peer relationships scale, 0.18 on the internalizing problem behaviors scale, and 0.18 on the externalizing problem behaviors scale.





and children who attended public schools for the first 4 years of school had reported greater competence and interest in mathematics than children who had always attended private schools. Results from the regression analyses for each scale also found that girls responded more positively on the reading scale than boys, although school type was not found to be substantively related to mathematics perceptions, after controlling for other factors (table A-14).

### **Peer-Relationships SDQ Scale**

On average, children responded positively about their relationships with their peers, with an overall mean score on the peer-relationships scale of 3.0 (“mostly true”) (table A-13). The relatively high scores on this measure indicated that children generally felt that they made friends easily and got along well with their peers. Black and Hispanic third-graders reported more positively about their peer relationships than Asian/Pacific Islander children. After controlling for the other factors, such as number of family risk factors and school type, Black third-graders still had higher scores on the peer-relationships scale than Asian/Pacific Islander third-graders (effect size of 0.24 SD) (table A-14).

### **Internalizing and Externalizing Problem Behaviors SDQ Scales**

In terms of the problem behaviors scales, children tended to indicate that items on the internalizing problem behavior (e.g., sad/lonely/anxious) scale and the externalizing problem behavior (e.g., anger/distractibility) scale were “a little bit true” for them, with means of 2.2 and 2.0, respectively (table A-13). These values indicate that children felt they occasionally exhibited internalizing problem behaviors (e.g., feeling ashamed of mistakes, worrying about school and friendships, and feelings of sadness or loneliness) or externalizing problem behaviors (e.g., fighting and arguing with other children, disturbing others, or causing distractions).

Children’s perceptions of their own problem behaviors varied by sex, race/ethnicity, number of family risk factors, and school type. In mean comparisons, boys were more likely than girls to indicate that they exhibited externalizing problem behaviors. Black third-graders reported the highest scores on both problem behavior scales, and Hispanic

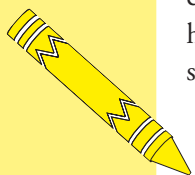
children rated themselves higher on the internalizing problem behavior scale than White and Asian/Pacific Islander children. Also, as children’s number of family risk factors increased, they tended to rate themselves higher on both problem behavior scales (figure 13). In terms of early school experiences, children who attended only public schools from kindergarten through third grade had higher scores on the internalizing problem behavior scale than children who had been enrolled in private schools for some or all of the first 4 years of school.

Many of the bivariate findings were supported in the corresponding regression analyses (table A-14). For instance, boys were more likely than girls to report exhibiting externalizing problem behaviors and Black children were more likely to indicate that they exhibited both types of problem behaviors than White and Asian/Pacific Islander third-graders, after controlling for the other characteristics. They were also more likely than Hispanic third-graders to have higher scores on the externalizing problem behavior scale. Also, children with more than one family risk factor were more likely to report experiencing internalizing and externalizing problem behaviors than those with no family risk factors.

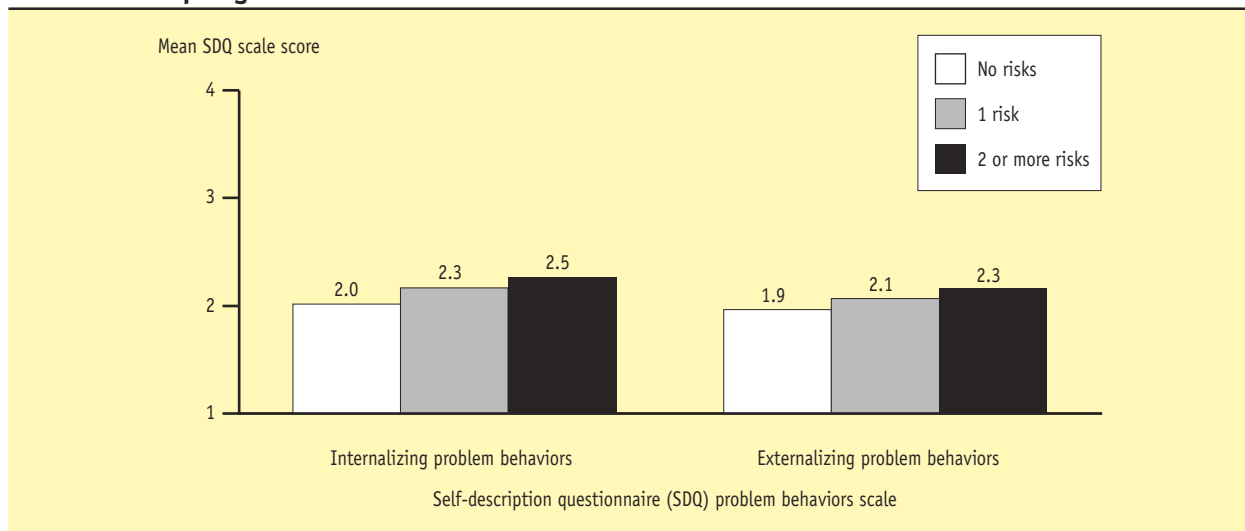
However, after controlling for the other factors, some of the bivariate differences did not persist in the regression analyses. For instance, Hispanic children were not substantively more likely to indicate that they experienced internalizing problem behaviors than White or Asian/Pacific Islander third-graders. Also, school type was not substantively related to the likelihood of either problem behavior type in the regression analyses.

### **Children’s Perceptions About School and Their Cognitive Status**

Previous research has noted positive associations between young children’s perceptions about their cognitive abilities and interests in subject areas and their academic achievement in different subject areas (Chapman and Tunmer 2003; Guay, Marsh, and Boivin 2003; O’Sullivan and Weiss 1999; Valeski and Stipek 2001). For instance, fourth-graders who outperformed others on the NAEP science assessment were more likely to report that they enjoyed science (O’Sullivan and Weiss 1999). The



**Figure 13. Mean scale scores for fall 1998 first-time kindergartners' perceptions of problem behaviors they exhibit in spring of third grade, by number of family risk factors: Spring 2002**



NOTE: Family risk factors included living below the federal poverty level, primary home language was non-English, mother's highest education was less than a high school diploma/GED, and living in a single-parent household. Values range from 0 to 4. Scale scores on children's perceptions come from a self-description questionnaire (SDQ). Scores on the SDQ scales ranged from 1 "not at all true" to 4 "very true". Estimates reflect the sample of children assessed in English in all assessment years. Although most of the children in the sample were in third grade in the spring of 2002, 10 percent were in second grade, and about 1 percent were enrolled in other grades.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998-99 (ECLS-K), Longitudinal Kindergarten-First Grade Public-Use Data File and Third Grade Restricted-Use Data File, fall 1998, spring 1999, and spring 2002.

ECLS-K data can also be used to explore relationships between children's perceptions and their achievement in school. In order to examine the relationship between children's perceptions about their competence and interests in reading, mathematics, and school in general with their achievement in different subject areas, children were categorized for this report into three equally sized achievement groups (lowest third, middle third, and highest third) in reading, mathematics, and science, based on their IRT-scale scores for each subject area (table A-15).<sup>36</sup> Children's perceptions of their competence and interest in reading, mathematics, and school in general were compared across the three achievement group categories because initial scatter plots displayed a non-linear relationship between achievement and perceptions.

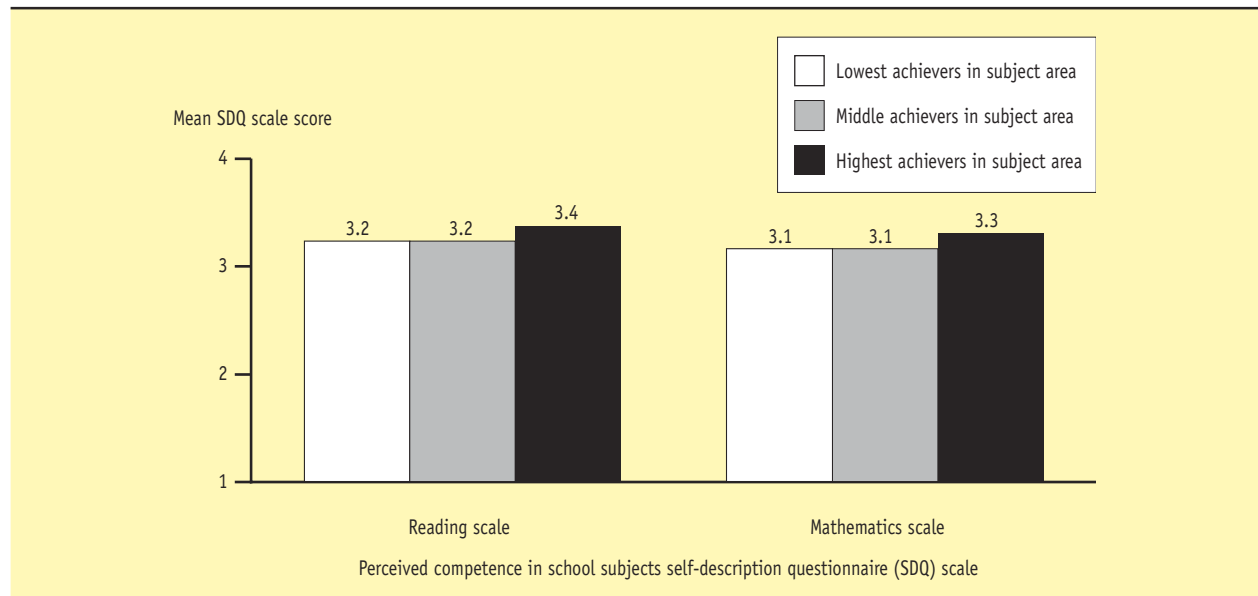
<sup>36</sup>The correlation between children's overall reading scale score in third grade and their score on the reading perceptions scale was 0.19 ( $t$ -value = 13.07). The correlation between children's overall mathematics scale score in third grade and their score on the SDQ mathematics perceptions scale was 0.11 ( $t$ -value = 6.83).

Children scoring in the highest third of the third-grade reading assessment tended to respond more positively on the SDQ reading scale than children who scored in the lower two-thirds of the reading assessment (figure 14). Thus, children who performed best on the reading assessment were more likely than children at the lowest reading levels to indicate that they were interested in and enjoyed reading, and that they did not perceive their reading assignments to be too difficult for them. The same pattern was detected for children's mathematics achievement; those achieving in the top third in mathematics had higher perceptions of their competence and interest in mathematics than children in the lower two-thirds of the third-grade mathematics assessment. Both sets of findings persisted after controlling for the other factors, such as children's race/ethnicity and school type (table A-16). The relationship between children's perceptions and achievement were subject-specific, however. For instance, children in the top third of the science assessment did not report substantively higher perceptions of their reading, mathematics,





**Figure 14. Mean scale scores for fall 1998 first-time kindergartners' perceptions of their competence and interest in reading and mathematics in spring of third grade, by their spring third-grade reading and mathematics achievement status: Spring 2002**



NOTE: Perceived competence and interest scores are from a self-description questionnaire (SDQ). Scores on the SDQ scales ranged from 1 “not at all true” to 4 “very true”. Children were categorized into 3 equally sized achievement groups (lowest, middle, and highest) for reading and mathematics based on their scale scores for each subject area. Estimates reflect the sample of children assessed in English in all assessment years. Although most of the children in the sample were in third grade in the spring of 2002, 10 percent were in second grade, and about 1 percent were enrolled in other grades.

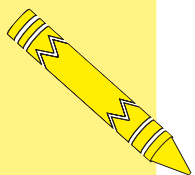
SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99 (ECLS-K), Third Grade Restricted-Use Data File, spring 2002.

or general school competence than children at lower levels, and there was no substantive relationship between achievement in one subject area and perception of competence and interest in a different subject area.

