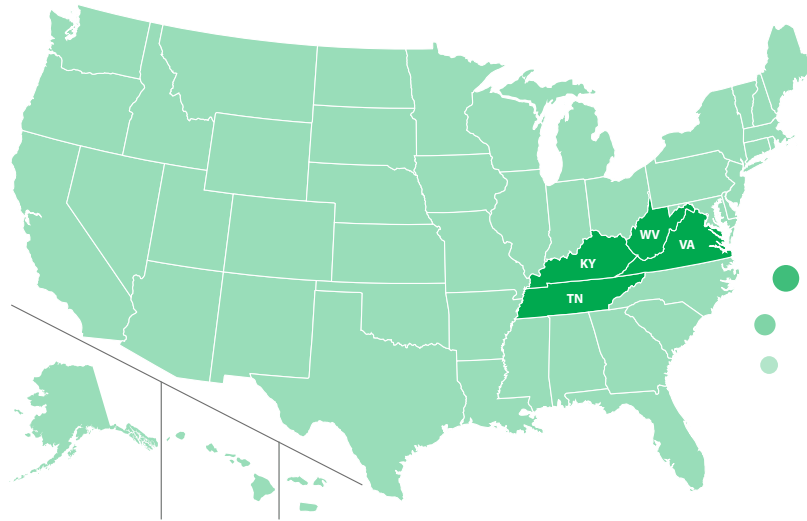




Participation during the first four years of Tennessee's Voluntary Prekindergarten program





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September 2011

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This report is available on the regional educational laboratory website at <http://ies.ed.gov/ncee/edlabs>.

Participation during the first four years of Tennessee’s Voluntary Prekindergarten program

This study examines the first four years of Tennessee’s Voluntary Prekindergarten program, directed to four-year-olds eligible for free or reduced-price lunch. It reviews participation levels and trends for the program as a whole, for collaborative partner classrooms, and for student and district subgroups and discusses the geographic distribution of program sites.

Research shows that high-quality prekindergarten (PreK) programs prepare children for later success in school. Children who participate in high-quality early childhood education develop better language skills, score higher on school readiness tests, and have better social skills and fewer behavioral problems once they enter school (Karloly et al. 1998; Sadowski 2006). Children with high-quality early learning experiences are 40 percent less likely to need special education or to be held back a grade (Reynolds et al. 2001). And children who participate in PreK are better prepared for kindergarten, especially in pre-reading, pre-math, and social skills (Vecchiotti 2001).

Recognizing the importance of early education, Tennessee adopted its Voluntary Prekindergarten program in 2005/06. Using an approach similar to that of other states (Barnett et al. 2008), the Tennessee program is directed to four-year-olds eligible for free or

reduced-price lunch while striving to distribute funding across all the state’s regions and counties. Funding increased each year through 2008/09. To help meet expansion goals, collaborating partners were allowed to offer seats through the PreK program. Such partners, including Head Start and other early education and early care providers, receive some state PreK funding when they collaborate with their local education agency to provide an approved PreK program at a location other than a public school.

This study provides information on growth in Tennessee’s PreK program for states seeking to expand their PreK program capacity. It is modeled on a previous Regional Educational Laboratory Appalachia report examining prekindergarten participation rates in West Virginia (Cavalluzzo et al. 2009). Four research questions guided this study:

- What were the participation levels and trends in Tennessee’s state-funded Voluntary Prekindergarten program over 2005/06–2008/09?
- What were the participation levels and trends in Voluntary Prekindergarten collaborative partner classrooms over 2005/06–2008/09?



Participation during the first four years of Tennessee's Voluntary Prekindergarten program

September 2011

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- What were the participation levels and trends among subgroups (racial/ethnic minority students, students in special education, and district location and size) for the entire Voluntary Prekindergarten program and for collaborative partner classrooms over 2005/06–2008/09?
- What was the geographic distribution of public school and collaborative partner Voluntary Prekindergarten program sites in 2008/09, and how had it changed since 2005/06?

The study uses data from five sources. The Tennessee Department of Education's *Annual Statistical Reports* provided public school enrollment data for grades K–2, which were used to estimate the number of children eligible for the PreK program for each school year. The Tennessee Department of Education Office of Early Learning provided data from the Tennessee Education Information System on student subgroups, PreK program enrollment, and PreK program sites. The U.S. Department of Education's Common Core of Data provided district-level information on locale and K–12 enrollment. The Tennessee Department of Education Office of School Nutrition Services provided information on eligibility for free or reduced-price lunch for students in grades K–12. And the U.S. Census Bureau provided information on local education agency boundaries, which were used for mapping the public school and collaborative partner sites.

Key findings include:

- From 2005/06 to 2008/09, the number of PreK program participants increased from 6,943 to 18,746, the proportion of eligible

children participating increased from 18 percent to 42 percent, and the proportion of local education agencies participating increased from 83 percent to nearly 99 percent.

- The number of participants at collaborative partner classrooms increased from 1,428 (21 percent of all participants) in 2005/06 to 3,621 (19 percent) in 2008/09. Collaborative partner classrooms consistently accounted for approximately 21 percent of total PreK program classrooms.
- PreK program participation levels and rates increased for all subgroups examined but exhibited varying growth rates across student and district subgroups. The participation rate increased faster for racial/ethnic minority students than for White students. Participation rates among students in special education increased from 8 percent to 32 percent. Large districts had fewer participants and lower participation rates than did small districts. Rural districts had higher levels and rates of participation than did nonrural districts. And the percentage of participants enrolled in collaborative classrooms was higher for racial/ethnic minority students and students in nonrural districts.
- The majority of public PreK program sites were in the four major urban areas of Tennessee: Chattanooga, Knoxville, Memphis, and Nashville. Collaborative partner sites were more evenly distributed across rural and nonrural areas.

This study has two important limitations. First, it is descriptive. The factors driving

the observed trends cannot be determined or inferred from this analysis. Second, participation rates are based on estimates of the state's population of four-year-olds and the number of four-year-old students eligible for free or reduced-price lunch. Both estimates

are subject to measurement error, possibly in opposite directions. As a result, the direction of error in the reported participation rates is unknown.

September 2011

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This study examines the first four years of Tennessee's Voluntary Prekindergarten program, directed to four-year-olds eligible for free or reduced-price lunch. It reviews participation levels and trends for the program as a whole, for collaborative partner classrooms, and for student and district subgroups and discusses the geographic distribution of program sites.

WHY THIS STUDY?

Numerous studies have shown that participation in high-quality prekindergarten (PreK) programs prepares children for success in school (see appendix A for a list of studies). Children who participate in high-quality early childhood education develop better language skills, score higher on school readiness tests, and have better social skills and fewer behavioral problems once they enter school (Karoly et al. 1998; Sadowski 2006). Children with high-quality early learning experiences are 40 percent less likely to need special education or to be held back a grade (Reynolds et al. 2001). Kindergarten teachers in Georgia, the first state with voluntary, universal PreK for four-year-olds, reported that children who participated in PreK were better prepared for kindergarten, especially in pre-reading, pre-math, and social skills (Vecchiotti 2001).

In some states, the strategy for expanding PreK to meet state targets involves local education agencies establishing collaborations between public school PreK programs and other types of early care and education programs. Collaboration allows states to expand PreK access without competing with existing programs. However, these collaborations may face challenges meeting multiple sources' requirements for appropriate use of funds. A study in Virginia found that such collaborations increased PreK access in 10 localities that participated in a pilot to implement PreK through diverse delivery systems (Bradburn, Hawdon, and Sedgwick 2008). A recent Regional Educational Laboratory Appalachia study of West Virginia's universal PreK program also found growth in the percentage of seats furnished by collaborating partners (Cavalluzzo et al. 2009).

In the early 1990s, Tennessee began implementing legislation to encourage PreK programs, although funding was not provided. In 1996, pilot PreK programs were allocated \$3 million to serve 600 three- and four-year-old children from households below the poverty level. (See appendix B for more on the history of the PreK program in Tennessee.) Eligibility for the programs was expanded to children eligible for free

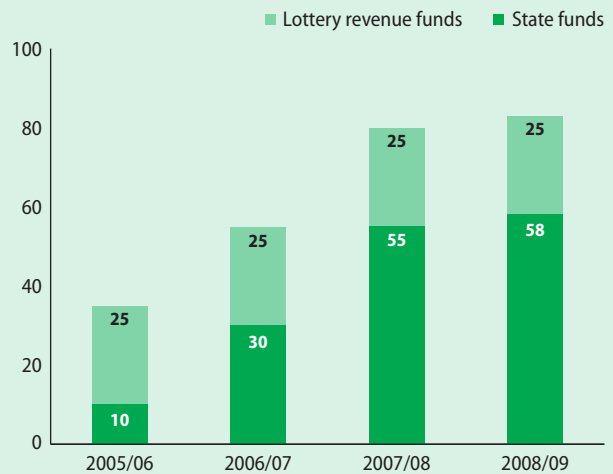
or reduced-price lunch in 2003, but additional funding was not approved until the Voluntary PreK for Tennessee Act was passed in 2005 (Tennessee Alliance for Early Education 2008; Wilson 2009). That legislation authorized lead education agencies to provide PreK programs for any child who was four years old on or before September 30, who was eligible for free or reduced-price lunch, and who resided in the area served by the local education agency. Four-year-olds not eligible for free or reduced-price lunch could enroll in a program if seats were available after all participating eligible children were enrolled. The legislation expanded funding for each school year through 2008/09.

Each local education agency applying for funding had to provide matching funding based on the applicable state and local Better Basic Education Program classroom component ratio.¹ While the legislation focused initially on children eligible for free or reduced-price lunch, each local education agency that applied had to describe how it would expand PreK programs to all children within its service area if sufficient state funding became available (Tennessee Code § 49-6-101, enacted 2005). And because research indicated that only high-quality programs were effective, programs also had to meet quality standards, which included a maximum class size of 20 students, at least one licensed teacher certified in early childhood education per classroom, and at least 5.5 hours of quality instruction each day (Tennessee Code Annotated § 49-6-104; see appendix B for a complete list of the quality standards).

