

# Assessing the Effectiveness of Tennessee's Pre-Kindergarten Program: Second Annual Report

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## Foreword and Acknowledgements

This Annual Report, produced under contract with the Tennessee State Comptroller's Office, provides additional background, context, and supplemental analyses to accompany the results of a longitudinal analysis of student outcomes for students who participated in Tennessee's Pre-K program between 1998-1999 and 2005-2006. Statistical analyses have explored the short- and long-term impact of Pre-K participation on student assessments in Kindergarten through Fifth Grade. This report supplements previous reports and aims to clarify a number of outstanding research questions identified after review of the Second Interim Report.

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## Executive Summary

The State of Tennessee has commissioned an evaluation of the effectiveness of its Pre-Kindergarten (Pre-K)<sup>1</sup> program through a secondary data analysis (i.e., analysis of existing data) of student outcomes comparing Pre-K participants to a comparison group of students who did not attend state-funded Pre-K. The primary objective of the project overall is to assess whether children who attended a Tennessee-funded Pre-K program perform better academically in the short- and long-term than a comparable group of peers who did not attend Tennessee's Pre-K program, and what measurable characteristics of Pre-K programs impact student academic outcomes in the short- and long-term.

The primary objective of this Second Annual Report is to analyze student outcomes in Kindergarten through Fifth Grade from the 2008-2009 academic year. Included in the analysis are the outcomes of criterion-referenced assessments completed by Fifth Grade students who participated in Pre-K in 2002-2003, Fourth Grade students who participated in Pre-K in 2003-2004, and Third Grade students who participated in Pre-K in 2004-2005. Also included in the present report are norm-referenced outcomes for Second Grade students who participated in Pre-K in 2005-2006, First Grade students who participated in Pre-K in 2006-2007, and Kindergarten students who participated in Pre-K in 2007-2008.

Similar to the Third Interim Report, only one year of student outcome data was under study in the present report. Data were analyzed using random effect analysis of covariance models, also referred to more broadly as hierarchical linear models or multilevel models. Analyses controlled for demographic characteristics such as child race and gender, as well as special education, attendance, and English as a Second Language (ESL) status.

Similar to the results of previous analyses, Pre-K participation continues to be associated with small but reliable effects on student outcomes in Kindergarten and First Grade in 2008-2009, primarily among economically disadvantaged students. The present analyses also suggest that a small but statistically significant difference was detectable on some assessments in Second Grade. Interpretation of these findings, though, is difficult, as the norm-referenced assessments conducted in 2008-2009 were markedly different from the assessments in previous years. Caution must be used in drawing comparisons between previous reports' findings which were based on longitudinal analyses and the present report, which is simply a cross-sectional look at one year of data. Further, students in Grades K-2 in 2008-2009 (the cohorts under study in this report), participated in a Pre-K program that was qualitatively different than students in previous years. The Pre-K program experienced significant change and was aligned to state standards in the 2005-2006 academic year, and this alignment may in some way be associated with a different trend across Grades K-2 than has been observed in previous analyses. However, additional longitudinal analyses would be necessary to determine whether the same patterns observed in previous reports still hold given the changes in both the Pre-K program and the nature of the assessments conducted in these grades.

Although the results of the norm-referenced assessments conducted in Grades K-2 show a relative advantage of Pre-K participation for economically disadvantaged students, on criterion-referenced assessments in Grades 3-5, there is no relative advantage for Pre-K participation. Among economically disadvantaged students, Pre-K participants scored, in aggregate, about the same on these criterion-referenced tests as did their peers who did not participate in Tennessee's Pre-K

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<sup>1</sup> Throughout this report, the term "Pre-Kindergarten" and its abbreviation "Pre-K" are used to refer specifically to Tennessee's state-funded Voluntary Pre-Kindergarten program and not any other type of early childhood education program. The term "non-Pre-K" is used to refer to students who did not attend Tennessee's Pre-K program, although they may have participated in other early childhood education programs.

program. Similarly, among students who did not experience economic disadvantage, Pre-K participation was not associated with an advantage on these tests. It is important to note, however, that many forms of “risk” other than economic disadvantage which would have qualified students for participation in Pre-K are not able to be captured and controlled for statistically in the data available for analysis. Ultimately, it is impossible to state with any confidence why, so many years after their participation in Pre-K, students’ outcomes in these higher grades may (or may not) differ.

Considering the cumulative results observed across the series of studies conducted on Pre-K student outcomes in Grades K-5 for the state of Tennessee, small but reliable short-term effects for economically disadvantaged students who participated in Pre-K were observed for multiple cohorts across multiple assessments. These effects occurred largely in Kindergarten and First Grade, suggesting the program is successful in preparing students as they begin attending school. Some possible effects may even extend into Second grade for some students. However, with each additional year past Kindergarten, the observable impact of Pre-K education attenuates. Moving forward, the state of Tennessee might consider focusing evaluation efforts on Kindergarten Readiness in particular, as well as implementing and evaluating additional interventions for school-age children that may be more likely to support and sustain their academic growth over time.

# Evaluating Tennessee’s Pre-K Program: Summary of Findings to Date

## Project Overview

The present evaluation, commissioned by the Tennessee Office of the Comptroller, aims to investigate the short- and long-term effects of Pre-Kindergarten participation on academic outcomes in Kindergarten through Fifth Grade through an examination of existing school records (i.e., secondary data). The evaluation is structured to take place over a multi-year timeframe and in a series of reporting stages. Table 1, below, summarizes the years and cohorts studied in this report as well as the years of data analyzed in each report. The overarching goal of this effort is to identify Pre-K participants in existing school assessment records and to determine, to the best possible extent given the data available for analysis, whether there is evidence to suggest that Pre-K participation is associated with a positive effect on student performance in Grades K-5 relative to students who did not participate in Pre-K.

**Table 1. Cohorts and Program Years Covered in this Evaluation and Corresponding Stages of Reporting**

	1998-1999	1999-2000	2000-2001	2001-2002	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009	
Cohort 1	Pre-K	K	1st	2nd	3rd	4th	5th					
Cohort 2		Pre-K	K	1st	2nd	3rd	4th	5th				
Cohort 3			Pre-K	K	1st	2nd	3rd	4th	5th			
Cohort 4				Pre-K	K	1st	2nd	3rd	4th	5th		
Cohort 5					Pre-K	K	1st	2nd	3rd	4th	5th	
Cohort 6						Pre-K	K	1st	2nd	3rd	4th	
Cohort 7							Pre-K	K	1st	2nd	3rd	
Cohort 8								Pre-K	K	1st	2nd	
Cohort 9									Pre-K	K	1st	
Cohort 10										Pre-K	K	
Cohort 11											Pre-K	
	Pilot Pre-K Program Only							Pre-K Expansion and Curriculum Alignment (starting in 2005-2006)				
<b>Reporting Stage</b>	<b>First Interim Report</b>						<b>Second Interim Report</b>			<b>2008 Annual Report/ Third Interim Report</b>	<b>2009 Annual Report/ Final Report</b>	

The State of Tennessee has been funding early childhood education since the 1990s. Legislation enacted in 1996 permitted the creation of Pilot early childhood and Pre-Kindergarten programs for economically disadvantaged three- and four-year-olds. In the 1998-1999 school year, 30 Pilot Pre-K classrooms were created, serving approximately 600 students. Since then the program has grown to over 934 classrooms, serving approximately 18,000 children. Table 2 summarizes the number of students served and the number of classrooms in operation in Tennessee since 1998-1999.

**Table 2. Number of Students Enrolled in Tennessee Pre-K, 1998-1999 to 2008-2009**

<b>Program Year</b>	<b>Students Served</b>	<b>Number of Classrooms</b>
1998-1999	600	30
1999-2000	600	30
2000-2001	3,000	150
2001-2002	3,000	90
2002-2003	3,000	150
2003-2004	2,900	150
2004-2005	2,900	147
2005-2006	8,900	446
2006-2007	13,000	677
2007-2008	17,300	934
2008-2009	18,000	934

Source: State of Tennessee, Office of Early Learning

### ***Summary of Findings to Date***

On the whole, the results of analyses conducted to date in this series of analyses of outcomes in Grade K-5 point to an initial short-term advantage associated with Pre-K participation in Kindergarten and First Grade—primarily for students who received Free/Reduced Price Lunch (FRPL) or are considered “at-risk” due to socioeconomic status. This initial difference is followed by a pattern of convergence, although a slight advantage of Pre-K participation appears to be maintained among economically disadvantaged students through the Second Grade. However, Pre-K participation, despite being associated with significant differences in early assessments of Reading, Language Arts, and Mathematics, is not a significant predictor for student outcomes in Grades 3-5, as measured by Tennessee’s criterion-referenced assessments in these subject areas.

The First Interim Report (November, 2007) analyzed student assessment data between 1999-2000 and 2003-2004. Due to small sample sizes and some missing data in these early years of the program, separate analyses were conducted for each grade level each year. These analyses revealed positive effects associated with Pre-K participation, particularly in the area of Reading and Language Arts in multiple cohorts (Cohorts 1, 3, 4, and 5), over multiple assessments (Reading, Language, Vocabulary, and Word Analysis), and in multiple grades (K, 1, 3, and 4). Because of the nature of the historical data and the relatively small number of Pre-K participants in the early years of the program, sample sizes were small and longitudinal analyses were not feasible. However, these were issues that were addressed in subsequent reports as additional cohorts became available for analysis.

The Second Interim Report (July, 2008) and the 2008 Annual Report analyzed student assessment data from 2004-2007. The analytic approach taken in these reports differed from the approach taken in the First Interim Report given that a much larger number of students had participated in Pre-K in the timeframe under study and, thus, there was an opportunity for longitudinal analysis. Data were analyzed using random effects models, also referred to as hierarchical linear models or multilevel models. These models included free/reduced price lunch history and participation in Tennessee state-funded Pre-K as predictors of academic achievement. In addition to these two important variables, all analyses in the Second Interim Report controlled for child race and gender, as well as special education, retention, attendance, and English as a Second Language (ESL) status. Growth curve models were used to examine change in assessment scores over three time points (for example, Kindergarten through Second Grade), and difference score models were used to examine change in assessment scores over two time points (for example, First and Second Grades). Single time point models were used to examine differences between the Pre-K and non-Pre-K groups when an assessment was administered in only one grade.

A consistent pattern of results was observed across the assessments administered in Grades K-2 between 2004-2007 reflecting positive short-term effects of Pre-K participation. Pre-K students scored better in the aggregate than a matched sample of non-Pre-K students, but these effects were most evident for economically disadvantaged students (i.e., students receiving FRPL). There was some evidence that the effects for these students may persist through the Second Grade, although the magnitude of the effect is objectively small (a relative difference of between 4-7 points, a difference of less than 0.1 standard deviation). Consistent with previous analyses conducted for this annual report, Pre-K participation was not in itself a significant predictor of student performance on assessments in First or Second Grades, and no positive effects attributable to Pre-K participation were identified in the Third Grade or beyond.

The Third Interim Report (February, 2010) examined student outcomes in Grades K-5 for a single academic year, 2007-2008. Because only one year of data was analyzed, this report compared outcomes for Pre-K and non-Pre-K students at each grade level; no longitudinal analyses were conducted. Consistent with the results observed in previous reports, student outcomes were positively associated with participation in Pre-K, although for the most part these effects were limited to economically disadvantaged students (i.e., students who received free or reduced-price lunch) and were evident primarily in Kindergarten and First Grade. The magnitude of these effects was found to be small—an estimated relative difference of between 6-7 points on standardized assessments. Effect sizes (Cohen's *d*) were less than 0.1, or an average change of approximately one-tenth of one standard deviation. No statistically significant effects were found for Pre-K participants in the Second Grade. Pre-K participation was not uniquely associated with significantly higher scores for any other assessment in Third, Fourth, or Fifth Grade.

Together, these reports suggested a general trend in academic outcomes for students who participated in the Pre-K program prior to the 2006-2007 academic year, such that among economically disadvantaged students, students who participated in Tennessee's Pre-K program scored, on average, higher than economically disadvantaged students who did not participate in this Pre-K program on some assessments in Kindergarten. This advantage persisted for some assessments into First Grade. However, the series of analyses conducted to date shows no evidence of a long-term advantage associated with Pre-K participation in analysis of student outcomes on standardized assessments in Grades 3-5.

## Objectives of the Present Report

This Second Annual Report focuses on one year of assessment data, 2008-2009. Included in the analysis are the outcomes of criterion-referenced assessments completed by Fifth Grade students who participated in Pre-K in 2002-2003, Fourth Grade students who participated in Pre-K in 2003-2004, and Third Grade students who participated in Pre-K in 2004-2005. Also included in the present report are norm-referenced outcomes for Second Grade students who participated in Pre-K in 2005-2006, First Grade students who participated in Pre-K in 2006-2007, and Kindergarten students who participated in Pre-K in 2007-2008 (see Table 1 for a list of all cohorts).

## Research Design

The research design utilized for this evaluation, as described in previous reports, utilizes a quasi-experimental research design known as the **nonequivalent groups design**. This methodology, although not without limitations, permits a comparison of Pre-K participants to a comparable group of students who did *not* attend state-funded Pre-K. This particular type of analysis is deemed to involve "nonequivalent groups" to acknowledge the fact that it does not involve random assignment of

students to groups at the time of enrollment in Pre-K.<sup>2</sup> However, it is important to note that this design does not preclude the possibility of obtaining comparable groups through random selection. Additionally, it allows for a longitudinal assessment of the progress of both Pre-K and non-Pre-K participants over time. Appendix A provides an overview of the research design.