## Summary of Findings

### Children’s Perceptions in Third Grade

- On average, children’s scores on the reading, mathematics, and general school scales were high, indicating that they were generally interested in and enjoyed school, and that they did not perceive their schoolwork to be too difficult.
- Girls tended to have greater interest in and perceived competence in reading than boys.
- On average, children responded positively on the peer-relationships scale, indicating that they generally made friends easily and got along well with their peers.
- Black and Hispanic third-graders responded more positively overall on the peer-relationships scale than Asian/Pacific Islander children. After controlling for the other factors, such as the child’s sex, number of family risk factors, kindergarten program type, and school type, Black third-graders still had higher scores on the peer-relationships scale than Asian/Pacific Islander third-graders.
- On average, scores on the two problem behaviors scales were relatively low, with children generally indicating that they only occasionally exhibited externalizing (e.g., fighting and arguing) or internalizing (e.g., anxiety, sadness, loneliness) problem behaviors.
- Boys indicated a higher likelihood of exhibiting externalizing behaviors than girls.
- Black third-graders were generally more likely to indicate that they exhibited externalizing and internalizing problem behaviors than children from other racial/ethnic groups, even after controlling for other factors.



- As the number of family risk factors increased for third-graders, they were more likely to indicate that they exhibited both types of problem behaviors, even after accounting for other factors.

### **Children's Perceptions About School and Their Cognitive Status**

- Those scoring in the highest third on the reading assessment had higher perceived interest

and competency in reading than children scoring in the lower two-thirds. The same pattern of relationships between perceptions and achievement occurred in mathematics.

- The relationship between children's perceptions and achievement were subject-specific, in that there was no substantive relationship between achievement in one subject area and perceived interest and competence in a different subject area.







## IV. Conclusion

This report provides information on the range of cognitive skills and knowledge that children demonstrate in their first 4 years of school, as they progress from kindergarten through third grade. It also describes how children perceive themselves in terms of their school experiences and their relationships with their peers.

This report builds on findings of the ECLS-K program's earlier reports, with the main purpose to continue to examine whether differences by certain child, family, and school characteristics found in earlier reports persist, desist, widen, or narrow. Those characteristics associated with differences in children's achievement found in earlier reports (and which are explored here) are: (1) child's sex; (2) race/ethnicity; (3) number of family risk factors; (4) kindergarten program type (full/half day); and (5) school type across the first 4 years of the study.

Consistent with patterns found in earlier ECLS-K reports, the knowledge and skills children demonstrated at the end of third grade continued to differ in relation to their race/ethnicity and their number of family risk factors. Black children had lower overall mean achievement scores in reading, mathematics, and science at the end of third grade, and were less likely to demonstrate specific third-grade reading and mathematics skills than White, Hispanic, and Asian/Pacific Islander children. Children with more family risk factors also demonstrated lower achievement in these areas than children with fewer risk factors. These types of differences were also present at the start and end of kindergarten and at the end of first grade (Denton and West 2002; West, Denton, and Reaney 2001). In addition, Black children made smaller gains in reading and mathematics from the start of school to the end of third grade than White, Hispanic, and Asian/Pacific Islander children. Over the same time period, as the number of family risk factors increased, children tended to make smaller gains in the two subject areas. Thus, the achievement gaps between disadvantaged and more advantaged children grew wider over the first 4 years of school.

Findings from this report indicate that children's overall gains and status in reading and mathemat-

ics at the end of third grade did not differ substantively by sex. In addition, substantive sex differences were not found in terms of children's third grade overall science achievement. However, as was found in first grade (Denton and West 2002), girls continued to be more likely than boys to demonstrate more advanced reading knowledge and skills, and boys were more likely than girls to demonstrate more advanced mathematics knowledge and skills.

This report also described children's achievement status and gains in relation to whether they had always attended a public school, private school, or had attended both types of schools between kindergarten and the end of third grade. In the first weeks of school, private school kindergartners demonstrated higher achievement status in reading and mathematics than public school kindergartners (West, Denton, and Germino Hausken 2000). When mean achievement scores were compared by school type, these differences also existed in third grade between children who attended public schools for all 4 years and those who attended private schools for all or part of the time, and were also found in terms of children's science achievement. When regression analyses were used, however, to control for the influence of other factors (e.g., race/ethnicity and number of family risk factors), the only substantive difference detected was that children who had always attended private schools had higher third-grade reading achievement than those who had only attended public schools. Also, the achievement gap between public and private school children did not widen substantively over the first 4 years of school, even between those children who always attended the same type of school from kindergarten through third grade.

Earlier ECLS-K reports found that public school children who attended full-day (vs. half-day) kindergarten programs made greater gains in kindergarten in reading and mathematics, after controlling for other characteristics, and were more likely to demonstrate advanced reading skills at the end of the kindergarten year (Walston and West 2004; Denton, West, and Walston 2003). When





overall achievement was compared for full-day and half-day children from both public and private schools, however, differences in reading and mathematics achievement were not detected (West, Denton, and Reaney 2001). Findings from the current report also detected no differences in achievement at the end of third grade for public and private school children combined, related to the type of kindergarten program children had attended.

During the kindergarten year, teachers reported that children tended to form friendships easily (82 percent) and accept peer ideas in cooperative activities (77 percent) and that few exhibited problem behaviors such as fighting with others (8 percent) or get angry easily (9 percent) (West, Denton, and Reaney 2001). In that year, White and Asian kindergartners were rated as more likely to accept peer ideas and form friendships than Black kindergartners, and teachers also indicated that children with fewer risk factors were more likely to demonstrate these skills than those with more risk factors. In third grade, when children reported for themselves on their school experiences, there were few group differences reported in their perceptions about their reading, mathematics, or general school interest and competence, or in their perceptions about their abilities to make and maintain friendships. In third grade, children generally indicated that they felt positively about their competence in these four areas. Girls had greater interest in and perceived competence in reading than boys.

Children's academic performance in reading and mathematics was also related to their perceptions of their interest and competence in the corresponding subject area. Children who were performing in the top third of the sample in a given subject area rated their competence in it more highly than children achieving at lower levels.

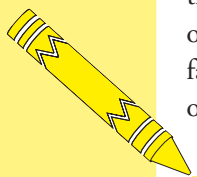
More differences were detected at the end of third grade on the two scales of internalizing (e.g., shy, withdrawn, sad) and externalizing (e.g., fighting, arguing, distractibility) problem behaviors than were detected on the other SDQ scales. Although children's scores on the problem behavior scales were generally low, indicating that they only exhibited these behaviors on an occasional basis, those groups that also have lower achievement scores at the end of third grade (e.g., those with higher numbers of family risk factors) tended to rate themselves higher on both of the behavior scales than those with higher

achievement levels (e.g., those with fewer family risk factors). In the kindergarten year, teachers also reported that these groups of disadvantaged children were more likely to get angry easily, argue with others, and fight with others (West, Denton, and Reaney 2001). Also, by the end of third grade, boys indicated that they were more likely to demonstrate externalizing problem behaviors than girls were.

The use of regression analyses in addition to bivariate analyses of children's school performance demonstrates the importance of taking other factors (e.g., family risk factors) into account when comparing scores for different groups of children. Although many of the bivariate findings in this report were consistent with the regression analyses, there were some cases where initial findings did not hold in the regression results. In such instances, overall differences attributed to a given characteristic (e.g., being Hispanic) may instead be associated with other factors, such as the number of family risk factors. Thus, it is important to supplement bivariate statistics with the use of multiple regression analyses that control for other variables that may be associated with children's school experiences.

It is important to remember that although the bivariate comparisons and regression analyses identify correlations between some independent variables and outcome measures, correlation does not imply causation. Apparent relationships between variables can change based on the particular independent variables examined. The small set of independent variables included in this descriptive report's regression analyses were used with the specific purpose to clarify the descriptive results observed in the multiple bivariate comparisons.

Many of the findings in this report suggest the value of more in-depth exploration into children's early school experiences. For instance, findings from this report indicate that children's achievement in the spring of third grade and some of their perceptions about school differ in relation to their cumulative number of family risk factors. Further research could disaggregate the family risk factor index into its components (i.e., primary home language, family structure, poverty status, and maternal education) to examine which components are more strongly related to children's achievement and perceptions about school.



Initial findings from this report did not detect any substantive differences in children's third-grade achievement relative to the type of kindergarten program (full-day vs. half-day) they attended. Given the fact that the percentage of children attending full-day kindergartens has increased in recent years (Walston and West 2004), further research is needed to more closely examine the relationships between kindergarten program type and children's achievement after 4 years of schooling by exploring interactions between kindergarten program type and child, family, and school characteristics. For instance, full-day kindergarten is not randomly distributed; rather, children at risk of school failure are more likely to attend such programs (Walston and West 2004). Researchers could also explore whether part-day kindergarten programs in conjunction with supplemental daycare arrangements function similarly to full-day kindergarten programs, in that both types of arrangements may provide the similar amounts of instructional time.

The ECLS-K data provide a unique opportunity to investigate how children's perceptions about their school experiences are influenced by and have an impact on their school achievement. For example,

researchers could explore whether third-graders' self-ratings of their internalizing and externalizing problem behaviors are related to their academic achievement, both in third grade and later when data are collected in fifth grade. Also, future studies could examine whether children's actual achievement is predicted by their perceived competence and interest in school subjects.

The ECLS-K is designed to provide a wealth of information on children's cognitive, socioemotional, and physical development from kindergarten through fifth grade across multiple contexts, including the home, classroom, school, and community. Using ECLS-K data collected from children's parents, teachers, and school administrators, future research on children's achievement could also include information on parenting practices, the types of instructional experiences that children are exposed to in their classrooms, the qualifications of their teachers, or characteristics of the schools they attend. The availability of child, parent, teacher, and school information also provides a data source that can be used for more sophisticated analysis models (e.g., hierarchical linear modeling (HLM), structural equation modeling (SEM)).





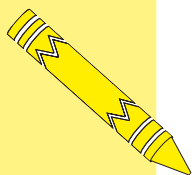
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# Appendix A: Tables

**Table A-1a. Standard errors of the percentage distribution of fall 1998 first-time kindergartners in the analytic report sample and the full ECLS-K sample, by child’s sex, race/ethnicity, and number of family risk factors: Fall 1998**

Selected child and family characteristics	Analytic report sample	Full ECLS-K sample
Sex		
Male	0.6	0.4
Female	0.6	0.4
Race/ethnicity		
White, non-Hispanic	1.8	1.5
Black, non-Hispanic	0.9	1.1
Hispanic	0.9	1.0
Asian/Pacific Islander	0.6	0.3
Other, non-Hispanic	0.9	0.8
Number of family risk factors <sup>1</sup>		
No risks	1.0	1.0
One risk	0.7	0.5
Two or more risks	0.8	0.8

<sup>1</sup>Family risk factors included living below the federal poverty level, primary home language was non-English, mother’s highest education was less than a high school diploma/GED, and living in a single-parent household. Values range from 0 to 4.

NOTE: Detail may not sum to totals because of rounding. Estimates for the analytic report sample reflect the sample of children assessed in English in all assessment years.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99 (ECLS-K), Longitudinal Kindergarten-First Grade Public-Use Data File and Third Grade Restricted-Use Data File, fall 1998 and spring 2002.







**Table A-2a. Standard errors of the percentage distribution of fall 1998 first-time kindergartners in the ECLS-K sample over the first 4 years of school, by selected family and school characteristics: Fall 1998, spring 1999, spring 2000, and spring 2002**

Selected family and school characteristics	Fall 1998	Spring 1999	Spring 2000	Spring 2002
Family type				
Two-parent/other	0.8	0.8	0.8	0.7
Single parent	0.8	0.8	0.8	0.7
Federal poverty status <sup>1</sup>				
Living below poverty level	—	0.9	1.0	1.0
Living at or above poverty level	—	0.9	1.0	1.0
School mobility				
Enrolled in fall kindergarten school	0.0	0.3	1.1	1.3
One school change	†	0.3	1.1	1.3
Two or more school changes	†	†	0.2	0.6
School type				
Public school all years	—	0.7	0.8	0.8
Private school all years	—	0.7	0.6	0.6
Switched from public to private school	†	†	0.4	0.3
Switched from private to public school	†	†	0.4	0.5
Multiple changes in school type	†	†	†	0.1

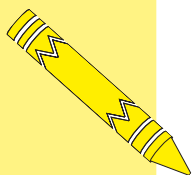
— Not available (Data were only collected in the spring of kindergarten).