Tennessee initially allocated \$35 million to fund 454 PreK classrooms in 2005/06, the first year of the program (figure 1). Between 2006/07 and 2008/09, the state allocated \$218 million in funding for PreK education, creating 484 new classrooms serving more than 11,000 additional preschoolers. Funding for 2008/09 was \$83 million—\$58 million from the state and \$25 million from lottery revenue.² In 2008/09, Tennessee had 934 state-funded PreK classrooms serving more than 18,000 students.³ State-supported PreK

FIGURE 1

Tennessee's Voluntary Prekindergarten program funding, by source, 2005/06–2008/09 (\$ millions)



Source: Wilson 2009.

programs were in 94 of 95 Tennessee counties and 133 of 135 eligible local education agencies (Tennessee Department of Education 2009).

This study provides information on growth in Tennessee's PreK program for states seeking to expand their PreK program capacity.

Four research questions guide this study:

- What were the participation levels and trends in Tennessee's state-funded Voluntary Prekindergarten program over 2005/06–2008/09?
- What were the participation levels and trends in Voluntary Prekindergarten collaborative partner classrooms over 2005/06–2008/09?
- What were the participation levels and trends among subgroups (racial/ethnic minority students, students in special education, and district location and size) for the entire Voluntary Prekindergarten program and for collaborative partner classrooms over 2005/06–2008/09?
- What was the geographic distribution of public school and collaborative partner Voluntary

Prekindergarten program sites in 2008/09, and how had it changed since 2005/06?

See box 1 for definitions of key terms and box 2 and appendix C for data sources and methodology.

FINDINGS

From 2005/06 through 2008/09, participation in Tennessee's PreK program increased 133 percent—from 18 percent in 2005/06 to 42 percent in 2008/09. Tennessee's collaborative partner

BOX 1

Key terms

At-risk child. A child eligible for free or reduced-price lunch.

Child in special education. A child who has an Individualized Education Program.

Collaborative partner classroom. A program that collaborates with a local education agency and receives some state funding and that may provide prekindergarten (PreK) at a location other than a public school. Such programs must meet state-mandated quality criteria. Providers that have collaborated with public schools to participate in the PreK program include Head Start, for-profit and not-for-profit childcare providers, faith-based agencies, and universities (Tennessee Department of Education 2009).

Collaborative partner site. A location with at least one collaborative partner classroom.

Four-year-old participation rate. The ratio of the number of children who participated in the PreK program to the total four-year-old population.

Four-year-old population. Children who were age four on or before September 30. This number was not available from the state and was thus

estimated as the average of enrollment in grades K–2 (see box 2).

Large district. A school district with more than 10,000 students in 2008/09. Approximately 14 percent of the school districts in Tennessee are classified as large.

PreK program-eligible population. Children who were four years old on or before September 30, who were eligible for free or reduced-price lunch, and who resided in the area served by the local education agency. To calculate this number, each district's K–12 percentage of free or reduced price-lunch recipients was multiplied by the district's estimated population of four-year-olds and then summed across districts.

PreK program participation rate. The ratio of the number of PreK program participants to the PreK program-eligible population.

PreK program participant. A child enrolled for more than 30 days during the school year in the state-funded PreK program, either at a public school or collaborative partner site.

PreK program site. The location of a state-funded program. A site may contain multiple classrooms.

Public school classroom. A PreK program located at and provided by a public school.

Public school site. A location with at least one public school classroom.

Racial/ethnic minority. All race/ethnicity categories other than White, as recorded in the Tennessee Education Information System, including Asian, Black, Egyptian, Hispanic, Native American, and other.

Rural district. A rural territory or town, as defined by the U.S. Census Bureau. Approximately 81 percent of Tennessee districts are classified as rural; 93 percent of rural districts are classified as small.

Small district. A school district with 10,000 students or fewer in the 2008/09 school year. Approximately 86 percent of the school districts in Tennessee are classified as small; 84 percent of small districts are classified as rural.

Targeted PreK program. A state-funded program that provides PreK at no cost to students who meet eligibility criteria. Often, as in Tennessee, the criteria are based on household income level. If seats remain after serving eligible children who chose to participate, enrollment opens to children not meeting the eligibility criteria.

Universal PreK program. A state-funded program that provides PreK to any child, without income level requirements or other needs-based criteria.

BOX 2

Data sources and methodology

Data sources. Data were obtained from five publicly available sources:

- Tennessee Department of Education *Annual Statistical Reports* provided information on K–2 enrollments. Following Cavalluzzo (2009), this study used the average number of students enrolled by grade level in grades K–2 in public schools (the sum of enrollments in grades K–2 divided by 3) as a proxy for the number of four-year-old children.
- The Tennessee Department of Education Office of Early Learning provided data from the Tennessee Education Information System public and collaborative partner sites on student race/ethnicity and special education status, enrollment by grade level, and the geographic location of program sites. Student subgroup data were used to identify the total number of students enrolled in the PreK programs as well as the number of PreK program students in each of the subgroups examined. District and school data were used to identify the number and geographic location of public and collaborative program sites across the state over the study period.

- The U.S. Department of Education's Common Core of Data provided district-level information on locale and K–12 enrollment.
- The Tennessee Department of Education Office of School Nutrition Services provided data on eligibility for free or reduced-price lunch for students in grades K–12 for each district.¹
- The U.S. Census Bureau provided information on local education agency boundaries, which were used for mapping the PreK program sites.

Methodology. The study is modeled on a recent report examining PreK participation rates in West Virginia (Cavalluzzo et al. 2009), one of a handful of states progressing toward a universal PreK program. Like most other states (Barnett et al. 2008), Tennessee's program uses a targeted approach. The methodology consisted of the following main steps:

- Calculating the PreK program-eligible population, by estimating the four-year-old population in each district, multiplying this number by the district percentage of K–12 students eligible for free or reduced-price lunch, and summing this across all districts offering PreK.

- Determining the number of PreK program participants from the Tennessee Education Information System data.
- Calculating the PreK program participation rates, by dividing the number of PreK program participants by the PreK program-eligible population.
- Examining participation trends by race/ethnicity, special education status, and district size and locale.
- Mapping the geographical distribution of program sites using the local education agency files from the U.S. Census Bureau and the program site information from the Tennessee Education Information System data.

See appendix C for a more detailed discussion of the data sources and methodology.

Note

1. The district percentage of students eligible for free or reduced-price lunch can include PreK–12 when the school provides the meals for PreK students. It does not include meals served to students who attend PreK collaborative partnership sites where the meal is provided through the Child and Adult Care Food Program, because those data are not available.

classrooms accounted for 21 percent of participants in 2005/06 and continued to play an active role in the state-funded PreK program through 2008/09 (accounting for 19 percent). The number of participants enrolled in collaborative partner classrooms grew from 1,428 in 2005/06 to 3,621

in 2008/09. In each study year, collaborative PreK classrooms enabled the state to serve one additional child for every four participants in the PreK program. The collaborative partner participation trends from 2005/06 to 2008/09 were similar across all subgroups examined.

While all subgroups experienced increasing participation rates over the study period, participation rates among students in special education experienced a year-to-year increase from 2007/08 to 2008/09, when other subgroup participation rates plateaued or declined. The PreK participation rate for students in special education increased 300 percent, compared with a 133 percent increase statewide, from 2005/06 to 2008/09.

Participation rates were similar among racial/ethnic minority and White children in 2005/06 but grew faster among racial/ethnic minority children over the four-year period. Racial/ethnic minority participants and participants in nonrural districts had the highest share of participants enrolled in collaborative classrooms.

Rural districts and small districts exhibited similar trends: both had higher PreK participation rates but less growth in these rates than did nonrural and large districts. The participation rate in rural districts increased 104 percent from 2005/06 to 2008/09, compared with 191 percent in nonrural districts. It increased 117 percent in small districts, compared with 170 percent in large districts.

For public school programs, the majority of PreK sites were located in Tennessee's four major urban areas (Chattanooga, Knoxville, Memphis, and Nashville). Collaborative partner sites, however, were distributed more evenly across rural and nonrural areas.

What were the participation levels and trends in Tennessee's state-funded Voluntary Prekindergarten program over 2005/06–2008/09?

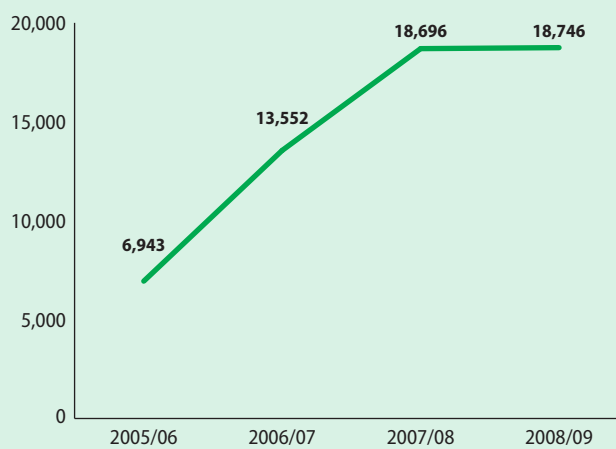
Statewide participation in the state-funded PreK program has risen since its inception in 2005/06. In that year, 109 of the 135 eligible local education agencies in Tennessee participated in the program. By 2008/09, nearly all (133) did.

The number of participants in the PreK program increased 170 percent, from 6,943 students in

2005/06 to 18,746 students in 2008/09 (figure 2). This trend is consistent with the budget trend, with increases of \$20 million in 2006/07 and \$25 million in 2007/08 but only \$3 million in 2008/09. The gains in participation during the program's first three years were not maintained because of budget constraints in the fourth year that limited the state's ability to expand the number of PreK classrooms offered. Lottery funding supplemented general state funds but was capped at \$25 million a year (McNichol and Johnson 2010). Consequently, the financial resources needed to expand the PreK program beyond the 2007/08 level were not available in 2008/09. While budgetary constraints limited program growth, all applicant districts received funding for 2008/09.