## Methodology

For the present study, the Tennessee Department of Education (TDOE) provided the following datasets: student assessment data for 2008-2009 and student demographic information from TDOE's Education Information System (EIS) for 2008-2009. TDOE also provided a file of Pre-K attendees spanning 1998-1999 through 2005-2006, at the start of the study. To conduct the present study, these data sources were merged, and any irregularities or inconsistencies between the sources had to be addressed and reconciled.

As we have discussed in previous reports, great care is taken by TDOE and SRG to ensure student anonymity. No identifying information was provided along with student outcome data. To protect student confidentiality and to comply with federal regulations regarding student FRPL status, SRG does not obtain student names or Social Security Numbers. Social Security Numbers, however, are encrypted by TDOE so that the various data sources could be combined for the data analysis. This permits SRG to link student assessment results with student demographic information and Pre-K participation data, but in a way that maintains student confidentiality.

### **Data Sources**

For the Third Interim Report, SRG drew from three data sources: 1) Pre-Kindergarten demographic data, 2) K-5 student assessment data, and 3) EIS student data from the 2006-2007 through 2008-2009 school years.

It is important to note here that data management is an ongoing process. As more data become available—that is, as additional years of assessment and EIS data are incorporated into the analysis—we are able to cross-check more Pre-K students who had questionable records in earlier files and attempt to resolve inconsistencies. This requires us to exclude some students over the course of the evaluation but enables us to include others who had to be excluded from previous analyses. This will be discussed further in the Data Management section (see Appendix B).

#### 1. Pre-Kindergarten Demographic File

The Pre-Kindergarten (Pre-K) demographic file is a database maintained by the TDOE's Office of Early Learning. The database spans eight academic years from 1998-1999 to 2005-2006. Starting with the 2006-2007 school year, demographic information about Pre-K students is included in the Education Information System (for more information about the EIS, see the following section).

The Pre-K demographic database contains information on the school (including county, system/local education agency (LEA), and school/provider name), program information (e.g., Pre-K funding source), and student demographic information (date of birth, gender, race, FRPL status, special education status, whether English is the student's native language, and whether the school provided transportation). Although information is not available for all variables for all years in the Pre-K demographic file, the most important function of this data source is to identify students who participated in Tennessee's Pre-K Program beginning in 1998-1999 through 2005-

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<sup>2</sup> Cook, T.D. & Campbell, D.T. (1979). Quasi-Experimentation: Design and Analysis for Field Settings. Rand McNally, Chicago, Illinois.

2006. The value of this database for this current report is that it identifies Pre-K participation among students in Grades 3-5 in 2008-2009.

## 2. Education Information System Data

The Education Information System (EIS) is a web-based data repository containing detailed student, teacher, school, and district level information. All schools input information in a standardized format, and the EIS system is designed to catch data entry errors. EIS data are available beginning with the 2005-2006 school year. Although EIS includes data for prior school years, SRG was informed that these data are not complete and the state-assigned student ID number was only implemented in 2005-2006.

The data provided to SRG by TDOE are in the form of spreadsheets that include demographic information, attendance records, disciplinary records, and special education records. EIS contains data for students in Kindergarten through Twelfth Grade, and for Pre-K students beginning in 2006-2007.<sup>3</sup>

## 3. Student Assessment Data

The third data source available for this evaluation contains standardized assessment scores for students. These files were provided to us by the TDOE Assessment, Evaluation, and Research Division via the Department's Director of Data Quality. SRG requested and received scores for the 2008-2009 school year. The files contain: 1) demographic characteristics of students (e.g., date of birth, gender, race) and 2) test scores in the following general content areas: reading and language arts, mathematics, science, and social studies, along with composite scores by content area.<sup>4</sup>

The Tennessee Comprehensive Assessment Program (TCAP) is the principal tool for assessing the performance of public school students in the State of Tennessee. The TCAP includes Tennessee-specific assessments which allow students, parents, and educators to interpret test scores as they relate to Tennessee's state curriculum standards.

For students in Grades K-2, the TCAP currently consists of Norm-Referenced Tests (NRT). Students in Grades 3-8 currently take Criterion-Referenced Tests (CRT). NRTs measure student performance relative to other test takers. Comparatively, CRTs measure performance according to specific standards, and test items are directly linked to specific performance indicators in the state curriculum.

The test for Kindergarteners includes three main content areas: Reading and Language Arts, Mathematics, and Science. For Grades 1 and 2, the content areas are Reading and Language Arts, Language, Spelling, Listening Skills, Mathematics, and Science. Administering assessments in Grades K-2 is a choice determined by school systems, and systems who elect to administer these assessments must incur the costs for these assessments themselves. Further, an LEA may choose to administer some of the subtests and not others. The CRT assessments are required for all students in Grades 3-8 and include four subject areas: Reading/Language Arts, Mathematics, Science, and Social Studies.<sup>5</sup> Tennessee students are assessed each spring.

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<sup>3</sup> SRG did not obtain data for students in Grades 6-12 as they are not needed for the present evaluation.

<sup>4</sup> See Table 12 on page 18 for a list of all specific assessments administered in Grades K-5.

<sup>5</sup> Note: The scope of the present analysis is focused exclusively on student performance in Grades K-5.

### Comparability of NRTs and CRTs

Although both NRTs and CRTs are important and valuable in their use and application, there are some issues in terms of their comparability. For example, when CRTs are employed, each individual student's results are compared with a predetermined standard. The performance of other students who also took the test at the same time is not taken into consideration in evaluating the results. Student scores are typically reported in terms of the number of items correct, or the percentage correct. In contrast, for NRTs, each individual student is compared with other students who took the test, and the score reflects that student's performance relative to other students (not a predetermined criterion). Scores are typically reported in terms of a percentile or stanine, which indicates the student's position relative to a national sample of other test-takers in the same cohort.

### Assessments Administered in Grades K-5

The TCAP Achievement test is mandated for all students in Grades 3-8. The test is not mandated for Grades K-2, however. School systems may elect to test students in Grades K, 1 and/or 2, and their choice to test may vary from year to year.

TDOE provided SRG a spreadsheet summarizing the number of assessments administered in Grades K-2 by each LEA each year between 1998 and 2008. LEAs may administer tests for one, two, or three of these grade levels in a given year, and they may change their decision to administer assessments each year. Thus, there is a great deal of variability in the number of schools administering assessments for students in Grades K-2 across this time period.

SRG next proceeded with the process of identifying Pre-K students, locating their assessment results, resolving any data discrepancies or inconsistencies in the data sources, and drawing a comparable sample of students who did not attend Pre-K. The procedures used were the same as those discussed in the Third Interim Report. A detailed discussion of the data management steps is in Appendix B.

### ***Sampling Strategy***

In order to evaluate the short- and long-term impact of Pre-K on student outcomes, Pre-K students must be compared to a similar group of students that did not attend Tennessee's Pre-K program.

Just as with previous reports, we selected the matched non-Pre-K samples such that they mirror the Pre-K groups with regard to gender, race, and FRPL status. For the First Interim Report (which covered the 1998-1999 through 2003-2004 school years) we also matched the two groups on school district. Because the numbers of Pre-K students in each grade level were significantly larger in the years covered in the Second Interim Report (2004-2005 through 2006-2007), as well as subsequent reports, it was possible to match the non-Pre-K and Pre-K students first at the school level and then at the district level in instances where a match was not possible at the school level but was possible at the district level. This modification to the sampling strategy offers a greater degree of assurance that the Pre-K and non-Pre-K students are similar in key ways aside from individual characteristics (e.g., gender, race, and FRPL status).

The sampling strategy for the non-Pre-K samples involved creating a distribution of the Pre-K group for each grade by district, then by school within district, then by FRPL status within each school, then by race and gender within each school. The goal was to create a sample of non-Pre-K students that resembled the Pre-K students as closely as possible in terms of their school district, school, FRPL status, race, and gender by finding an appropriate number of non-Pre-K students with the same demographic characteristics as each individual Pre-K student (i.e., precision matching). It is important to note here that the majority of non-Pre-K matches were identified at the school level.

Because the Pre-K group sizes exceeded 1,000 in grades 1-5, we selected one non-Pre-K student for every Pre-K student. For the Kindergarten non-Pre-K sample, we attempted to select two non-Pre-K students for every Pre-K student. As we discussed in the Second Interim Report, we chose this variable ratio strategy rather than a fixed sample size strategy for two main reasons. First, it assured that there were sufficient data to evaluate the outcomes of interest accurately, particularly for the relatively small group of students who had attended Pre-K and were assessed in Kindergarten. Using a 2:1 sampling ratio to select the non-Pre-K comparison group of Kindergarteners ensured adequate information was available for evaluation of these outcomes. Given the relatively larger Pre-K groups in grades 1-5, the results could be based on equal initial sample sizes for comparison groups. The second reason a variable ratio selection criterion was utilized was to maintain a comparison group that was relatively comparable in size to the Pre-K group, an important consideration given that the overall population of students who did not attend Pre-K is much larger than the population of students who did attend Pre-K. This ensured that the results were not, in a sense, dominated by the comparison group.

Table 5 provides the Pre-K group sizes and corresponding non-Pre-K sample sizes for each grade as well as the percentage of Pre-K students for whom the appropriate number of non-Pre-K matches existed in each grade level, based on the sampling ratio (2:1 for Kindergarten and 1:1 for grades 1-5). For example, there are 831 Kindergarten students with assessment scores who attended Pre-K, so we attempted to match each Pre-K student with two non-Pre-K students, which would result in 1,662 Kindergarten non-Pre-K students. As Table 5 indicates, 55.9% of the Pre-K students were at least partially matched. In grades 1-5, a non-Pre-K match was found for nearly every Pre-K student. Compared with Grades 1-5, it was more difficult to identify matches for Pre-K students in Kindergarten. This is not surprising given that, first, a 2:1 sampling ratio was used rather than a 1:1 ratio. As such, a high percentage of Pre-K students may have been matched, but not fully (i.e., with two non-Pre-K students). Second, the pool of non-Pre-K students is smallest for this grade level because few LEAs administer assessments in Kindergarten, thus resulting in a lower success rate for finding non-Pre-K matches.

**Table 5. Pre-K Group Sizes, Non-Pre-K Sample Sizes, and the Percentage of Pre-K Students Matched for Each Grade**

Grade	Pre-K Group Size	Non-Pre-K Sample Size	Percentage Matched
Kindergarten	831	929	55.9%
First	2,636	2,417	91.7%
Second	3,144	3,085	98.1%
Third	2,142	2,107	98.4%
Fourth	2,372	2,350	99.1%
Fifth	2,310	2,287	99.0%

To review, for each Pre-K student, we attempted to identify at random non-Pre-K students (again, one or two, depending on grade level) of the same race, gender, and FRPL status within the same school, or else at least within the same district. Also, when it was necessary to choose a non-Pre-K match from an alternate school within the same district, preference was given to selecting students from schools where there were other students who had attended Pre-K. Although it was not always possible to match Pre-K students to non-Pre-K students in their *own* school, matching Pre-K students

with non-Pre-K students from schools where there were other Pre-K students helped maintain the comparability of the Pre-K and non-Pre-K groups. Further, students were never matched across district, only within district.

It should be noted that non-Pre-K samples were drawn from a three-category classification of race (White, Black, and Other Race) rather than the five category classification available in the assessment data (White, Black, Hispanic, American Indian/Native American, and Asian/Pacific Islander). The very low numbers of students in the latter three categories (combined, these three categories comprised only 6.1% of the Pre-K students) meant that it was very often not possible to match students on their specific racial category. Yet, it is important to maintain the minority status of these students through the creation of the “Other Race” category. Even after collapsing the three categories to create an “Other Race” category for purposes of matching, however, there were still too few cases to allow them to be analyzed with a reasonable degree of confidence. For purposes of analysis, then, we created two categories for race—white and non-white.

At this point, as many Pre-K students as possible had been identified in the assessment data, any inaccuracies or irregularities were resolved, and a comparable sample of non-Pre-K students was selected for each grade/year in the timeframe under investigation. The next step was to conduct the appropriate statistical analysis to determine whether there were meaningful differences, in aggregate, between the Pre-K and non-Pre-K groups.

### ***Analytic Approach***

Once the Pre-K students had been identified in the assessment data, and once a comparable sample of non-Pre-K students had been selected, the next step was to move to the analysis of the assessment results. All data reported in subsequent tables include only valid student records for Pre-K students and the sample of non-Pre-K students. For a small number of students, data on a given variable were missing or could not be determined due to conflicting information in the data sources, and these students were not included in the subsequent analyses.

### **Variables Included in the Models and Characteristics of Students**

The following section provides the distribution of students for all of the key predictor variables in the analysis, for all students overall and also for the Pre-K group (13,435 students) and non-Pre-K group (13,175 students).

- 1. FRPL status** (FRPL or no FRPL). Students’ FRPL status was coded into one of two categories. A student was identified as receiving FRPL if he or she received FRPL in 2008-2009 according to the assessment dataset, and/or while attending Pre-K (according to the EIS or Pre-K Demographic File). Table 6 summarizes students’ FRPL status overall and in the Pre-K and non-Pre-K groups.

