

Assessing the Effectiveness of Tennessee's Pre-Kindergarten Program: Third Interim 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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Table of Contents

Executive Summary	5
Evaluating Tennessee’s Pre-K Program: Summary of Findings to Date	7
Project Overview.....	7
Summary of Findings to Date	8
Objectives of the Present Report	9
Research Design	9
Methodology	9
<i>Data Sources</i>	10
1. Pre-Kindergarten Demographic File	10
2. Education Information System Data	10
3. Student Assessment Data	11
<i>Sampling Strategy</i>	12
<i>Analytic Approach</i>	14
<i>Analysis</i>	17
Results	18
Short-term Effects of Pre-K Participation.....	18
Long-term Effects of Pre-K Participation	22
Characteristics of School Systems Attended by Pre-K Students.....	25
General Summary and Conclusions	27
Appendix A. Research Design	28
Appendix B. Data Management	31
Appendix C. Technical Specification of Models	34
Appendix D. Means, <i>p</i>-values, and Effect Sizes for Analyses Reported	36
Appendix E. Pre-K Participation by LEA, 1998-2008	40
Appendix F. Pre-K Students with Assessment records in Grades K-5 by LEA, 2005-2008	44
Appendix G. Pre-K Participation and Kindergarten Assessment Records by LEA, 2004-2008 .	48
Appendix H. Characteristics of School Systems in Tennessee	51

Executive Summary

The State of Tennessee has commissioned an evaluation of the effectiveness of its Pre-Kindergarten (Pre-K)¹ 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 Third Interim Report is to analyze student outcomes in Kindergarten through Fifth Grade from the 2007-2008 academic year. Included in the analysis are the outcomes of criterion-referenced assessments completed by Fifth Grade students who participated in Pre-K in 2001-2002, Fourth Grade students who participated in Pre-K in 2002-2003, and Third Grade students who participated in Pre-K in 2003-2004. Also included in the present report are norm-referenced outcomes for Second Grade students who participated in Pre-K in 2004-2005, First Grade students who participated in Pre-K in 2005-2006, and Kindergarten students who participated in Pre-K in 2006-2007.

Although the overall evaluation methodology, sampling, and data management followed the approach taken in previous reports in this series, the analytic approach differed slightly, given that only one year of student outcome data was under study. 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.

As previous reports in this series have found, there are positive effects on these outcomes associated with participation in Pre-K, although they are for the most part limited to economically disadvantaged students (i.e., students who received free or reduced-price lunch) and are evident primarily in Kindergarten and First Grade. The analysis of 2007-2008 student outcomes was consistent with this general trend. Positive effects of Pre-K participation 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. Also as found previously, the magnitude of these effects is small—an estimated relative difference of between 6-7 points on these assessments. Effect sizes (Cohen's *d*) are less than 0.1, or an average change of approximately one-tenth of one standard deviation. Positive effects associated with Pre-K participation were also identified in First Grade among economically disadvantaged students in Reading, Language Arts, Mathematics, Math Computation, and Science. 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 Free/Reduced Price Lunch.

Among students who completed the Second Grade in 2007-2008, there were no significant effects for any assessment associated with Pre-K participation. This general pattern of results is consistent with the pattern of convergence noted in previous reports, such that effects associated with Pre-K participation tend to diminish over time.

¹ 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.

It is worth noting that students in the Second Grade in 2007-2008 would have participated in Pre-K in 2004-2005, prior to program expansion and curricular alignment. However, these students would have been assessed in Kindergarten in 2005-2006 and again in First Grade in 2006-2007; both of these assessments were included in analyses performed for the 2008 Annual Report, and both of which indicated positive effects associated with Pre-K participation in Kindergarten and First Grade, particularly among economically disadvantaged students. The lack of statistically significant differences among economically disadvantaged students in this analysis further suggests that the effects of Pre-K may diminish by the Second Grade.

Analyses of student outcomes in higher grades (3-5) revealed no systematic differences attributable to Pre-K participation, although among economically disadvantaged students, Pre-K participants scored slightly higher on average than non-Pre-K participants in Third Grade Reading scores. Pre-K participation was not uniquely associated with significantly higher scores for any other assessment in Third, Fourth, or Fifth Grade.

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)				
Reporting Stage	First Interim Report						Second Interim Report			2008 Annual Report/ Third Interim Report	2009 Annual Report/ Final Report	

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

Program Year	Students Served	Number of Classrooms
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	17,308	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 grades 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 Three-Five, 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 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 FRPL 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 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.

Objectives of the Present Report

This Third Interim Report focuses on one year of assessment data, 2007-2008. Included in the analysis are the outcomes of criterion-referenced assessments completed by Fifth Grade students who participated in Pre-K in 2001-02, Fourth Grade students who participated in Pre-K in 2002-03, and Third Grade students who participated in Pre-K in 2003-04. Also included in the present report are norm-referenced outcomes for Second Grade students who participated in Pre-K in 2004-05, First Grade students who participated in Pre-K in 2005-06, and Kindergarten students who participated in Pre-K in 2006-07 (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.² 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 2007-2008 and student demographic information from TDOE's Education Information System (EIS) for 2007-2008. 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

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

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 2007-2008 school year.

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 2005-2006. The value of this database for this current report is that it identifies Pre-K participation among students in Grades 2-5 in 2007-2008.

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 2006-2007.³

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

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 2007-2008 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 subject areas: reading/language arts, mathematics, science, and social studies, along with composite scores by academic year.⁴

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 Reading, Language Arts, and Mathematics. At First Grade, the test includes Reading, Language Arts, Mathematics, Science, Social Studies, Word Analysis, Vocabulary, and Math Computation. The Second Grade test includes all these subjects and also incorporates Spelling. 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. 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.⁵ Tennessee students are assessed each spring.

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.

Because there are significant conceptual and practical differences in the nature of the CRT and NRT assessments, longitudinal analyses across these measures are not feasible. For this reason, we will examine short-term (Grades K-2) and long-term (Grades 3-5) outcomes among Pre-K and non-Pre-K participants separately.

⁴ See Table 13 on page 17 for a list of all specific assessments administered in Grades K-5.

⁵ Note: The scope of the present analysis is focused exclusively on student performance in grades K-5.

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 Local Education Agency (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 very similar as those discussed in the Second Interim Report; the main difference is that the current report includes only one year of data, whereas the Second Interim Report included three years, which necessitated some additional management steps. 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 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, as well as the current report, 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 836 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 1,672 Kindergarten non-Pre-K students. As Table 5 indicates, 66.3% 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	836	1,108	66.3%
First	2,221	2,147	96.7%
Second	1,288	1,213	94.2%
Third	2,369	2,342	98.9%
Fourth	2,295	2,277	99.2%
Fifth	1,729	1,704	98.6%

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 4.0% 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 (10,738 students) and non-Pre-K group (10,791 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 2007-2008 according to the assessment dataset, and/or while attending Pre-K (according to the EIS). Table 6 summarizes students' FRPL status overall and in the Pre-K and non-Pre-K groups. The percentage of students who received FRPL is the same for 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	79.2%	79.2%	79.2%
No FRPL	20.8%	20.8%	20.8%
Total	100.0% (21,529)	100.0% (10,738)	100.0% (10,791)

- 2. Race** (white/non-white). See page 12 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. A chi-square test indicated that the Pre-K group has a statistically significantly higher proportion of non-white students than the non-Pre-K group. However, race will be controlled for in the analysis of assessment scores and thus this difference will be accounted for.

Table 7. Race of Pre-K and Non-Pre-K Students⁶

	Overall	Pre-K	Non-Pre-K
White	65.0%	64.3%	65.7%
Non-white	35.0%	35.7%	34.3%
Total	100.0% (21,509)	100.0% (10,718)	100.0% (10,791)

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	51.8%	51.5%	52.1%
Female	48.2%	48.5%	47.9%
Total	100.0% (21,515)	100.0% (10,724)	100.0% (10,791)

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 2007-2008 and/or while in Pre-K according to the assessment dataset and/or the EIS data. 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.

⁶ The non-white group is comprised of the following groups: Black (Pre-K = 31.4%, Non-Pre-K = 30.6%, Overall = 31.0%), Hispanic (Pre-K = 3.7%, Non-Pre-K = 3.2%, Overall = 3.4%), American Indian/Native American (Pre-K = 0.1%, Non-Pre-K = 0.1%, Overall = 0.1%), and Asian/Pacific Islander (Pre-K = 0.5%, Non-Pre-K = 0.4%, Overall = 0.5%).

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

	Overall	Pre-K	Non-Pre-K
Yes	18.7%	20.2%	17.1%
No	81.3%	79.8%	82.9%
Total	100.0% (21,529)	100.0% (10,738)	100.0% (10,791)

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.

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

	Overall	Pre-K	Non-Pre-K
Native English Speaker	90.6%	90.2%	90.9%
Non-Native English Speaker	9.4%	9.8%	9.1%
Total	100.0% (21,449)	100.0% (10,722)	100.0% (10,727)

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 190 students total, or 0.8% of students were reported to have missed more than 46 days in a given school year) and the numbers ranged much higher than possible (e.g., up to 243 days absent in a single 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. 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

	Overall	Pre-K	Non-Pre-K
Mean (days)	9.14	8.89	9.30
Total (students)	21,449	10,722	10,727

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.

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 Arts	X	X	X			
Math Computation		X	X			
Mathematics	X	X	X	X	X	X
Reading	X	X	X	X	X	X
Science		X	X	X	X	X
Social Studies		X	X	X	X	X
Spelling			X			
Vocabulary		X	X			
Word Analysis		X	X			

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 again 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. Sample sizes, means (model-implied scores), *p*-values, and effect sizes for all comparisons are reported in Appendix D.