One criterion for participating in Tennessee's PreK program is that the child must be four years old on or before September 30 of the participation year. The population of four-year-olds was estimated at 70,661 in 2005/06 and peaked at 75,599 in 2007/08 before declining to 73,634 in 2008/09 (table 1). Dividing the number of participants by the population of four-year-olds yields the percentage of four-year-olds participating: approximately 10 percent in 2005/06 and approximately 25 percent in both 2007/08 and 2008/09.

FIGURE 2
Number of Tennessee Voluntary Prekindergarten program participants, 2005/06–2008/09



Source: Authors' calculations based on data described in the text.

TABLE 1

Tennessee Voluntary Prekindergarten program participants, eligible population, and participation rate, 2005/06–2008/09

Participation indicator	2005/06	2006/07	2007/08	2008/09
PreK program participants	6,943	13,552	18,696	18,746
Four-year-old population ^a	70,661	74,705	75,599	73,634
Four-year-old participation rate (percent)	10	18	25	25
PreK program–eligible population ^b	39,428	41,758	42,497	44,274
PreK participation rate (percent)	18	32	44	42

a. Average enrollment in grades K–2 in each district, summed across all districts.

b. Average enrollment in grades K–2 in each district multiplied by the percentage of students eligible for free- or reduced-price lunch in each district, summed across all districts.

Source: Authors' calculations based on data described in the text.

Another criterion is that the child must be eligible for free or reduced-price lunch. Four-year-olds eligible for free or reduced-price lunch are considered the PreK program–eligible population, which rose from 39,428 in 2005/06 to 44,274 in 2008/09. The participation rate for the PreK program–eligible population was 42 percent in 2008/09, a 133 percent increase over the 18 percent participation rate in 2005/06. However, 2008/09 represented a decline from 2007/08 of 2 percentage points.

What were the participation levels and trends in Voluntary Prekindergarten collaborative partner classrooms over 2005/06–2008/09?

The Tennessee Voluntary PreK program allows collaboration with non–school system providers, such as Head Start, for-profit and not-for-profit childcare providers, faith-based agencies, community-based agencies, and higher education institutions. Eligible collaborative partner classrooms must be within the local education agency area and meet state quality criteria, such as no more than 20 students per classroom and at least

5.5 hours of quality instructional time each day (Tennessee Code Annotated § 49-6-101—§ 49-6-110; see appendix A for more details on the quality standards). This section discusses the role of the collaborative partner classrooms in the first four years of Tennessee's Voluntary PreK program.

Participation in collaborative PreK program classrooms increased over 2005/06–2008/09, mirroring the statewide participation trend that peaked in 2007/08 and declined in 2008/09. The number of local education agencies with collaborative partner classrooms increased from 30 in 2005/06 to 37 in 2007/08 and then declined to 35 in 2008/09 (table 2). The number of collaborative partner classrooms more than doubled, from 95 in 2005/06 to 201 in 2008/09, as did the number of participants in these collaborative classrooms, from 1,428 in 2005/06 to 3,621 in 2008/09. The proportion of collaborative classrooms remained steady at 21–22 percent.

The number of PreK program participants in collaborative partner classrooms increased despite the slight drop in participants in collaborative partner classrooms as a percentage of all participants (from 21 percent in 2005/06 to 19 percent in 2008/09; figure 3). These data suggest that collaborative partners were active in providing of PreK in Tennessee throughout the study period.

What were the participation levels and trends among subgroups for the entire Voluntary Prekindergarten program and for collaborative partner classrooms over 2005/06–2008/09?

This section reviews the participation levels and trends among various subgroups (racial/ethnic minority students, students in special education, and district location and size).

Participation within student and district subgroups showed a trend similar to that for overall participation, with participation levels and rates increasing for all subgroups over 2005/06–2008/09. The increase in PreK program participation rates was greater than the statewide trend

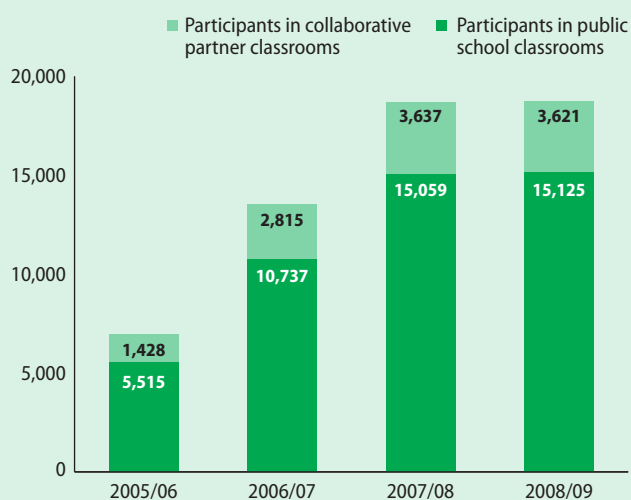
TABLE 2

Overall and collaborative partner participation in Tennessee's Voluntary Prekindergarten program, 2005/06–2008/09

Participation indicator	2005/06	2006/07	2007/08	2008/09
Local education agencies	135	135	135	135
Local education agencies participating in the PreK program	112	124	133	133
Local education agencies with collaborative partner classrooms	30	32	37	35
Number of public school classrooms	359	538	734	737
Number of collaborative partner classrooms	95	149	205	201
Collaborative partner classrooms as a percentage of all PreK classrooms	21	22	22	21
PreK program participants	6,943	13,552	18,696	18,746
PreK program participants in collaborative partner classrooms	1,428	2,815	3,637	3,621
PreK program participants in collaborative partner classrooms as a percentage of all participants	21	21	19	19

Source: Tennessee Department of Education n.d., 2009.

FIGURE 3

Number of participants in Tennessee's Voluntary Prekindergarten program, by classroom type, 2005/06–2008/09

Source: Authors' calculations based on data described in the text.

and the corresponding subgroup counterparts for racial/ethnic minority students, students in special education, students in rural districts, and students in small districts. Collaborative participation showed a trend similar to the statewide trend, with the share of participants enrolled in collaborative partner classrooms for each subgroup declining 2 percentage points or less over the four-year period.

Participation grew faster among racial/ethnic minority children than among White children.

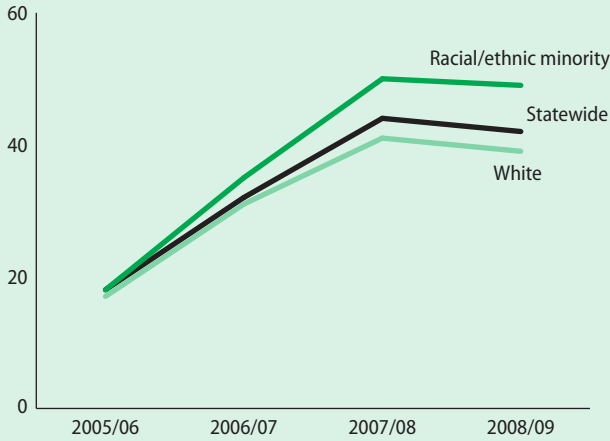
PreK program participation rates were similar for racial/ethnic minority children (18 percent) and White children (17 percent) in 2005/06, but racial/ethnic minority children saw a greater increase in participation, with 49 percent participating in 2008/09, compared with 39 percent of White children (figure 4). In addition, the number of racial/ethnic minority participants also grew faster than the number of White participants (figure 5).

Compared with the statewide trend, the PreK program participation rate for racial/ethnic minority children began at the same level but grew faster in the remaining three years, while the PreK participation rate for White children was closer to the statewide rate (see figure 4).

The participation rate for students in special education increased each year.

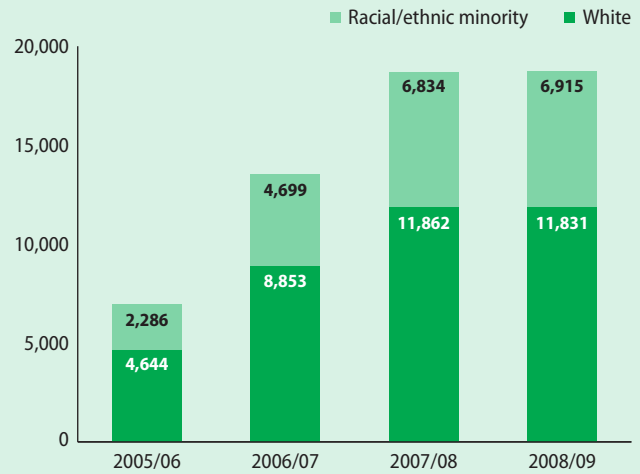
Students in special education accounted for approximately 7 percent (464 participants) of the PreK program students in 2005/06 and 11 percent (2,042 participants) in 2008/09 (figure 6). Program participation rates were lower for students in special education than for general education students (figure 7). Rates for students in special education increased in each year studied, from 8 percent in 2005/06 to 32 percent in 2008/09, a 300 percent change, compared

FIGURE 4
Tennessee Voluntary Prekindergarten participation rate, by racial/ethnic subgroup, 2005/06–2008/09 (percent)



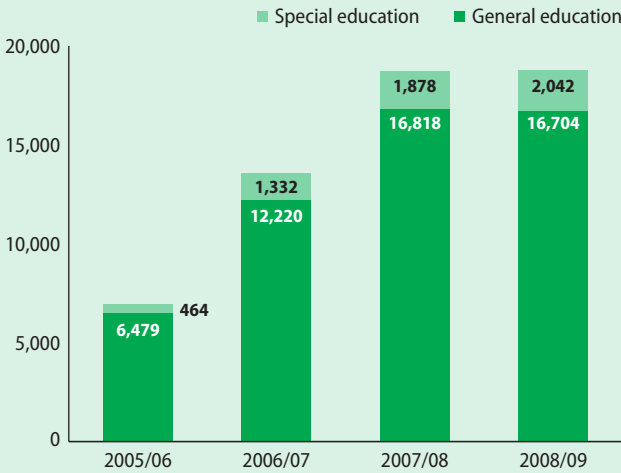
Source: Authors' calculations based on data described in the text.