**Table 6. Free/Reduced Price Lunch (FRPL) Status for Pre-K and Non-Pre-K Students**

	Overall	Pre-K	Non-Pre-K
FRPL	82.6%	82.5%	82.7%
No FRPL	17.4%	17.5%	17.3%
Total	100.0% (26,610)	100.0% (13,435)	100.0% (13,175)

2. **Race** (white/non-white). See page 13 for a discussion of this variable. Table 7 summarizes the proportion of white and non-white students in the Pre-K and non-Pre-K groups.

**Table 7. Race of Pre-K and Non-Pre-K Students**

	Overall	Pre-K	Non-Pre-K
White	66.4%	65.9%	66.9%
Non-white	33.6%	34.1%	33.1%
Total	100.0% (26,563)	100.0% (13,392)	100.0% (13,171)

3. **Gender** (male or female). Table 8 summarizes the proportion of male and female students overall and in the Pre-K and non-Pre-K groups.

**Table 8. Gender of Pre-K and Non-Pre-K Students**

	Overall	Pre-K	Non-Pre-K
Male	51.6%	51.3%	51.9%
Female	48.4%	48.7%	48.1%
Total	100.0% (26,586)	100.0% (13,414)	100.0% (13,172)

4. **Special education status** (yes/ received special education or no/did not receive special education). Similar to the FRPL measure, special education students were identified as those who had received special education services in 2008-2009 and/or while in Pre-K according to the assessment dataset, the EIS data, and/or the Pre-K Demographic File. Table 9 summarizes the proportion of students receiving special education services overall and in the Pre-K and non-Pre-K groups. A chi-square test indicated that the Pre-K group has a statistically significantly higher proportion of Special Education students than the non-Pre-K group. However, Special Education status will be controlled for in the analysis of assessment scores and, thus, this difference will be accounted for.

**Table 9. Special Education Services Received by Pre-K and Non-Pre-K Students**

	Overall	Pre-K	Non-Pre-K
Yes	18.9%	19.6%	18.1%
No	81.1%	80.4%	81.9%
Total	100.0% (26,610)	100.0% (13,435)	100.0% (13,175)

**6. Native English speaker** (yes/native English speaker or no/non-native English speaker). Native English speakers are defined as students whose primary or native language is English. This information was obtained from the EIS. A chi-square test indicated that the Pre-K group has a statistically significantly lower proportion of native English speaking students than the non-Pre-K group. However, native English speaker will be controlled for in the analysis of assessment scores and thus this difference will be accounted for.

**Table 10. Native English Speaker Status for Pre-K and Non-Pre-K Students**

	Overall	Pre-K	Non-Pre-K
Native English Speaker	92.4%	91.9%	92.8%
Non-Native English Speaker	7.6%	8.1%	7.2%
Total	100.0% (26,489)	100.0% (13,412)	100.0% (13,077)

**7. Attendance** (number of full-day absences). The attendance variable (days absent) is a continuous variable that ranges from 0 to 46. The original data contained values greater than 46 but they were few (only 55 students total, or 0.2% of students with attendance information were reported to have missed more than 46 days in a given school year). Therefore, attendance was truncated, or capped at 46 days absent (which equates to one-fourth of an average school year). Sensitivity analysis found that the truncation had no meaningful effect on the results described below. A difference of means t-test indicated that the Pre-K students have, on average, fewer absences in the 2008-2009 school year than non-Pre-K students. However, number of absences will be controlled for in the analysis of assessment scores and thus this difference will be accounted for. Table 11 summarizes average student attendance overall and in the Pre-K and non-Pre-K groups.

**Table 11. Mean Annual Attendance for Pre-K and Non-Pre-K Students**

	<b>Overall</b>	<b>Pre-K</b>	<b>Non-Pre-K</b>
Mean (days)	7.76	7.44	7.91
Total (students)	26,489	13,412	13,077

### **Characteristics of the Assessments**

As indicated previously, there are some differences in the number and type of assessments administered each year in Grades K-2 and 3-5. Table 12 summarizes the assessments and the grade levels in which they are administered. It is important to note that the norm-referenced assessments conducted in Kindergarten, First, and Second Grades were markedly different in the 2008-2009 academic year than in any previous year under study in the current series of reports (beginning with assessment data for the 1999-2000 academic year).

**Table 12. Summary of Assessments Administered in Grades K-5**

	Kindergarten	First Grade	Second Grade	Third Grade	Fourth Grade	Fifth Grade
	Norm-Referenced Assessments			Criterion-Referenced Assessments		
Language		X	X			
Listening to Words and Stories	X	X	X			
Math	X	X	X	X	X	X
Problem Solving		X	X			
Procedures		X	X			
Reading				X	X	X
Reading Comprehension		X	X			
Reading First <sup>1</sup>	X	X	X			
Science <sup>2</sup>	X	X	X	X	X	X
Social Studies				X	X	X
Spelling		X	X			
Words Reading <sup>3</sup>	X	X	X			
Sounds and Letters <sup>4</sup>	X	X	X			

<sup>1</sup> Pearson developed *Stanford Reading First* in response to the Reading First initiative of *No Child Left Behind*. This valid, reliable test meets all the Reading First requirements for an outcome measure. *Stanford Reading First* questions were selected from the SESAT 1 (K.0 – K.5) through Primary 3 (3.5 – 4.5) Reading and Listening subtests of *Stanford 10*. The questions were selected to assess the five essential components of reading as specified by the Reading First legislation: **phonemic awareness, phonics, vocabulary development, reading fluency, and reading comprehension strategies**. Teacher-scored measures of oral fluency were also developed for *Stanford Reading First*.

<sup>2</sup> Referred to as “Environment” in Grades K-2.

<sup>3</sup> In Grade 2, “Words Reading” is referred to as “Word Study Skills.”

<sup>4</sup> In Grades 1 and 2, “Sounds and Letters” is referred to as “Word Study Skills.”

## **Analysis**

Child-level data were analyzed using random effect analysis of covariance models, also referred to more broadly as hierarchical linear models or multilevel models. These models allow for “nesting” in the data. Simply put, “nesting” occurs when observations are organized or “exist” within larger units or levels. For example, a series of schools selected from one district, say District A, would be said to be nested within District A. A group of schools selected from a different district, for example District B, would be nested within District B. In this example there are multiple sources of nesting. Children can be nested within schools and schools can be nested within school district.

It is important to consider these relationships because students in one aggregate unit (school) can often be more alike than students from different units. Consequently, student assessment scores from a particular elementary school will likely be more similar to one another (i.e., correlated with one another) than scores from children attending different elementary schools. This can occur because, all else being equal, children “nested” within the same school have a more similar learning environment than children from different schools. The same is true at the district level.

In essence, the models used here cluster related observations into unique groups thereby controlling for these intergroup relationships—for example, multiple observations from a single school are treated as a single group, or schools from the same district may be treated as a unique group. Given this, the variability in scores can be further decomposed into within-group and between-group variability. By doing so, the models provide a more accurate representation of the data. Indeed, failing to account for “nesting” can lead to biased findings and thus a misunderstanding of the processes giving rise to the observed scores.

The mean (i.e., average score) and variability (i.e., how scores vary around the mean) of an outcome are of interest in the models presented here. When nesting is present in the data, a portion of the variability associated with a given outcome is due solely to the similarities in the source (school, district) of the scores and not necessarily due to the predictors of interest (e.g., Pre-K participation). Failing to account for this nesting can lead to biased results—specifically, finding no effect of Pre-K when there was indeed an effect, or vice versa. Therefore, all models used in this report examined the degree of nesting and accounted for this dependency when statistical evaluation suggested such steps were warranted. More specifically, the models in the current report examined the relationship between each outcome and the predictors outlined above. In order to obtain accurate estimates of the relationship between each of these predictors and each outcome, the models tested and accounted for multiple sources of variability in the outcome of interest (e.g., student test scores). These sources of variability included both school and school district variability.

See Appendix C for technical specifications for all models discussed in this report.

## **Results**

### **Short-term Effects of Pre-K Participation**

“Short-term effects” are defined for purposes of this report as significant differences associated with Pre-K participation in Kindergarten through Second Grade. The model-implied mean scores for all Kindergarten, First Grade, and Second Grade assessments are reports in Tables 14-16. Means (model-implied scores), *p*-values, and effect sizes for all comparisons are reported in Appendix D.

Students who completed Kindergarten in 2008-2009 would have participated in Pre-K in 2007-2008. Overall, on end-of-year assessments administered in Kindergarten in 2009, Pre-K participants did not score higher, in the aggregate, than a matched sample of non-Pre-K participants (see Table 13). However, positive effects were observed for economically disadvantaged students who participated in Pre-K, relative to a matched sample of economically disadvantaged students who did not participate

in Pre-K. This pattern of results is consistent with analyses of previous years' data (specifically, 2004-2008), which also found the effect of Pre-K to be limited to students considered "at risk" due to low socioeconomic status (i.e., students who received FRPL). Also, as found previously, the magnitude of these effects is small—an estimated relative difference of between 4-6 points on these assessments. Effect sizes (Cohen's *d*) are less than 0.1, or a change of approximately one-tenth of one standard deviation. The differences between Pre-K and non-Pre-K students who did *not* receive FRPL were *not* statistically significant in these analyses, with one exception: non-Pre-K students scored higher, on average, on the Environment (i.e., Science) assessment. Table 13 presents estimated means for Kindergarten assessments.<sup>6</sup>

**Table 13. Model-Implied Adjusted Mean Scores for Pre-K and Non-Pre-K Students—Kindergarten 2008-2009**

Kindergarten Assessment	Group					
	Pre-K	Non-Pre-K	Pre-K FRPL	Non-Pre-K FRPL	Pre-K No FRPL	Non-Pre-K No FRPL
Sounds and Letters	517.46	518.19	<b>510.92**</b>	<b>504.70**</b>	523.99	531.68
Words Reading	443.19	442.73	434.87	431.06	451.51	454.40
Listening to Words and Stories	545.70	543.69	539.48	536.51	551.91	550.86
Reading First	516.30	517.15	509.20	505.70	523.40	528.59
Mathematics	486.95	485.80	<b>479.43**</b>	<b>474.98**</b>	494.48	496.62
Science	549.46	551.99	<b>547.76**</b>	<b>543.76**</b>	<b>551.16***</b>	<b>560.22***</b>

\* Denotes a statistically significant difference between Pre-K and non-Pre-K students, at the  $p < 0.05$  level after adjusting for multiple comparisons (means appear in bold).

\*\* Denotes a statistically significant difference between Pre-K and non-Pre-K students who received FRPL, at the  $p < 0.05$  level after adjusting for multiple comparisons (means appear in bold).

\*\*\* Denotes a statistically significant difference between Pre-K and non-Pre-K students who did not receive FRPL, at the  $p < 0.05$  level after adjusting for multiple comparisons (means appear in bold).

Next, results are presented for First Grade students. As found in previous reports, some positive effects associated with Pre-K participation were again identified in First Grade among economically disadvantaged students. Aggregated Pre-K/Non-Pre-K comparisons for Reading, Language Arts, and

<sup>6</sup> As noted in previous reports, all models presented here control for child race and gender. In addition, the models also include additional control variables: whether or not a child received special education within the observed grades, whether or not a child was retained within the observed grades, the average number of days a child was absent from class during the observed timeframe, and whether or not the child's primary or native language is English. These control variables (and their theoretically or statistically relevant interactions) were included to ensure an accurate representation of the population under study and to ensure potentially mitigating effects were accounted for in the model to control for any potential bias.

Mathematics all indicated a significant effect of Pre-K. However, these effects appear to be limited to students who received FRPL. In First Grade, Pre-K participants who received FRPL had, on average, higher scores for Word Study Skills, Reading First, and Problem Solving compared to Non-Pre-K students who also received FRPL. The effects were small (estimated between 2-4 points,  $d < 0.1$ ), and there were no significant effects associated with Pre-K participation among students who did not receive FRPL.

Table 14 presents the estimated means for First Grade assessments.

**Table 14. Model-Implied Adjusted Mean Scores for Pre-K and Non-Pre-K Students—  
First Grade 2008-2009**

First Grade Assessment	Group					
	Pre-K	Non-Pre-K	Pre-K FRPL	Non-Pre-K FRPL	Pre-K No FRPL	Non-Pre-K No FRPL
Word Study Skills	572.07	573.35	<b>567.15**</b>	<b>563.62**</b>	576.98	583.07
Words Reading	532.34	531.86	526.35	523.30	538.33	540.42
Reading Comprehension	553.46	554.78	547.72	545.31	559.20	564.24
Reading First	570.22	571.56	<b>565.22**</b>	<b>562.68**</b>	575.23	580.45
Language	554.61	556.03	549.12	546.86	560.10	565.20
Spelling	519.81	519.74	513.32	510.83	526.31	528.64
Listening Skills	569.69	569.33	563.56	561.69	575.82	576.97
Problem Solving	541.08	541.88	<b>534.90**</b>	<b>532.45**</b>	547.26	551.31
Mathematical Procedures	521.72	522.17	516.37	513.67	527.06	530.67
Science	574.13	573.84	570.16	568.68	578.10	578.99

\* Denotes a statistically significant difference between Pre-K and non-Pre-K students, at the  $p < 0.05$  level after adjusting for multiple comparisons (means appear in bold).