Students who completed Kindergarten in 2007-2008 would have participated in Pre-K in 2006-2007. Overall, on end-of-year assessments administered in Kindergarten in 2008, Pre-K participants did not score higher, in the aggregate, than a matched sample of non-Pre-K participants in Reading, Language Arts, or Mathematics (see Table 14). 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 – 2007), 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 6-7 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 in Reading, Language Arts, and Mathematics were *not* statistically significant in these analyses. Table 13 presents estimated means for Kindergarten assessments.⁷

⁷ 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.

**Table 13. Model-Implied Adjusted Mean Scores for Pre-K and Non-Pre-K Students—
Kindergarten 2007-2008**

Assessment	Group					
	Pre-K	Non-Pre-K	Pre-K FRPL	Non-Pre-K FRPL	Pre-K No FRPL	Non-Pre-K No FRPL
Kindergarten Reading	543.64	540.96	536.98	534.30	550.30	547.61
Kindergarten Language Arts	542.43	538.75	534.11**	529.10**	550.75	548.39
Kindergarten Mathematics	502.14	498.36	494.37**	488.03**	509.91	508.69

* 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. In addition to Reading, Language Arts, and Mathematics, students in the First Grade also complete Norm-Referenced Assessments in Vocabulary, Word Analysis, Math Computation, Social Studies, and Science. As found in previous reports, 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 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 Reading, Language Arts, Mathematics, Math Computation, and Science 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.

Students who completed the First Grade in 2007-2008 would have participated in Pre-K in 2005-2006 and Kindergarten in 2006-2007. Thus, at least some of these students were included in analyses of Kindergarten assessments conducted for the 2008 Annual Report. Those analyses also indicated a positive effect of Pre-K participation overall and among economically disadvantaged students in Reading, Language Arts, and Mathematics.

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 2007-2008**

Assessment	Group					
	Pre-K	Non-Pre-K	Pre-K FRPL	Non-Pre-K FRPL	Pre-K No FRPL	Non-Pre-K No FRPL
First Grade Reading	586.25*	582.78*	579.50**	576.95**	593.00	588.61
First Grade Language Arts	584.73*	580.31*	575.59**	572.09**	593.87	588.52
First Grade Mathematics	530.57*	525.00*	523.01**	517.18**	538.12	532.81
First Grade Math Computation	491.28	488.37	486.57**	482.79**	496.00	493.95
First Grade Science	559.29	555.94	556.20**	552.01**	562.39	559.88
First Grade Social Studies	580.95	577.86	575.09	572.74	586.81	582.97
First Grade Vocabulary	551.78	549.68	543.86	540.85	559.69	558.52
First Grade Word Analysis	579.65	577.79	573.33	570.61	585.97	584.97

* 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).

Among students who completed the Second Grade in 2007-2008, there were no significant effects for any assessment suggesting more favorable outcomes associated with Pre-K participation. This general pattern of results is consistent with the pattern of convergence noted in previous reports, such that effects associated with Pre-K participation tend to diminish over time.

It is worth noting that students in the Second Grade in 2007-2008 would have participated in Pre-K in 2004-2005, prior to program expansion and curricular alignment. However, these students would have been assessed in Kindergarten in 2005-2006 and again in First Grade in 2006-2007; both of these assessments were included in analyses performed for the 2008 Annual Report, and both of which indicated positive effects associated with Pre-K participation in Kindergarten and First Grade, particularly among economically disadvantaged students. The lack of statistically significant

differences among economically disadvantaged students in this analysis further suggests that the effects of Pre-K generally diminish by the Second Grade.

For one assessment, math computation, non-Pre-K students scored higher, on average, than Pre-K students in the group of students that had not received FRPL. This may be a spurious effect, or it may reflect greater variability in the non-Pre-K/no FRPL group. It is worth noting that at least some portion (if not all) of the Pre-K students has some identifiable (although not necessarily economic) risk factors. Students in the non-FRPL comparison group, on the other hand, have no identified disadvantage (economic or otherwise).

Table 15 presents the estimated means of the Second Grade assessments.

**Table 15. Model-Implied Adjusted Mean Scores for Pre-K and Non-Pre-K Students—
Second Grade 2007-2008**

Assessment	Group					
	Pre-K	Non-Pre-K	Pre-K FRPL	Non-Pre-K FRPL	Pre-K No FRPL	Non-Pre-K No FRPL
Second Grade Reading	611.21	612.06	605.92	603.97	616.50	620.15
Second Grade Language Arts	613.11	612.02	606.38	604.57	619.85	619.47
Second Grade Mathematics	562.65	563.18	557.28	554.92	568.02	571.44
Second Grade Math Computation	538.69	542.93	535.14	533.46	542.25***	552.40***
Second Grade Science	585.92	587.36	579.64	577.45	592.20	597.26
Second Grade Social Studies	606.62	608.37	598.07	596.20	615.18	620.54
Second Grade Spelling	572.84	572.73	563.64	563.99	582.03	581.46
Second Grade Vocabulary	591.72	594.12	585.20	584.24	598.24	603.99
Second Grade Word Analysis	613.99	614.54	608.62	607.00	619.37	622.08

* 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 Three through Five again sought to determine whether there were systematic significant differences to indicate a long-term advantage associated with Pre-K participation (see Tables 17 - 19). Analysis of Third Grade Reading scores indicated that among economically disadvantaged students, Pre-K participants scored slightly higher on average than non-Pre-K participants. Overall, however, 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. Thus, regardless of Pre-K participation, FRLP status does appear to impact assessments in the grade levels, as was found in previous reports.

Also as observed in previous analyses conducted in the course of this project, some differences were observed at higher grade levels among Pre-K and non-Pre-K students who did not receive FRPL. 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). Consistent with the findings reported in the 2008 Annual Report, for example, fourth grade students who did not participate in Pre-K scored slightly higher than the Pre-K students in Reading and Science. It is worth noting that this same pattern of results was observed for these students when they were assessed in the Third Grade in 2006-2007.

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 2007-2008**

Assessment	Group					
	Pre-K	Non-Pre-K	Pre-K FRPL	Non-Pre-K FRPL	Pre-K No FRPL	Non-Pre-K No FRPL
Reading	483.89	483.61	480.10**	478.03**	487.68	489.19
Mathematics	471.77	471.84	468.37	466.77	475.17	476.92
Social Studies	198.93	199.15	195.91	195.79	201.94	202.50
Science	198.85	199.17	196.35	195.95	201.34	202.38

Note: Growth curve models based on a minimum sample size of 15,138 children.

* 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 2007-2008**

Assessment	Group					
	Pre-K	Non-Pre-K	Pre-K FRPL	Non-Pre-K FRPL	Pre-K No FRPL	Non-Pre-K No FRPL
Reading	491.39*	493.95*	487.41	487.09	495.38***	500.80***
Mathematics	486.26	487.14	482.56	481.03	489.96	493.25
Social Studies	202.58	203.37	199.52	199.18	205.64	207.56
Science	199.84	201.07	197.16	197.01	202.51***	205.13***

Note: Growth curve models based on a minimum sample size of 15,138 children.

* 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 2007-2008**

Assessment	Group					
	Pre-K	Non-Pre-K	Pre-K FRPL	Non-Pre-K FRPL	Pre-K No FRPL	Non-Pre-K No FRPL
Reading	510.32	511.49	506.14	505.01	514.51	517.96
Mathematics	505.06*	507.78*	500.22	500.85	509.90***	514.71***
Social Studies	204.04	204.98	201.05	200.97	207.02	208.99
Science	202.82	204.15	199.71	199.80	205.92***	208.51***

Note: Growth curve models based on a minimum sample size of 15,138 children.

* 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).

Characteristics of School Systems Attended by Pre-K Students

A relevant question in exploring the research objectives for this evaluation is what are the characteristics of school systems attended by Pre-K students? Further, given that only a small percentage of school systems administer assessments in Kindergarten – Second Grade, what are the characteristics of these school systems, and what are the implications for the results of this evaluation?

Table E1 in Appendix E summarizes the number of students participating in the Voluntary Pre-K program each academic year by LEA (we have placed this table in an appendix due to its size, as well as Tables F1 and G1). This information was first presented in the 2008-2009 Annual Report (submitted by SRG in September 2009) for the 1998-1999 through 2005-2006 school years and we have added data for the 2006-2007 and 2007-2008 school years. As Table E1 indicates, the Pre-K program experienced continuous growth statewide between 1998-1999 and 2005-2006, with the largest increases occurring in the 2000-2001 and 2001-2002 school years, and 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 2007-2008.

As discussed earlier, only a small percentage of students who participated in Pre-K were assessed in Grades K-2. The table 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.

Because the results of this evaluation to date have found that effects of Pre-K are most evident in Kindergarten, a logical question then is which school systems conduct assessments in Kindergarten, and what are the characteristics of these school systems? Table G1 in Appendix G summarizes, by school system, the number of students who participated in Pre-K in a particular school system for Pre-K program years 2004-2005 and 2005-2006. These students would have been eligible to go on to Kindergarten the following year. Table G1 also summarizes the number of Pre-K participants for whom valid assessment records are available in Kindergarten.

To synthesize the information presented in Tables E1-G1, although nearly all of Tennessee school systems are represented in the present evaluation's analysis of academic achievement, only 12% of school systems are represented in the analysis of *Kindergarten* assessments. This is largely a result of the infrequency with which assessments are conducted in Kindergarten. A similar pattern exists for First and (to a lesser extent) Second Grade. A logical question, then, is what are the characteristics of these school systems? What systematic differences might there be between districts that assess (particularly in Kindergarten) and districts that do not assess in these grades?

To attempt to address this question, descriptive/demographic data for Tennessee's school systems were obtained from the National Center for Education Statistics and the 2000 Census. Given the priorities and target populations of the Voluntary Pre-K program as well as results of other conceptually similar studies on the impact of Pre-K participation, we identified a subset of "risk factors" to examine to determine whether there were systematic differences between the districts represented in the present evaluation (because they chose to conduct assessments in Grades K-2), and whether these characteristics might be controlled for in analysis of student academic achievement.