† Not applicable.

<sup>1</sup>Poverty is a function of household size and household income. Based on 1998 Census information, a household of four with a total income below \$16,655 was considered to be below the federal poverty level.

NOTE: Estimates reflect the sample of children assessed in English in all assessment years. The ECLS-K assessment was not administered in 2001, when most of the children were in second grade.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99 (ECLS-K), Longitudinal Kindergarten-First Grade Public-Use Data File and Third Grade Restricted-Use Data File, fall 1998, spring 1999, spring 2000, and spring 2002.



**Table A-3. Percentage distribution of family risk factors for fall 1998 first-time kindergartners, by selected child, family, and early school experience characteristics: Academic year 1998–99**

Selected child, family, and school characteristics	Total	Number of family risk factors				
		Zero	One	Two	Three	Four
Total	100	62	23	12	3	#
Child's sex						
Male	100	62	23	11	3	#
Female	100	62	23	12	3	#
Child's race/ethnicity						
White, non-Hispanic	100	75	18	6	1	#
Black, non-Hispanic	100	34	34	26	7	#
Hispanic	100	40	28	21	9	1
Asian/Pacific Islander	100	47	36	12	4	#
Other, non-Hispanic	100	53	25	19	2	#
Mother's education						
Less than high school	100	†	35	38	26	2
High school diploma or equivalent	100	60	26	14	#	†
Some college	100	70	21	9	#	†
Bachelor's degree or higher	100	85	13	1	#	†
Family type						
Two parent/other	100	81	14	5	1	†
Single parent	100	†	52	36	11	1
Primary home language						
English	100	66	22	11	2	†
Non-English language	100	†	46	34	16	4
Federal poverty status <sup>1</sup>						
Below federal poverty level	100	†	29	54	16	1
At or above federal poverty level	100	76	22	2	#	†
School type						
Public all years	100	58	25	14	4	#
Private all years	100	83	15	2	#	#
Changes in school type	100	76	19	6	#	#

# Rounds to zero.

† Not applicable. This value must equal zero by definition.

<sup>1</sup>Poverty is a function of household size and household income. Based on 1998 Census information, a household of four with a total income below \$16,655 was considered to be below the federal poverty level.

NOTE: Family risk factors included living below the federal poverty level, primary home language was non-English, mother's highest education was less than a high school diploma/GED, and living in a single-parent household. Values range from 0 to 4. Estimates reflect the sample of children assessed in English in all assessment years.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99 (ECLS-K), Longitudinal Kindergarten-First Grade Public-Use Data File, and Third Grade Restricted-Use Data File, fall 1998, spring 1999, spring 2000, and spring 2002.





**Table A-3a. Standard errors of the percentage distribution of family risk factors for fall 1998 first-time kindergartners, by selected child, family, and early school experience characteristics: Academic year 1998–99**

Selected child, family, and school characteristics	Number of family risk factors				
	Zero	One	Two	Three	Four
Total	0.9	0.6	0.7	0.3	0.1
Child's sex					
Male	1.2	0.8	0.8	0.4	0.1
Female	1.1	0.8	0.9	0.4	0.1
Child's race/ethnicity					
White, non-Hispanic	0.9	0.7	0.5	0.2	#
Black, non-Hispanic	2.2	2.1	2.2	1.0	#
Hispanic	1.8	2.1	1.7	0.9	0.4
Asian/Pacific Islander	2.8	2.6	2.0	1.0	0.3
Other, non-Hispanic	6.5	3.4	4.0	0.8	#
Mother's education					
Less than high school	†	2.6	2.3	1.9	0.5
High school diploma or equivalent	1.3	1.0	1.2	0.1	†
Some college	1.2	1.0	0.8	0.1	†
Bachelor's degree or higher	0.9	0.8	0.3	0.1	†
Family type					
Two parent/other	0.9	0.7	0.4	0.1	†
Single parent	†	1.9	1.8	1.0	0.3
Primary home language					
English	1.0	0.6	0.7	0.3	†
Non-English language	†	2.5	2.4	1.9	1.1
Federal poverty status <sup>1</sup>					
Below federal poverty level	†	1.8	1.6	1.3	0.3
At or above federal poverty level	0.8	0.7	0.3	0.0	†
School type					
Public all years	1.1	0.7	0.8	0.3	0.1
Private all years	1.5	1.4	0.6	#	#
Changes in school type	2.7	2.4	1.2	0.1	0.1

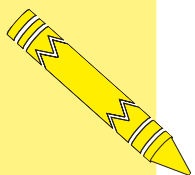
# Rounds to zero.

† Not applicable. This value must equal zero by definition.

<sup>1</sup>Poverty is a function of household size and household income. Based on 1998 Census information, a household of four with a total income below \$16,655 was considered to be below the federal poverty level.

NOTE: Family risk factors included living below the federal poverty level, primary home language was non-English, mother's highest education was less than a high school diploma/GED, and living in a single-parent household. Values range from 0 to 4. Estimates reflect the sample of children assessed in English in all assessment years.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99 (ECLS-K), Longitudinal Kindergarten-First Grade Public-Use Data File, and Third Grade Restricted-Use Data File, fall 1998, spring 1999, spring 2000, and spring 2002.



**Table A-4. Mean reading scale scores for fall 1998 first-time kindergartners, by time of assessment and selected child, family, and early school experience characteristics: Fall 1998, spring 1999, spring 2000, and spring 2002**

Selected child, family, and school characteristics	Mean reading scale score				Fall kindergarten to 3 <sup>rd</sup> grade reading score gain
	Fall 1998 kindergarten	Spring 1999 kindergarten	Spring 2000 1 <sup>st</sup> grade	Spring 2002 3 <sup>rd</sup> grade	
Total	27	39	69	108	81
Child's sex					
Male	26	38	67	107	80
Female	28	39	70	110	83
Child's race/ethnicity					
White, non-Hispanic	28	40	71	112	84
Black, non-Hispanic	25	34	61	98	73
Hispanic	24	36	65	105	81
Asian/Pacific Islander	30	43	75	111	81
Other, non-Hispanic	25	36	63	101	76
Number of family risk factors <sup>1</sup>					
No risks	29	41	73	113	84
One risk	25	36	65	105	79
Two or more risks	22	32	58	95	73
Kindergarten program type					
Half-day program	27	37	68	110	83
Full-day program	27	39	69	108	80
School type across all waves of the study					
Public school all years	26	37	67	107	81
Private school all years	31	44	78	116	85
Change in school type during study	30	42	74	113	83

<sup>1</sup>Family risk factors included living below the federal poverty level, primary home language was non-English, mother's highest education was less than a high school diploma/GED, and living in a single-parent household.

NOTE: Detail may not sum to totals because of rounding. Estimates reflect the sample of children assessed in English in all assessment years. The ECLS-K assessment was not administered in 2001, when most of the children were in second grade. Although most of the children in the sample were in third grade in the spring of 2002, 10 percent were in second grade, and about 1 percent were enrolled in other grades.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99 (ECLS-K), Longitudinal Kindergarten-First Grade Public-Use Data File and Third Grade Restricted-Use Data File, fall 1998, spring 1999, spring 2000, and spring 2002.





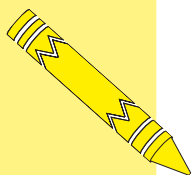
**Table A-4a. Standard errors of the mean reading scale scores for fall 1998 first-time kindergartners, by time of assessment and selected child, family, and early school experience characteristics: Fall 1998, spring 1999, spring 2000, and spring 2002**

Selected child, family, and school characteristics	Mean reading scale score				Fall kindergarten to 3 <sup>rd</sup> grade reading score gain
	Fall 1998 kindergarten	Spring 1999 kindergarten	Spring 2000 1 <sup>st</sup> grade	Spring 2002 3 <sup>rd</sup> grade	
Total	0.3	0.5	0.8	0.7	0.4
Child's sex					
Male	0.4	0.5	0.9	1.0	0.4
Female	0.3	0.5	0.8	0.6	0.4
Child's race/ethnicity					
White, non-Hispanic	0.4	0.5	0.8	0.7	0.3
Black, non-Hispanic	0.5	0.8	1.0	1.0	0.7
Hispanic	0.5	0.8	1.1	1.3	0.9
Asian/Pacific Islander	0.9	1.4	1.9	1.7	1.1
Other, non-Hispanic	1.2	1.6	2.8	3.5	2.4
Number of family risk factors <sup>1</sup>					
No risks	0.4	0.5	0.8	0.7	0.3
One risk	0.3	0.5	1.0	0.9	0.6
Two or more risks	0.3	0.7	0.9	1.2	1.0
Kindergarten program type					
Half-day program	0.4	0.5	0.8	0.7	0.4
Full-day program	0.4	0.7	1.0	1.0	0.6
School type across all waves of the study					
Public school all years	0.4	0.6	0.9	0.9	0.4
Private school all years	0.5	0.7	1.0	0.6	0.6
Change in school type during study	0.7	1.1	1.6	1.1	0.9

<sup>1</sup>Family risk factors included living below the federal poverty level, primary home language was non-English, mother's highest education was less than a high school diploma/GED, and living in a single-parent household.

NOTE: Estimates reflect the sample of children assessed in English in all assessment years. The ECLS-K assessment was not administered in 2001, when most of the children were in second grade. Although most of the children in the sample were in third grade in the spring of 2002, 10 percent were in second grade, and about 1 percent were enrolled in other grades.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99 (ECLS-K), Longitudinal Kindergarten-First Grade Public-Use Data File and Third Grade Restricted-Use Data File, fall 1998, spring 1999, spring 2000, and spring 2002.



**Table A-5. Mean mathematics scale scores for fall 1998 first-time kindergartners, by time of assessment and selected child, family, and early school experience characteristics: Fall 1998, spring 1999, spring 2000, and spring 2002**

Selected child, family, and school characteristics	Mean mathematics scale score				Fall kindergarten to 3 <sup>rd</sup> grade mathematics score gain
	Fall 1998 kindergarten	Spring 1999 kindergarten	Spring 2000 1 <sup>st</sup> grade	Spring 2002 3 <sup>rd</sup> grade	
Total	22	32	55	85	63
Child's sex					
Male	22	32	56	86	65
Female	22	32	55	83	62
Child's race/ethnicity					
White, non-Hispanic	23	34	58	89	65
Black, non-Hispanic	18	26	47	73	55
Hispanic	19	29	52	82	63
Asian/Pacific Islander	23	34	56	88	65
Other, non-Hispanic	20	29	51	80	61
Number of family risk factors <sup>1</sup>					
No risks	24	34	59	89	65
One risk	20	29	51	81	61
Two or more risks	17	25	47	74	57
Kindergarten program type					
Half-day program	22	31	56	86	64
Full-day program	22	32	55	84	62
School type across all waves of the study					
Public school all years	21	31	54	84	63
Private school all years	26	37	61	90	64
Change in school type during study	24	34	59	88	65

<sup>1</sup>Family risk factors included living below the federal poverty level, primary home language was non-English, mother's highest education was less than a high school diploma/GED, and living in a single-parent household.

NOTE: Estimates reflect the sample of children assessed in English in all assessment years. The ECLS-K assessment was not administered in 2001, when most of the children were in second grade. Although most of the children in the sample were in third grade in the spring of 2002, 10 percent were in second grade, and about 1 percent were enrolled in other grades.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99 (ECLS-K), Longitudinal Kindergarten-First Grade Public-Use Data File and Third Grade Restricted-Use Data File, fall 1998, spring 1999, spring 2000, and spring 2002.