\*\* Denotes a statistically significant difference between Pre-K and non-Pre-K students who received FRPL, at the  $p < 0.05$  level after adjusting for multiple comparisons (means appear in bold).

\*\*\* Denotes a statistically significant difference between Pre-K and non-Pre-K students who did not receive FRPL, at the  $p < 0.05$  level after adjusting for multiple comparisons (means appear in bold).

Assessment results for students who completed the Second Grade in 2008-2009 were similar to results for Kindergarten and First Grade students, with economically disadvantaged students who attended Pre-K scoring, on average, higher than similar students who did not attend Pre-K.

Previous analyses in this series of reports did not find evidence for an advantage among Pre-K students that persisted into Second Grade. However, caution must be taken in extrapolating from previous years' reports as the nature of the K-2 assessments has changed considerably. It is worth noting, though, that students who completed Second Grade in 2008-2009 completed Pre-K in 2005-2006, the first year of Pre-K expansion in Tennessee, and the first year that the Pre-K curriculum was fully aligned to state academic standards, and that alignment may be positively associated with these outcomes. Again, however, it is impossible to draw a causal conclusion from these data, given the nature of the methodology employed in this study and the data available for analysis.

Table 15 presents the estimated means for Second Grade assessments.

**Table 15. Model-Implied Adjusted Mean Scores for Pre-K and Non-Pre-K Students—  
Second Grade 2008-2009**

Second Grade Assessment	Group					
	Pre-K	Non-Pre-K	Pre-K FRPL	Non-Pre-K FRPL	Pre-K No FRPL	Non-Pre-K No FRPL
Word Study Skills	601.09	602.36	596.21	594.02	605.97	610.70
Reading Vocabulary	574.93	574.96	<b>566.95**</b>	<b>562.69**</b>	582.91	587.23
Reading Comprehension	595.12	594.38	<b>589.24**</b>	<b>585.19**</b>	601.00	603.57
Reading First	611.55	612.56	<b>605.83**</b>	<b>602.80**</b>	617.27	622.32
Language	588.11	588.67	<b>583.85**</b>	<b>579.73**</b>	592.37	597.61
Spelling	578.31	577.18	<b>573.01**</b>	<b>568.30**</b>	583.60	586.06
Listening Skills	591.81	592.19	<b>587.07**</b>	<b>584.73**</b>	596.56	599.65
Problem Solving	572.13	570.87	<b>566.56**</b>	<b>563.02**</b>	577.70	578.72
Mathematical Procedures	569.30	569.55	<b>564.16**</b>	<b>559.79**</b>	574.45	579.30
Science	601.88	602.26	597.94	596.56	605.82	607.95

\* Denotes a statistically significant difference between Pre-K and non-Pre-K students, at the  $p < 0.05$  level after adjusting for multiple comparisons (means appear in bold).

\*\* Denotes a statistically significant difference between Pre-K and non-Pre-K students who received FRPL, at the  $p < 0.05$  level after adjusting for multiple comparisons (means appear in bold).

\*\*\* Denotes a statistically significant difference between Pre-K and non-Pre-K students who did not receive FRPL, at the  $p < 0.05$  level after adjusting for multiple comparisons (means appear in bold).

## Long-term Effects of Pre-K Participation

In Grades 3-5, Criterion-Referenced Assessments are administered in Reading, Mathematics, Social Studies, and Science. Student performance on these assessments is compared to a predetermined standard (i.e., “cut point”) to determine proficiency. The cut points established by TDOE for each of these subjects in each grade are presented in Table 16.

**Table 16. TCAP Cut Scores for Reading, Mathematics, Social Studies, and Science in Grades 3-5**

Final Cut Scores Established in 2004			
Content Area	Grade	Proficient	Advanced
Reading	3	455	496
	4	461	510
	5	467	522
Mathematics	3	448	484
	4	457	507
	5	463	517
Social Studies	3	188	212
	4	190	216
	5	194	217
Science	3	188	213
	4	189	215
	5	191	218

Source: Tennessee Department of Education

Analyses across assessments administered in Grades 3 through 5 sought to determine whether there were systematic significant differences to indicate a long-term advantage associated with Pre-K participation (see Tables 17-19). Pre-K participation did not predict significantly higher scores for any assessment in Third, Fourth, or Fifth Grade. The difference between students who received FRPL and those who did not (i.e., student socioeconomic status), was consistently a significant predictor for student outcomes across all assessments in Grades 3-5.

Also as observed in previous analyses conducted in the course of this research, some differences were observed at higher grade levels among Pre-K and non-Pre-K students who did not receive FRPL. For example, overall Pre-K students scored lower on Third Grade reading than non-Pre-K students; however, this effect is due to significantly higher performance by the non-Pre-K students who did not experience economic disadvantage (e.g., did not receive FRPL). These findings do not support the hypothesis that Pre-K participation improves student outcomes on standardized assessments, but neither does this pattern of results disprove such a hypothesis. These differences likely reflect increased variability among the non-FRPL group as well as the impact of other risk factors apart from economic disadvantage (which are more prevalent among Pre-K students in Tennessee, given program eligibility requirements). However, it is impossible to draw a causal conclusion from these data, given the nature of the methodology employed in this study and the data available for analysis. Ultimately, these data are consistent with the findings of previous reports which illustrate through longitudinal analyses that an initial difference between Pre-K and non-Pre-K

students gradually attenuates by Second Grade. No analysis conducted to date has found reliable significant effects suggesting a persistent advantage of Pre-K participation beyond Second Grade.

Tables 17-19 summarize the estimated mean scores for Pre-K and non-Pre-K students in Third, Fourth, and Fifth Grade.

**Table 17. Model-Implied Adjusted Mean Scores for Pre-K and Non-Pre-K Students—  
Third Grade 2008-2009**

Third Grade Assessment	Group					
	Pre-K	Non-Pre-K	Pre-K FRPL	Non-Pre-K FRPL	Pre-K No FRPL	Non-Pre-K No FRPL
Reading	<b>479.94*</b>	<b>483.33*</b>	476.54	477.42	<b>483.33***</b>	<b>489.24***</b>
Mathematics	469.33	470.60	465.15	465.31	473.52	475.89
Science	198.78	199.89	195.63	195.69	201.92	204.08
Social Studies	197.89	199.26	194.25	194.82	201.53	203.70

\* Denotes a statistically significant difference between Pre-K and non-Pre-K students, at the  $p < 0.05$  level after adjusting for multiple comparisons (means appear in bold).

\*\* Denotes a statistically significant difference between Pre-K and non-Pre-K students who received FRPL, at the  $p < 0.05$  level after adjusting for multiple comparisons (means appear in bold).

\*\*\* Denotes a statistically significant difference between Pre-K and non-Pre-K students who did not receive FRPL, at the  $p < 0.05$  level after adjusting for multiple comparisons (means appear in bold).

**Table 18. Model-Implied Adjusted Mean Scores for Pre-K and Non-Pre-K Students—  
Fourth Grade 2008-2009**

Fourth Grade Assessment	Group					
	Pre-K	Non-Pre-K	Pre-K FRPL	Non-Pre-K FRPL	Pre-K No FRPL	Non-Pre-K No FRPL
Reading	491.68	492.12	485.98	486.37	497.37	497.87
Mathematics	488.27	489.15	483.94	482.57	492.60	495.72
Science	202.53	202.42	199.01	198.87	206.05	205.96
Social Studies	203.42	203.66	200.37	200.31	206.47	207.02

\* Denotes a statistically significant difference between Pre-K and non-Pre-K students, at the  $p < 0.05$  level after adjusting for multiple comparisons (means appear in bold).

\*\* Denotes a statistically significant difference between Pre-K and non-Pre-K students who received FRPL, at the  $p < 0.05$  level after adjusting for multiple comparisons (means appear in bold).

\*\*\* Denotes a statistically significant difference between Pre-K and non-Pre-K students who did not receive FRPL, at the  $p < 0.05$  level after adjusting for multiple comparisons (means appear in bold).

**Table 19. Model-Implied Adjusted Mean Scores for Pre-K and Non-Pre-K Students—  
Fifth Grade 2008-2009**

Fifth Grade Assessment	Group					
	Pre-K	Non-Pre-K	Pre-K FRPL	Non-Pre-K FRPL	Pre-K No FRPL	Non-Pre-K No FRPL
Reading	<b>506.77*</b>	<b>509.60*</b>	501.89	503.71	<b>511.65***</b>	<b>515.48***</b>
Mathematics	<b>503.48*</b>	<b>507.36*</b>	498.90	500.71	<b>508.05***</b>	<b>514.02***</b>
Science	<b>200.80*</b>	<b>203.18*</b>	<b>197.62**</b>	<b>199.05**</b>	<b>203.98***</b>	<b>207.32***</b>
Social Studies	203.33	204.59	200.12	201.31	206.55	207.88

\* Denotes a statistically significant difference between Pre-K and non-Pre-K students, at the  $p < 0.05$  level after adjusting for multiple comparisons (means appear in bold).

\*\* Denotes a statistically significant difference between Pre-K and non-Pre-K students who received FRPL, at the  $p < 0.05$  level after adjusting for multiple comparisons (means appear in bold).

\*\*\* Denotes a statistically significant difference between Pre-K and non-Pre-K students who did not receive FRPL, at the  $p < 0.05$  level after adjusting for multiple comparisons (means appear in bold).

## General Summary

There are a number of challenges in interpreting the results of analysis of student outcomes from 2008-2009 in light of previous reports' findings. Similar to what has been found in previous analyses, Pre-K participation continues to be associated with small but reliable effects on student outcomes in Kindergarten and First Grade, primarily among economically disadvantaged students. Although previous analyses had found no reliable effects persisting beyond First grade, the present analyses do suggest that a small but statistically significant difference was detectable on some assessments in Second Grade. Interpretation of these findings, though, is difficult, as the assessments conducted in 2008-2009 were markedly different from the assessments in previous years. Caution must be used in drawing comparisons between previous reports' findings which were based on longitudinal analyses and the present report, which is simply a cross-sectional look at one year of data.

Also complicating comparisons between the present findings and earlier reports is the fact that the Pre-K program experienced significant change and was aligned to state standards in 2005-2006. Thus, students in Grades K-2 in 2008-2009 (the cohorts under study in this report) participated in a Pre-K program that was qualitatively different than students in previous years. Additional longitudinal analyses would be necessary to determine whether the same patterns observed in previous analyses still hold given the changes in both the Pre-K program and the nature of the assessments conducted in these grades.

Although the results of the norm-referenced assessments conducted in Grades K-2 show a relative advantage of Pre-K participation for economically disadvantaged students, on criterion-referenced assessments in Grades 3-5, there is no relative advantage for Pre-K participation. Among economically disadvantaged students, Pre-K participants scored, in aggregate, about the same on these criterion-referenced tests as did their peers who did not participate in Tennessee's Pre-K program. Similarly, among students who did not experience economic disadvantage, Pre-K participation was not associated with an advantage on these tests. Unfortunately, many forms of "risk" which would have qualified students for participation in Pre-K are not able to be captured and controlled for statistically in the data available for analysis.

Considering the cumulative results observed across the series of studies conducted on Pre-K student outcomes in Grades K-5 for the state of Tennessee, small but reliable short-term effects for economically disadvantaged students who participated in Pre-K were observed for multiple cohorts across multiple assessments. These effects occurred largely in Kindergarten and First Grade, suggesting the program is successful in preparing students as they begin attending school. Some possible effects may even extend into Second Grade for some students. However, with each additional year past Kindergarten, the observable impact of Pre-K education attenuates. Moving forward, the state of Tennessee might consider focusing evaluation efforts on Kindergarten Readiness in particular, as well as implementing and evaluating additional interventions for school-age children that may be more likely to support and sustain their academic growth over time.

## Appendix A. Research Design

For the purpose of this project, and as specified by RFP 308.14-004, “Pre-Kindergarten students” refers to students who attend state funded Pre-Kindergarten programs; specifically, either the pilot Pre-Kindergarten programs or lottery/general fund-funded Pre-Kindergarten programs. Also for the purpose of this project, as defined by the RFP, the non-Pre-K comparison groups consist of students who do/did not attend Pre-Kindergarten but whose characteristics otherwise match as nearly as practicable those of “Pre-Kindergarten students.”

This evaluation, again as specified by the State of Tennessee, Office of the Comptroller, utilizes a quasi-experimental research design known as the **nonequivalent groups design**. This methodology, although not without limitations, permits a comparison of Pre-K participants to a comparable group of students who did *not* attend state-funded Pre-K. This particular type of analysis is deemed to involve “nonequivalent groups” to acknowledge the fact that it does not involve random assignment of students to groups at the time of enrollment in Pre-K.<sup>7</sup> However, it is important to note that this design does not preclude the possibility of obtaining comparable groups through random selection. Additionally, it allows for a longitudinal assessment of the progress of both Pre-K and non-Pre-K participants over time.