The table in Appendix H summarizes the characteristics of school systems according to their urban-centric locale, percent of children receiving FRPL, percent of minority/nonwhite students in the district, and total expenditures per student (variables from NCES), as well as the median household income in the district and the percent of children living in poverty in the district (variables from the 2000 Census, obtained from NCES).

The analyses of child outcomes for academic year 2007-2008 were re-analyzed using these district-level variables as statistical controls to adjust for socioeconomic and demographic variation due to school district. Overall, controlling for these variables in the analysis produced results that were virtually identical to the results reported earlier in this report, with only three exceptions (out of 96 comparisons). Two previously statistically significant, but weak effects finding an advantage of students who attended Pre-K (Kindergarten Language Arts and Fifth Grade Science) were found to be non-significant. These are denoted in Appendix D. It should be noted that despite these changes in the results of the analysis, the overall effect (i.e., the effect size) of these variables was relatively unchanged. Conversely, one previously statistically non-significant effect finding an advantage of economically disadvantaged students who attended Pre-K (First Grade Word Analysis) was found to be statistically significant after controlling for district level effects, suggesting more favorable outcomes for this assessment associated with Pre-K participation. This effect was also found to be objectively small and remained unchanged with the inclusion of additional statistical controls. There were no other differences in the outcome of the analyses due to the incorporation of these district-level controls.

General Summary and Conclusions

The present interim report adds one more year's results to the evaluation to date, and again reveals a basically similar pattern of results: Pre-K participation is associated with small but reliable effects on student outcomes in Kindergarten and First Grade, primarily among economically disadvantaged students, although by Second Grade the difference between Pre-K students and a reasonably comparable group of non-Pre-K students is negligible. This report provides the first indication, however, that some positive effects associated with Pre-K participation may extend beyond the second grade, as one effect identified in previous reports did appear to persist into Third Grade. However, on the whole, the differences between Pre-K and non-Pre-K students in Grades Three – Five are negligible.

Taken together with the results of previous reports in this series, the results suggest a consistent pattern in student outcomes. However, as the Pre-K program experienced significant growth, stabilized, and aligned to state standards prior to 2005, only two groups of students studied in this report—Kindergarten and First Grade students—actually participated in the Pre-K program as it currently exists in Tennessee today. Therefore, as consecutive years of data become available and are incorporated into the analysis, the comparisons are likely to more accurately reflect the impact of the Pre-K program in its present state. As more years of data are compiled, the state of Tennessee will be better positioned to address the question of whether the program changes that have taken place since 2005 are potentially associated with longer-lasting advantages in student outcomes. More specifically, as the students who participated in Pre-K after the 2005 curricular alignment and program expansion move through Second Grade and on into higher grades, is the relative advantage identified here more likely to persist? Although this series of reports is due to conclude with analysis of the 2008-2009 academic year, it will remain a research question for the State of Tennessee as to whether the pattern observed in this evaluation—largely the result of participation in the Pilot Pre-K program—remains the same or shows evidence of change 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.⁸ 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.⁹ 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.¹⁰ 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.¹¹

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

⁸ Cook, T.D. & Campbell, D.T. (1979). Quasi-Experimentation: Design and Analysis for Field Settings. Rand McNally, Chicago, Illinois.

⁹ See Appendix A for program overview including eligibility requirements.

¹⁰ Campbell, D. T., & Stanley, J. C. (1966). Experimental and quasi-experimental designs for research. Chicago: Rand McNally.

¹¹ 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.¹² 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.¹³ 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.

¹² Gribbons, B., & Herman, J. (1997). True and quasi-experimental designs. Washington, DC: ERIC Clearinghouse on Assessment and Evaluation. [ED421483]

¹³ 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 2007-2008 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 69,497 cases in the NRT dataset and 218,960 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 2005-2006 and 2006-2007 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 exclude assessment records with duplicate encrypted Social Security Numbers (ESSNs).

The next step in preparing the data for analysis was to identify and exclude records with duplicate encrypted Social Security Numbers (ESSNs). Each year the assessment data contained 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 in 2005-2006 or 2006-2007, both records were excluded from analysis. It should be noted however, cases with duplicate ESSNs represented a very small proportion of all cases.

3. Identify and flag records for students with assessment scores for more than one grade level.

The third step was to identify and flag 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.¹⁴ 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 demographic information. Again, efforts were made to retain as many valid Pre-K student records by individually cross-checking these students' records with the Pre-K demographic file and EIS data. Because it was not feasible to individually check non-Pre-K records with multiple sets of

¹⁴ This was verified by the Senior Executive Director for the TDOE Office of Assessment, Evaluation and Research.

scores in the same school year at different grade levels, these records were excluded from the analysis.

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 in 2005-2006 and/or 2006-2007.

Following the same approach outlined in step four, 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 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 TN school system), or new students entering the TN 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 2007-2008

Year & Number of Pre-K Participants in PKD File or EIS	Number and Percent of Pre-K Students Assessed in Each Grade
2001-2002 N = 2,195	Grade 5: 1,729 (78.8%)
2002-2003 N = 2,631	Grade 4: 2,295 (87.2%)
2003-2004 N = 2,404	Grade 3: 2,369 (98.5%)
2004-2005 N = 2,345	Grade 2: 1,288 (54.9%)
2005-2006 N = 7,559	Grade 1: 2,221 (29.4%)
2006-2007 N = 12,234	Grade K: 836 (6.8%)

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, π_{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 $\sum_{j=1}^J x_{ij} = 0$.

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 σ .

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 π_{0sd} and π_{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., π_{0sd}) is a linear combination of the overall mean score within school district d , β_{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 τ_{00} (see Equation 4). As can be seen in Equation 3, the effect of the j^{th} child-level predictor () is assumed to be a function of school district d 's effect for the j^{th} predictor ().

Level 3

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

$$\beta_{00d} = \mu_{00} + \sum_{q=1}^Q \gamma_{00q} \alpha_{dq} + \delta_{00d} \quad (5)$$

and

$$\beta_{j0d} = \mu_{j0} + \sum_{q=1}^Q \gamma_{j0q} \alpha_{dq} + \delta_{j0d} \quad (6)$$

Equation 5 states that the effect of being in district d () is a linear combination of the overall mean score () conditioned on Q district level predictors (), and a district-specific deviation () from the overall mean score. Equation 5 also states that the effect of the j^{th} child-level predictor () is a linear combination of the overall effect of the j^{th} predictor () 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:

$$\quad (7)$$

where all deviations are distributed as described in Equations 2, 4, and 6. Cross-level interactions 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:

$$\quad (8)$$

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	Reading	Overall	543.64	540.96	0.146	0.02
		FRPL Only	536.98	534.30	0.155	0.02
		Non-FRPL Only	550.30	547.61	0.396	0.01
	Language Arts	Overall	542.43	538.75	0.108	0.02
		FRPL Only †	534.11	529.10	0.032*	0.02
		Non-FRPL Only	550.75	548.39	0.548	0.01
	Mathematics	Overall	502.14	498.36	0.073	0.02
		FRPL Only	494.37	488.03	0.003*	0.03
		Non-FRPL Only	509.91	508.69	0.735	>0.01

† This comparison of Pre-K and non-Pre-K students who received FRPL was not found to be statistically significant after controlling for district-level socioeconomic characteristics. See page 26.

Grade Level	Assessment	Comparison	Model-Implied Adjusted Mean Scores		p -value	Effect Size (d)
			Pre-K	Non-Pre-K		
First Grade	Reading	Overall	586.25	582.78	0.017*	0.03
		FRPL Only	579.50	576.95	0.026*	0.02
		Non-FRPL Only	593.00	588.61	0.101	0.02
	Language Arts	Overall	584.73	580.31	0.014*	0.03
		FRPL Only	575.59	572.09	.014*	0.03
		Non-FRPL Only	593.87	588.52	0.107	0.02
	Mathematics	Overall	530.57	525.00	0.0008*	0.04
		FRPL Only	523.01	517.18	0.0001*	0.05
		Non-FRPL Only	538.12	532.81	0.082	0.02
	Math Computation	Overall	491.28	488.37	0.127	0.02
		FRPL Only	486.57	482.79	0.011*	0.03
		Non-FRPL Only	496.00	493.95	0.560	0.01

Grade Level	Assessment	Comparison	Model-Implied Adjusted Mean Scores		<i>p</i> -value	Effect Size (d)
			Pre-K	Non-Pre-K		
First Grade (cont'd)	Social Studies	Overall	580.95	577.86	0.071	0.02
		FRPL Only	575.09	572.74	0.080	0.02
		Non-FRPL Only	586.81	582.97	0.022	0.02
	Science	Overall	559.29	555.94	0.127	0.02
		FRPL Only	556.20	552.01	.015*	0.03
		Non-FRPL Only	562.39	559.88	0.533	0.01
	Vocabulary	Overall	551.78	549.68	0.282	0.01
		FRPL Only	543.86	540.85	0.047	0.03
		Non-FRPL Only	559.69	558.52	0.743	>0.01
	Word Analysis	Overall	579.65	577.79	0.260	0.01
		FRPL Only †	573.33	570.61	0.036	0.03
		Non-FRPL Only	585.97	584.97	0.741	>0.01

† The comparison of Pre-K and non-Pre-K students who received FRPL was found to be statistically significant after controlling for district-level socioeconomic characteristics. See page 26.