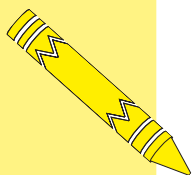
**Table A-5a. Standard errors of the mean mathematics scale scores for fall 1998 first-time kindergartners, by time of assessment and selected child, family, and early school experience characteristics: Fall 1998, spring 1999, spring 2000, and spring 2002**

Selected child, family, and school characteristics	Mean mathematics scale score				Fall kindergarten to 3 <sup>rd</sup> grade mathematics score gain
	Fall 1998 kindergarten	Spring 1999 kindergarten	Spring 2000 1 <sup>st</sup> grade	Spring 2002 3 <sup>rd</sup> grade	
Total	0.3	0.4	0.5	0.6	0.3
Child's sex					
Male	0.4	0.5	0.7	0.9	0.4
Female	0.3	0.4	0.4	0.6	0.4
Child's race/ethnicity					
White, non-Hispanic	0.4	0.5	0.6	0.7	0.3
Black, non-Hispanic	0.3	0.6	0.7	1.0	0.8
Hispanic	0.4	0.7	0.8	1.1	0.7
Asian/Pacific Islander	0.9	1.2	1.3	1.4	0.8
Other, non-Hispanic	1.1	1.3	1.7	2.8	1.9
Number of family risk factors <sup>1</sup>					
No risks	0.3	0.4	0.5	0.7	0.3
One risk	0.3	0.5	0.7	0.9	0.6
Two or more risks	0.2	0.6	0.6	0.9	0.8
Kindergarten program type					
Half-day program	0.4	0.5	0.6	0.7	0.4
Full-day program	0.4	0.6	0.7	0.9	0.5
School type across all waves of the study					
Public school all years	0.3	0.5	0.6	0.8	0.4
Private school all years	0.4	0.5	0.6	0.6	0.5
Change in school type during study	0.6	0.8	1.1	1.2	0.8

<sup>1</sup>Family risk factors included living below the federal poverty level, primary home language was non-English, mother's highest education was less than a high school diploma/GED, and living in a single-parent household.

NOTE: Estimates reflect the sample of children assessed in English in all assessment years. The ECLS-K assessment was not administered in 2001, when most of the children were in second grade. Although most of the children in the sample were in third grade in the spring of 2002, 10 percent were in second grade, and about 1 percent were enrolled in other grades.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99 (ECLS-K), Longitudinal Kindergarten-First Grade Public-Use Data File and Third Grade Restricted-Use Data File, fall 1998, spring 1999, spring 2000, and spring 2002.



**Table A-6. Regression of fall 1998 first-time kindergartners' reading and mathematics gains from the fall of kindergarten to the spring of third grade on selected child, family, and early school experience characteristics: Fall 1998 and spring 2002**

Selected child, family, and school characteristics	Unstandardized regression coefficients	
	Reading score gain	Mathematics score gain
Intercept	85.55	64.53
Male	-2.68*	2.86*
Race/ethnicity <sup>1</sup>		
Black, non-Hispanic	-7.52* <sup>4</sup>	-8.21* <sup>4</sup>
Hispanic	-0.89	-0.10
Asian/Pacific Islander	-1.70	1.05
Other, non-Hispanic	-6.04* <sup>4</sup>	-3.65* <sup>4</sup>
Number of family risk factors <sup>2</sup>	-3.64*	-2.43*
Full-day kindergarten program	-1.50*	-0.45
School type across all waves of the study <sup>3</sup>		
Private school all years	1.45*	-1.11*
Change in school type during study	0.34	0.67

\*p<0.05.

<sup>1</sup>The reference group for this comparison is White, non-Hispanic.

<sup>2</sup>Family risk factors included living below the federal poverty level, primary home language was non-English, mother's highest education was less than a high school diploma/GED, and living in a single-parent household. Values range from 0 to 4.

<sup>3</sup>The reference group for this comparison is children who attended public school for all years.

<sup>4</sup>Effect size of estimate is greater than or equal to 0.25 standard deviations of the dependent variable (i.e., 4.2 points for reading gains and 3.4 points for mathematics gains).

NOTE: Estimates reflect the sample of children assessed in English in all assessment years. Although most of the children in the sample were in third grade in the spring of 2002, 10 percent were in second grade, and about 1 percent were enrolled in other grades.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998-99 (ECLS-K), Longitudinal Kindergarten-First Grade Public-Use Data File and Third Grade Restricted-Use Data File, fall 1998, spring 1999, spring 2000, and spring 2002.







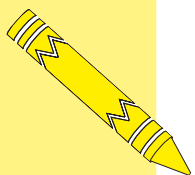
**Table A-7. Mean science scale scores for fall 1998 first-time kindergartners in spring of third grade, by selected child, family, and early school experience characteristics: Spring 2002**

Selected child, family, and school characteristics	Mean science scale score
Total	35
Child's sex	
Male	36
Female	34
Child's race/ethnicity	
White, non-Hispanic	37
Black, non-Hispanic	27
Hispanic	32
Asian/Pacific Islander	35
Other, non-Hispanic	32
Number of family risk factors <sup>1</sup>	
No risks	37
One risk	33
Two or more risks	28
Kindergarten program type	
Half-day program	35
Full-day program	34
School type across all waves of the study	
Public school all years	34
Private school all years	38
Change in school type during study	37

<sup>1</sup>Family risk factors included living below the federal poverty level, primary home language was non-English, mother's highest education was less than a high school diploma/GED, and living in a single-parent household. Values range from 0 to 4.

NOTE: Estimates reflect the sample of children assessed in English in all assessment years. Although most of the children in the sample were in third grade in the spring of 2002, 10 percent were in second grade, and about 1 percent were enrolled in other grades.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998-99 (ECLS-K), Longitudinal Kindergarten-First Grade Public-Use Data File and Third Grade Restricted-Use Data File, fall 1998, spring 1999, spring 2000, and spring 2002.



**Table A-7a. Standard errors of the mean science scale scores for fall 1998 first-time kindergartners in spring of third grade, by selected child, family, and early school experience characteristics: Spring 2002**

Selected child, family, and school characteristics	Mean science scale score
Total	0.4
Child's sex	
Male	0.5
Female	0.4
Child's race/ethnicity	
White, non-Hispanic	0.4
Black, non-Hispanic	0.6
Hispanic	0.7
Asian/Pacific Islander	0.7
Other, non-Hispanic	1.7
Number of family risk factors <sup>1</sup>	
No risks	0.4
One risk	0.5
Two or more risks	0.5
Kindergarten program type	
Half-day program	0.4
Full-day program	0.6
School type across all waves of the study	
Public school all years	0.5
Private school all years	0.4
Change in school type during study	0.6

<sup>1</sup>Family risk factors included living below the federal poverty level, primary home language was non-English, mother's highest education was less than a high school diploma/GED, and living in a single-parent household. Values range from 0 to 4.

NOTE: Estimates reflect the sample of children assessed in English in all assessment years. Although most of the children in the sample were in third grade in the spring of 2002, 10 percent were in second grade, and about 1 percent were enrolled in other grades.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998-99 (ECLS-K), Longitudinal Kindergarten-First Grade Public-Use Data File and Third Grade Restricted-Use Data File, fall 1998, spring 1999, spring 2000, and spring 2002.





**Table A-8. Regression of fall 1998 first-time kindergartners' spring of third grade reading, mathematics, and science achievement on selected child, family, and early school experience characteristics: Spring 2002**

Selected child, family, and school characteristics	Unstandardized regression coefficients		
	Reading	Mathematics	Science
Intercept	115.04	88.18	36.64
Male	-3.81*	3.13*	2.19*
Race/ethnicity <sup>1</sup>			
Black, non-Hispanic	-9.32* <sup>4</sup>	-11.74* <sup>4</sup>	-8.13* <sup>4</sup>
Hispanic	-3.04*	-2.55*	-3.39* <sup>4</sup>
Asian/Pacific Islander	0.65	1.85	-1.17
Other, non-Hispanic	-8.41* <sup>4</sup>	-6.54* <sup>4</sup>	-3.87* <sup>4</sup>
Number of family risk factors <sup>2</sup>	-6.05* <sup>4</sup>	-4.77* <sup>4</sup>	-2.70* <sup>4</sup>
Full-day kindergarten program	-0.42	0.20	-0.13
School type across all waves of the study <sup>3</sup>			
Private school all years	5.14* <sup>4</sup>	2.68	1.48
Change in school type during study	3.43*	2.33*	2.05*

\* p<0.05.

<sup>1</sup>The reference group for this comparison is White, non-Hispanic.

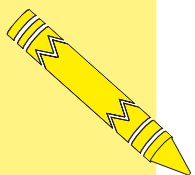
<sup>2</sup>Family risk factors included living below the federal poverty level, primary home language was non-English, mother's highest education was less than a high school diploma/GED, and living in a single-parent household. Values range from 0 to 4.

<sup>3</sup>The reference group for this comparison is children who attended public school for all years.

<sup>4</sup>Effect size of estimate is greater than or equal to 0.25 standard deviations of the dependent variable (i.e., 5.0 for reading, 4.5 for mathematics, and 2.4 for science).

NOTE: Estimates reflect the sample of children assessed in English in all assessment years. Although most of the children in the sample were in third grade in the spring of 2002, 10 percent were in second grade, and about 1 percent were enrolled in other grades.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99 (ECLS-K), Longitudinal Kindergarten-First Grade Public-Use Data File and Third Grade Restricted-Use Data File, fall 1998, spring 1999, spring 2000, and spring 2002.



**Table A-9. Percentage of fall 1998 first-time kindergartners demonstrating specific reading knowledge and skills in the spring of first and third grade, by grade level and selected child, family, and early school experience characteristics: Spring 2000 and spring 2002**

Selected child, family, and school characteristics	Reading knowledge and skills											
	Ending sounds		Sight words		Words in context		Literal inference		Deriving meaning		Interpret beyond text	
	1 <sup>st</sup> grade	3 <sup>rd</sup> grade	1 <sup>st</sup> grade	3 <sup>rd</sup> grade	1 <sup>st</sup> grade	3 <sup>rd</sup> grade	1 <sup>st</sup> grade	3 <sup>rd</sup> grade	1 <sup>st</sup> grade	3 <sup>rd</sup> grade	1 <sup>st</sup> grade	3 <sup>rd</sup> grade
Total	93	100	77	99	46	95	16	78	4	46	3	29
Child's sex												
Male	91	100	73	99	42	93	14	76	4	43	3	27
Female	95	100	81	99	50	96	17	81	4	49	3	31
Child's race/ethnicity												
White, non-Hispanic	95	100	81	99	50	97	18	84	5	53	3	34
Black, non-Hispanic	88	100	66	98	33	90	8	63	1	27	1	15
Hispanic	92	100	74	99	40	93	11	74	2	39	2	23
Asian/Pacific Islander	95	100	83	99	57	98	24	82	6	48	4	31
Other, non-Hispanic	87	100	67	97	35	90	11	67	4	35	2	21
Number of family risk factors <sup>1</sup>												
No risks	96	100	83	100	53	98	20	85	5	54	3	34
One risk	90	100	72	98	39	93	11	73	2	39	2	24
Two or more risks	86	99	60	97	25	86	5	57	1	24	1	14
Kindergarten program type												
Half-day program	93	100	78	99	45	95	15	80	4	48	2	30
Full-day program	93	100	77	99	46	94	16	77	4	45	3	28
School type across all waves of the study												
Public school all years	92	100	76	99	42	94	13	76	3	44	2	27
Private school all years	98	100	89	100	63	99	26	90	7	60	4	38
Change in school type during study	95	100	80	100	54	97	24	84	6	54	4	35

<sup>1</sup>Family risk factors included living below the federal poverty level, primary home language was non-English, mother's highest education was less than a high school diploma/GED, and living in a single-parent household. Values range from 0 to 4.

NOTE: Estimates reflect the sample of children assessed in English in all assessment years. The ECLS-K assessment was not administered in 2001, when most of the children were in second grade. Although most of the children in the sample were in third grade in the spring of 2002, 10 percent were in second grade, and about 1 percent were enrolled in other grades.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998-99 (ECLS-K), Longitudinal Kindergarten-First Grade Public-Use Data File and Third Grade Restricted-Use Data File, fall 1998, spring 1999, spring 2000, and spring 2002.