FIGURE 5
Number of participants in Tennessee's Voluntary Prekindergarten program, by racial/ethnic subgroup, 2005/06–2008/09



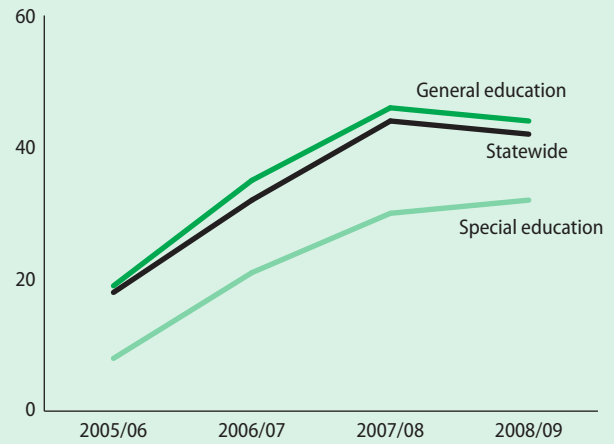
Source: Authors' calculations based on data described in the text.

FIGURE 6
Number of participants in Tennessee's Voluntary Prekindergarten program, by special education status, 2005/06–2008/09



Source: Authors' calculations based on data described in the text.

FIGURE 7
Tennessee Voluntary Prekindergarten program participation rates, by special education status, 2005/06–2008/09 (percent)



Source: Authors' calculations based on data described in the text.

with 133 percent statewide. Participation rates for students in general education also increased, from 19 percent to 44 percent, a 131 percent change.

PreK program participation rates for students in general education were close to the statewide average in all four years, even exhibiting a similar year-to-year decline of 2 percentage points from

2007/08 to 2008/09, unlike the rate for students in special education (see figure 7). The rates for students in general education, however, were consistently higher than those for students in special education.

Large districts had lower participation levels and rates than small districts, but large districts

experienced greater percentage growth in participation rates. Cavalluzzo et al. (2009) found that in West Virginia large districts had lower PreK participation rates than small districts. In Tennessee, results were similar. Participation levels and rates were lower in large districts than in small districts (figure 8), and the disparity in participation rates increased over the study period. Rates in large districts rose from 10 percent in 2005/06 to 27 percent in 2008/09, a change of 170 percent, while rates in small districts rose from 29 percent to 63 percent, a change of 117 percent (figure 9). Participation rates in large districts were consistently lower than the statewide participation rates and rates in small districts consistently higher (see figure 9). The participation rates for both large and small districts also followed the state trend, peaking in 2007/08.

Rural districts had higher participation levels and rates than nonrural districts, but nonrural districts experienced greater percentage growth in participation rates. The majority of Tennessee’s school districts are in rural areas, with the majority of PreK program participants residing in these districts. Both rural and nonrural districts

saw their participation levels increase, with a greater percentage increase in nonrural districts (199 percent) than in rural districts (152 percent; figure 10). Rural districts also had higher participation rates, growing from 27 percent in 2005/06 to 55 percent in 2008/09, than did nonrural districts, growing from 11 percent to 32 percent (figure 11). The gap between rural and nonrural district rates widened over the first three years of the study but narrowed in the fourth year. Compared with statewide trends, participation rates for rural districts were consistently higher and rates for nonrural districts consistently lower (see figure 11).

The share of program participants enrolled in collaborative partner classrooms differed by subgroup. Racial/ethnic minority students and students in nonrural districts were more likely to be in collaborative partner programs—with approximately one participant in four enrolled in a collaborative partner classroom in both subgroups (table 3). And most subgroups followed the overall trend in percentage of participants in collaborative partner classrooms, with a decrease of 2 percentage points or less from 2005/06 to 2008/09.

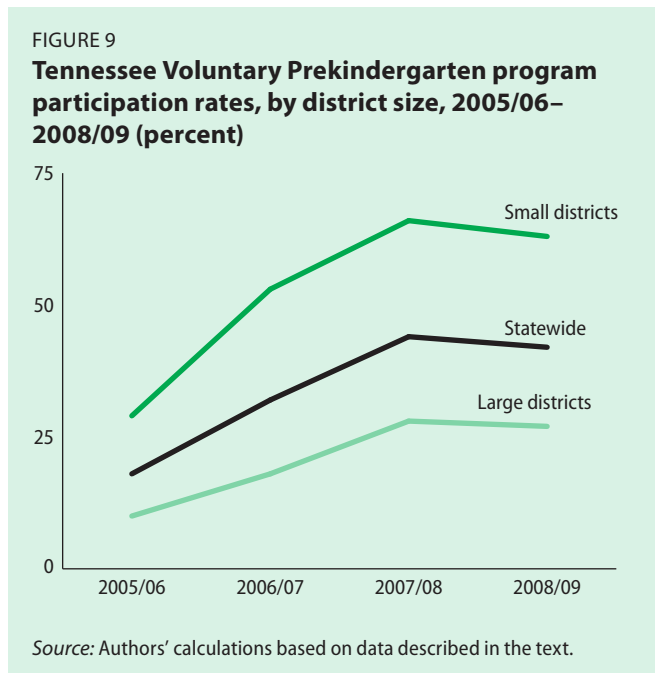
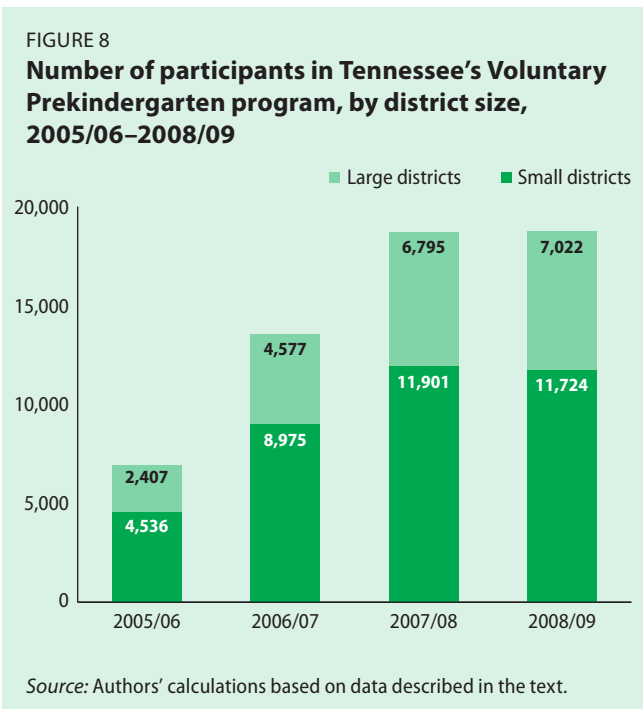
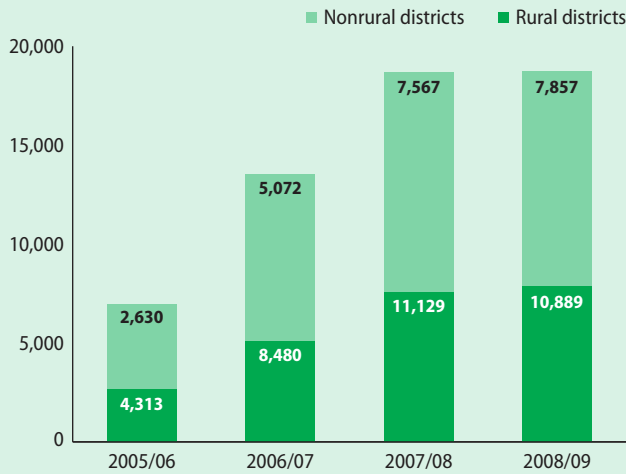


FIGURE 10
Number of participants in Tennessee's Voluntary Prekindergarten program, by district rurality, 2005/06–2008/09



Source: Authors' calculations based on data described in the text.

TABLE 3
Tennessee Voluntary Prekindergarten program participants enrolled in collaborative partner programs, by subgroup, 2005/06–2008/09 (percent)

Subgroup	2005/06	2006/07	2007/08	2008/09
Special education	17	13	18	16
General education	21	22	20	20
Racial/ethnic minority	25	27	24	23
White	18	18	17	17
Small districts	20	19	17	18
Large districts	22	25	23	22
Rural districts	11	13	11	10
Nonrural districts	27	27	25	25

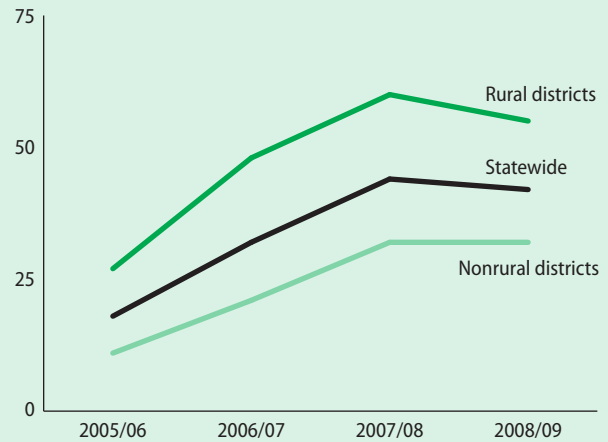
Note: Percentages are the number of subgroup participants in a collaborative partner classroom divided by the total number of subgroup participants in public school and collaborative partner classrooms.

Source: Authors' calculations based on data described in the text.

What was the geographic distribution of public school and collaborative partner Voluntary Prekindergarten program sites in 2008/09, and how had it changed since 2005/06?

Although PreK program participation levels and rates were greater in rural districts than in

FIGURE 11
Tennessee Voluntary Prekindergarten program participation rates, by district rurality, 2005/06–2008/09 (percent)



Note: Rural refers to a district classified as rural or town; nonrural refers to a district classified as city or suburb.

Source: Authors' calculations based on data described in the text.