Grade Level	Assessment	Comparison	Model-Implied Adjusted Mean Scores		<i>p</i> -value	Effect Size (d)
			Pre-K	Non-Pre-K		
Second Grade	Reading	Overall	611.21	612.06	0.640	0.01
		FRPL Only	605.92	603.97	0.203	0.01
		Non-FRPL Only	616.50	620.15	0.269	0.01
	Language Arts	Overall	613.11	612.02	0.629	0.01
		FRPL Only	606.38	604.57	0.341	0.01
		Non-FRPL Only	619.85	619.47	0.927	>0.01
	Mathematics	Overall	562.65	563.18	0.797	>0.01
		FRPL Only	557.28	554.92	0.178	0.01
		Non-FRPL Only	568.02	571.44	0.364	0.01
	Math Computation	Overall	538.69	542.93	0.071	0.02
		FRPL Only	535.14	533.46	0.401	0.01
		Non-FRPL Only	542.25	552.40	0.016*	0.03
	Social Studies	Overall	606.62	608.37	0.423	0.01
		FRPL Only	598.07	596.20	0.311	0.01
		Non-FRPL Only	615.18	620.54	0.176	0.02
	Science	Overall	585.92	587.36	0.608	0.01
		FRPL Only	579.64	577.45	0.347	0.01
		Non-FRPL Only	592.20	597.26	0.318	0.01

Grade Level	Assessment	Comparison	Model-Implied Adjusted Mean Scores		p-value	Effect Size (d)
			Pre-K	Non Pre-K		
Second Grade <i>(cont'd)</i>	Spelling	Overall	572.84	572.73	0.970	>0.01
		FRPL Only	563.64	563.99	0.892	>0.01
		Non-FRPL Only	582.03	581.46	0.916	>0.01
	Vocabulary	Overall	591.72	594.12	0.314	0.01
		FRPL Only	585.20	584.24	0.640	0.01
		Non-FRPL Only	598.24	603.99	0.182	0.02
	Word Analysis	Overall	613.99	614.54	0.789	>0.01
		FRPL Only	608.62	607.00	0.353	0.01
		Non-FRPL Only	619.37	622.08	0.461	0.01

Grade Level	Assessment	Comparison	Model-Implied Adjusted Mean Scores		p-value	Effect Size (d)
			Pre-K	Non Pre-K		
Third Grade	Reading	Overall	483.89	483.61	0.781	>0.01
		FRPL Only	480.10	478.03	0.024*	0.02
		Non-FRPL Only	487.68	489.19	0.407	0.01
	Mathematics	Overall	471.77	471.84	0.939	>0.01
		FRPL Only	468.37	466.77	0.080	0.02
		Non-FRPL Only	475.17	476.92	0.332	0.01
	Social Studies	Overall	198.93	199.15	0.717	>0.01
		FRPL Only	195.91	195.79	0.836	>0.01
		Non-FRPL Only	201.94	202.50	0.609	>0.01
	Science	Overall	198.85	199.17	0.614	>0.01
		FRPL Only	196.35	195.95	0.486	0.01
		Non-FRPL Only	201.34	202.38	0.359	0.01

Grade Level	Assessment	Comparison	Model-Implied Adjusted Mean Scores		p-value	Effect Size (d)
			Pre-K	Non Pre-K		
Fourth Grade	Reading	Overall	491.39	493.95	0.009*	0.02
		FRPL Only	487.41	487.09	0.742	>0.01
		Non-FRPL Only	495.38	500.80	0.002*	0.03
	Mathematics	Overall	486.26	487.14	0.364	0.01
		FRPL Only	482.56	481.03	0.106	0.01
		Non-FRPL Only	489.96	493.25	0.052	0.02
	Social Studies	Overall	202.58	203.37	0.172	0.01
		FRPL Only	199.52	199.18	0.554	0.01
		Non-FRPL Only	205.64	207.56	0.058	0.02
	Science	Overall	199.84	201.07	0.043	0.02
		FRPL Only	197.16	197.01	0.796	>0.01
		Non-FRPL Only	202.51	205.13	0.014*	0.02

Grade Level	Assessment	Comparison	Model-Implied Adjusted Mean Scores		p-value	Effect Size (d)
			Pre-K	Non Pre-K		
Fifth Grade	Reading	Overall	510.32	511.49	0.300	0.01
		FRPL Only	506.14	505.01	0.308	0.01
		Non-FRPL Only	514.51	517.96	0.078	0.02
	Mathematics	Overall	505.06	507.78	0.015*	0.02
		FRPL Only	500.22	500.85	0.562	0.01
		Non-FRPL Only	509.90	514.71	0.013*	0.02
	Social Studies	Overall	204.04	204.98	0.155	0.01
		FRPL Only	201.05	200.97	0.910	>0.01
		Non-FRPL Only	207.02	208.99	0.090	0.02
	Science	Overall	202.82	204.15	0.056	0.02
		FRPL Only	199.71	199.80	0.902	>0.01
		Non-FRPL Only †	205.92	208.51	0.033*	0.02

† This comparison of Pre-K and non-Pre-K students who did not receive FRPL was not found to be statistically significant after controlling for district-level socioeconomic characteristics. See page 26.

Appendix E. Pre-K Participation by LEA, 1998-2008

Table E1 summarizes the number of students participating in the Voluntary Pre-K program each academic year by LEA. 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 or EIS 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.

Table E1. Number of Students Participating in Pre-K by School System, 1998-1999 to 2007-2008

School System	Number of Pre-K Students by School System and Year (Valid Records Only)										
	98-99	99-00	00-01	01-02	02-03	03-04	04-05	05-06	06-07	07-08	TOTAL 1998- 2008
Alamo								42	62	69	173
Alcoa								19	32	46	97
Anderson County	17	19	18	29	35	33	38	105	128	131	553
Athens								59	95	125	279
Bedford County										60	60
Bells								33	34	45	112
Benton County									26	43	69
Bledsoe County				17	14	11	17	38	67	69	233
Blount County	17	7	78	72	110	47	65	81	112	143	732
Bradford			1	14	16	14	14	35	19	32	145
Bradley County				36				62	181	271	550
Bristol			9	18		18	22	26	69	83	245
Campbell County				19	23	16	15	62	93	156	384
Cannon County								27	44	63	134
Carroll County											0
Carter County					33	*			46	45	124
Cheatham County								38	59	104	201
Chester County									20	43	63
Claiborne County	16	10	10	21	26	24	26	83	138	230	584
Clay County								34	40	39	113
Cleveland			33		34	53	44	119	120	105	508
Clinton								18	21	21	60
Cocke County									63	61	124
Coffee County	13	14	25	27	32	36	35	54	99	131	466
Crockett County									16	28	44
Cumberland County								105	146	222	473
Davidson County	9	4	59	218	243	183	175	383	690	930	2,894
Dayton								12	18	19	49
Decatur County									40	61	101
DeKalb County			6	25	34	34	30	59	66	76	330

School System	Number of Pre-K Students by School System and Year (Valid Records Only)										
	98-99	99-00	00-01	01-02	02-03	03-04	04-05	05-06	06-07	07-08	TOTAL 1998- 2008
Dickson County			11	10	22	15	19	40	72	93	282
Dyer County	15	17	34	47	57	56	56	134	123	126	665
Dyersburg				10	19	20	20	44	94	101	308
Elizabethton			42	36		42	42	57	63	78	360
Etowah									22	34	56
Fayette County				22	49	63	62	110	149	161	616
Fayetteville								19	37	60	116
Fentress County								46	92	113	251
Franklin								15	42	48	105
Franklin County	15	19	36	62	84	70	63	136	172	231	888
Gibson County SSD			5	37	32	35	36	55	63	108	371
Giles County										92	92
Grainger County								36	68	80	184
Greene County			16					99	249	298	662
Greeneville	3	2	20	63	76	83	87	109	57	97	597
Grundy County								14	33	62	109
Hamblen County								55	68	141	264
Hamilton County			48	92	99	97	107	320	474	725	1,962
Hancock County			14	12	23	17	24	60	57	39	246
Hardeman County								24	122	179	325
Hardin County								27	68	106	201
Hawkins County			5	12	16	9	17	35	71	77	242
Haywood County	28	21		27	27	30	30	32	78	121	394
Henderson County									1	92	93
Henry County	17		19	28	28	31	26	56	46	47	298
Hickman County								32	69	78	179
Hollow Rock Bruceton								20	18	20	58
Houston County								40	54	52	146
Humboldt			38	36	25	40	41	58	74	67	379
Humphreys County			5	3	17	19	16	77	113	148	398
Huntingdon								46	63	67	176
Jackson County			3	7	13	9	10	22	14	42	120
Jefferson County	12	10	12	6	30	67	23	100	116	149	525
Johnson City	12	11	13		40	25	27	36	41	72	277
Johnson County				27				29	51	48	155
Kingsport	16	16	28	31		21	30	65	88	111	406
Knox County	13	34	48	60	20	58	47	169	164	400	1,013
Lake County			*	15	38	20	20	34	34	43	204
Lauderdale County			19	*	11	22	18	86	137	179	472
Lawrence County	9	17	55	90	114	107	110	158	181	245	1,086
Lebanon								53	138	167	204
Lenoir City	17	30	15	35	51	36	33	36	38	43	472

School System	Number of Pre-K Students by School System and Year (Valid Records Only)										
	98-99	99-00	00-01	01-02	02-03	03-04	04-05	05-06	06-07	07-08	TOTAL 1998- 2008
Lewis County								41	61	54	156
Lexington								16	17	37	70
Lincoln County			19	26	25	20	20	36	139	137	422
Loudon County			15	19	35	22	20	92	118	153	474
Macon County									42	56	98
Madison County			20	53	65	91	94	152	252	307	1,034
Manchester								38	38	60	136
Marion County								57	79	85	221
Marshall County										42	42
Maryville								18	39	41	98
Maury County			6	78	87	59	64	65	156	191	706
McKenzie								19	21	21	61
McMinn County				14	13	15	9	50	93	186	380
McNairy County			15	20	21	15	21	81	107	138	418
Meigs County								43	78	69	190
Memphis	53	17	98	234	53	218	198	675	1,241	2,096	4,883
Milan	4	17		35	41	40	49	60	36	101	383
Monroe County								22	38	65	125
Montgomery County								41	260	431	732
Moore County										20	20
Morgan County								70	111	113	294
Murfreesboro				49		64	80	151	211	228	783
Newport									19	38	57
Oak Ridge								38	51	104	193
Obion County								20	39	103	162
Oneida								34	36	49	119
Overton County								60	109	97	266
Paris									59	63	122
Perry County			10	6	17	12	10	34	48	41	178
Pickett County								14	19	20	53
Polk County								34	61	81	176
Putnam County			16	45	90	89	66	247	313	343	1,209
Rhea County			11	23	20	22	19	54	83	91	323
Richard City										7	7
Roane County									106	127	233
Robertson County								38	110	191	339
Rogersville								14	13	14	41
Rutherford County			29		61	*		72	125	231	518
Scott County				42	49	43	52	123	125	160	594
Sequatchie County			13	14	16	10				20	73
Sevier County	14	8	14	3	20	*	20	94	80	108	361
Shelby County			2	72	272	21	18	95	158	259	897
Smith County								30	63	88	181