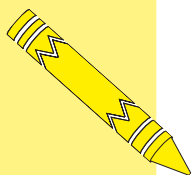
**Table A-9a. Standard errors of the percentage of fall 1998 first-time kindergartners demonstrating specific reading knowledge and skills in the spring of first and third grade, by grade level and selected child, family, and early school experience characteristics: Spring 2000 and spring 2002**

Selected child, family, and school characteristics	Reading knowledge and skills											
	Ending sounds		Sight words		Words in context		Literal inference		Deriving meaning		Interpret beyond text	
	1 <sup>st</sup> grade	3 <sup>rd</sup> grade	1 <sup>st</sup> grade	3 <sup>rd</sup> grade	1 <sup>st</sup> grade	3 <sup>rd</sup> grade	1 <sup>st</sup> grade	3 <sup>rd</sup> grade	1 <sup>st</sup> grade	3 <sup>rd</sup> grade	1 <sup>st</sup> grade	3 <sup>rd</sup> grade
Total	0.7	0.0	1.4	0.1	1.5	0.5	0.7	1.2	0.2	1.2	0.1	0.8
Child's sex												
Male	0.9	0.0	1.8	0.2	1.5	0.8	0.7	1.7	0.2	1.5	0.2	1.0
Female	0.5	0.0	1.2	0.1	1.6	0.4	0.8	1.0	0.2	1.1	0.1	0.8
Child's race/ethnicity												
White, non-Hispanic	0.7	0.0	1.4	0.1	1.6	0.4	0.8	1.2	0.3	1.4	0.2	1.0
Black, non-Hispanic	1.0	0.1	1.9	0.4	1.9	1.1	1.0	2.0	0.2	1.5	0.1	0.8
Hispanic	0.9	0.0	2.0	0.2	2.3	1.2	1.1	2.3	0.3	2.1	0.2	1.4
Asian/Pacific Islander	0.8	0.1	2.3	0.3	4.2	0.8	2.5	2.7	1.0	3.2	0.6	2.3
Other, non-Hispanic	3.2	0.2	5.6	1.1	4.5	3.5	2.2	6.2	1.0	4.8	0.6	3.2
Number of family risk factors <sup>1</sup>												
No risks	0.5	0.0	1.2	0.1	1.6	0.3	1.0	1.1	0.3	1.3	0.2	1.0
One risk	0.9	0.0	1.9	0.3	2.2	0.8	0.8	1.6	0.3	1.6	0.2	1.0
Two or more risks	1.7	0.1	2.3	0.5	1.4	1.8	0.7	2.3	0.4	1.6	0.2	1.1
Kindergarten program type												
Half-day program	0.6	0.0	1.2	0.1	1.8	0.6	1.0	1.1	0.3	1.3	0.2	0.9
Full-day program	0.9	0.0	1.8	0.2	1.9	0.7	1.0	1.7	0.3	1.7	0.2	1.1
School type across all waves of the study												
Public school all years	0.8	0.0	1.5	0.2	1.7	0.6	0.9	1.5	0.2	1.5	0.1	1.0
Private school all years	0.3	0.0	1.2	0.1	2.1	0.3	1.7	0.8	0.6	1.4	0.4	1.1
Change in school type during study	0.8	0.0	2.2	0.2	3.3	0.6	2.1	1.6	0.8	2.3	0.4	1.7

<sup>1</sup>Family risk factors included living below the federal poverty level, primary home language was non-English, mother's highest education was less than a high school diploma/GED, and living in a single-parent household. Values range from 0 to 4.

NOTE: Estimates reflect the sample of children assessed in English in all assessment years. The ECLS-K assessment was not administered in 2001, when most of the children were in second grade. Although most of the children in the sample were in third grade in the spring of 2002, 10 percent were in second grade, and about 1 percent were enrolled in other grades.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99 (ECLS-K), Longitudinal Kindergarten-First Grade Public-Use Data File and Third Grade Restricted-Use Data File, fall 1998, spring 1999, spring 2000, and spring 2002.



**Table A-10. Regression of fall 1998 first-time kindergartners' probability of demonstrating specific reading knowledge and skills in the spring of third grade on selected child, family, and early school experience characteristics: Spring 2002**

Selected child, family, and school characteristics	Unstandardized regression coefficients		
	Literal inference	Deriving meaning	Interpreting beyond text
Intercept	0.88	0.58	0.37
Male	-0.05* <sup>4</sup>	-0.06* <sup>4</sup>	-0.04*
Race/ethnicity <sup>1</sup>			
Black, non-Hispanic	-0.12* <sup>4</sup>	-0.18* <sup>4</sup>	-0.13* <sup>4</sup>
Hispanic	-0.02	-0.07* <sup>4</sup>	-0.06* <sup>4</sup>
Asian/Pacific Islander	0.03	-0.02	-0.01
Other, non-Hispanic	-0.12* <sup>4</sup>	-0.15* <sup>4</sup>	-0.10* <sup>4</sup>
Number of family risk factors <sup>2</sup>	-0.10* <sup>4</sup>	-0.10* <sup>4</sup>	-0.06* <sup>4</sup>
Full-day kindergarten program	-0.01	-0.01	#
School type across all waves of the study <sup>3</sup>			
Private school all years	0.08* <sup>4</sup>	0.10* <sup>4</sup>	0.06* <sup>4</sup>
Change in school type during study	0.04*	0.06* <sup>4</sup>	0.05* <sup>4</sup>

# Estimate rounds to zero.

\* p<0.05.

<sup>1</sup>The reference group for this comparison is White, non-Hispanic.

<sup>2</sup>Family risk factors included living below the federal poverty level, primary home language was non-English, mother's highest education was less than a high school diploma/GED, and living in a single-parent household. Values range from 0 to 4.

<sup>3</sup>The reference group for this comparison is children who attended public school for all years.

<sup>4</sup>Effect size of estimate is greater than or equal to 0.05.

NOTE: Estimates reflect the sample of children assessed in English in all assessment years. Although most of the children in the sample were in third grade in the spring of 2002, 10 percent were in second grade, and about 1 percent were enrolled in other grades.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998-99 (ECLS-K), Longitudinal Kindergarten-First Grade Public-Use Data File and Third Grade Restricted-Use Data File, fall 1998, spring 1999, spring 2000, and spring 2002.





**Table A-11. Percentage of fall 1998 first-time kindergartners demonstrating specific mathematics knowledge and skills in spring of first and third grade, by grade level and selected child, family, and early school experience characteristics: Spring 2000 and spring 2002**

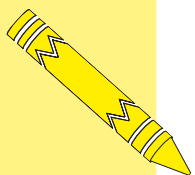
Selected child, family, and school characteristics	Mathematics knowledge and skills									
	Ordinality and sequence		Addition and subtraction		Multiplication and division		Place value		Rate and measurement	
	1 <sup>st</sup> grade	3 <sup>rd</sup> grade	1 <sup>st</sup> grade	3 <sup>rd</sup> grade	1 <sup>st</sup> grade	3 <sup>rd</sup> grade	1 <sup>st</sup> grade	3 <sup>rd</sup> grade	1 <sup>st</sup> grade	3 <sup>rd</sup> grade
Total	95	100	72	97	25	78	3	42	#	16
Child's sex										
Male	94	100	72	97	27	79	4	46	#	19
Female	95	100	73	97	22	77	2	38	#	12
Child's race/ethnicity										
White, non-Hispanic	96	100	78	98	30	84	4	50	#	19
Black, non-Hispanic	89	100	56	93	10	58	1	20	#	5
Hispanic	94	100	68	97	18	75	1	35	#	11
Asian/Pacific Islander	96	100	74	98	25	83	4	49	#	22
Other, non-Hispanic	92	100	64	95	18	70	2	34	#	11
Number of family risk factors <sup>1</sup>										
No risks	97	100	79	98	30	85	4	50	#	20
One risk	92	100	65	96	18	72	2	34	#	11
Two or more risks	89	100	57	93	10	61	1	21	#	5
Kindergarten program type										
Half-day program	95	100	73	97	25	80	3	44	#	16
Full-day program	95	100	72	97	24	77	3	41	#	15
School type across all waves of the study										
Public school all years	94	100	70	97	23	77	3	41	#	14
Private school all years	99	100	84	99	35	87	5	52	#	20
Change in school type during study	97	100	79	98	31	84	5	48	#	22

# Rounds to zero.

<sup>1</sup>Family risk factors included living below the federal poverty level, primary home language was non-English, mother's highest education was less than a high school diploma/GED, and living in a single-parent household. Values range from 0 to 4.

NOTE: Estimates reflect the sample of children assessed in English in all assessment years. The ECLS-K assessment was not administered in 2001, when most of the children were in second grade. Although most of the children in the sample were in third grade in the spring of 2002, 10 percent were in second grade, and about 1 percent were enrolled in other grades.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998-99 (ECLS-K), Longitudinal Kindergarten-First Grade Public-Use Data File and Third Grade Restricted-Use Data File, fall 1998, spring 1999, spring 2000, and spring 2002.



**Table A-11a. Standard errors of the percentage of fall 1998 first-time kindergartners demonstrating specific mathematics knowledge and skills in spring of first and third grade, by grade level and selected child, family, and early school experience characteristics: Spring 2000 and spring 2002**

Selected child, family, and school characteristics	Mathematics knowledge and skills									
	Ordinality and sequence		Addition and subtraction		Multiplication and division		Place value		Rate and measurement	
	1 <sup>st</sup> grade	3 <sup>rd</sup> grade	1 <sup>st</sup> grade	3 <sup>rd</sup> grade	1 <sup>st</sup> grade	3 <sup>rd</sup> grade	1 <sup>st</sup> grade	3 <sup>rd</sup> grade	1 <sup>st</sup> grade	3 <sup>rd</sup> grade
Total	0.6	#	0.9	0.2	0.9	1.0	0.2	1.4	#	0.9
Child's sex										
Male	0.9	#	1.3	0.5	1.1	1.5	0.3	1.7	#	1.1
Female	0.4	#	0.8	0.3	0.8	1.0	0.2	1.3	#	0.8
Child's race/ethnicity										
White, non-Hispanic	0.5	#	1.1	0.3	1.1	1.0	0.3	1.7	0.1	1.1
Black, non-Hispanic	1.3	#	1.9	0.6	0.9	2.1	0.2	1.6	#	1.0
Hispanic	1.0	#	1.9	0.3	1.3	1.8	0.3	2.5	#	1.3
Asian/Pacific Islander	1.3	#	2.5	0.7	2.3	2.0	1.2	3.2	0.1	2.7
Other, non-Hispanic	1.9	#	3.6	1.3	2.6	5.2	0.5	4.8	0.1	2.4
Number of family risk factors <sup>1</sup>										
No risks	0.4	#	0.9	0.3	1.0	0.9	0.3	1.6	#	1.0
One risk	0.8	#	1.4	0.4	1.2	1.6	0.3	1.8	#	1.0
Two or more risks	1.4	#	1.5	0.6	0.9	1.9	0.2	1.5	#	0.7
Kindergarten program type										
Half-day program	0.6	#	1.1	0.3	1.1	1.0	0.3	1.5	#	1.0
Full-day program	0.7	#	1.3	0.4	1.2	1.5	0.3	1.7	#	1.0
School type across all waves of the study										
Public school all years	0.7	#	1.0	0.3	1.1	1.2	0.2	1.6	#	1.0
Private school all years	0.3	#	0.9	0.1	1.2	0.9	0.5	1.7	0.1	1.2
Change in school type during study	0.5	#	1.7	0.4	2.1	1.7	0.9	2.6	0.2	2.2

# Rounds to zero.

<sup>1</sup>Family risk factors included living below the federal poverty level, primary home language was non-English, mother's highest education was less than a high school diploma/GED, and living in a single-parent household. Values range from 0 to 4.