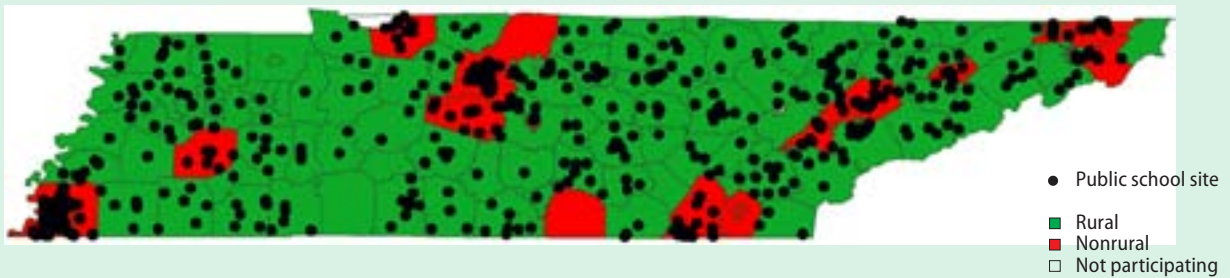
nonrural districts, the majority of program sites were in urban areas (map 1). Of the 563 public school sites that participated in the PreK program during the study period, 404 were in the state's four major urban areas: Memphis, in the southwest corner of the state; Nashville, in the upper midstate region; Chattanooga, in the southeast corner; and Knoxville, in the middle eastern part of the state. Because the four urban areas were defined based on Census geolocation data, they do not precisely correspond to the nonrural local education agencies in map 1, whose locale status was based on information from the Common Core of Data. For the geographic distribution of public sites during each year, see appendix D.

Over 2005/06–2008/09, 195 collaborative partner sites participated in the PreK program, 81 of them in the four major urban areas of the state (map 2). For the distribution of partner sites by year, see appendix D.

Over the study period, 20 collaborative partner sites and 27 public school sites withdrew or dropped out of the state's PreK program (map 3). There does not appear to be a systematic difference

MAP 1

Public school sites for the Tennessee Voluntary Prekindergarten program, by local education agency and rurality, 2005/06–2008/09



Note: Map shows 563 public school sites, representing 737 classrooms.

Source: U.S. Census Bureau and the Office of Early Learning, Tennessee Department of Education 2009.

MAP 2

Collaborative partner sites for the Tennessee Voluntary Prekindergarten program, by local education agency and rurality, 2005/06–2008/09



Note: Map shows 195 collaborative partner sites, representing 201 classrooms.

Source: U.S. Census Bureau and the Office of Early Learning, Tennessee Department of Education 2009.

MAP 3

Collaborative partner and public school sites that dropped out of Tennessee's Voluntary Prekindergarten program, 2005/06–2008/09



Note: Map shows 20 collaborative partner sites and 27 public school sites.

Source: U.S. Census Bureau and the Office of Early Learning, Tennessee Department of Education 2009.

in the geographic patterns associated with sites that dropped out.

LIMITATIONS OF THE STUDY

This report describes the participation levels and rates in Tennessee's Voluntary PreK program and how they have changed over 2005/06–2008/09. It does not explain why the changes occurred, so causality cannot be determined or inferred. For instance, this study does not address the supply of providers across the state, such as whether enough providers were available and accessible in all areas and whether supply was meeting demand. Data were not available to categorize collaborative partner classroom participants by type of provider (such as Head Start, faith-based, university), so the study looks only at aggregate collaborative partner participation data.

Another significant limitation involves data availability and the resulting estimation error. Tennessee could not furnish information on the population of four-year-olds in the state. The researchers thus constructed a proxy for the number of four-year-olds, as done by Cavalluzzo et al. (2009), using the average of K–2 enrollments in each district, summed across all districts. District estimates are based on public school enrollment because the number of students attending private schools was not available. District-level data from the Common Core of Data were used to calculate the proportions of students in each subgroup in

each district, which were multiplied by the K–2 proxy for the number of four-year-olds to estimate the number of PreK program–eligible children by subgroup. For the subpopulation of students receiving special education, the statewide average of the proportion of students receiving special education was multiplied by the K–2 enrollment proxy.

Participation rates are based on these estimates, which are subject to estimation error. The percentage of students eligible for free or reduced-price lunch was based on district K–12 recipient data. Enrollment in the lunch program is optional, so it is possible that not all eligible students enrolled. This possibility has been shown to be more common with older students (Harwell and LeBeau 2010). Thus, using K–12 recipient percentages may understate the true number of four-year-olds eligible for free or reduced-price lunch, meaning that the PreK program participation rate may overstate the true participation rate. At the same time, the number of participants eligible for free or reduced-price lunch may be overstated, because local education agencies can offer excess PreK seats to children not eligible for free or reduced-price lunch. Data on the number of students participating in the PreK program not eligible for free or reduced-price lunch were not available, so all participants are assumed to be eligible. As a result, the direction of error in the reported participation rates is unknown. However, all calculated participation rates were below 100 percent, and the state did not appear to be at a capacity level that would allow additional students to enroll.

NOTES

1. Funds generated by the Basic Education Program are what the state has defined as sufficient to provide a basic level of education for Tennessee students. The basic level of funding includes both a state and local share. The program has three major categories (instruction, classroom, and non-classroom), and the distribution of funds generated is driven by student enrollment. The state and local share of the program is based on an equalization formula driven by property values and the sales tax applied at the county level.
2. The Voluntary Pre-K for Tennessee Act of 2005 also authorized the use of \$25 million in lottery revenues for PreK funds.
3. The state reports that it funds 934 classrooms; however, some districts stretch their dollars to fund additional classrooms, so there are actually 4 additional classrooms operating around the state. No information is available on which districts these are.

APPENDIX A LITERATURE REVIEW

Several studies show that participation in quality prekindergarten (PreK) programs prepare children for later success in school (Karoly et al. 1998; Sadowski 2006; Reynolds et al. 2001; Currie 2000). One report examined a set of nine early childhood intervention programs (for which evaluations had been conducted) and found that children who participate in high-quality early childhood education develop better language skills, score higher on school-readiness tests, and have better social skills and fewer behavioral problems once they enter school (Karoly et al. 1998; Sadowski 2006).

Three of the nine interventions—High/Scope Perry preschool program, Chicago Child-Parent Center program, and Carolina Abecedarian program—are widely cited programs that have demonstrated the long-term benefits of early interventions, with follow-up measurements extending into the participants' adult years. These programs were well funded, used quality teachers, and had small class sizes. State-funded programs, such as Tennessee's, may not have the same resources and thus may not confer similar gains. Regardless, these interventions show the association between quality early education and later outcomes.

In a study of the High/Scope Perry preschool program, Schweinhart et al. (1993) analyzed the effects of a high-quality demonstration PreK program for a cohort of 123 young Black children from low-income households in Ypsilanti, Michigan. Of the 123 children, 58 were randomly assigned to the treatment group and 65 to the control group. The children were matched on several characteristics, including IQ, age, and gender. The effects of the program were followed over time, with staff that were blind to the treatment condition collecting data annually from age 4 to age 11, with follow-up at ages 14, 15, 19, and 27. The effects of the Perry preschool program included higher intellectual performance at school entry, higher scores on achievement tests through age 14, higher high school graduation rates, lower crime rates,

and higher earnings and greater property wealth in adulthood.

The federally funded Chicago Child-Parent Center program provided educational and family-support services to children ages 3–9. In a study that looked at longitudinal data on selected matched pairs in a nonrandomized cohort of 1,539 children from low-income households, Reynolds et al. (2001) found that children with high-quality early learning experiences were 40 percent less likely to need special education or to be held back a grade and had a higher rate of high school completion.

The Carolina Abecedarian Project, an education intervention for 104 children from low-income households, also demonstrated many benefits. The study that reached this conclusion included two treatment phases, one for preschool and one for school age, and had three treatment groups with varying exposure to treatment: one with both preschool and school-age treatment, one with preschool treatment only, and one with school-age treatment only. There was also a control group with no exposure to treatment. The initial sample consisted of 111 children, with 57 randomly assigned to the preschool treatment and 54 assigned to the control group during this phase. An early post-intervention study found that positive effects of preschool treatment were maintained through age 12 (Campbell and Ramey 1994). A follow-up at age 21 that included data on 104 of the participants (53 preschool treatment and 51 control) indicated that those in the preschool treatment group achieved significantly higher scores on academic and intellectual measures as adults and were more likely to attend a four-year college (Campbell et al. 2002).

While the Perry Preschool, Chicago Child-Parent Center, and Abecedarian programs have been successful, they are different from many state-funded programs. Current state-funded programs are not as well funded, often do not provide comprehensive services for the child and family, and serve a much larger and more diverse population. Nevertheless, literature has shown that state programs

for early education also have positive impacts (Barnett, Lamy, and Jung 2005; Center for Child Development 2007; Gormley et al. 2005; Hustedt et al. 2009).

In a report for the National Institute for Early Education Research, Barnett, Lamy, and Jung (2005) studied preschool programs in five states, three with targeted programs (Michigan, New Jersey, and South Carolina) and two with universal programs (Oklahoma and West Virginia). Using a regression discontinuity design, the authors mitigated selection bias and pooled across the five programs in the analysis. They found that these state-funded preschool programs had statistically significant impacts on children's early language, literacy, and mathematical development. In addition, there was some evidence of an enhanced program effect for print awareness skills for children from low-income households. Their findings suggested that appropriately staffed preschool programs for four-year-olds had consistent positive impacts on student performance, and the improvements were slightly greater for children from low-income households.

Similar results have been found in more recent studies focusing on single-state programs. The Center for Child Development (2007) examined the impacts of Louisiana's state PreK program, LA-4, by making two group comparisons: children eligible for free or reduced-price lunch who attended public PreK to children eligible for free or reduced-price lunch who did not attend public PreK, and children not eligible for free or reduced-price lunch who attended public PreK to children not eligible for free or reduced-price lunch who did not attend public PreK. The authors conducted tests of statistical significance and found that the impacts of LA-4 participation were positive, but some results were statistically significant only for children eligible for free or reduced-price lunch. In particular, public PreK participants eligible for free or reduced-price lunch had fewer occurrences of future grade retention and achieved higher standardized test scores in all four core subjects (math, science, language arts, and social studies).

For all children, participation in public PreK was associated with a lower percentage of children needing special education services in later grades.