Parents elect for their children to participate in the Pre-K program in Tennessee, and program eligibility is determined by state policy such that all children meeting the state-determined eligibility requirements may be served.<sup>8</sup> Thus, randomization was not utilized in the present study in terms of assigning students to the Pre-K group. This is an important consideration in understanding and interpreting the results of the present study, and in distinguishing the present research methodology from experimental research methods.<sup>9</sup> Random assignment to a treatment or control group effectively equates the groups *before* an intervention is administered (for example, participation in a Pre-K program) and helps ensure that any resulting differences between the groups in later measurements are due to the intervention under study and not some other systematic difference between the treatment and control group. Experimental research methodology uses random assignment to create treatment and comparison groups—that is, the researchers conducting the study determine on a randomized basis which participants receive the treatment (the experimental group) and which do not (the control group). The experimental method is considered the most rigorous of research designs and enables researchers to address cause-and-effect relationships with the greatest degree of certainty.<sup>10</sup>

However, when implementing and evaluating complex educational programs, experimental methods are not always the most practical choice. First, fledgling programs often devote their resources to program implementation first and incorporate evaluation later. Thus, new programs are rarely designed with a rigorous experimental evaluation in place at the beginning. Further, researchers simply cannot control all the important variables which are likely to influence program outcomes, even with the best experimental design. Educational programs do not operate in a vacuum; even with a rigorous experimental design, researchers cannot be completely confident that any individual program

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<sup>7</sup> Cook, T.D. & Campbell, D.T. (1979). Quasi-Experimentation: Design and Analysis for Field Settings. Rand McNally, Chicago, Illinois.

<sup>8</sup> See Appendix A for program overview including eligibility requirements.

<sup>9</sup> Campbell, D. T., & Stanley, J. C. (1966). Experimental and quasi-experimental designs for research. Chicago: Rand McNally.

<sup>10</sup> Trochim, William M. The Research Methods Knowledge Base, 2nd Edition. Internet WWW page, at URL: <<http://www.socialresearchmethods.net/kb/>> (version current as of October, 2006).

independently produces specific results in terms of student achievement.<sup>11</sup> Thus, although utilizing random assignment is advantageous it does not in itself guarantee high internal validity—and may actually create a “false sense of security” in the research findings.<sup>12</sup> Experimental designs tend to be rare given the complexity and expense required to implement them effectively and because of logistical and ethical concerns—for example, is it ethical to deny a child access to an intervention like Pre-K?

Because of such limitations, other designs like the quasi-experimental design utilized in the present evaluation are often reasonable alternatives to address research questions of interest. Although quasi-experimental designs do not possess the same degree of scientific rigor as the experimental design, they are a practical and frequently utilized technique in applied social science.

In the present study, rigorous sampling techniques were used to select a comparison group from the many Tennessee schoolchildren who completed assessments in Grades K-5 but did not attend Pre-K, with the aim of constructing a valid comparison group that is matched as practicably as possible with the Pre-K group. Still, by the very nature of this research design, there is no way to ensure that the groups are, indeed, equivalent in all respects (thus the use of the term “nonequivalent groups”). There may be important differences between the Pre-K group and the non-Pre-K participants that simply cannot be captured retrospectively and accounted for in the data available for analysis in this report. Further, we can safely assume that there are important ways the non-Pre-K students may differ from the Pre-K participants. For example, a student may not have participated in Pre-K but may have participated in some other form of early childhood educational intervention. Unfortunately, the data available for analysis at present do not address participation in other early childhood programs and thus we cannot statistically control for the possibility that non-Pre-K participants did not receive *any* other form of intervention—we can only say for certain that they did not participate in Tennessee’s Pre-K program. Random sampling, however, is the best technique to minimize the effects of such extraneous variables.

It is important to note that even if groups were constructed based on random assignment to the Pre-K and non-Pre-K groups, it would still be important to address whether non-Pre-K children participated in another, different early childhood education program. Ideally, at the time the groups were formed, information would be collected from both groups about their experiences. Because the present study is retrospective as opposed to prospective, there is a great deal of information about the comparison group that remains unknown. However, the goal of the present study was to describe the performance of Pre-K students on TCAP assessments relative to students who did not participate in Pre-K using data collected and maintained by TDOE—not to collect such additional data—although future prospective studies may be able to include such additional controls.

Finally, we acknowledge that this study also faces the limitation of utilizing a “post-test only” approach. That is, no baseline or pre-test data are available for either the Pre-K group or the non-Pre-K matched sample over the time period studied in this report. Given that randomization in selecting children to participate in the program is not feasible, there is clearly no possibility of statistically controlling for baseline differences for the non-Pre-K comparison group. Thus, we must make the assumption that the Pre-K and non-Pre-K groups “started out” at a similar point prior to the opportunity to participate in Pre-K. However, it is entirely possible given the nonrandom formation of the Pre-K group that the two groups may have initially differed had a pre-test been administered. From an evaluation standpoint, this makes any differences observed in later assessments difficult to interpret, and any such differences must be interpreted with caution.

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<sup>11</sup> Gribbons, B., & Herman, J. (1997). True and quasi-experimental designs. Washington, DC: ERIC Clearinghouse on Assessment and Evaluation. [ED421483]

<sup>12</sup> Gribbons & Herman (1997).

Despite the limitations of the present design, this particular design offers some distinct advantages. First, because multiple measurements are available for the Pre-K and non-Pre-K groups, the resulting analyses afford a better sense of the patterns of variability *within* each group over time as well as *between* each group over time. Second, this design permits an exploration of ten years of existing data without the need to collect additional data on past program participants, a time-consuming and costly process. **The present study is not a means of conclusively determining whether participation in the Pre-K program causes an improvement in students' later performance on standardized assessments, and to construe it as such would be to misinterpret the goals and methodology applied here.** A prospective, experimental study would be better suited to permit such conclusions about the program. However, using existing data collected and maintained by TDOE, the present study uses the data at hand to provide the most accurate description possible of how Pre-K participants are doing in the short- and long-term based on the information available at the present time. Thus, the overarching goal of the present evaluation is to identify dominant trends in the overall pattern of results for Pre-K and non-Pre-K students and to determine if, overall, Pre-K students demonstrate any clear differences over time in their performance on these assessments relative to the non-Pre-K comparison group.

## Appendix B. Data Management

As was mentioned previously, SRG requested and received assessment data for the 2008-2009 school year. The data were provided in two files: one containing the scores for the Norm-Referenced Assessments (administered to students in Grades K-2), and the other containing the scores for the Criterion-Referenced Assessments (administered to students in Grades 3-5). In the original datasets that were provided by the TDOE, there were 50,155 cases in the NRT dataset and 223,167 in the CRT dataset. The two datasets were merged together into one dataset, and readied for analysis, which required several steps.

### 1. Identify Pre-K Students in the Assessment Data

The first step in the data management process was to identify which students in the assessment datasets attended Pre-K. To do so, the assessment datasets were merged together with the Pre-K demographic file and the EIS data for 2006-2007 and 2007-2008 and a variable was created that indicated whether or not the student had attended Tennessee-funded Pre-K. This allowed us to individually examine questionable records of Pre-K students throughout the data management phase. The subsequent steps detail the effort taken to prepare Pre-K and non-Pre-K students' assessment records for analysis.

### 2. Identify and examine assessment records with duplicate encrypted Social Security Numbers (ESSNs).

The next step in preparing the data for analysis was to identify and examine records with duplicate encrypted Social Security Numbers (ESSNs). Each year the assessment data contains a small number of cases with duplicate ESSNs, meaning that there were two (and in a very small number of instances, three) sets of scores for the same grade level and school year linked to the same ESSN. An examination of duplicate records found that in most cases, although the ESSN was the same, the demographic information (i.e., date of birth, gender, and/or race) was not, indicating that the assessment scores were for different students. For students with duplicate records who had attended Pre-K, each record was individually cross-checked with the demographic information linked to the ESSN with the Pre-K demographic file (when available) and EIS data (again, when available) to determine which record was incorrect. For Pre-K students whose demographic information was not reported in the Pre-K demographic file and did not have a record in the EIS, both records were excluded from analysis. It should be noted however, cases with duplicate ESSNs represented a very small proportion of all cases. Additionally, because so few students are assessed in Grades K-2 (and especially in Kindergarten), duplicate records were examined for all students in these grades regardless of whether the records were for students who had attended Pre-K or not. This effort allowed us to retain as many valid assessment records in Grades K-2 as possible.

### 3. Identify and examine records for students with assessments scores for more than one grade level in a given school year.

The third step was to identify and examine records for students that had assessment scores for more than one grade level in the same school year. Although it is reasonable for a student to have scores at the same grade level for consecutive years (e.g., scores as a First Grader in both 2004-2005 and 2005-2006) as a result of retention, multiple sets of scores in the same school year at different grade levels is indicative of an error.<sup>13</sup> An examination of a number of these instances found that in each instance, the two sets of scores, although linked to the same ESSN, differed on

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<sup>13</sup> This was verified by the Senior Executive Director for the TDOE Office of Assessment, Evaluation and Research.

demographic information. Again, efforts were made to retain as many valid Pre-K student records and for students in K-2 by individually cross-checking these students' records with the Pre-K demographic file and EIS data when available.

**4. Examine the consistency of demographic information between the assessment data and EIS data.**

An additional means of checking the validity of student records was to compare demographic information for students who had both assessment scores and a record in the Pre-K demographic file and/or the EIS.

Following the same approach outlined in steps two and three above, all records for Pre-K students with discrepant values for date of birth, gender and/or race in the assessment and EIS data were examined individually. Their demographic information was also cross-checked against the Pre-K demographic file, when available. The small number of non-Pre-K students with discrepant demographic information between assessment and EIS data were excluded from the analysis. As before there was one exception: students who had different values for race were retained, provided their values for gender and date of birth were consistent.

Table B1 displays the final number of Pre-K students with assessment scores in 2008-2009 for each grade covered in this report. The table also includes the percentage of students assessed in a given grade based on the total number of four-year-olds with valid records in the Pre-K demographic file or the EIS data the year students likely attended Pre-K. It is important to keep in mind that the percentages of students assessed in each grade are estimates. They do not take into consideration grade retention, demotion, or skipping, any type of attrition (such as leaving the Tennessee school system), or new students entering the Tennessee school system.

The reader should also keep in mind that Table B1 reflects the number of *valid records* in the Pre-K demographic file, EIS, and Pre-K assessment records available for analysis at the conclusion of the data management phase of this analysis.

**Table B1. Number of Pre-K Students in the Pre-K Demographic File or EIS and Number and Percentage of Pre-K Students Available for Analysis in Each Grade for 2008-2009 (Valid Records Only)**

<b>Year &amp; Number of Pre-K Participants in PKD File or EIS</b>	<b>Number and Percent of Pre-K Students Assessed in Each Grade</b>
<b>2002-2003</b> N = 2,631	<b>Grade 5:</b> 2,310 (87.8%)
<b>2003-2004</b> N = 2,404	<b>Grade 4:</b> 2,372 (98.7%)
<b>2004-2005</b> N = 2,345	<b>Grade 3:</b> 2,142 (91.3%)
<b>2005-2006</b> N = 7,599	<b>Grade 2:</b> 3,144 (41.4%)
<b>2006-2007</b> N = 12,234	<b>Grade 1:</b> 2,636 (21.5%)
<b>2007-2008</b> N = 17,081	<b>Grade K:</b> 831 (4.9%)

The number of Pre-K students with valid records who were assessed in a given grade varies widely. There are two main reasons for the range of group sizes beyond naturally occurring differences in the number of students who completed Pre-K each year.

First, as was mentioned previously, assessments in Grades K-2 are not mandated. Second, it is clear that some number of students changed LEAs, and some number of students may have entered Kindergarten late or repeated a grade, placing them in a different cohort from which they started. A third factor impacting the number of Pre-K students in each grade/year, as was discussed previously, is that some students whose records indicated demographic discrepancies were excluded from analyses. Students were also excluded if they were found to have more than one set of scores in a particular school year at different grade levels. However, this resulted in the exclusion of a small number of cases.

It is important to note that even though a relatively small percentage of Pre-K students have assessment scores in Kindergarten, the number of students for whom valid assessment records are available is sufficient to be able to conduct statistical analysis.

## Appendix C. Technical Specification of Models

The models presented in this report can be understood through a general 3-level hierarchical linear model that accounts for child-level outcomes nested within school and school nested within school district. The general model is presented relying heavily on the Raudenbush and Bryk (2002) terminology. The general model is presented in “levels” and is discussed in terms of multiple observations within schools and multiple schools within school district.

### Level 1

Level 1 defines the relationship between child-level outcomes and child-level predictors:

$$y_{isd} = \pi_{0sd} + \sum_{j=1}^J (\pi_{jsd} * x_{ij}) + e_{isd} \quad (1)$$

and

$$e_{isd} = \sim N(0, \sigma^2). \quad (2)$$

In Equation 1,  $y_{isd}$  denotes outcome  $y$  for individual  $i$  in school  $s$  within school district  $d$ . The score is defined by an intercept,  $\pi_{0sd}$ , and  $J$  child-level predictors ( $x_{ij}$ ) including interactions of interest (e.g. Pre-K status by free/reduced-lunch status). The intercept denotes the mean level of  $y$  when  $\sum_{j=1}^J x_{ji} = 0$ .

The residual,  $e_{isd}$ , captures the individual-specific deviation from the mean score for school  $s$  within school district  $d$ . This deviation is the “error” in prediction not otherwise account for by unique school or school district variability. As described in Equation 2,  $e_{isd}$  is assumed to be normally distributed with a mean of 0 and a standard deviation of  $\sigma$ .

$e_{isd}$  is not the only variance component in the general model. Indeed, the intercept is a “random” coefficient allowed to vary over school. This unique school variability is parameterized in Level 2 of the general model.