NOTE: Estimates reflect the sample of children assessed in English in all assessment years. The ECLS-K assessment was not administered in 2001, when most of the children were in second grade. Although most of the children in the sample were in third grade in the spring of 2002, 10 percent were in second grade, and about 1 percent were enrolled in other grades.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998-99 (ECLS-K), Longitudinal Kindergarten-First Grade Public-Use Data File and Third Grade Restricted-Use Data File, fall 1998, spring 1999, spring 2000, and spring 2002.







**Table A-12. Regression of fall 1998 first-time kindergartners probability of demonstrating specific mathematics knowledge and skills in spring of third grade on selected child, family, and early school experience characteristics: Spring 2002**

Selected child, family, and school characteristics	Unstandardized regression coefficients		
	Multiplication and division	Place value	Rate and measurement
Intercept	0.85	0.48	0.17
Male	0.03*	0.08* <sup>4</sup>	0.07* <sup>4</sup>
Race/ethnicity <sup>1</sup>			
Black, non-Hispanic	-0.20* <sup>4</sup>	-0.23* <sup>4</sup>	-0.11* <sup>4</sup>
Hispanic	-0.03*	-0.07* <sup>4</sup>	-0.05* <sup>4</sup>
Asian/Pacific Islander	0.02	0.03	0.04
Other, non-Hispanic	-0.11* <sup>4</sup>	-0.13* <sup>4</sup>	-0.07* <sup>4</sup>
Number of family risk factors <sup>2</sup>	-0.08* <sup>4</sup>	-0.09* <sup>4</sup>	-0.05* <sup>4</sup>
Full-day kindergarten program	#	0.01	0.01
School type across all waves of the study <sup>3</sup>			
Private school all years	0.05* <sup>4</sup>	0.05* <sup>4</sup>	0.02
Change in school type during study	0.04*	0.03	0.05* <sup>4</sup>

# Estimate rounds to zero.

\*  $p < 0.05$ .

<sup>1</sup>The reference group for this comparison is White, non-Hispanic.

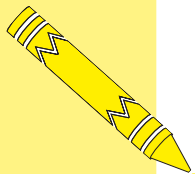
<sup>2</sup>Family risk factors included living below the federal poverty level, primary home language was non-English, mother's highest education was less than a high school diploma/GED, and living in a single-parent household. Values range from 0 to 4.

<sup>3</sup>The reference group for this comparison is children who attended public school for all years.

<sup>4</sup>Effect size of estimate is greater than or equal to 0.05.

NOTE: Estimates reflect the sample of children assessed in English in all assessment years. Although most of the children in the sample were in third grade in the spring of 2002, 10 percent were in second grade, and about 1 percent were enrolled in other grades.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99 (ECLS-K), Longitudinal Kindergarten-First Grade Public-Use Data File and Third Grade Restricted-Use Data File, fall 1998, spring 1999, spring 2000, and spring 2002.



**Table A-13. Mean scale scores for fall 1998 first-time kindergartners' perceptions about their school experiences, peer relationships, and problem behaviors in spring of third grade, by selected child, family, and early school experience characteristics: Spring 2002**

Selected child, family, and school characteristics	Perceived competence and interest in...			Peer relationships	Externalizing problem behaviors	Internalizing problem behaviors
	Reading	Mathematics	All school subjects			
Total	3.3	3.2	2.9	3.0	2.0	2.2
Child's sex						
Male	3.2	3.2	2.9	3.0	2.1	2.2
Female	3.4	3.1	2.9	3.1	1.9	2.2
Child's race/ethnicity						
White, non-Hispanic	3.2	3.1	2.9	3.0	1.9	2.1
Black, non-Hispanic	3.3	3.2	3.0	3.1	2.3	2.5
Hispanic	3.3	3.2	3.0	3.1	2.0	2.3
Asian/Pacific Islander	3.3	3.2	3.0	2.9	1.9	2.1
Other, non-Hispanic	3.3	3.2	3.0	2.9	2.0	2.2
Number of family risk factors <sup>1</sup>						
No risks	3.3	3.1	2.9	3.0	1.9	2.0
One risk	3.3	3.2	2.9	3.0	2.1	2.3
Two or more risks	3.3	3.2	3.0	3.0	2.3	2.5
Kindergarten program type						
Half-day program	3.3	3.2	2.9	3.0	1.9	2.1
Full-day program	3.3	3.1	2.9	3.0	2.0	2.2
School type across all waves of the study						
Public school all years	3.3	3.2	2.9	3.0	2.0	2.2
Private school all years	3.2	3.0	2.8	3.0	1.9	2.0
Change in school type during study	3.3	3.1	2.9	3.0	1.9	2.0

<sup>1</sup>Family risk factors included living below the federal poverty level, primary home language was non-English, mother's highest education was less than a high school diploma/GED, and living in a single-parent household. Values range from 0 to 4.

NOTE: Scale scores on children's perceptions come from a self-description questionnaire (SDQ). Scores on the SDQ scales ranged from 1 "not at all true" to 4 "very true". Estimates reflect the sample of children assessed in English in all assessment years. Although most of the children in the sample were in third grade in the spring of 2002, 10 percent were in second grade, and about 1 percent were enrolled in other grades.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998-99 (ECLS-K), Longitudinal Kindergarten-First Grade Public-Use Data File and Third Grade Restricted-Use Data File, fall 1998, spring 1999, spring 2000, and spring 2002.





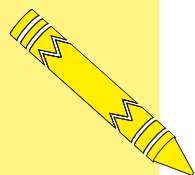
**Table A-13a. Standard errors of the mean scale scores for fall 1998 first-time kindergartners' perceptions about their school experiences, peer relationships, and problem behaviors in spring of third grade, by selected child, family, and early school experience characteristics: Spring 2002**

Selected child, family, and school characteristics	Perceived competence and interest in...			Peer relationships	Externalizing problem behaviors	Internalizing problem behaviors
	Reading	Mathematics	All school subjects			
Total	0.01	0.01	0.01	0.01	0.02	0.03
Child's sex	0.02	0.02	0.02	0.02	0.03	0.03
Male	0.01	0.02	0.02	0.01	0.02	0.03
Female						
Child's race/ethnicity						
White, non-Hispanic	0.02	0.02	0.02	0.01	0.02	0.03
Black, non-Hispanic	0.03	0.04	0.03	0.04	0.04	0.05
Hispanic	0.04	0.03	0.02	0.03	0.03	0.05
Asian/Pacific Islander	0.05	0.05	0.05	0.05	0.06	0.05
Other, non-Hispanic	0.04	0.06	0.04	0.05	0.06	0.07
Number of family risk factors <sup>1</sup>						
No risks	0.01	0.02	0.01	0.01	0.02	0.03
One risk	0.02	0.02	0.02	0.02	0.03	0.03
Two or more risks	0.03	0.04	0.04	0.05	0.05	0.05
Kindergarten program type						
Half-day program	0.02	0.02	0.02	0.01	0.02	0.02
Full-day program	0.02	0.02	0.02	0.02	0.03	0.04
School type across all waves of the study						
Public school all years	0.01	0.02	0.01	0.01	0.01	0.02
Private school all years	0.02	0.03	0.03	0.02	0.03	0.03
Change in school type during study	0.04	0.04	0.04	0.03	0.04	0.04

<sup>1</sup>Family risk factors included living below the federal poverty level, primary home language was non-English, mother's highest education was less than a high school diploma/GED, and living in a single-parent household. Values range from 0 to 4.

NOTE: Scale scores on children's perceptions come from a self-description questionnaire (SDQ). Scores on the SDQ scales ranged from 1 "not at all true" to 4 "very true". Estimates reflect the sample of children assessed in English in all assessment years. Although most of the children in the sample were in third grade in the spring of 2002, 10 percent were in second grade, and about 1 percent were enrolled in other grades.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998-99 (ECLS-K), Longitudinal Kindergarten-First Grade Public-Use Data File and Third Grade Restricted-Use Data File, fall 1998, spring 1999, spring 2000, and spring 2002.



**Table A-14. Regression of fall 1998 first-time kindergartners' perceptions about their school experiences, peer relationships, and problem behaviors in spring of third grade, on selected child, family, and early school experience characteristics: Spring 2002**

Selected child, family, and school characteristics	Perceived competence and interest in...			Externalizing	Internalizing
	Reading	Mathematics	All school subjects	Peer relationships	problem behaviors
Intercept	3.31	3.06	2.92	3.07	2.10
Male	-0.17* <sup>4</sup>	0.17*	-0.06*	-0.09*	-0.01
Race/ethnicity <sup>1</sup>					
Black, non-Hispanic	0.08*	0.08	0.10*	0.07*	0.26* <sup>4</sup>
Hispanic	0.08*	0.06	0.06*	0.03	0.11*
Asian/Pacific Islander	0.06	0.02	0.07	-0.09*	#
Other, non-Hispanic	0.03	0.05	0.08	-0.08	0.08
Number of family risk factors <sup>2</sup>	#	#	#	-0.02	0.17*
Full-day kindergarten program	-0.05	#	-0.02	-0.02	0.11*
School type across all waves of the study <sup>3</sup>					
Private school all years	-0.03	-0.17*	-0.11*	-0.01	-0.11*
Change in school type during study	-0.01	-0.04	-0.06	-0.02	-0.14*

# Rounds to zero.

\* p<0.05.

<sup>1</sup>The reference group for this comparison is White, non-Hispanic.

<sup>2</sup>Family risk factors included living below the federal poverty level, primary home language was non-English, mother's highest education was less than a high school diploma/GED, and living in a single-parent household. Values range from 0 to 4.

<sup>3</sup>The reference group for this comparison is children who attended public school for all years.

<sup>4</sup>Effect size of estimate is greater than or equal to 0.25 standard deviations of the dependent variable (i.e., 0.17 for reading, 0.20 for mathematics, 0.17 for all school subjects, 0.16 for peer relationships, 0.17 for externalizing behaviors, and 0.18 for internalizing behaviors).

NOTE: Scale scores on children's perceptions come from a self-description questionnaire (SDQ). Scores on the SDQ scales ranged from 1 "not at all true" to 4 "very true". Estimates reflect the sample of children assessed in English in all assessment years. Although most of the children in the sample were in third grade in the spring of 2002, 10 percent were in second grade, and about 1 percent were enrolled in other grades.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998-99 (ECLS-K), Longitudinal Kindergarten-First Grade Public-Use Data File and Third Grade Restricted-Use Data File, fall 1998, spring 1999, spring 2000, and spring 2002.



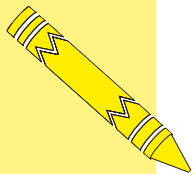


**Table A-15. Mean scale scores for fall 1998 first-time kindergartners' perceived competence and interest in reading, mathematics, and all school subjects in spring of third grade, by their spring third-grade reading, mathematics, and science achievement scores: Spring 2002**

Third-grade achievement status, by subject	Perceived competence and interest in...		
	Reading	Mathematics	All school subjects
Total	3.3	3.2	2.9
Reading achievement status			
Lowest third	3.2	3.2	2.9
Middle third	3.2	3.1	2.9
Highest third	3.4	3.1	3.0
Mathematics achievement status			
Lowest third	3.3	3.1	2.9
Middle third	3.2	3.1	2.9
Highest third	3.3	3.3	3.0
Science achievement status			
Lowest third	3.3	3.2	3.0
Middle third	3.2	3.1	2.9
Highest third	3.3	3.1	2.9

NOTE: Perceived competence and interest scores are from a self-description questionnaire (SDQ). Scores on the SDQ scales ranged from 1 “not at all true” to 4 “very true”. Children were categorized for this report into 3 equally sized achievement groups (lowest third, middle third, highest third) for reading, mathematics, and science, based on their scale scores for each subject area. Estimates reflect the sample of children assessed in English in all assessment years. Although most of the children in the sample were in third grade in the spring of 2002, 10 percent were in second grade, and about 1 percent were enrolled in other grades.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99 (ECLS-K), Longitudinal Kindergarten-First Grade Public-Use Data File and Third Grade Restricted-Use Data File, fall 1998, spring 1999, spring 2000, and spring 2002.