The Abbott Preschool Program, New Jersey's PreK program, offers high-quality full-day PreK to three- and four-year-olds in a variety of settings (public school, child care center, or Head Start facility). In an initial study on the Abbott program, Frede et al. (2007) examined the impact of attending the Abbott program on oral language, early literacy, and math skills at the beginning and end of kindergarten. Using a regression discontinuity design, they found positive impacts on each. In a follow-up study, Frede et al. (2009) explored the longitudinal effects of the Abbott program beyond kindergarten entry for a sample of 1,038 children in 15 districts. Because a research discontinuity design cannot be used to estimate the longitudinal effect, the authors instead compared children who attended PreK with a conventional no-treatment comparison group identified at kindergarten entry. They found that the positive impacts on language, literacy, and math skills from the initial study persist through the end of grade 2.

Gormley et al. (2005) focused on the effects of Oklahoma's universal PreK program and identified academic benefits of PreK. The authors used a regression discontinuity design to minimize selection bias, comparing a sample of 1,567 PreK students with 1,461 kindergarteners who just completed PreK to estimate the impact on achievement scores. They found that the treatment of PreK participation had a positive impact on letter-word identification, spelling, and applied problem scores and that the results held regardless of socioeconomic status (using eligibility for free or reduced-price lunch as an indicator of low income).

Hustedt et al. (2009) used a similar approach in examining the impacts of the New Mexico PreK initiative. The authors employed a regression discontinuity design comparing a group of children beginning PreK to a group who just finished PreK and were entering kindergarten. Their sample

consisted of three cohorts of children in school years 2005/06 ($n = 856$), 2006/07 ($n = 893$), and 2007/08 ($n = 1,299$). The analyses found statistically significant positive impacts on literacy and math achievement for all three cohorts, but the positive effects on language skills were only significant for the first two cohorts and for the combined sample.

In a quasi-experimental study of the PreK Literacy program in Little Rock, Arkansas, Grehan et al. (2006) found that children in kindergarten who participated in PreK consistently outperformed nonparticipants on the Qualls Early Learning Inventory, Dynamic Indicators of Basic Early Literacy Skills, and Iowa Tests of Basic Skills subtests. While the differences were small, they were significant for the achievement tests and 15 subtests. Significant differences in performance were evident 10 years after participation. Differences between participants and nonparticipants were most pronounced for Black students. The study reported that 14.8 percent of Black students without PreK required special education, compared with 8.9 percent of Black students who attended PreK. Similar comparisons for Black students indicated that enrollment rates at grade level were 87 percent for students who attended PreK and 79 percent for those who did not. The authors used a quasi-experimental, post-test only research design. Students who participated in the Little Rock preschool program were compared with students who did not participate on performance indicators of student achievement. Demographic characteristics were included as covariates to account for the relative influence of personal characteristics on student achievement. Although robust for social science research, this design was not suited to drawing causal inference. Instead, it illustrated correlational relationships between participation and later student achievement.

Barnett and Yarosz (2007) wrote a Preschool Policy Brief that used both Current Population Survey data and National Household Education Survey data to describe the overall growth of

preschool education for three- and four-year-old children and the impact of that growth on reducing inequality in participation and access to quality programs among students entering K–12 systems. The authors reported that participation rates for preschool education programs had increased dramatically over the 40 years covered by the Current Population Survey data but were highly unequal and tended to increase rather than reduce inequality. Participation rates were higher for higher income households, households where the mother was in the labor force and employed, and households where the mother was more highly educated. Due to the growth of Head Start and other publicly supported programs, some of the education disadvantages associated with being poor had been reduced. Participation rates were highest for Black families (lowest for Hispanic families) and highest in the Northeast.

As states grapple with declining revenues resulting from the current economic downturn, it also becomes important to understand the impact of funding trade-offs between PreK, K–12, and other public expenditures. Studies have compared investments in PreK education programs with other public investments. Bartik (2006), for example, found that investments in PreK are associated with long-run economic benefits in excess of those found for traditional tax incentives and other economic development tools. In that study, Bartik compared investments in PreK with investments of the same resources in economic development subsidies to businesses and found that dollar for dollar, investments in PreK were the more economically beneficial option. Bartik concluded that high-quality preschool might increase participant earnings by 15–30 percent, increase GDP by 1–2 percent, and generate economic returns in excess of PreK program costs. According to the author, the increase in tax revenues would offset the program costs fourfold. Bartik found that from a national perspective the present value of a dollar spent on universal PreK generated \$3.79, while business incentives generated only \$0.65, a 580 percent advantage for PreK.

APPENDIX B BACKGROUND ON TENNESSEE'S VOLUNTARY PREKINDERGARTEN PROGRAM

In 1963, Tennessee passed legislation to permit school systems to use federal or local funds for prekindergarten (PreK) programs. But not until the 1990s did the state begin implementing legislation to encourage the development of PreK programs. These measures were due to extensive examination of issues dealing with PreK programs and to evidence of the positive short- and long-term benefits of early interventions. (See box B1 on the history of the PreK program in Tennessee). In 1990, a resolution was passed directing the Tennessee State Board of Education and the Tennessee Department of Education to form a task force to develop a state-funded comprehensive early childhood and parental education plan for the state. Two years later, the state's Education Improvement Act of 1992 mentioned PreK but provided no funding. Then in 1996, the state allocated \$3 million for pilot PreK programs to serve 600 at-risk three- and four-year-old children. Starting with these pilot programs, PreK programs gained support from succeeding governors and state legislators, but funding remained an obstacle to expanding coverage for all children.

In 2005, the Voluntary PreK for Tennessee Act was passed, increasing the state's investment in

early childhood education and access for students (Tennessee Alliance for Early Education 2008; Wilson 2009). The legislation authorized local education agencies to provide PreK programs for children eligible for free or reduced-price lunch who resided in the area served by the local education agency and who were four years old on or before September 30. Any child who was four years old on or before September 30 was allowed to enroll in a PreK program to fill available seats when an insufficient number of needs-based children were enrolled.

Given the research indicating that only high-quality programs were effective, programs had to comply with the following requirements (Tennessee Code Annotated § 49-6-104):

- A maximum class size of 20.
- At least one licensed teacher certified in early childhood education per classroom.
- At least one education assistant who holds a child development associate credential or associate degree in early childhood education or who is actively working toward acquiring such credentials per classroom. (If no person with such credentials is available, education assistants who hold a high school diploma and have relevant experience working with

BOX B1

History of prekindergarten programs in Tennessee

1963	Legislation passed permitting school systems to use federal or local funds for prekindergarten programs.
1990	Resolution passed directing the Tennessee State Board of Education and Tennessee Department of Education to convene a task force "for the purpose of developing and proposing a state plan for establishment of a comprehensive system of [state-funded] early childhood and parent education programs for at-risk children and their parents."
1992	The earliest version of the bill that became the Education Improvement Act of 1992 mentioned prekindergarten.
1995	The State Board of Education adopted the Tennessee Early Childhood Education Plan.
1996	Legislation passed permitting the development of early childhood pilot programs for economically disadvantaged three- and four-year-olds.
2003	Legislation passed expanding early childhood pilot program eligibility.
2005	The Voluntary Pre-Kindergarten Act passed.
2008	Voluntary Pre-Kindergarten Program serves more than 18,000 children in more than 900 classrooms across the state.

Source: Wilson 2009.

children in prekindergarten or other early childhood programs may be employed.)

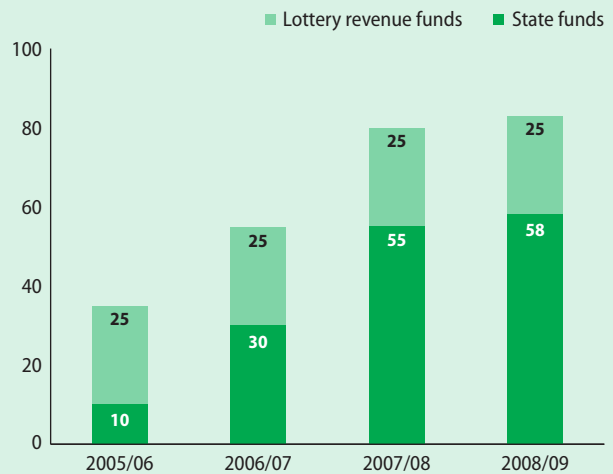
- A minimum of 5.5 hours of quality instruction time per day.
- Use of an educational, age-appropriate curriculum that is aligned with the state-approved early learning standards and that includes, but is not limited to, literacy, writing, math, and science skills.
- A developmental learning program that addresses the cognitive, physical, emotional, social, and communication areas of child development.
- Rules and policies of the state board of education related to early childhood education and prekindergarten programs.

Each local education agency applying for funding was required to provide matching funds, based on the applicable state and local Better Basic Education Program classroom component ratio. The act also authorized the state to use up to \$25 million in excess state lottery proceeds to support the PreK programs. While initial funding provided by the act focused on at-risk children, each local education agency applying for funding had to produce a plan describing how it would expand PreK programs to all children within its service area if sufficient state funding became available (Code § 49-6-101, enacted 2005).

Funding increased after the first year of the program, when the state approved \$35 million for PreK education (figure B1). In the following three years, Tennessee provided an additional \$218 million for PreK education, creating 484 new classrooms serving more than 11,000 additional preschoolers across Tennessee. In 2008/09, Tennessee PreK funding was \$83 million (\$58 million in state funding and \$25 million from lottery revenues), and the state had 934 state-funded PreK classes serving approximately 18,000 children. State-supported PreK programs were in 94 of 95

FIGURE B1

Tennessee's Voluntary Prekindergarten program funding, by source, 2005/06–2008/09 (\$ millions)



Source: Wilson 2009.

Tennessee counties and 133 of 135 eligible local education agencies (Tennessee Department of Education 2009).

Funding for PreK programs expanded dramatically, at first with lottery receipts and later from the state's general fund. By 2008/09, funding had increased 137 percent, from \$35 million in 2005/06 to \$83 million in 2008/09. Lottery funding was capped at \$25 million, but the general fund commitments for PreK programs rose from \$10 million in 2005/06 to \$58 million in 2008/09. Even though the state's economy and tax revenues did not expand at the same pace, general fund revenues were provided for PreK.