### Level 2

Level 1 parameters  $\pi_{0sd}$  and  $\pi_{jsd}$  are the outcomes of interest in Level 2 of the general model:

$$\begin{aligned} \pi_{0sd} &= \beta_{00d} + r_{0sd} \\ \pi_{jsd} &= \beta_{j0d} \end{aligned} \quad (3)$$

and

$$r_{0sd} \sim N(0, \tau_{00}^2). \quad (4)$$

Equation 3 states that the mean score for school  $s$  in school district  $d$  (i.e.,  $\pi_{0sd}$ ) is a linear combination of the overall mean score within school district  $d$ ,  $\beta_{00d}$ , and a school-specific deviation ( $r_{0sd}$ ). The school-specific residuals are assumed to be normally distributed with a mean 0 and a standard deviation of  $\tau_{00}$  (see Equation 4). As can be seen in Equation 3, the effect of the  $j^{\text{th}}$  child-level predictor ( $\pi_{jsd}$ ) is assumed to be a function of school district  $d$ 's effect for the  $j^{\text{th}}$  predictor ( $\beta_{j0d}$ ).

### Level 3

Level 3 defines the Level 2 parameters ( $\beta_{00d}$  and  $\beta_{j0d}$ ) as outcomes of interest such that

$$\begin{aligned}\beta_{00d} &= \gamma_{000} + \sum_{q=1}^Q (\gamma_{00q} * w_{dq}) + u_{00d} \\ \beta_{j0d} &= \gamma_{j00} + \sum_{q=1}^Q (\gamma_{j0q} * w_{dq})\end{aligned}, \quad (5)$$

and

$$u_{00d} \sim N(0, \tau_{000}^2). \quad (6)$$

Equation 5 states that the effect of being in district  $d$  ( $\beta_{00d}$ ) is a linear combination of the overall mean score ( $\gamma_{000}$ ) conditioned on  $Q$  district level predictors ( $w_{dq}$ ), and a district-specific deviation ( $u_{00d}$ ) from the overall mean score. Equation 5 also states that the effect of the  $j^{\text{th}}$  child-level predictor ( $\beta_{j0d}$ ) is a linear combination of the overall effect of the  $j^{\text{th}}$  predictor ( $\gamma_{j00}$ ) conditioned on  $Q$  district-level predictors.

### General Model

Given the parameterizations for each level outlined above the general model in its reduced form (i.e., substituting and combining terms) is:

$$\begin{aligned}y_{isd} &= \gamma_{000} + \sum_{j=1}^J (\gamma_{j00} * x_{ij}) + \sum_{q=1}^Q (\gamma_{00q} * w_{dq}) \\ &\quad + \sum_{j=1}^J \sum_{q=1}^Q (\gamma_{j0q} * w_{dq} * x_{ij}) + [e_{isd} + r_{0sd} + u_{00d}]\end{aligned}, \quad (7)$$

where all deviations are distributed as described in Equations 2, 4, and 6. Cross-level interactions ( $w_{dq} * x_{ij}$ ) were only included for two child-level predictors (Pre-K status and free/reduced-lunch status). For the “child-level” models discussed in this paper, all  $q$ -predictors are absent from the model reducing Equation 7 to:

$$y_{isd} = \gamma_{000} + \sum_{j=1}^J (\gamma_{j00} * x_{ij}) + [e_{isd} + r_{0sd} + u_{00d}]. \quad (8)$$

The interpretation of the parameters in Equation 7 (the “district-level” model) remain unchanged for the “child-level” model described in Equation 8.

## Appendix D. Means, $p$ -values, and Effect Sizes for Analyses Reported

Note that  $p$ -values are marked with an asterisk (\*) to denote values deemed statistically significant at  $p > 0.05$  after controlling for the False Discovery Rate, a statistical adjustment necessary given the number of multiple comparisons being made in the present analysis. In other words, only scores in boldface type with  $p$ -values marked with an asterisk remain statistically significant after controlling for the number of comparisons involved in the analysis.

Grade Level	Assessment	Comparison	Model-Implied Adjusted Mean Scores		$p$ -value	Effect Size (d)
			Pre-K	Non-Pre-K		
Kindergarten	Sounds and Letters	Overall	517.46	518.19	0.785	<0.01
		<b>FRPL Only</b>	<b>510.92</b>	<b>504.70</b>	<b>0.011*</b>	<b>0.02</b>
		Non-FRPL Only	523.99	531.68	0.109	0.01
	Words Reading	Overall	443.19	442.73	0.874	<0.01
		FRPL Only	434.87	431.06	0.146	0.01
		Non-FRPL Only	451.51	454.40	0.576	0.01
	Listening to Words and Stories	Overall	545.70	543.69	0.280	0.01
		FRPL Only	539.48	536.51	0.077	0.02
		Non-FRPL Only	551.91	550.86	0.752	<0.01
	Reading First	Overall	516.30	517.15	0.688	<0.01
		FRPL Only	509.20	505.70	0.066	0.02
		Non-FRPL Only	523.40	528.59	0.167	0.01
	Mathematics	Overall	486.95	485.80	0.608	<0.01
		<b>FRPL Only</b>	<b>479.43</b>	<b>474.98</b>	<b>0.028*</b>	<b>0.02</b>
		Non-FRPL Only	494.48	496.62	0.591	<0.01
	Environment	Overall	549.46	551.99	0.175	0.01
		<b>FRPL Only</b>	<b>547.76</b>	<b>543.76</b>	<b>0.011*</b>	<b>0.02</b>
		<b>Non-FRPL Only</b>	<b>551.16</b>	<b>560.22</b>	<b>0.007*</b>	<b>0.03</b>

Grade Level	Assessment	Comparison	Model-Implied Adjusted Mean Scores		p-value	Effect Size (d)
			Pre-K	Non-Pre-K		
First Grade	Word Study Skills	Overall	572.07	573.35	0.458	0.01
		<b>FRPL Only</b>	<b>567.15</b>	<b>563.62</b>	<b>0.009*</b>	<b>0.02</b>
		Non-FRPL Only	576.98	583.07	0.054	0.02
	Words Reading	Overall	532.34	531.86	0.796	<0.01
		FRPL Only	526.35	523.30	0.037	0.02
		Non-FRPL Only	538.33	540.42	0.539	0.01
	Reading Comprehension	Overall	553.46	554.78	0.416	0.01
		FRPL Only	547.72	545.31	0.060	0.02
		Non-FRPL Only	559.20	564.24	0.090	0.02
	Reading First	Overall	570.22	571.56	0.341	0.01
		<b>FRPL Only</b>	<b>565.22</b>	<b>562.68</b>	<b>0.022*</b>	<b>0.02</b>
		Non-FRPL Only	575.23	580.45	0.044	0.02
	Language	Overall	554.61	556.03	0.335	0.01
		FRPL Only	549.12	546.86	0.052	0.02
		Non-FRPL Only	560.10	565.20	0.059	0.02
	Spelling	Overall	519.81	519.74	0.967	<0.01
		FRPL Only	513.32	510.83	0.097	0.02
		Non-FRPL Only	526.31	528.64	0.506	0.01
	Listening Skills	Overall	569.69	569.33	0.772	<0.01
		FRPL Only	563.56	561.69	0.057	0.02
		Non-FRPL Only	575.82	576.97	0.617	<0.01
	Problem Solving	Overall	541.08	541.88	0.574	0.01
		<b>FRPL Only</b>	<b>534.90</b>	<b>532.45</b>	<b>0.030*</b>	<b>0.02</b>
		Non-FRPL Only	547.26	551.31	0.121	0.02
	Mathematical Procedures	Overall	521.72	522.17	0.791	<0.01
		FRPL Only	516.37	513.67	0.048	0.02
		Non-FRPL Only	527.06	530.67	0.254	0.01
	Environment	Overall	574.13	573.84	0.787	>0.01
		FRPL Only	570.16	568.68	0.076	0.02
		Non-FRPL Only	578.10	578.99	0.651	>0.01

Grade Level	Assessment	Comparison	Model-Implied Adjusted Mean Scores		p-value	Effect Size (d)
			Pre-K	Non-Pre-K		
Second Grade	Word Study Skills	Overall	601.09	602.36	0.455	0.01
		FRPL Only	596.21	594.02	0.066	0.02
		Non-FRPL Only	605.97	610.70	0.136	0.01
	Reading Vocabulary	Overall	574.93	574.96	0.987	<0.01
		<b>FRPL Only</b>	<b>566.95</b>	<b>562.69</b>	<b>0.001*</b>	<b>0.03</b>
		Non-FRPL Only	582.91	587.23	0.207	0.01
	Reading Comprehension	Overall	595.12	594.38	0.641	<0.01
		<b>FRPL Only</b>	<b>589.24</b>	<b>585.19</b>	<b>0.0003*</b>	<b>0.03</b>
		Non-FRPL Only	601.00	603.57	0.390	0.01
	Language	Overall	588.11	588.67	0.701	>0.01
		<b>FRPL Only</b>	<b>583.85</b>	<b>579.73</b>	<b>0.0001*</b>	<b>0.04</b>
		Non-FRPL Only	592.37	597.61	0.054	0.02
	Reading First	Overall	611.55	612.56	0.467	0.01
		<b>FRPL Only</b>	<b>605.83</b>	<b>602.80</b>	<b>0.002*</b>	<b>0.03</b>
		Non-FRPL Only	617.27	622.32	0.051	0.02
	Spelling	Overall	578.31	577.18	0.546	0.01
		<b>FRPL Only</b>	<b>573.01</b>	<b>568.30</b>	<b>0.0003*</b>	<b>0.04</b>
		Non-FRPL Only	583.60	586.06	0.483	0.01
	Listening Skills	Overall	591.81	592.19	0.758	<0.01
		<b>FRPL Only</b>	<b>587.07</b>	<b>584.73</b>	<b>0.006*</b>	<b>0.03</b>
		Non-FRPL Only	596.56	599.65	0.178	0.01
	Problem Solving	Overall	572.13	570.87	0.370	0.01
		<b>FRPL Only</b>	<b>566.56</b>	<b>563.02</b>	<b>0.0003*</b>	<b>0.03</b>
		Non-FRPL Only	577.70	578.72	0.695	<0.01
Mathematical Procedures	Overall	569.30	569.55	0.885	<0.01	
	<b>FRPL Only</b>	<b>564.16</b>	<b>559.79</b>	<b>0.0003</b>	<b>0.04</b>	
	Non-FRPL Only	574.45	579.30	0.126	0.01	
Environment	Overall	601.88	602.26	0.720	>0.01	
	FRPL Only	597.94	596.56	0.056	0.02	
	Non-FRPL Only	605.82	607.95	0.280	0.01	

Grade Level	Assessment	Comparison	Model-Implied Adjusted Mean Scores		p-value	Effect Size (d)
			Pre-K	Non Pre-K		
Third Grade	Reading	<b>Overall</b>	<b>479.94</b>	<b>483.83</b>	<b>0.002*</b>	<b>0.03</b>
		FRPL Only	476.54	477.42	0.338	0.01
		<b>Non-FRPL Only</b>	<b>483.33</b>	<b>489.24</b>	<b>0.004*</b>	<b>0.03</b>
	Mathematics	Overall	469.33	470.60	0.277	0.01
		FRPL Only	465.15	465.31	0.862	<0.01
		Non-FRPL Only	473.52	475.89	0.265	0.01
	Science	Overall	198.78	199.89	0.133	0.01
		FRPL Only	195.63	195.69	0.925	<0.01
		Non-FRPL Only	201.92	204.08	0.109	0.01
	Social Studies	Overall	197.89	199.26	0.052	0.02
		FRPL Only	194.25	194.82	0.331	0.01
		Non-FRPL Only	201.53	203.70	0.090	0.02

Grade Level	Assessment	Comparison	Model-Implied Adjusted Mean Scores		p-value	Effect Size (d)
			Pre-K	Non Pre-K		
Fourth Grade	Reading	Overall	491.68	492.12	0.656	<0.01
		FRPL Only	485.98	486.37	0.664	<0.01
		Non-FRPL Only	497.37	497.87	0.779	<0.01
	Mathematics	Overall	488.27	489.15	0.398	0.01
		FRPL Only	483.94	482.57	0.140	0.01
		Non-FRPL Only	492.60	495.72	0.093	0.01
	Science	Overall	202.53	202.42	0.863	<0.01
		FRPL Only	199.01	198.87	0.814	<0.01
		Non-FRPL Only	206.05	205.96	0.940	<0.01
	Social Studies	Overall	203.42	203.66	0.701	<0.00
		FRPL Only	200.37	200.31	0.911	<0.01
		Non-FRPL Only	206.47	207.02	0.627	<0.01

Grade Level	Assessment	Comparison	Model-Implied Adjusted Mean Scores		p-value	Effect Size (d)
			Pre-K	Non Pre-K		
Fifth Grade	Reading	<b>Overall</b>	<b>506.77</b>	<b>509.60</b>	<b>0.003*</b>	<b>0.03</b>
		FRPL Only	501.89	503.71	0.047	0.02
		<b>Non-FRPL Only</b>	<b>511.65</b>	<b>515.48</b>	<b>0.023*</b>	<b>0.02</b>
	Mathematics	<b>Overall</b>	<b>503.48</b>	<b>507.36</b>	<b>0.0001*</b>	<b>0.03</b>
		FRPL Only	498.90	500.17	0.059	0.02
		<b>Non-FRPL Only</b>	<b>508.05</b>	<b>514.02</b>	<b>0.0007*</b>	<b>0.03</b>
	Science	<b>Overall</b>	<b>200.80</b>	<b>203.18</b>	<b>0.0002*</b>	<b>0.03</b>
		<b>FRPL Only</b>	<b>197.62</b>	<b>199.05</b>	<b>0.018*</b>	<b>0.02</b>
		<b>Non-FRPL Only</b>	<b>203.98</b>	<b>207.32</b>	<b>0.003*</b>	<b>0.03</b>
	Social Studies	Overall	203.33	204.59	0.037	0.02
		FRPL Only	200.12	201.31	0.039	0.02
		Non-FRPL Only	206.55	207.88	0.208	0.01

## Appendix E. Pre-K Participation by LEA, 1998-2009

Table E1 summarizes the number of students participating in the Voluntary Pre-K program each academic year by LEA. These students would have been eligible to attend Kindergarten the following year. It is important to note that the figures in Table E1 represent “valid cases only,” or student records that were complete and included a valid student identifier, as some records were incomplete and could not be used for analysis. As such, the actual numbers of Pre-K students who attended the program in a given year are larger in some instances than those reported in Table E1.