**Table A-15a. Standard errors of the mean scale scores for fall 1998 first-time kindergartners' perceived competence and interest in reading, mathematics, and all school subjects in spring of third grade, by their spring third-grade reading, mathematics, and science achievement scores: Spring 2002**

Third-grade achievement status, by subject	Perceived competence and interest in...		
	Reading	Mathematics	All school subjects
Total	0.01	0.01	0.01
Reading achievement status			
Lowest third	0.02	0.02	0.02
Middle third	0.02	0.02	0.02
Highest third	0.02	0.02	0.02
Mathematics achievement status			
Lowest third	0.02	0.03	0.02
Middle third	0.02	0.02	0.01
Highest third	0.02	0.02	0.02
Science achievement status			
Lowest third	0.02	0.02	0.02
Middle third	0.02	0.02	0.02
Highest third	0.02	0.02	0.02

NOTE: Perceived competence and interest scores are from a self-description questionnaire (SDQ). Scores on the SDQ scales ranged from 1 “not at all true” to 4 “very true”. Children were categorized for this report into 3 equally sized achievement groups (lowest third, middle third, highest third) for reading, mathematics, and science, based on their scale scores for each subject area. Estimates reflect the sample of children assessed in English in all assessment years. Although most of the children in the sample were in third grade in the spring of 2002, 10 percent were in second grade, and about 1 percent were enrolled in other grades.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998–99 (ECLS-K), Longitudinal Kindergarten-First Grade Public-Use Data File and Third Grade Restricted-Use Data File, fall 1998, spring 1999, spring 2000, and spring 2002.





**Table A-16. Regression of fall 1998 first-time kindergartners' reading and mathematics perceptions in spring of third grade on their spring third-grade achievement scores and selected child, family, and early school experience characteristics: Spring 2002**

Selected child, family, and school characteristics	Unstandardized regression coefficients	
	Perceptions of competence and interest in reading	Perceptions of competence and interest in mathematics
Intercept	3.45	3.20
Male	-0.15*	0.15*
Race/ethnicity <sup>1</sup>		
Black, non-Hispanic	0.14*	0.14*
Hispanic	0.10*	0.08*
Asian/Pacific Islander	0.06	0.02
Other, non-Hispanic	0.08	0.08
Number of family risk factors <sup>2</sup>	0.04*	0.02
Full-day kindergarten program	-0.05	-0.01
School type across all waves of the study <sup>3</sup>		
Private school all years	-0.06*	-0.18*
Change in school type during study	-0.03	-0.05
Reading achievement status		
Lowest third	-0.33* <sup>4</sup>	†
Middle third	-0.22* <sup>4</sup>	†
Mathematics achievement status		
Lowest third	†	-0.26* <sup>4</sup>
Middle third	†	-0.20* <sup>4</sup>

† Not applicable.

\*  $p < 0.05$ .

<sup>1</sup>The reference group for this comparison is White, non-Hispanic.

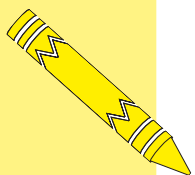
<sup>2</sup>Family risk factors included living below the federal poverty level, primary home language was non-English, mother's highest education was less than a high school diploma/GED, and living in a single-parent household. Values range from 0 to 4.

<sup>3</sup>The reference group for this comparison is children who attended public school for all years.

<sup>4</sup>Effect size of estimate is greater than or equal to 0.25 standard deviations of the dependent variable (i.e., 0.17 for reading and 0.20 for mathematics).

NOTE: Perceived competence and interest scores are from a self-description questionnaire (SDQ). Scores on the SDQ scales ranged from 1 "not at all true" to 4 "very true". Children were categorized for this report into 3 equally sized achievement groups (lowest third, middle third, highest third) for reading and mathematics, based on their IRT-scale scores for each subject area. Estimates reflect the sample of children assessed in English in all assessment years. Although most of the children in the sample were in third grade in the spring of 2002, 10 percent were in second grade, and about 1 percent were enrolled in other grades.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Kindergarten Class of 1998-99 (ECLS-K), Longitudinal Kindergarten-First Grade Public-Use Data File and Third Grade Restricted-Use Data File, fall 1998, spring 1999, spring 2000, and spring 2002.



# Appendix B: Methodology and Technical Notes

## Survey Methodology

The Early Childhood Longitudinal Study, Kindergarten Class of 1998–99 (ECLS-K), is being conducted by Westat for the U.S. Department of Education, National Center for Education Statistics (NCES). It is designed to provide detailed information on children’s early school achievement and experiences. The study began in the fall of the 1998–99 school year. The children participating in the ECLS-K are being followed longitudinally from kindergarten through the fifth grade. Estimates in this report are based on data collected from and about children who entered kindergarten for the first time in the fall of 1998 and who were assessed in English in the fall and spring of kindergarten, the spring of 2000 when most of the children were in first grade, and the spring of 2002 when most were third-graders.

## Sample Design

A nationally representative sample of 22,782 children enrolled in 1,277 kindergarten programs during the 1998–99 school year was selected to participate in the ECLS-K. The children attended both public and private kindergartens that offered full-day and part-day programs. The sample includes children from different racial/ethnic and socioeconomic backgrounds, and includes oversamples of Asian/Pacific Islander children, private kindergartens, and private kindergartners.

Sampling for the ECLS-K involved a dual-frame, multistage sampling design. The first stage of sampling involved the selection of 100 primary sampling units (PSU) from a national sample of PSUs. The PSUs were counties and county groups. Public and private schools were then selected within the PSUs, and children were sampled from the selected schools. Public schools were selected from the NCES 1995–96 Common Core of Data (CCD) Universe File, which is a public school frame, and private schools were selected from a private school frame developed from the 1995–96 Private School

Survey (PSS), another NCES survey.<sup>37</sup> Approximately 23 kindergartners were selected in each of the sampled schools. In the spring of first grade, the sample was freshened to obtain a nationally representative sample of first-graders by bringing into the study first-graders who were not enrolled in kindergarten during the 1998–99 school year and therefore did not have an opportunity for selection in the base year.

While all students still enrolled in their base-year schools were recontacted, a 50 percent subsample of base-year students who had transferred from their kindergarten school was followed. For information on freshening procedures and subsampling of transfer children (i.e., movers), refer to the *ECLS-K First-grade Public-Use Data Files User’s Manual* (NCES 2002). Fall kindergarten data were obtained from September to December 1998, with 80 percent of the assessments conducted between early October and mid-November. The spring kindergarten data were obtained from March to June 1999, with 80 percent of the assessments conducted between mid-April and late May. Spring first-grade data were obtained from March to July 2000, and spring third-grade data were obtained from March to July 2002, with 80 percent of the assessments at each round conducted between early April and late May.

## Response Rates

A total of 944 of the 1,277 originally sampled schools participated during the base year of the study. This translates into a weighted response rate of 74 percent for the base year of the study. The school response rate during the spring of the base year (74.2 percent) was higher than during the fall (69.4 percent); this was due to some of the schools that originally declined to participate deciding to participate in the spring. Nearly all (99.4 percent)

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<sup>37</sup> During the spring of 1998, Westat identified new schools that were not found on either frame. A sample of these schools was included in the ECLS-K school sample.







of the schools that participated in the fall of the base year also participated in the spring.

The child base-year survey completion rate was 92 percent (i.e., 92 percent of the children were assessed at least once during kindergarten). The parent base-year completion rate was 89 percent (i.e., a parent interview was completed at least once during kindergarten). Thus, the overall base-year response rate for children was 68.1 percent (74 percent x 92 percent) and the base-year response rate for the parent interview was 65.9 percent (74 percent x 89 percent). About 95 percent of the children and 94 percent of the parents who participated in the fall of kindergarten also participated in the spring. About 88 percent of the children and 85 percent of the parents who were eligible for the spring first-grade collection participated. In the spring of 2002, about 80 percent of the children and 77 percent of the parents who were eligible participated.

A nonresponse bias analysis was conducted to determine if substantial bias was introduced as a result of the base-year school nonresponse. For information on the nonresponse bias analysis, refer to the *ECLS-K Base Year Public-Use Data Files User's Manual* (NCES 2001) and the *ECLS-K First-grade Public-Use Data Files User's Manual* (NCES 2002). Findings from these analyses suggest that there is not a bias due to nonresponse.

The item nonresponse rates for the variables used in this report are low, ranging from 0 to about 1.5 percent for the analysis sample. A few of the variables were fully imputed and have no missing data (e.g., income, mother's education). More information on item missing data can be found in the *ECLS-K Grade Three Electronic Codebook* (NCES 2004-002).

### Data Reliability

Estimates produced using data from the ECLS-K are subject to two types of error, sampling and nonsampling errors. Nonsampling errors are errors made in the collection and processing of data. Sampling errors occur because the data are collected from a sample rather than a census of the population. A detailed discussion of these types of errors can be found in *America's Kindergartners* (West, Denton, and Germino Hausken 2000).

### Standard Errors and Weights

In order to produce national estimates from the ECLS-K data collected during the kindergarten and first-grade year, the sample data were weighted. Weighting the data adjusts for unequal selection probabilities at both the school and the child levels, and also adjusts for school, child, teacher, and parent nonresponse. The first stage of the weighting process assigns weights to the sampled primary sampling units (PSUs) that are equal to the inverse of the PSU probability of selection.<sup>38</sup> The second stage of the weighting process assigns weights to the schools sampled within PSUs. The base weight for each sampled school is the PSU weight multiplied by the inverse of the probability of selecting the school. The base weights for eligible schools are adjusted for nonresponse. These adjustments are made separately for public and private schools.

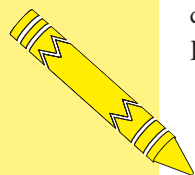
The base weight for each child in the sample is the school nonresponse adjusted weight for the school the child attends, multiplied by a post-stratified within-school student weight (total number of students in the school, divided by the number of students sampled in the school). The child panel weight (C1\_5FC0), which is the weight used to produce the estimates found in this report, is the base-year child weight adjusted for nonresponse to the child assessments at each round of data collection. Only those cases with child assessment data in both fall and spring of kindergarten, spring of first grade, and spring of third grade are included in this weighting procedure.<sup>39</sup> Again, these adjustments are made separately for public and private schools. This weight sums to the population of all children who attended kindergarten in the fall of 1998.

In addition to properly weighting the responses, special procedures for estimating the statistical significance of the estimates were employed, because the data were collected using a complex sample

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<sup>38</sup>The approach used to develop weights for the ECLS-K is described in the *ECLS-K user's manuals* (NCES 2001, NCES 2002, NCES 2003a).

<sup>39</sup>Children received a valid child assessment weight if they participated in any part of the child assessment, such as the height and weight measurements, at each time period. Thus, children who were unable to take the cognitive assessments because of their disability or language status could still have a valid child assessment weight.



design. Complex sample designs, like that used in the ECLS-K, result in data that violate the assumptions that are normally required to assess the statistical significance of the results. Frequently, the standard errors of the estimates in complex samples are larger than would be expected if the sample was a simple random sample and the observations were independent and identically distributed random variables. Replication methods of variance estimation were used to reflect multistage sample design used in the ECLS-K. Using WesVar PC statistical software,<sup>40</sup> the jackknife replication method (JK2) was used with 90 ECLS-K replicate weights to compute approximately unbiased estimates of the standard errors of the estimates in the report. The jackknife method was used to estimate the precision of the estimates of the reported national percentages, means, and regression coefficients.