In some states, an important strategy for expanding PreK to meet state targets is to establish collaborations between PreK and other types of early care and education programs. A study in Virginia found that such collaborations succeeded in increasing access to PreK education in 10 localities participating in a pilot to implement PreK through diverse delivery systems (Bradburn, Hawdon, and Sedgwick 2008). In Tennessee, legislation and policies also promoted collaboration between public schools and partner programs. In 2007/08, there were 205 collaborative classroom partnerships

between 37 local school systems and nonprofit and for-profit providers, such as Head Start, Even Start, for-profit and not-for-profit child care providers, faith-based agencies, community agencies, and higher education institutions.

The Third Interim Report on Assessing the Effectiveness of Tennessee's Prekindergarten Program was completed in March 2010. It describes the performance of students in grades K–5 who participated in the PreK program compared with that of children who did not participate (Strategic Research Group 2010). This report was the third of four reports (with the final report completed later in 2010) on PreK programs in Tennessee. In the first report (November 2007) the authors found that positive differences were associated with PreK participation, especially in reading and language arts in multiple cohorts, over multiple assessments, and in multiple grades. The second report (July 2008) found added support for the finding that PreK students scored higher on standardized tests than non-PreK students and that disadvantaged students had the largest differences. Data for the second report were analyzed using random effects models, which included history of eligibility for free or reduced-price lunch and participation in PreK as predictors of academic achievement. All analyses in this report controlled for child race/ethnicity and gender as well as special education status, retention, attendance, and English

language learner status. The authors suggested that the positive differences might last through grade 2.

The objective of the third report was to determine whether the differences for PreK participants continued through grade 5 and to identify the characteristics of PreK programs that lead to both short- and long-term differences. The report used a nonequivalent groups design, a type of quasi-experimental research design. Data were analyzed using random effect analysis of covariance models. Analyses controlled for demographic characteristics such as child race/ethnicity and gender as well as special education status, attendance, and English language learner status. The report acknowledges that this “post-test only” approach was a limitation of the study. The authors reported that the PreK program generated small but positive differences, particularly for economically disadvantaged students, and that these differences were evident during kindergarten and grade 1. Most differences disappeared after grade 1, but there was some evidence that reading scores remained higher through grade 3 for economically disadvantaged students. Most of the differences were short term and did not appear in grades 2–5. The convergence of performance levels supported the idea that PreK would close the inequality gap, but the differences would occur early (Strategic Research Group 2010).

APPENDIX C

DATA SOURCES AND METHODOLOGY

This appendix details the data sources and methodology behind the study.

Data sources

Data were collected from five sources. Data from two of the sources, the Tennessee Education Information System and the Tennessee Department of Education Office of Nutrition Services, were provided by the Tennessee Department of Education Office of Early Learning via publicly available datasets. The data from the other three sources, the Tennessee Department of Education's *Annual Statistical Reports*, the U.S. Department of Education's Common Core of Data, and the U.S. Census Bureau, are all publicly available online.

The Tennessee Education Information System provided PreK program participant counts, data on student subgroups (racial/ethnic minority status, special education status), enrollments by grade level, and geographic locations of program sites. Data on student subgroups were used to calculate the total number of students participating in the PreK programs as well as the number of PreK students in each subgroup examined. District and school data from the Tennessee Education Information System were used to identify the number and geographic location of the public and collaborative program sites across the state over the study period.

The second source, the Tennessee Department of Education Office of Nutrition Services, provided the percentage of students eligible for free or reduced-price lunch in grades K–12 for each district.

The third source, the Tennessee Department of Education *Annual Statistical Reports*, provided information on K–2 enrollments. Following the methodology used in the West Virginia PreK study (Cavalluzzo et al. 2009), this study used

the average number of children enrolled by grade level in grades K–2 in public schools (the sum of enrollments in grades K–2 divided by 3) as a proxy for the population of four-year-old children (see equation 1 in the next section).

The fourth source, the U.S. Department of Education's Common Core of Data, provided further information on Tennessee school districts, such as district-level information on locale for 2007/08, K–12 enrollment, and racial/ethnic minority percentages. K–12 enrollment was used as a district size indicator, with greater than 10,000 students in 2008/09 constituting a large district and less than 10,000 a small district.

The fifth source, the U.S. Census Bureau, provided information on local education agency boundaries in Tennessee. The data collected were in two shape files for local education agencies, one for those that are county-based and another for those that are not county-based (called special local education agencies).

Methodology

For the first research question, participation rates are calculated for two populations: the population representing all four-year-olds in Tennessee and the PreK program–eligible population (children identified as the state's target population: four-year-olds eligible for free or reduced-price lunch). For the second and third research questions, the main report presents information on the PreK program–eligible population, with analysis of the entire four-year-old population in appendix C.

The four-year-old population was estimated using a proxy, since the number of four-year-olds in Tennessee was not available. The four-year-old population was estimated according to the methodology in Cavalluzzo et al. (2009) and is the average number of children enrolled in public schools in grades K–2.

To calculate the four-year-old population for each year, the average enrollments for grades K–2

($enroll_k$, $enroll_1$, $enroll_2$) in each district is calculated and then summed across all districts:

$$\text{Four-year-old population} = \frac{\sum enroll_k + enroll_1 + enroll_2}{3}. \quad (1)$$

The four-year-old participation rate is approximated by dividing the number of PreK program participants by the four-year-old population:

$$\text{Four-year-old participation rate} = \frac{\text{Number of PreK participants}}{\text{Four-year-old population}}. \quad (2)$$

To calculate the PreK program-eligible population—that is, the number of four-year-olds who are eligible for free or reduced-price lunch—the percentage of recipients of free or reduced-price lunch was obtained for each district and multiplied by the four-year-old population to estimate the number of four-year-olds; this total is then summed across districts to get the statewide PreK eligible population:

$$\text{PreK program-eligible population} = \frac{(\text{Percent of free or reduced-price lunch recipients}) \times (\text{four-year-old population})}{1}. \quad (3)$$

The PreK program participation rate is calculated as the number of program participants divided by the PreK program-eligible population:

$$\text{PreK program participation rate} = \frac{\text{Number of PreK participants}}{\text{PreK program-eligible population}}. \quad (4)$$

For the fourth research question, maps of Tennessee were constructed with two primary spatial datasets for the PreK program sites and the local education agency boundaries. The shape files for local education agency boundaries (from the U.S. Census Bureau) were merged and served as the base layer for mapping the local education agency data. Sites were mapped by geocoding the addresses provided by the state. The geocoding process used a composite geolocator that matched addresses against TeleAtlas Data, Local Data, and other sources. Unmatched, tied, and weakly matched address matches were then manually reviewed to ensure the best possible accuracy. Each address was then assigned an X,Y coordinate to ease future mapping.

APPENDIX D PARTICIPATION BY ALL FOUR- YEAR-OLDS IN THE STATE

The findings of the main report focused on the participation of children who met the Tennessee's

Voluntary Prekindergarten (PreK) program's target criteria: age 4 on or before September 30, eligible for free or reduced-price lunch, and residing in the area served by the local education agency. This appendix provides information on participation by all four-year-olds in the state.

TABLE D1

Participation among all four-year-olds in Tennessee's Voluntary Prekindergarten program, by public and collaborative programs, 2005/06–2008/09

Participation indicator	2005/06	2006/07	2007/08	2008/09
Statewide				
Number of PreK program participants	6,943	13,552	18,696	18,746
Four-year-old population ^a	70,661	74,705	75,599	73,634
Four-year-old participation rate (percent)	10	18	25	25
Collaborative programs				
Number of PreK program participants	1,428	2,815	3,637	3,621
Four-year-old participation rate (percent)	2	2	2	2

a. Sum of the average of reported enrollments in grades K–2 in each district, summed across districts.

Source: Authors' calculations based on data described in the text.

TABLE D2

Participation among all four-year-olds in Tennessee's Voluntary Prekindergarten program, by student subgroup, 2005/06 - 2008/09

Participation indicator	2005/06	2006/07	2007/08	2008/09
Race/ethnicity				
<i>Number of PreK program participants</i>				
Racial/ethnic minority	2,286	4,699	6,834	6,915
White	4,646	8,853	11,862	11,831
<i>Four-year-old population^a</i>				
Racial/ethnic minority	22,611	23,906	24,192	23,563
White	48,050	50,799	51,407	50,071
<i>Four-year-old participation rate (percent)</i>				
Racial/ethnic minority	10	20	28	29
White	10	17	23	24
Special education				
<i>Number of PreK program participants</i>				
Special education	464	1,332	1,878	2,042
General education	6,479	12,220	16,818	16,704
<i>Four-year-old population^a</i>				
Special education	10,529	11,505	11,113	10,677
General education	60,132	63,200	64,486	62,957
<i>Four-year-old participation rate (percent)</i>				
Special education	4	12	17	19
General education	11	19	26	27

a. The sum of the average of reported enrollments in grades K–2 in each district, summed across districts.

Source: Authors' calculations based on data described in the text.

TABLE D3

Participation among all four-year-olds in Tennessee's Voluntary Prekindergarten program, by district locale and size, 2005/06–2008/09

Participation indicator	2005/06	2006/07	2007/08	2008/09
District locale				
<i>Number of PreK program participants</i>				
Large districts	2,407	4,577	6,795	7,022
Small districts	4,536	8,975	11,901	11,724
<i>Four-year-old population^a</i>				
Large districts	41,657	44,925	44,918	42,918
Small districts	29,004	29,780	30,681	30,716
<i>Four-year-old participation rate (percent)</i>				
Large districts	6	10	15	16
Small districts	16	30	39	38
District size				
<i>Number of PreK program participants</i>				
Rural districts	4,313	8,480	11,129	10,889
Nonrural districts	2,630	5,072	7,567	7,857
<i>Four-year-old population^a</i>				
Rural districts	19,785	22,391	23,712	23,832
Nonrural districts	50,876	52,314	51,887	49,802
<i>Four-year-old participation rate (percent)</i>				
Rural districts	22	38	47	46
Nonrural districts	5	10	15	16

a. Sum of the average of reported enrollments in grades K–2 in each district, summed across districts.

Source: Authors' calculations based on data described in the text.