Cells with a “\*” denote instances in which the Pre-K demographic data file did include records for that particular school system and school year, but because the records did not include a student identifier, the exact number of Pre-K students could not be determined.

As Table E1 indicates, the Pre-K program has experienced continuous growth statewide since 1998-1999, with the largest increases occurring in the 2000-2001 and 2001-2002 school years, especially in the 2005-2006 school year (as would be expected). There are 13 school systems with valid Pre-K records in every school year from 1998-1999 to 2008-2009.

**Table E1. Number of Students Participating in Pre-K by School System, 1998-1999 to 2008-2009**

School System	Number of Pre-K Students by School System and Year (Valid Records Only)											TOTAL 1998- 2009
	98-99	99-00	00-01	01-02	02-03	03-04	04-05	05-06	06-07	07-08	08-09	
Alamo								42	62	69	58	231
Alcoa								19	32	46	39	136
Anderson County	17	19	18	29	35	33	38	105	128	131	144	697
Athens								59	95	124	140	418
Bedford County										60	63	123
Bells								33	34	44	39	150
Benton County									26	43	43	112
Bledsoe County				17	14	11	17	38	67	67	72	303
Blount County	17	7	78	72	110	47	65	81	112	142	149	880
Bradford			1	14	16	14	14	35	19	32	19	164
Bradley County				36				62	181	270	278	827
Bristol			9	18		18	22	26	69	82	83	327
Campbell County				19	23	16	15	62	93	157	139	524
Cannon County								27	44	41	83	195
Carroll County											1	1
Carter County					33	*			46	45	56	180
Cheatham County								38	59	104	109	310
Chester County									20	43	42	105
Claiborne County	16	10	10	21	26	24	26	83	138	230	195	779
Clay County								34	40	38	51	163
Cleveland			33		34	53	44	119	120	103	168	674
Clinton								18	21	21	25	85
Cocke County									63	60	61	184
Coffee County	13	14	25	27	32	36	35	54	99	108	120	563

School System	Number of Pre-K Students by School System and Year (Valid Records Only)											TOTAL 1998- 2009
	98-99	99-00	00-01	01-02	02-03	03-04	04-05	05-06	06-07	07-08	08-09	
Crockett County									16	27	25	68
Cumberland County								105	146	221	205	677
Davidson County	9	4	59	218	243	183	175	383	690	929	1,041	3,934
Dayton								12	18	19	18	67
Decatur County									40	61	56	157
DeKalb County			6	25	34	34	30	59	66	76	96	426
Dickson County			11	10	22	15	19	40	72	93	104	386
Dyer County	15	17	34	47	57	56	56	134	123	126	136	801
Dyersburg				10	19	20	20	44	94	100	124	431
Elizabethton			42	36		42	42	57	63	78	81	441
Etowah									22	34	31	87
Fayette County				22	49	63	62	110	149	158	147	760
Fayetteville								19	37	60	61	177
Fentress County								46	92	112	104	354
Franklin								15	42	48	80	185
Franklin County	15	19	36	62	84	70	63	136	172	229	236	1,122
Gibson County SSD			5	37	32	35	36	55	63	108	76	447
Giles County										91	89	180
Grainger County								36	68	80	78	262
Greene County			16					99	249	296	303	963
Greeneville	3	2	20	63	76	83	87	109	57	92	97	689
Grundy County								14	33	62	69	178
Hamblen County								55	68	138	142	403
Hamilton County			48	92	99	97	107	320	474	723	720	2,680
Hancock County			14	12	23	17	24	60	57	34	58	299
Hardeman County								24	122	179	186	511
Hardin County								27	68	105	117	317
Hawkins County			5	12	16	9	17	35	71	77	66	308
Haywood County	28	21		27	27	30	30	32	78	120	2	395
Henderson County									1	92	107	200
Henry County	17		19	28	28	31	26	56	46	45	53	349
Hickman County								32	69	78	81	260
Hollow Rock Bruceton								20	18	19	22	79
Houston County								40	54	52	48	194
Humboldt			38	36	25	40	41	58	74	66	62	440
Humphreys County			5	3	17	19	16	77	113	144	157	551
Huntingdon								46	63	67	64	240
Jackson County			3	7	13	9	10	22	14	41	48	167
Jefferson County	12	10	12	6	30	67	23	100	116	149	156	681
Johnson City	12	11	13		40	25	27	36	41	71	72	348
Johnson County				27				29	51	48	58	213
Kingsport	16	16	28	31		21	30	65	88	111	116	522
Knox County	13	34	48	60	20	58	47	169	164	389	367	1,369
Lake County			*	15	38	20	20	34	34	42	44	247

School System	Number of Pre-K Students by School System and Year (Valid Records Only)											TOTAL 1998- 2009
	98-99	99-00	00-01	01-02	02-03	03-04	04-05	05-06	06-07	07-08	08-09	
Lauderdale County			19	*	11	22	18	86	137	179	181	653
Lawrence County	9	17	55	90	114	107	110	158	181	245	207	1,293
Lebanon								53	138	167	143	501
Lenoir City	17	30	15	35	51	36	33	36	38	43	39	373
Lewis County								41	61	54	83	239
Lexington								16	17	37	34	104
Lincoln County			19	26	25	20	20	36	139	137	141	563
Loudon County			15	19	35	22	20	92	118	153	186	660
Macon County									42	54	65	161
Madison County			20	53	65	91	94	152	252	307	308	1,342
Manchester								38	38	60	71	207
Marion County								57	79	85	77	298
Marshall County										42	33	75
Maryville								18	39	41	44	142
Mauzy County			6	78	87	59	64	65	156	189	227	931
McKenzie								19	21	21	21	82
McMinn County				14	13	15	9	50	93	177	198	569
McNairy County			15	20	21	15	21	81	107	136	122	538
Meigs County								43	78	69	67	257
Memphis	53	17	98	234	53	218	198	675	1,241	2,094	2,254	7,135
Milan	4	17		35	41	40	49	60	36	101	81	464
Monroe County								22	38	65	65	190
Montgomery County								41	260	431	427	1,159
Moore County										20	13	33
Morgan County								70	111	112	121	414
Murfreesboro				49		64	80	151	211	225	258	1,038
Newport									19	38	42	99
Oak Ridge								38	51	104	91	284
Obion County								20	39	103	102	264
Oneida								34	36	49	45	164
Overton County								60	109	96	97	362
Paris									59	63	62	184
Perry County			10	6	17	12	10	34	48	40	41	218
Pickett County								14	19	20	18	71
Polk County								34	61	79	75	249
Putnam County			16	45	90	89	66	247	313	340	355	1,561
Rhea County			11	23	20	22	19	54	83	91	87	410
Richard City										7	12	19
Roane County									106	126	132	364
Robertson County								38	110	191	192	531
Rogersville								14	13	14	22	63
Rutherford County			29		61	*		72	125	230	231	748
Scott County				42	49	43	52	123	125	155	181	770
Sequatchie County			13	14	16	10				20	19	92

School System	Number of Pre-K Students by School System and Year (Valid Records Only)											TOTAL 1998- 2009
	98-99	99- 00	00-01	01-02	02-03	03-04	04-05	05-06	06-07	07-08	08-09	
Sevier County	14	8	14	3	20	*	20	94	80	107	109	469
Shelby County			2	72	272	21	18	95	158	259	270	1,167
Smith County								30	63	88	94	275
South Carroll			14	21	20	17	19	23	13	20	22	169
Stewart County			4	7	16	20	6	49	79	88	99	368
Sullivan County			10	28	95	38	21	63	80	125	115	575
Sumner County									1	2		3
Sweetwater								23	45	65	64	197
Tipton County								159	167	210	208	744
Trenton				9	20	20	15	35	62	62	80	303
Trousdale County										15	21	36
Tullahoma										80	86	166
Unicoi County			13	28	30	33	30	80	89	96	98	497
Union City								21	41	44	42	148
Union County								20	65	69	62	216
Van Buren County			22	16	15	22	21	22	21	28	30	197
Warren County								37	103	129	141	410
Washington County									1			1
Wayne County			18	41	44	47	46	84	101	113	118	612
Weakley County	18		18	48	15	5	2	32	57	117	112	424
West Carroll SSD								20	41	39	35	135
White County								21	74	79	82	256
Williamson County								104	103	119	139	465
Wilson County									79	167	189	435
<b>TOTAL</b>	<b>318</b>	<b>273</b>	<b>1,092</b>	<b>2,195</b>	<b>2,631</b>	<b>2,404</b>	<b>2,345</b>	<b>7,599</b>	<b>12,234</b>	<b>17,081<sup>a</sup></b>	<b>17,668<sup>b</sup></b>	<b>66,098</b>

<sup>a</sup> The figures for 2007-2008 differ slightly from those presented in the Third Interim report because data from this year were cross-checked with data from 2008-2009 once the 2008-2009 data became available to SRG. As such, some 2007-2008 student records that had previously been deemed invalid are now considered valid, and vice versa.

<sup>b</sup> The total for 2008-2009 also includes two students from the Tennessee School for the Deaf.

## Appendix F. Pre-K Students with Assessment records by LEA, 2006-2009

As discussed earlier in this report, only a small percentage of students who participated in Pre-K were assessed in Grades K-2. Table F1 in Appendix F summarizes the number of Pre-K students for whom assessment records are available in Grades K-5 by LEA, which illustrates the trend. These tables provide the number of students at each grade level who participated in Tennessee's Pre-K program and for whom assessment data were available for analysis in this series of reports.

It is important to keep in mind that the actual numbers of students who attended Pre-K and then were administered assessments at any time in Grades K-5 will be greater in some instances than the numbers reported in Table F1. Table F1 includes only those students with both valid Pre-K and assessment records. If, for example, a student's Social Security Number was not included in the Pre-K demographic file, EIS data, and/or the assessment data, that student's Pre-K and assessment information could not be linked, and the student would not be included in Table F1 (and thus would not be included in analysis of Pre-K student outcomes). Because of size constraints, Table F1 includes only the past three school years. This information for the 2004-2005 school year can be found in Table 16 of the Annual Report (2008-2009) and in Appendix F of the Third Interim Report for the 2005-2006 school year.