School System	Number of Pre-K Students by School System and Year (Valid Records Only)										
	98-99	99-00	00-01	01-02	02-03	03-04	04-05	05-06	06-07	07-08	TOTAL 1998- 2008
South Carroll			14	21	20	17	19	23	13	20	147
Stewart County			4	7	16	20	6	49	79	89	270
Sullivan County			10	28	95	38	21	63	80	125	460
Sumner County									1	2	3
Sweetwater								23	45	65	133
Tipton County								159	167	210	536
Trenton				9	20	20	15	35	62	61	222
Trousdale County										15	15
Tullahoma										81	81
Unicoi County			13	28	30	33	30	80	89	97	400
Union City								21	41	44	106
Union County								20	65	69	154
Van Buren County			22	16	15	22	21	22	21	28	167
Warren County								37	103	129	269
Washington County									1		1
Wayne County			18	41	44	47	46	84	101	114	495
Weakley County	18		18	48	15	5	2	32	57	118	313
West Carroll SSD								20	41	39	100
White County								21	74	79	174
Williamson County								104	103	120	327
Wilson County									79	169	248
TOTAL	318	273	1,092	2,195	2,631	2,404	2,345	7,599	12,234	17,231	48,322

Appendix F. Pre-K Students with Assessment records in Grades K-5 by LEA, 2005-2008

As discussed earlier, only a small percentage of students who participated in Pre-K were assessed in Grades K-2. Table F1 in Appendix E summarizes the number of Pre-K students for whom assessment records are available in Grades K-5 by LEA, which illustrates the trend. Again, 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.

Table F1. Number of Pre-K Students Assessed in Grades K-5, 2005-2008

System	Number of Pre-K Students Assessed by School System and Year																	
	2005-2006						2006-2007						2007-2008					
	K	1	2	3	4	5	K	1	2	3	4	5	K	1	2	3	4	5
Alamo	1	1	0	2	0	0	38	0	0	0	2	0	57	30	0	0	0	2
Alcoa	3	1	5	0	0	0	0	2	1	6	0	0	0	20	1	1	4	0
Anderson County	0	0	0	19	9	7	0	0	0	24	20	8	0	0	0	25	22	15
Athens	0	2	2	0	0	0	0	1	1	3	0	0	0	25	1	3	4	0
Bedford County	1	3	3	4	3	0	0	0	0	5	3	2	0	0	0	5	4	3
Bells	0	0	0	0	1	0	0	0	1	1	0	1	0	3	0	2	2	0
Benton County	0	0	2	0	0	0	0	1	0	0	0	0	0	3	0	2	2	0
Bledsoe County	0	13	9	13	1	0	0	0	11	9	13	0	0	0	12	14	7	11
Blount County	0	0	57	57	39	5	0	0	69	56	56	37	0	0	48	65	63	52
Bradford	0	0	10	7	1	2	0	0	12	8	9	1	0	0	9	14	8	8
Bradley County	0	0	28	20	5	1	0	0	21	25	20	4	0	0	15	23	26	18
Bristol	0	23	16	16	1	0	0	22	21	20	17	1	0	21	20	21	19	18
Campbell County	0	11	18	14	0	0	0	11	11	18	12	0	0	47	11	11	15	14
Cannon County	1	1	2	0	1	0	22	3	1	2	1	1	39	21	4	1	1	0
Carroll County	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carter County	12	6	14	10	4	2	0	11	9	13	10	4	0	12	10	10	16	12
Cheatham County	0	0	2	2	0	0	0	1	0	2	2	0	0	2	1	4	3	2
Chester County	1	2	2	2	0	0	0	3	0	2	1	1	0	3	1	2	3	1
Claiborne County	0	0	18	15	10	7	0	0	14	22	18	8	0	0	17	13	22	16
Clay County	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cleveland	0	15	12	7	11	0	0	14	14	10	8	10	0	55	17	13	11	8
Clinton	0	7	6	2	4	1	0	8	6	5	2	5	0	0	0	6	4	4
Cocke County	0	0	1	2	1	0	0	0	0	1	2	1	0	0	0	0	1	2
Coffee County	0	0	0	15	15	11	0	0	0	23	15	16	0	0	0	30	23	13
Crockett County	0	1	2	3	0	0	0	2	0	2	4	1	0	7	2	0	3	4
Cumberland County	0	1	3	2	0	0	0	0	1	4	2	0	0	81	0	1	4	4
Davidson County	0	0	209	164	18	7	0	0	0	206	169	21	0	0	0	187	200	155
Dayton	0	1	0	1	0	0	0	1	1	1	3	0	0	0	0	1	1	2

System	Number of Pre-K Students Assessed by School System and Year																	
	2004-2005						2005-2006						2007-2008					
	K	1	2	3	4	5	K	1	2	3	4	5	K	1	2	3	4	5
Decatur County	0	1	1	0	0	0	0	0	1	2	0	0	0	1	0	1	2	0
DeKalb County	0	30	24	19	3	0	0	14	26	24	14	4	0	38	30	26	25	16
Dickson County	0	0	13	11	2	0	0	0	21	11	14	2	0	0	0	20	13	13
Dyer County	0	42	46	27	6	0	0	48	37	44	29	6	0	107	47	35	44	28
Dyersburg	0	0	0	22	16	5	0	0	0	26	18	14	0	0	0	25	27	20
Elizabethton	0	0	26	24	21	0	0	0	29	26	22	22	0	35	20	29	21	22
Etowah	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fayette County	0	47	41	11	0	0	68	48	46	41	10	0	131	73	48	49	40	11
Fayetteville	0	6	3	10	2	0	0	3	4	3	7	4	0	15	3	4	4	6
Fentress County	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Franklin	0	0	0	1	0	0	0	0	0	0	0	0	0	0	2	2	2	2
Franklin County	0	0	61	46	25	14	0	0	67	66	46	26	0	0	57	63	65	42
Gibson County Special	0	28	29	23	3	0	0	31	26	28	25	4	0	44	29	22	30	25
Giles County	4	2	6	3	0	0	1	4	2	5	3	0	0	4	5	4	4	3
Grainger County	1	1	1	1	0	0	31	1	0	4	0	0	68	36	2	0	4	2
Greene County	0	0	0	28	10	2	0	0	0	34	31	9	0	0	0	34	39	29
Greeneville	0	0	21	12	2	4	0	0	26	22	14	1	0	0	34	28	20	17
Grundy County	0	0	0	0	1	0	14	0	0	0	0	1	24	14	0	0	0	1
Hamblen County	0	0	4	1	2	1	0	0	4	6	0	3	0	0	3	7	6	0
Hamilton County	21	51	74	84	26	3	0	62	80	77	84	26	0	143	96	75	787	83
Hancock County	18	21	17	7	5	0	39	16	20	17	7	3	54	36	15	20	17	7
Hardeman County	4	1	0	1	0	0	0	0	0	1	1	0	0	0	0	2	0	1
Hardin County	0	0	0	1	0	0	0	0	2	0	0	0	0	0	0	3	1	0
Hawkins County	0	12	12	9	4	1	0	13	10	13	10	5	0	34	11	9	12	10
Haywood County	0	44	18	13	8	21	0	30	42	17	12	8	0	32	30	39	15	12
Henderson County	1	0	2	4	1	0	0	0	0	4	3	1	0	0	0	1	5	3
Henry County	14	10	17	11	5	8	35	13	12	17	10	6	43	32	7	9	16	8
Hickman County	4	1	4	3	1	0	30	3	1	6	4	0	0	0	0	1	5	3
Hollow Rock Bruceton	0	1	0	1	0	0	0	0	1	0	1	0	0	13	1	2	0	2
Houston County	0	0	0	1	0	0	0	1	0	0	2	0	0	27	1	0	1	1
Humboldt	0	29	12	24	12	0	0	35	32	14	24	9	0	46	27	33	11	25
Humphreys County	0	15	6	9	0	0	0	0	14	7	9	0	0	0	15	13	7	7
Huntingdon	1	2	3	2	5	0	34	1	2	3	2	5	52	31	1	3	3	1
Jackson County	0	10	6	4	1	0	0	11	7	7	6	0	0	21	10	8	7	7
Jefferson County	0	0	0	10	10	8	0	0	0	12	12	8	0	0	0	14	14	13
Johnson City	0	0	0	13	2	6	0	0	0	21	13	2	0	0	0	13	21	13
Johnson County	0	0	1	0	0	0	0	0	0	0	0	0	0	12	0	0	0	0
Kingsport	0	0	0	16	19	9	0	0	0	26	16	16	0	0	0	17	27	17
Knox County	0	0	0	63	42	32	0	0	0	41	69	40	0	0	0	61	39	64
Lake County	17	24	26	8	1	1	24	15	20	27	8	1	33	29	18	20	27	9
Lauderdale County	0	0	0	8	4	1	0	0	0	14	7	4	0	0	0	18	11	7
Lawrence County	0	0	0	63	34	13	0	0	0	89	64	34	0	0	0	101	86	63