### Statistical Procedures

Comparisons made in the text were tested for statistical significance to ensure that the differences are larger than might be expected due to sampling variation. When comparing estimates between categorical groups (e.g., sex, race/ethnicity), *t* statistics were calculated. The formula used to compute the *t* statistic was:

$$t = \frac{\text{Est}_1 - \text{Est}_2}{\text{SQRT}[(se_1)^2 + (se_2)^2]}$$

Where  $\text{Est}_1$  and  $\text{Est}_2$  are the estimates being compared and  $se_1$  and  $se_2$  are their corresponding standard errors. For example, information from Tables 4 and 4a are used to compare children's third-grade mathematics IRT-scale scores by children's race/ethnicity. The formula used to compute the *t* statistic for the comparison of White and Black third-graders' mathematics scores would be:

$$t = \frac{\text{White estimate} - \text{Black estimate}}{\text{SQRT}[(\text{White } se)^2 + (\text{Black } se)^2]}$$

$$t = \frac{89 - 73}{\text{SQRT}[(0.8)^2 + (1.0)^2]}$$

$$t = 12.49$$

<sup>40</sup>WesVar PC statistical software is designed to calculate estimates and appropriate standard errors for multistage, stratified, and unequal probability sample designs.

Due to the large sample size, many differences (no matter how substantively minor) are statistically significant. In this report, we define "substantive differences" as percentage differences of 5 points or greater, or mean score differences of one-quarter of a standard deviation or more.

In addition to *t*-test comparisons, ordinary least squares (OLS) regression analyses were conducted in many sections in order to describe the relationship of selected child, family, and school variables to children's scores, after controlling for these other variables. Independent variables were entered simultaneously for each regression analysis. White children served as the reference racial/ethnic group, and children who attended public school for the first 4 years served as the reference school-type group. *T*-test comparisons for other groups (e.g., Hispanic vs. Black) were conducted using the unstandardized coefficients produced in the regression analyses. The same significance criteria used in the bivariate analyses (p-value of .05 or less and effect size of 0.25 standard deviation or higher or 5 percentage points difference) was used for the regression coefficients.

When describing children's gains in reading and mathematics over the first 4 years of school, the dependent variables in the regression analyses are gain scores that represent the differences between the IRT fall kindergarten and spring third-grade scale scores for the reading and mathematics assessments. Using gain scores as the dependent variable rather than spring scores as the dependent variable with fall scores as a covariate allows results to be presented in terms of progress made during the year regardless of where along the continuum that progress is made. There are longstanding concerns about the unreliability of gain scores in the measurement literature, although these concerns have more recently been shown to be unfounded and based on faulty assumptions (e.g., Gottman and Rushe 1993; Williams and Zimmerman 1996). Rogosa and Willett (1983) show that gain score reliabilities are strong when individual differences between pre-test and post-test are substantial, as is the case in most longitudinal assessment applications such as the ECLS-K assessments. Maris (1998) argues that regression toward the mean is not a legitimate argument against using gain scores nor is pretest measurement error a concern unless





assignment into independent variable groups is determined from pre-test performance (which is not the case in the ECLS-K). Additionally, the use of IRT-scale scores and the adaptive testing approach used in the ECLS-K limit the concern that gain scores may be unreliable due to floor and ceiling effects (Rock and Pollack 2002).

## **Direct Assessment Administration Procedures**

### **Reading, Mathematics, and Science Assessments**

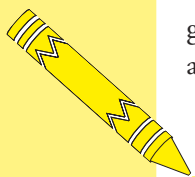
The ECLS-K cognitive assessment batteries were developed with the goal of assessing children's cognitive status in kindergarten, first grade, and third grade, and to provide a means of measuring growth since kindergarten entry. In deference to time and efficiency, the cognitive assessment was developed as a two-stage assessment. Separately for each domain, all children received the first-stage routing test. The routing test was a set of items of varying difficulty levels, in which all children received all items. Depending on the number of items children correctly answered in the routing test, they were then "routed" into a second-stage form, which varied by level of difficulty. The two-stage design allowed for the maximum amount of information with efficiency of time. The routing test provided a rough estimate of each child's achievement level, so that a second-stage form with items of the appropriate difficulty for maximizing measurement accuracy could be selected. Scores for each domain were developed using Item Response Theory (IRT). The IRT scores can be compared regardless of which second-stage form a student was administered. In other words, each child has a score that reflects how many items they would have answered correctly if they had been administered the entire battery of items.

During the ECLS-K cognitive test development, an initial review of commercial assessments indicated that there were no "off-the-shelf" tests that met the domain requirements of the ECLS-K, were both individually administered and adaptive, or provided items that could be used to measure children's cognitive achievement longitudinally. The framework for the ECLS-K drew from the National Assessment of Educational Progress (NAEP) fourth-grade test specifications. The NAEP assessment goals are similar to those of the ECLS-K in that both

projects assess cognitive skills typically emphasized in schools. For the grades in which the NAEP frameworks were inappropriate, the ECLS-K solicited advice from early elementary school educators and curriculum specialists to articulate more suitable test specifications. The expertise of item writers from Educational Testing Service (ETS), elementary school curriculum specialists, and elementary school teachers was also used to develop new assessment items and select existing items to borrow or adapt, with permission, from published tests, including the Peabody Individual Achievement Test-Revised (PIAT-R), Peabody Picture Vocabulary Test-Revised (PPVT-R), the Primary Test of Cognitive Skills (PTCS), the Test of Early Reading Ability (TERA-2), the Test of Early Mathematics Ability (TEMA-2), and the Woodcock-Johnson Tests of Achievement-Revised (WJ-R) (Rock and Pollack 2002).

In kindergarten and first grade, the same set of reading and mathematics items were used in all four rounds of data collection. The kindergarten/first-grade reading and mathematics assessments each had three second-stage forms, with most children routing into the easiest of the second-stage forms in fall-kindergarten and most into the most difficult forms in the spring of first grade. For third grade, a new set of items was developed since children's academic skills could be expected to have advanced beyond the levels covered by the kindergarten/first-grade assessment. The third-grade reading, mathematics, and science assessment each had three second-stage forms. Some of the kindergarten/first-grade items were retained in the third-grade assessment to support the development of a longitudinal score scale (Pollack et al. forthcoming).

This report focuses on those children who were assessed in English in fall of kindergarten, spring of kindergarten, spring of first grade, and spring of third grade. In the ECLS-K, the reading and science assessments, specifically designed for the ECLS-K, were only administered in English. The mathematics assessment was administered in both English and Spanish in the kindergarten and first-grade year, and only in English in third grade. Prior to administering the English reading and mathematics assessment in kindergarten and first grade, children's English language proficiency was evaluated. Children whose home language was other than English (as determined by school records) were administered the Oral



Language Development Scale (OLDS) (for more information, see the *ECLS-K Base-Year User's Manual*, National Center for Education Statistics 2001). If children demonstrated sufficient proficiency in English for the ECLS-K direct child assessment, they received the English reading and mathematics battery. Approximately 68 percent of Hispanic children and 78 percent of Asian/Pacific Islander children were assessed in English in the fall and spring of kindergarten and in the spring of first grade (Denton and West 2002).<sup>41</sup> In the fall of kindergarten, 1,567 children were not administered the English battery because of their performance on the OLDS. By spring of first grade, this number was down to 350.<sup>42</sup> In the third-grade year, the OLDS was not administered and all children were assessed in English.

### Self-Description Questionnaire (SDQ) Assessment

Since children's reading abilities may vary greatly in third grade, the SDQ was administered by having assessors read each item to the child and then providing the child a few seconds after each statement to mark their response. Assessors were trained not to look at children's answers in an effort to avoid making children feel tempted to answer more positively than they would have otherwise. The SDQ was administered first to each child, followed by the cognitive assessments.

Children responded to each of 42 behavioral statements in relation to their perception of themselves on a scale from 1 to 4, including "not at all true," "a little bit true," "mostly true," and "very true." Children's responses on the 42 items were then used to calculate scores on six scales: (1) reading scale, (2) mathematics scale, (3) school scale,

(4) peer scale, (5) externalizing problem behavior scale, and (6) internalizing problem behavior scale. Children's scale scores on each of the SDQ scales represent the mean rating of the items included in the scale. The first four scales were based on scales from Marsh's (1990) Self-Description Questionnaire I. The last two scales were added to collect data on children's perceptions of behaviors that may interfere with learning. The six scales were field tested in spring of 2000. Scale reliabilities in the spring 2002 data collection ranged from .77 to .90 (Pollack et al. forthcoming).

### Derived Variables

A number of variables used in this report were derived by combining information from one or more questions in the ECLS-K study instruments. The derivation of key variables is described in this section. Unless otherwise noted, steps for deriving variables were identical for kindergarten, first-grade, and third-grade data. Variable names from the ECLS-K database are included in the descriptions using the kindergarten names and are indicated by all capital letters.

**Children's race/ethnicity.** The race/ethnicity composite (R5RACE) on the ECLS-K Third Grade restricted-use data file was constructed from two parent-reported variables: ethnicity and race. Following new Office of Management and Budget guidelines, a respondent could select more than one race (OMB 1997). Each respondent was asked to identify whether the child was Hispanic, and then to select one or more races. The following are the five composite race/ethnicity categories presented in this report: White non-Hispanic, Black non-Hispanic, Hispanic, Asian/Pacific Islander and Other (which includes American Indians, Alaska Natives, and non-Hispanic multiracial children). When race/ethnicity differences are presented in this report, White refers to White, non-Hispanic and Black refers to Black, non-Hispanic.

**Number of family risk factors.** This variable is a composite based on family type (P2HFAMIL), federal poverty status (WKPOV\_R), primary home language (WKLANGST), and mother's highest education level (WKMOMED), as collected in the kindergarten year. The variables used to construct this composite come from the ECLS-K Longitudinal

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<sup>41</sup>In an earlier ECLS-K report (Denton and West 2002), analyses were conducted to explore how including children who initially could not take the battery in English but were screened in by spring of first grade would impact achievement estimates. Significant reading *t*-score differences overall and by specific racial/ethnic group were not detected between the analytic sample of children assessed in English at all time points and the total sample, including those who were screened into the English assessment over time.

<sup>42</sup>This information is based on the *ECLS-K Longitudinal Kindergarten-First Grade Public Use Electronic Code Book* (NCES 2002-148) variable CPSOLDS (Round in which child passed English OLDS).





Kindergarten-First Grade public-use data file. Children receive one point on the index for each of the following risk factors: single-parent household, below federal poverty level,<sup>43</sup> primary home language other than English, and mother's highest education level less than a high school diploma. Children's values for this composite variable were equal to the total number of family risk factors, ranging from 0 to 4. For children without a mother in the household in the kindergarten year ( $n = 137$ ), their risk factor score was calculated based on the three variables with valid data (WKPOV\_R, WKLANGST, and P2HFAMIL).

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<sup>43</sup>The federal poverty level status composite variable is derived from household income and the total number of household members. Federal poverty thresholds are used to define households below the poverty level. For instance, in 1998 if a household contained 4 members, and the household income was lower than \$16,655, then the household was considered to be in poverty.

**Fall kindergarten program type.** This variable is a composite derived from A1CLASS (fall kindergarten classroom type based on teacher information) and F1CLASS (child kindergarten program type data from the field management system) variables on the ECLS-K Longitudinal Kindergarten-First Grade public-use data file. If children had valid data on A1CLASS and were designated as being in an AM or PM kindergarten, their kindergarten program type was set to "half-day kindergarten." If they had valid data on A1CLASS and were designated as being in an all-day kindergarten, their kindergarten program type was set to "full-day." If a child was missing data on A1CLASS, their values on F1CLASS were used to designate fall kindergarten program type.

**School type across all waves of the study.** This variable is a composite based on S2KPUPRI and S4PUPRI from the ECLS-K Longitudinal Kindergarten-First Grade public-use data file and S5PUPRI from the ECLS-K Third Grade restricted-use data file. They are indicators of whether a child attended at public or private school in the spring of kindergarten, first grade, and third grade. Public schools included Bureau of Indian Affairs and tribal schools, schools of choice (e.g., charter schools), and public schools with magnet programs. Private schools included Catholic schools, other religious private schools, and non-religious private schools. Children were categorized into "public school all years," "private school all years," or "public and private school attendance between kindergarten and third grade" based on their values on each of the three variables.