APPENDIX E

MAPS OF PUBLIC SCHOOL AND COLLABORATIVE PARTNER SITES FOR TENNESSEE'S VOLUNTARY PREKINDERGARTEN PROGRAM, 2005/06–2008/09

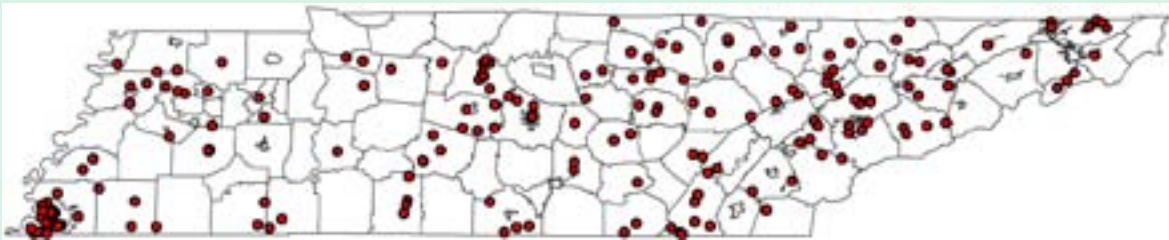
This appendix provides maps to supplement the information in the main report. The first section

contains maps showing public school sites for Tennessee's Voluntary Prekindergarten (PreK) program in each year from 2005/06 to 2008/09. The second contains maps showing collaborative partner PreK program sites. The third contains maps that distinguish between large (greater than 10,000 students) and small districts (less than 10,000 students) in displaying geographic distribution of PreK sites.

Public school sites for Tennessee's Voluntary Prekindergarten program

MAP E1

Public school sites for Tennessee Voluntary Prekindergarten, 2005/06

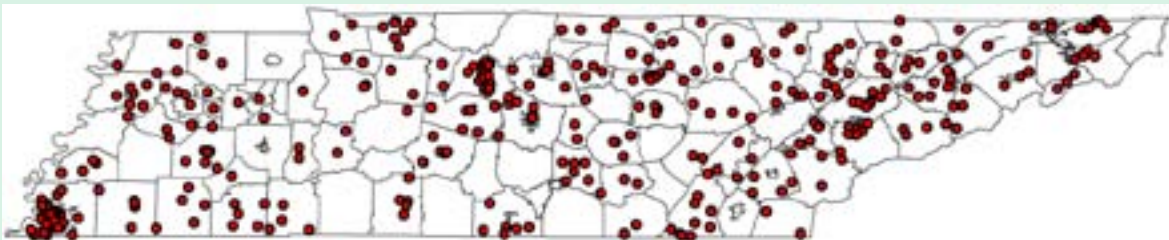


Note: Map shows 202 public school sites representing 359 classrooms.

Source: U.S. Census Bureau and the Office of Early Learning, Tennessee Department of Education 2009.

MAP E2

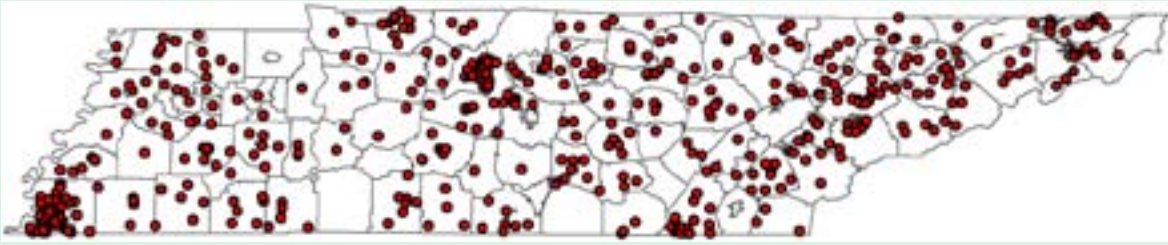
Public school sites for Tennessee Voluntary Prekindergarten, 2006/07



Note: Map shows 359 public school sites representing 538 classrooms.

Source: U.S. Census Bureau and the Office of Early Learning, Tennessee Department of Education 2009.

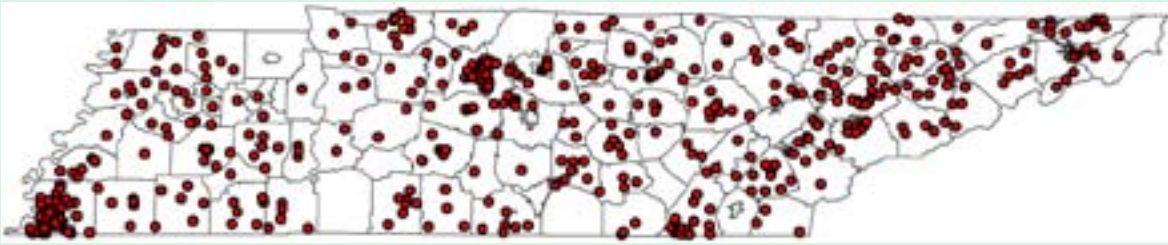
MAP E3

Public school sites for Tennessee Voluntary Prekindergarten, 2007/08

Note: Map shows 523 public school sites representing 734 classrooms.

Source: U.S. Census Bureau and the Office of Early Learning, Tennessee Department of Education 2009.

MAP E4

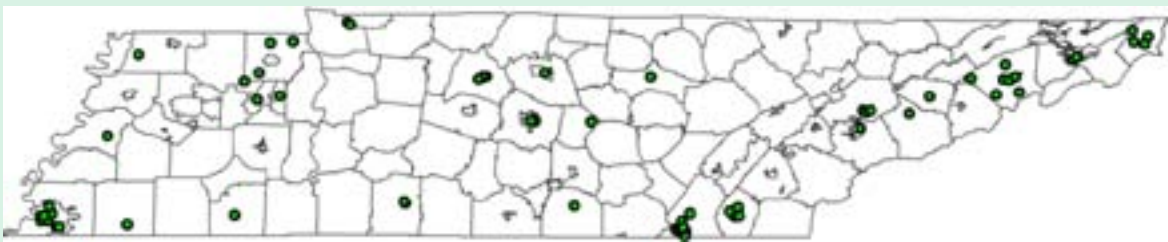
Public school sites for Tennessee Voluntary Prekindergarten, 2008/09

Note: Map shows 528 public school sites representing 737 classrooms.

Source: U.S. Census Bureau and the Office of Early Learning, Tennessee Department of Education 2009.

**Collaborative partner sites for Tennessee's
Voluntary Prekindergarten program**

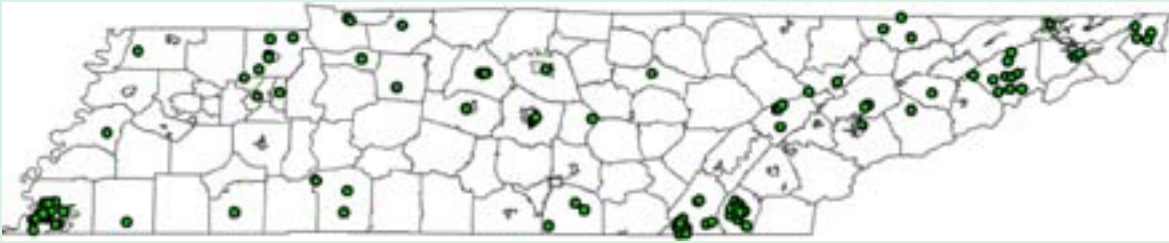
MAP E5

Collaborative partner sites for Tennessee Voluntary Prekindergarten, 2005/06

Note: Map shows 69 collaborative partner sites representing 95 classrooms.

Source: U.S. Census Bureau and the Office of Early Learning, Tennessee Department of Education 2009.

MAP E6

Collaborative partner sites for Tennessee Voluntary Prekindergarten, 2006/07

Note: This map shows 127 collaborative partner sites representing 149 classrooms.

Source: U.S. Census Bureau and the Office of Early Learning, Tennessee Department of Education 2009.

MAP E7

Collaborative partner sites for Tennessee Voluntary Prekindergarten, 2007/08

Note: This map shows 178 collaborative partner sites representing 205 classrooms.

Source: U.S. Census Bureau and the Office of Early Learning, Tennessee Department of Education 2009.

MAP E8

Collaborative partner sites for Tennessee Voluntary Prekindergarten, 2008/09

Note: This map shows 171 collaborative partner sites representing 201 classrooms.

Source: U.S. Census Bureau and the Office of Early Learning, Tennessee Department of Education 2009.

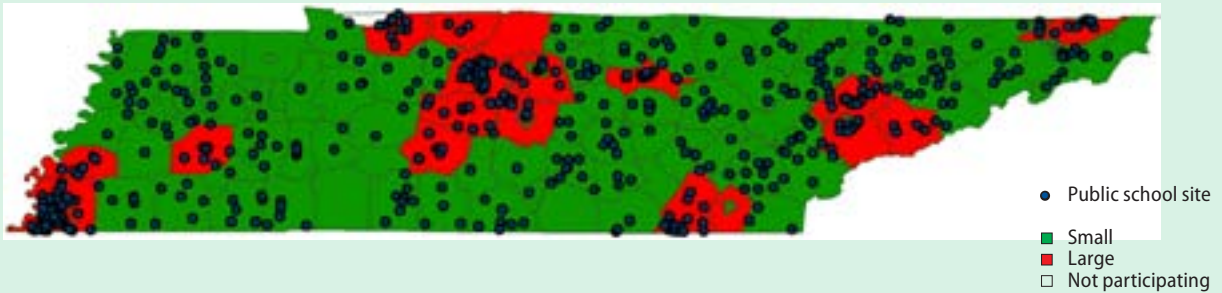
Public school and collaborative partner sites for Tennessee’s Voluntary Prekindergarten program, by district size, 2005/06–2008/09

MAP E9
Local education agencies, by size, 2008/09



Source: U.S. Census Bureau and the Office of Early Learning, Tennessee Department of Education 2009.

MAP E10
Public school sites for Tennessee Voluntary Prekindergarten, by district size, 2005/06–2008/09



Source: U.S. Census Bureau and the Office of Early Learning, Tennessee Department of Education 2009.

MAP E11
Collaborative partner sites for Tennessee Voluntary Prekindergarten, by district size, 2005/06–2008/09



Source: U.S. Census Bureau and the Office of Early Learning, Tennessee Department of Education 2009.

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