System	Number of Pre-K Students Assessed by School System and Year																	
	2004-2005						2005-2006						2007-2008					
	K	1	2	3	4	5	K	1	2	3	4	5	K	1	2	3	4	5
Lebanon	0	0	0	2	1	0	0	0	0	1	1	1	0	0	0	2	0	1
Lenoir City	0	0	0	23	4	21	0	0	0	27	23	4	0	0	0	30	26	24
Lewis County	0	2	6	4	0	0	39	3	2	4	2	0	62	38	2	2	5	2
Lexington	1	0	2	3	0	0	16	0	0	1	2	0	0	0	0	1	2	1
Lincoln County	0	0	0	15	10	0	0	0	0	17	17	10	0	0	0	11	15	19
Loudon County	0	12	41	22	12	2	0	6	35	40	23	14	0	70	18	38	38	22
Macon County	0	0	1	0	1	1	0	0	0	1	0	0	0	3	0	0	0	0
Madison County	0	100	72	37	11	2	0	84	99	71	39	10	0	146	89	94	70	39
Manchester	0	0	0	3	3	0	0	0	0	2	2	1	0	0	0	6	2	2
Marion County	1	2	2	4	0	0	47	1	2	2	4	0	0	0	2	1	1	3
Marshall County	0	0	3	1	1	0	0	2	0	4	2	1	0	8	2	2	5	2
Maryville	0	1	5	4	3	0	0	2	2	7	4	3	0	5	5	5	5	6
Maury County	0	0	15	53	3	0	0	0	0	63	54	3	0	0	0	46	62	53
McKenzie	1	2	2	0	0	0	17	2	2	2	0	0	22	18	4	1	3	0
McMinn County	0	15	9	8	2	0	0	10	15	7	7	1	0	55	11	13	6	7
McNairy County	0	12	22	13	10	0	0	0	0	21	14	9	0	0	0	15	21	15
Meigs County	0	0	1	0	0	0	0	0	3	3	1	0	0	0	2	3	3	0
Memphis	0	139	258	175	59	42	0	91	249	264	168	63	0	0	180	240	261	161
Milan	36	45	33	27	4	10	53	35	43	33	28	5	0	52	30	40	31	28
Monroe County	0	0	1	1	0	0	0	0	2	3	1	0	0	0	1	3	4	1
Montgomery County	0	0	0	2	0	0	0	0	0	5	6	0	0	0	0	6	4	5
Moore County	0	0	1	0	0	0	0	0	2	0	0	0	0	0	1	2	0	0
Morgan County	0	1	0	0	0	0	0	1	1	0	0	0	0	53	2	1	0	2
Murfreesboro	0	52	31	32	6	1	0	53	54	28	27	6	0	85	46	46	25	31
Newport	0	0	1	0	0	0	2	0	0	1	0	0	15	1	0	0	0	0
Oak Ridge	0	0	1	3	1	0	0	0	2	1	2	1	0	0	0	2	1	1
Obion County	1	7	4	7	0	0	18	1	7	3	9	0	49	11	0	6	2	10
Oneida	0	0	6	2	0	0	0	0	0	8	4	0	0	0	0	11	9	3
Overton County	0	0	0	2	0	0	0	0	0	4	2	0	0	0	0	3	5	2
Paris	0	0	0	9	4	2	0	0	0	12	8	3	0	0	0	15	11	6
Perry County	10	13	10	5	1	0	0	0	15	11	7	1	0	0	10	15	8	5
Pickett County	0	0	0	0	0	0	13	0	0	0	0	0	19	14	0	1	0	0
Polk County	0	0	2	2	0	0	0	0	1	2	2	0	0	0	1	1	4	2
Putnam County	0	0	0	29	5	0	0	10	18	56	27	5	0	20	10	78	58	25
Rhea County	0	0	19	14	5	0	0	0	0	18	11	5	0	0	0	25	18	14
Richard City	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Roane County	0	0	4	4	2	1	0	0	0	3	4	2	0	0	0	7	2	5
Robertson County	0	3	2	2	0	0	0	1	2	2	3	1	0	34	0	3	2	3
Rogersville	0	0	4	3	0	0	0	0	3	4	3	0	0	0	0	3	5	3
Rutherford County	0	19	15	11	5	3	0	21	24	20	16	7	0	93	22	30	29	18
Scott County	0	36	40	21	0	0	0	41	32	40	20	0	0	83	40	33	37	20
Sequatchie County	5	4	13	16	5	0	0	4	4	15	17	5	0	0	2	7	14	18

System	Number of Pre-K Students Assessed by School System and Year																	
	2004-2005						2005-2006						2007-2008					
	K	1	2	3	4	5	K	1	2	3	4	5	K	1	2	3	4	5
Sevier County	0	13	23	15	12	7	0	20	13	19	16	10	0	72	21	13	15	17
Shelby County	0	0	0	19	12	7	0	0	0	46	24	11	0	0	38	38	46	28
Smith County	0	0	0	2	0	0	0	0	2	0	1	1	0	30	0	2	0	1
South Carroll	0	12	15	13	6	0	0	0	13	15	14	6	0	0	0	12	13	13
Stewart County	8	11	14	2	3	0	37	10	12	12	3	3	68	39	9	11	11	4
Sullivan County	0	0	0	28	4	2	0	0	0	34	22	5	0	0	0	39	35	22
Sumner County	0	0	8	6	1	2	0	0	0	8	7	0	0	0	0	4	11	8
Sweetwater	0	0	0	0	0	0	0	0	2	0	1	1	0	0	1	2	1	1
Tipton County	0	5	4	4	2	0	0	1	5	3	4	2	0	0	1	4	4	4
Trenton	0	0	0	4	1	0	0	0	0	20	4	1	0	0	0	15	15	2
Trousdale County	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0
Tullahoma	0	4	8	4	3	1	0	2	5	8	5	3	0	5	3	5	7	5
Unicoi County	0	0	25	26	7	0	0	0	17	25	23	7	0	0	0	18	21	23
Union City	0	3	5	11	1	1	19	0	3	5	12	1	37	14	0	5	7	10
Union County	0	0	3	1	1	0	0	0	0	2	1	1	63	24	3	4	2	0
Van Buren County	13	17	11	12	10	0	18	12	17	10	12	12	0	0	12	17	10	13
Warren County	0	0	0	3	1	1	0	0	0	6	3	1	0	0	0	3	5	4
Washington County	0	7	18	5	2	2	0	9	7	19	5	4	0	15	11	9	17	6
Wayne County	0	0	29	23	11	0	0	9	21	38	25	11	0	9	18	33	36	26
Weakley County	0	11	15	20	7	1	0	5	14	18	17	10	0	25	5	12	17	19
West Carroll Special	0	0	5	1	0	2	0	2	0	5	1	0	0	0	2	2	6	1
White County	0	5	6	1	2	0	0	2	4	6	2	2	0	25	2	4	4	2
Williamson County	0	0	2	2	0	2	0	0	2	1	1	0	0	0	0	0	0	0
Wilson County	0	0	0	2	1	1	0	0	0	1	3	1	0	0	0	4	2	3
TOTALS	181	1019	1712	1734	643*	286	615	869	1482	2333	1752	640	836	2221	1288	2369	2295	1729

*The assessment dataset for 2004-2005 also included one student in Grade 4 from the West Tennessee School of the Deaf.

Appendix G. Pre-K Participation and Kindergarten Assessment Records by LEA, 2004-2008

Table G1 summarizes, by school system, the number of students who participated in Pre-K in a particular school system for Pre-K program years 2004-2005 and 2005-2006. These students would have been eligible to go on to Kindergarten the following year. Table G1 also summarizes the number of Pre-K participants for whom valid assessment records are available in Kindergarten. As discussed previously, this represents only a small number of Pre-K participants. Thus, many more students participate in Pre-K than are assessed in Kindergarten, and this is true across all school districts.

Table G1. Number of Pre-K Students Assessed in Kindergarten by School System, Pre-K Program Years 2005-2008

System	Number of Pre-K Students (Valid Records Only) 2004-2005	Number of Pre-K Students Assessed in Kindergarten 2005-2006	Number of Pre-K Students (Valid Records Only) 2005-2006	Number of Pre-K Students Assessed in Kindergarten 2006-2007	Number of Pre-K Students (Valid Records Only) 2006-2007	Number of Pre-K Students Assessed in Kindergarten 2007-2008
Alamo	0	1	42	38	62	57
Alcoa	0	3	19	0	32	0
Anderson County	38	0	105	0	128	0
Athens	0	0	59	0	95	0
Bedford County	0	1	0	0	0	0
Bells	0	0	33	0	34	0
Benton County	0	0	0	0	26	0
Bledsoe County	17	0	38	0	67	0
Blount County	65	0	81	0	112	0
Bradford	14	0	35	0	19	0
Bradley County	0	0	62	0	181	0
Bristol	22	0	26	0	69	0
Campbell County	15	0	62	0	93	0
Cannon County	0	1	27	22	44	39
Carroll County	0	0	0	0	0	0
Carter County	0	12	0	0	46	0
Cheatham County	0	0	38	0	59	0
Chester County	0	1	0	0	20	0
Claiborne County	26	0	83	0	138	0
Clay County	0	0	34	0	40	0
Cleveland	44	0	119	0	120	0
Clinton	0	0	18	0	21	0
Cocke County	0	0	0	0	63	0
Coffee County	35	0	54	0	99	0
Crockett County	0	0	0	0	16	0
Cumberland County	0	0	105	0	146	0
Davidson County	175	0	383	0	690	0
Dayton	0	0	12	0	18	0
Decatur County	0	0	0	0	40	0
DeKalb County	30	0	59	0	66	0
Dickson County	19	0	40	0	72	0
Dyer County	56	0	134	0	123	0
Dyersburg	20	0	44	0	94	0
Elizabethton	42	0	57	0	63	0
Etowah	0	1	0	0	22	0
Fayette County	62	0	110	68	149	131
Fayetteville	0	0	19	0	37	0
Fentress County	0	0	46	0	92	0
Franklin	0	0	15	0	42	0
Franklin County	63	0	136	0	172	0
Gibson County SSD	36	0	55	0	63	0
Giles County	0	4	0	1	0	0