**Table F1. Number of Pre-K Students Assessed in Grades K-5, 2006-2009**

System	Number of Pre-K Students Assessed by School System and Year																	
	2006-2007						2007-2008						2008-2009*					
	K	1	2	3	4	5	K	1	2	3	4	5	K	1	2	3	4	5
Alamo	38	0	0	0	2	0	57	30	0	0	0	2	62	56	29	0	1	0
Alcoa	0	2	1	6	0	0	0	20	1	1	4	0	0	21	15	2	1	5
Anderson County	0	0	0	24	20	8	0	0	0	25	22	15	0	0	0	23	23	24
Athens	0	1	1	3	0	0	0	25	1	3	4	0	0	62	24	0	1	3
Bedford County	0	0	0	5	3	2	0	0	0	5	4	3	0	0	0	2	5	4
Bells	0	0	1	1	0	1	0	3	0	2	2	0	0	26	18	2	2	2
Benton County	0	1	0	0	0	0	0	3	0	2	2	0	0	24	2	1	2	1
Bledsoe County	0	0	11	9	13	0	0	0	12	14	7	11	0	0	20	11	12	5
Blount County	0	0	69	56	56	37	0	0	48	65	63	52	0	0	61	48	62	65
Bradford	0	0	12	8	9	1	0	0	9	14	8	8	0	0	20	10	13	8
Bradley County	0	0	21	25	20	4	0	0	15	23	26	18	0	0	66	17	22	27
Bristol	0	22	21	20	17	1	0	21	20	21	19	18	0	43	23	21	20	19
Campbell County	0	11	11	18	12	0	0	47	11	11	15	14	0	0	0	10	13	14
Cannon County	22	3	1	2	1	1	39	21	4	1	1	0	53	32	20	3	1	1
Carroll County	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carter County	0	11	9	13	10	4	0	12	10	10	16	12	0	48	11	10	9	12
Cheatham County	0	1	0	2	2	0	0	2	1	4	3	2	0	0	0	1	2	3
Chester County	0	3	0	2	1	1	0	3	1	2	3	1	0	23	5	2	2	5
Claiborne County	0	0	14	22	18	8	0	0	17	13	22	16	0	0	43	18	13	19
Clay County	0	0	0	0	0	0	0	0	0	0	0	0	0	0	43	18	13	19
Cleveland	0	14	14	10	8	10	0	55	17	13	11	8	0	87	50	15	13	11
Clinton	0	8	6	5	2	5	0	0	0	6	4	4	0	0	20	9	4	4

Cont'd  System	Number of Pre-K Students Assessed by School System and Year																	
	2006-2007						2007-2008						2008-2009*					
	K	1	2	3	4	5	K	1	2	3	4	5	K	1	2	3	4	5
Cocke County	0	0	0	1	2	1	0	0	0	0	1	2	0	0	4	0	1	2
Coffee County	0	0	0	23	15	16	0	0	0	30	23	13	0	0	0	19	28	21
Crockett County	0	2	0	2	4	1	0	7	2	0	3	4	0	20	5	1	0	2
Cumberland County	0	0	1	4	2	0	0	81	0	1	4	4	0	118	61	1	2	6
Davidson County	0	0	0	206	169	21	0	0	0	187	200	155	0	0	0	156	189	203
Dayton	0	1	1	1	3	0	0	0	0	1	1	2	0	0	0	0	1	1
Decatur County	0	0	1	2	0	0	0	1	0	1	2	0	0	26	2	0	2	1
DeKalb County	0	14	26	24	14	4	0	38	30	26	25	16	0	0	20	25	26	25
Dickson County	0	0	21	11	14	2	0	0	0	20	13	13	0	0	0	16	19	11
Dyer County	0	48	37	44	29	6	0	107	47	35	44	28	0	108	95	41	36	44
Dyersburg	0	0	0	26	18	14	0	0	0	25	27	20	0	0	0	28	25	24
Elizabethton	0	0	29	26	22	22	0	35	20	29	21	22	0	45	31	19	30	25
Etowah	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Fayette County	68	48	46	41	10	0	131	73	48	49	40	11	124	107	55	45	52	38
Fayetteville	0	3	4	3	7	4	0	15	3	4	4	6	0	32	12	3	4	3
Fentress County	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1
Franklin	0	0	0	0	0	0	0	0	2	2	2	2	0	0	11	1	1	1
Franklin County	0	0	67	66	46	26	0	0	57	63	65	42	0	0	111	58	61	61
Gibson County Special	0	31	26	28	25	4	0	44	29	22	30	25	0	58	40	29	24	38
Giles County	1	4	2	5	3	0	0	4	5	4	4	3	0	0	4	7	4	2
Grainger County	31	1	0	4	0	0	68	36	2	0	4	2	0	0	28	2	1	5
Greene County	0	0	0	34	31	9	0	0	0	34	39	29	0	0	0	40	33	37
Greeneville	0	0	26	22	14	1	0	0	34	28	20	17	0	0	43	32	33	20
Grundy County	14	0	0	0	0	1	24	14	0	0	0	1	51	23	15	0	1	0
Hamblen County	0	0	4	6	0	3	0	0	3	7	6	0	0	0	47	6	3	5
Hamilton County	0	62	80	77	84	26	0	143	96	75	787	83	0	188	243	98	76	76
Hancock County	39	16	20	17	7	3	54	36	15	20	17	7	31	47	35	16	21	17
Hardeman County	0	0	0	1	1	0	0	0	0	2	0	1	0	0	0	4	2	0
Hardin County	0	0	2	0	0	0	0	0	0	3	1	0	0	0	0	2	4	1
Hawkins County	0	13	10	13	10	5	0	34	11	9	12	10	0	0	0	12	13	14
Haywood County	0	30	42	17	12	8	0	32	30	39	15	12	0	66	30	31	38	15
Henderson County	0	0	0	4	3	1	0	0	0	1	5	3	0	0	0	2	4	7
Henry County	35	13	12	17	10	6	43	32	7	9	16	8	55	34	24	8	9	16
Hickman County	30	3	1	6	4	0	0	0	0	1	5	3	0	0	0	4	1	4
Hollow Rock Bruceton	0	0	1	0	1	0	0	13	1	2	0	2	0	18	13	0	1	0
Houston County	0	1	0	0	2	0	0	27	1	0	1	1	0	45	27	1	0	1
Humboldt	0	35	32	14	24	9	0	46	27	33	11	25	0	52	37	29	30	9
Humphreys County	0	0	14	7	9	0	0	0	15	13	7	7	0	0	36	14	14	6
Huntingdon	34	1	2	3	2	5	52	31	1	3	3	1	55	43	26	2	2	2
Jackson County	0	11	7	7	6	0	0	21	10	8	7	7	0	18	18	8	8	7
Jefferson County	0	0	0	12	12	8	0	0	0	14	14	13	0	0	0	24	17	12
Johnson City	0	0	0	21	13	2	0	0	0	13	21	13	0	0	0	23	13	18
Johnson County	0	0	0	0	0	0	0	12	0	0	0	0	0	21	23	0	1	1

Cont'd  System	Number of Pre-K Students Assessed by School System and Year																	
	2006-2007						2007-2008						2008-2009*					
	K	1	2	3	4	5	K	1	2	3	4	5	K	1	2	3	4	5
Kingsport	0	0	0	26	16	16	0	0	0	17	27	17	0	0	0	14	16	26
Knox County	0	0	0	41	69	40	0	0	0	61	39	64	0	0	0	53	60	38
Lake County	24	15	20	27	8	1	33	29	18	20	27	9	34	31	22	17	20	26
Lauderdale County	0	0	0	14	7	4	0	0	0	18	11	7	0	0	0	21	20	12
Lawrence County	0	0	0	89	64	34	0	0	0	101	86	63	0	0	0	83	101	84
Lebanon	0	0	0	1	1	1	0	0	0	2	0	1	0	0	0	83	101	84
Lenoir City	0	0	0	27	23	4	0	0	0	30	26	24	0	0	0	2	3	0
Lewis County	39	3	2	4	2	0	62	38	2	2	5	2	0	0	0	22	32	25
Lexington	16	0	0	1	2	0	0	0	0	1	2	1	54	49	34	2	2	5
Lincoln County	0	0	0	17	17	10	0	0	0	11	15	19	0	0	12	0	1	2
Loudon County	0	6	35	40	23	14	0	70	18	38	38	22	0	0	0	16	11	13
Macon County	0	0	0	1	0	0	0	3	0	0	0	0	0	69	67	21	35	40
Madison County	0	84	99	71	39	10	0	146	89	94	70	39	0	0	127	88	100	76
Manchester	0	0	0	2	2	1	0	0	0	6	2	2	0	0	0	1	8	3
Marion County	47	1	2	2	4	0	0	0	2	1	1	3	0	0	32	3	1	2
Marshall County	0	2	0	4	2	1	0	8	2	2	5	2	0	0	8	0	2	5
Maryville	0	2	2	7	4	3	0	5	5	5	5	6	0	0	0	4	6	6
Maury County	0	0	0	63	54	3	0	0	0	46	62	53	0	0	0	67	47	66
McKenzie	17	2	2	2	0	0	22	18	4	1	3	0	18	31	13	3	1	5
McMinn County	0	10	15	7	7	1	0	55	11	13	6	7	0	0	52	13	10	6
McNairy County	0	0	0	21	14	9	0	0	0	15	21	15	0	0	0	12	15	21
Meigs County	0	0	3	3	1	0	0	0	2	3	3	0	0	0	0	0	2	3
Memphis	0	91	249	264	168	63	0	0	180	240	261	161	0	0	405	180	235	257
Milan	53	35	43	33	28	5	0	52	30	40	31	28	0	0	0	33	37	33
Monroe County	0	0	2	3	1	0	0	0	1	3	4	1	0	0	16	2	3	4
Montgomery County	0	0	0	5	6	0	0	0	0	6	4	5	0	0	0	1	2	6
Moore County	0	0	2	0	0	0	0	0	1	2	0	0	0	0	1	1	2	0
Morgan County	0	1	1	0	0	0	0	53	2	1	0	2	0	100	50	1	2	0
Murfreesboro	0	53	54	28	27	6	0	85	46	46	25	31	0	138	77	54	39	25
Newport	2	0	0	1	0	0	15	1	0	0	0	0	18	14	1	0	0	1
Oak Ridge	0	0	2	1	2	1	0	0	0	2	1	1	0	0	27	0	4	2
Obion County	18	1	7	3	9	0	49	11	0	6	2	10	105	41	16	1	6	1
Oneida	0	0	0	8	4	0	0	0	0	11	9	3	0	0	21	4	11	11
Overton County	0	0	0	4	2	0	0	0	0	3	5	2	0	0	0	4	2	5
Paris	0	0	0	12	8	3	0	0	0	15	11	6	0	0	0	7	15	12
Perry County	0	0	15	11	7	1	0	0	10	15	8	5	36	35	24	12	15	10
Pickett County	13	0	0	0	0	0	19	14	0	1	0	0	17	18	12	0	1	0
Polk County	0	0	1	2	2	0	0	0	1	1	4	2	0	0	21	2	1	3
Putnam County	0	10	18	56	27	5	0	20	10	78	58	25	0	22	15	59	81	57
Rhea County	0	0	0	18	11	5	0	0	0	25	18	14	0	0	0	15	26	17
Richard City	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2	0	0	0
Roane County	0	0	0	3	4	2	0	0	0	7	2	5	0	0	0	5	6	3
Robertson County	0	1	2	2	3	1	0	34	0	3	2	3	0	77	19	3	5	4

Cont'd  System	Number of Pre-K Students Assessed by School System and Year																	
	2006-2007						2007-2008						2008-2009*					
	K	1	2	3	4	5	K	1	2	3	4	5	K	1	2	3	4	5
Rogersville	0	0	3	4	3	0	0	0	0	3	5	3	0	0	11	2	2	6
Rutherford County	0	21	24	20	16	7	0	93	22	30	29	18	0	0	0	22	32	27
Scott County	0	41	32	40	20	0	0	83	40	33	37	20	0	98	81	38	33	37
Sequatchie County	0	4	4	15	17	5	0	0	2	7	14	18	18	1	0	4	6	15
Sevier County	0	20	13	19	16	10	0	72	21	13	15	17	0	77	63	20	13	16
Shelby County	0	0	0	46	24	11	0	0	38	38	46	28	0	0	82	40	38	45
Smith County	0	0	2	0	1	1	0	30	0	2	0	1	0	60	23	0	1	0
South Carroll	0	0	13	15	14	6	0	0	0	12	13	13	0	0	0	15	10	14
Stewart County	37	10	12	12	3	3	68	39	9	11	11	4	69	67	37	10	13	11
Sullivan County	0	0	0	34	22	5	0	0	0	39	35	22	0	0	0	25	39	37
Sumner County	0	0	0	8	7	0	0	0	0	4	11	8	0	0	0	4	1	11
Sweetwater	0	0	2	0	1	1	0	0	1	2	1	1	0	0	0	3	3	1
Tipton County	0	1	5	3	4	2	0	0	1	4	4	4	0	0	0	0	1	0
Trenton	0	0	0	20	4	1	0	0	0	15	15	2	0	0	0	1	0	2
Trousdale County	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0
Tullahoma	0	2	5	8	5	3	0	5	3	5	7	5	0	5	8	4	5	10
Unicoi County	0	0	17	25	23	7	0	0	0	18	21	23	0	0	0	28	17	23
Union City	19	0	3	5	12	1	37	14	0	5	7	10	31	24	10	0	6	5
Union County	0	0	0	2	1	1	63	24	3	4	2	0	0	0	0	2	4	1
Van Buren County	18	12	17	10	12	12	0	0	12	17	10	13	0	0	14	11	16	9
Warren County	0	0	0	6	3	1	0	0	0	3	5	4	0	0	0	5	3	5
Washington County	0	9	7	19	5	4	0	15	11	9	17	6	0	20	10	13	8	21
Wayne County	0	9	21	38	25	11	0	9	18	33	36	26	0	0	30	34	31	35
Weakley County	0	5	14	18	17	10	0	25	5	12	17	19	0	66	25	7	14	16
West Carroll Special	0	2	0	5	1	0	0	0	2	2	6	1	0	0	0	2	4	5
White County	0	2	4	6	2	2	0	25	2	4	4	2	0	72	24	2	5	4
Williamson County	0	0	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Wilson County	0	0	0	1	3	1	0	0	0	4	2	3	0	0	0	1	5	3
<b>TOTALS</b>	<b>615</b>	<b>869</b>	<b>1482</b>	<b>2333</b>	<b>1752</b>	<b>640</b>	<b>836</b>	<b>2221</b>	<b>1288</b>	<b>2369</b>	<b>2295</b>	<b>1729</b>	<b>831</b>	<b>2636</b>	<b>3144</b>	<b>2142</b>	<b>2372</b>	<b>2310</b>

\* The total numbers of students by grade level for 2008-2009 also include one student from the Tennessee School of the Blind (Grade 4) and three students from the Tennessee School of the Deaf (one in Grade 3 and two in Grade 5). The totals also include nine students (one in Grade 3, four in Grade 4, and four in Grade 5) who attended private schools and thus cannot be classified into a Tennessee school system.