<i>Cont'd</i>						
System	Number of Pre-K Students (Valid Records Only) 2004-2005	Number of Pre-K Students Assessed in Kindergarten 2005-2006	Number of Pre-K Students (Valid Records Only) 2005-2006	Number of Pre-K Students Assessed in Kindergarten 2006-2007	Number of Pre-K Students (Valid Records Only) 2006-2007	Number of Pre-K Students Assessed in Kindergarten 2007-2008
Grainger County	0	1	36	31	68	68
Greene County	0	0	99	0	249	0
Greeneville	87	0	109	0	57	0
Grundy County	0	0	14	14	33	24
Hamblen County	0	0	55	0	68	0
Hamilton County	107	21	320	0	474	0
Hancock County	24	18	60	39	57	54
Hardeman County	0	4	24	0	122	0
Hardin County	0	0	27	0	68	0
Hawkins County	17	0	35	0	71	0
Haywood County	30	0	32	0	78	0
Henderson County	0	1	0	0	1	0
Henry County	26	14	56	35	46	43
Hickman County	0	4	32	30	69	0
Hollow Rock Bruceton	0	0	20	0	18	0
Houston County	0	0	40	0	54	0
Humboldt	41	0	58	0	74	0
Humphreys County	16	0	77	0	113	0
Huntingdon	0	1	46	34	63	52
Jackson County	10	0	22	0	14	0
Jefferson County	23	0	100	0	116	0
Johnson City	27	0	36	0	41	0
Johnson County	0	0	29	0	51	0
Kingsport	30	0	65	0	88	0
Knox County	47	0	169	0	164	0
Lake County	20	17	34	24	34	33
Lauderdale County	18	0	86	0	137	0
Lawrence County	110	0	158	0	181	0
Lebanon	0	0	53	0	138	0
Lenoir City	33	0	36	0	38	0
Lewis County	0	0	41	39	61	62
Lexington	0	1	16	16	17	0
Lincoln County	20	0	36	0	139	0
Loudon County	20	0	92	0	118	0
Macon County	0	0	0	0	42	0
Madison County	94	0	152	0	252	0
Manchester	0	0	38	0	38	0
Marion County	0	1	57	47	79	0
Marshall County	0	0	0	0	0	0
Maryville	0	0	18	0	39	0
Maury County	64	0	65	0	156	0
McKenzie	0	1	19	17	21	22
McMinn County	9	0	50	0	93	0
McNairy County	21	0	81	0	107	0
Meigs County	0	0	43	0	78	0
Memphis	198	0	675	0	1,241	0
Milan	49	36	60	53	36	0
Monroe County	0	0	22	0	38	0
Montgomery County	0	0	41	0	260	0
Moore County	0	0	0	0	0	0
Morgan County	0	0	70	0	111	0
Murfreesboro	80	0	151	0	211	0
Newport	0	0	0	2	19	15
Oak Ridge	0	0	38	0	51	0
Obion County	0	1	20	18	39	49
Oneida	0	0	34	0	36	0
Overton County	0	0	60	0	109	0
Paris	0	0	0	0	59	0
Perry County	10	10	34	0	48	0
Pickett County	0	0	14	13	19	19

<i>Cont'd</i>						
System	Number of Pre-K Students (Valid Records Only) 2004-2005	Number of Pre-K Students Assessed in Kindergarten 2005-2006	Number of Pre-K Students (Valid Records Only) 2005-2006	Number of Pre-K Students Assessed in Kindergarten 2006-2007	Number of Pre-K Students (Valid Records Only) 2006-2007	Number of Pre-K Students Assessed in Kindergarten 2007-2008
Grainger County	0	1	36	31	68	68
Greene County	0	0	99	0	249	0
Greeneville	87	0	109	0	57	0
Grundy County	0	0	14	14	33	24
Hamblen County	0	0	55	0	68	0
Hamilton County	107	21	320	0	474	0
Hancock County	24	18	60	39	57	54
Hardeman County	0	4	24	0	122	0
Hardin County	0	0	27	0	68	0
Hawkins County	17	0	35	0	71	0
Haywood County	30	0	32	0	78	0
Henderson County	0	1	0	0	1	0
Henry County	26	14	56	35	46	43
Polk County	0	0	34	0	61	0
Putnam County	66	0	247	0	313	0
Rhea County	19	0	54	0	83	0
Richard City	0	0	0	0	0	0
Roane County	0	0	0	0	106	0
Robertson County	0	0	38	0	110	0
Rogersville	0	0	14	0	13	0
Rutherford County	0	0	72	0	125	0
Scott County	52	0	123	0	125	0
Sequatchie County	0	5	0	0	0	0
Sevier County	20	0	94	0	80	0
Shelby County	18	0	95	0	158	0
Smith County	0	0	30	0	63	0
South Carroll	19	0	23	0	13	0
Stewart County	6	8	49	37	79	68
Sullivan County	21	0	63	0	80	0
Sumner County	0	0	0	0	1	0
Sweetwater	0	0	23	0	45	0
Tipton County	0	0	159	0	167	0
Trenton	15	0	35	0	62	0
Trousdale County	0	0	0	0	0	0
Tullahoma	0	0	0	0	0	0
Unicoi County	30	0	80	0	89	0
Union City	0	0	21	19	41	37
Union County	0	0	20	0	65	63
Van Buren County	21	13	22	18	21	0
Warren County	0	0	37	0	103	0
Washington County	0	0	0	0	1	0
Wayne County	46	0	84	0	101	0
Weakley County	2	0	32	0	57	0
West Carroll SSD	0	0	20	0	41	0
White County	0	0	21	0	74	0
Williamson County	0	0	104	0	103	0
Wilson County	0	0	0	0	79	0
TOTALS	2,345	181	7,599	615	12,234	836

Appendix H. Characteristics of School Systems in Tennessee

System	Urban-Centric Locale 2006-2007 (NCES)	Median Household Income in District (2000 Census)	% of Children in Poverty in District (2000 Census)	% of Children Receiving Free or Reduced Price Lunch, 2006-2007 (NCES)	% Minority/ Non-White Students in District, 2006-2007 (NCES)	Total Expenditures per Student in District, 2006-2007 (NCES)
Alamo	Rural: Distant	\$38,295	22.8	53.7	25.8	\$6,483
Alcoa	Suburb: Large	\$44,333	16.4	45.4	27.6	\$9,449
Anderson County	Rural: Fringe	\$38,861	17.1	43.3	3.0	\$8,259
Athens	Town: Distant	\$39,563	20.9	41.1	24.8	\$8,107
Bedford County	Rural: Distant	\$40,691	15.8	44.8	24.6	\$9,515
Bells	Rural: Distant	\$31,827	26.9	58.2	45.2	\$6,847
Benton County	Rural: Fringe	\$32,727	23.2	56.3	5.6	\$7,308
Bledsoe County	Rural: Distant	\$34,593	20.1	64.3	3.8	\$7,505
Blount County	Rural: Fringe	\$43,933	11.9	39.8	4.1	\$7,230
Bradford	Rural: Distant	\$40,788	19.4	54.6	7.7	\$6,965
Bradley County	Suburb: Small	\$42,710	11.8	43.1	5.3	\$6,947
Bristol	City: Small	\$37,341	17.3	42.3	7.3	\$8,750
Campbell County	Rural: Fringe	\$30,197	31.5	65.8	0.8	\$6,683
Cannon County	Rural: Distant	\$38,424	13.4	46.5	3.9	\$6,846
Carroll County	Rural: Remote	--	--	7.0	17.3	--
Carter County	Suburb: Mid-size	\$33,913	20.5	64.3	2.2	\$7,834
Cheatham County	Rural: Distant	\$49,143	7.4	30.1	3.7	\$7,190
Chester County	Rural: Fringe	\$41,127	17.3	39.6	15.8	\$5,880
Claiborne County	Rural: Fringe	\$31,234	27.9	60.6	1.7	\$7,232
Clay County	Rural: Remote	\$29,784	23.3	52.0	3.3	\$8,264
Cleveland	City: Small	\$40,150	18.6	49.9	25.0	\$8,189
Clinton	Town: Fringe	\$43,099	21.3	47.9	7.6	\$8,230
Cocke County	Rural: Distant	\$31,014	30.5	64.9	4.9	\$7,308
Coffee County	Rural: Fringe	\$42,258	9.6	43.2	5.3	\$6,554
Crockett County	Rural: Distant	\$37,511	13.6	52.3	26.0	\$7,055
Cumberland County	Rural: Fringe	\$35,928	19.4	55.1	3.4	\$7,024
Davidson County	City: Large	\$49,317	18.2	60.9	64.6	\$9,627
Dayton	Town: Distant	\$33,149	20.8	52.6	16.9	\$6,251
Decatur County	Rural: Remote	\$34,919	18.1	36.0	7.7	\$7,088
DeKalb County	Rural: Fringe	\$36,920	19.6	51.6	9.2	\$6,584
Dickson County	Town: Distant	\$45,575	12	46.1	10.4	\$7,395
Dyer County	Rural: Remote	\$42,406	12.6	53.5	9.9	\$7,888
Dyersburg	Town: Remote	\$34,754	27.1	58.9	37.8	\$7,904
Elizabethton	Suburb: Mid-size	\$33,333	28.7	38.0	5.4	\$8,689
Etowah	Town: Distant	\$33,034	26.4	62.2	5.0	\$7,111
Fayette County	Rural: Distant	\$46,283	17.4	70.2	63.8	\$7,591
Fayetteville	Town: Distant	\$32,477	27.4	45.1	28.1	\$8,183

<i>Cont'd</i>						
System	Urban-Centric Locale 2006-2007 (NCES)	Median Household Income in District (2000 Census)	% of Children in Poverty in District (2000 Census)	% of Children Receiving Free or Reduced Price Lunch, 2006-2007 (NCES)	% Minority/ Non-White Students in District, 2006-2007 (NCES)	Total Expenditures per Student in District, 2006-2007 (NCES)
Fentress County	Rural: Remote	\$28,856	27.8	66.1	1.1	\$7,191
Franklin	City: Small	\$65,652	9.5	28.0	32.5	\$11,925
Franklin County	Rural: Distant	\$42,279	16.1	48.5	9.9	\$7,720
Gibson County SSD	Rural: Fringe	\$40,107	11.8	34.5	10.2	\$6,445
Giles County	Rural: Fringe	\$41,714	13.8	44.7	17.4	\$7,134
Grainger County	Rural: Distant	\$33,347	23.0	60.5	2.7	\$9,966
Greene County	Rural: Distant	\$37,088	16.0	53.9	3.5	\$6,647
Greeneville	Town: Distant	\$36,129	27.0	32.7	13.1	\$9,364
Grundy County	Rural: Remote	\$27,691	30.0	70.5	0.3	\$7,635
Hamblen County	City: Small	\$39,138	18.5	48.4	18.5	\$7,131
Hamilton County	City: Mid-size	\$48,037	16.0	51.0	39.8	\$8,375
Hancock County	Rural: Distant	\$25,372	36.3	83.3	1.2	\$8,971
Hardeman County	Town: Distant	\$34,746	23.4	72.6	56.6	\$7,196
Hardin County	Rural: Fringe	\$34,157	26.4	56.9	7.7	\$7,075
Hawkins County	Suburb: Small	\$37,696	19.2	58.1	2.7	\$7,335
Haywood County	Town: Distant	\$32,597	21.3	76.2	70.3	\$7,683
Henderson County	Rural: Distant	\$37,977	14.7	46.8	9.7	\$6,673
Henry County	Rural: Distant	\$36,555	16.5	57.8	9.8	\$8,148
Hickman County	Rural: Remote	\$36,342	15.2	49.1	4.4	\$7,729
Hollow Rock Bruceton	Rural: Distant	\$34,205	14.2	45.3	11.6	\$6,346
Houston County	Rural: Distant	\$35,395	22.7	48.0	6.5	\$6,604
Humboldt	Town: Fringe	\$32,730	22.4	76.4	74.3	\$7,237
Humphreys County	Rural: Distant	\$42,129	13.0	41.3	4.8	\$6,876
Huntingdon	Rural: Distant	\$38,822	17.3	49.3	19.0	\$6,750
Jackson County	Rural: Remote	\$32,088	15.2	54.3	1.1	\$6,502
Jefferson County	Rural: Fringe	\$38,537	16.4	48.5	5.6	\$7,161
Johnson City	City: Small	\$40,834	16.8	41.0	18.6	\$8,469
Johnson County	Town: Distant	\$28,400	26.1	68.7	1.8	\$8,960
Kingsport	City: Small	\$40,038	23.5	41.1	11.6	\$8,608
Knox County	Suburb: Large	\$49,182	13.7	33.1	20.5	\$7,615
Lake County	Rural: Remote	\$30,339	31.2	67.7	29.8	\$7,309
Lauderdale County	Town: Distant	\$36,841	23.0	70.5	44.4	\$7,142
Lawrence County	Rural: Distant	\$35,326	17.8	52.9	4.2	\$6,797
Lebanon	Town: Fringe	\$46,915	16.7	48.0	29.9	\$7,443
Lenoir City	Suburb: Large	\$33,462	18.6	53.4	16.0	\$7,545
Lewis County	Town: Remote	\$35,972	15.5	55.6	5.1	\$6,549
Lexington	Town: Distant	\$41,429	11.3	44.3	25.9	\$7,563
Lincoln County	Rural: Distant	\$42,485	12.3	44.5	7.6	\$6,695
Loudon County	Suburb: Large	\$49,214	9.7	38.4	8.8	\$7,127
Macon County	Rural: Fringe	\$37,577	15.3	48.1	4.7	\$6,349

<i>Cont'd</i>						
System	Urban-Centric Locale 2006-2007 (NCES)	Median Household Income in District (2000 Census)	% of Children in Poverty in District (2000 Census)	% of Children Receiving Free or Reduced Price Lunch, 2006-2007 (NCES)	% Minority/ Non-White Students in District, 2006-2007 (NCES)	Total Expenditures per Student in District, 2006-2007 (NCES)
Madison County	City: Small	\$44,595	18.0	60.3	61.3	\$7,585
Manchester	Town: Distant	\$38,404	21.7	49.8	17.5	\$8,290
Marion County	Rural: Distant	\$36,614	19.1	56.9	5.5	\$7,947
Marshall County	Rural: Distant	\$45,731	11.1	39.6	14.5	\$7,001
Maryville	Suburb: Large	\$49,182	11.2	21.4	8.7	\$9,260
Mauzy County	Town: Distant	\$48,010	13.6	42.8	25.6	\$7,092
McKenzie	Town: Distant	\$38,298	14.7	57.6	15.7	\$6,677
McMinn County	Rural: Fringe	\$39,540	14.8	48.7	7.6	\$6,919
McNairy County	Rural: Distant	\$36,045	19.8	50.3	9.7	\$6,907
Meigs County	Rural: Distant	\$34,114	23.1	62.3	2.6	\$6,902
Memphis	City: Large	\$37,767	28.2	73.5	92.3	\$9,181
Milan	Rural: Fringe	\$40,166	14.9	45.9	26.3	\$6,985
Monroe County	Rural: Distant	\$34,848	17.8	56.9	5.3	\$7,237
Montgomery County	City: Mid-size	\$43,071	12.3	38.5	36.7	\$7,248
Moore County	Rural: Distant	\$41,484	13.9	42.8	2.6	\$7,696
Morgan County	Rural: Fringe	\$31,901	16.9	49.2	1.5	\$6,801
Murfreesboro	City: Small	\$52,654	11.7	38.5	39.9	\$8,023
Newport	Town: Fringe	\$26,791	35.4	43.7	10.1	\$7,879
Oak Ridge	Town: Fringe	\$52,361	15.7	28.1	24.6	\$10,331
Obion County	Rural: Distant	\$40,449	14.7	43.2	7.4	\$7,002
Oneida	Town: Remote	\$29,786	28.7	59.7	1.0	\$7,181
Overton County	Rural: Fringe	\$32,156	19.1	59.5	1.2	\$6,816
Paris	Town: Remote	\$33,259	23.6	54.4	23.3	\$7,312
Perry County	Rural: Remote	\$34,792	16.9	57.8	5.1	\$7,857
Pickett County	Rural: Remote	\$31,355	19.4	56.6	0.6	\$8,522
Polk County	Rural: Distant	\$36,370	14.1	49.0	1.6	\$6,524
Putnam County	Town: Remote	\$39,553	15.0	43.6	10.7	\$7,296
Rhea County	Rural: Fringe	\$36,331	18.6	54.4	6.0	\$7,234
Richard City	Town: Distant	\$29,762	26.7	43.6	6.4	\$6,582
Roane County	Town: Distant	\$43,030	18.4	44.4	5.5	\$7,358
Robertson County	Rural: Fringe	\$49,412	11.5	37.3	17.5	\$6,537
Rogersville	Town: Fringe	\$32,236	28.2	39.2	4.9	\$8,026
Rutherford County	Suburb: Mid-size	\$53,975	6.2	29.5	25.8	\$7,716
Scott County	Rural: Distant	\$28,238	23.8	83.1	0.4	\$7559
Sequatchie County	Rural: Distant	\$36,435	25.2	54.6	3.5	\$8,592
Sevier County	Town: Fringe	\$40,474	12.3	48.7	5.5	\$7,772
Shelby County	Suburb: Large	\$71,754	5.5	29.3	42.2	\$8,009
Smith County	Rural: Distant	\$41,645	14.3	40.3	5.0	\$6,494
South Carroll	Rural: Remote	\$37,134	11.0	40.6	5.8	\$6,813
Stewart County	Rural: Distant	\$38,655	12.6	56.2	3.9	\$7,548

<i>Cont'd</i>						
System	Urban-Centric Locale 2006-2007 (NCES)	Median Household Income in District (2000 Census)	% of Children in Poverty in District (2000 Census)	% of Children Receiving Free or Reduced Price Lunch, 2006-2007 (NCES)	% Minority/ Non-White Students in District, 2006-2007 (NCES)	Total Expenditures per Student in District, 2006-2007 (NCES)
Sullivan County	Suburb: Small	\$42,172	13.1	42.2	1.5	\$7,462
Sumner County	Suburb: Large	\$52,125	9.8	29.3	15.0	\$7,026
Sweetwater	Rural: Fringe	\$35,269	26.9	60.1	16.5	\$5,961
Tipton County	Rural: Fringe	\$49,009	10.6	46.6	27.5	\$6,773
Trenton	Town: Distant	\$41,775	12.8	54.6	31.2	\$6,387
Trousdale County	Rural: Distant	\$37,401	12.1	39.3	12.2	\$7,089
Tullahoma	Town: Distant	\$38,210	21.3	38.6	13.3	\$8,573
Unicoi County	Town: Fringe	\$36,871	16.3	50.2	6.0	\$7,048
Union City	Town: Remote	\$40,737	26.7	52.1	48.1	\$8,057
Union County	Rural: Distant	\$31,843	25.8	63.2	1.2	\$8,134
Van Buren County	Rural: Remote	\$34,949	19.1	56.8	0.4	\$7,959
Warren County	Rural: Fringe	\$37,835	18.4	50.5	14.9	\$6,952
Washington County	Rural: Fringe	\$41,377	15.7	43.8	3.8	\$6,664
Wayne County	Rural: Remote	\$30,973	19	63.2	2.7	\$9,348
Weakley County	Rural: Distant	\$38,658	15.9	48.4	11.8	\$6,691
West Carroll SSD	Rural: Distant	\$36,098	21.6	57.1	12.1	\$6,374
White County	Town: Remote	\$34,854	16.9	50.9	3.8	\$7,128
Williamson County	Rural: Fringe	\$82,731	4.2	7.7	10.8	\$9,394
Wilson County	Rural: Fringe	\$60,071	5.5	20.0	11.6	\$8,116