ISSUES&ANSWERS REL 2009–No. 070

REL APPALACHIA
Regional Educational Laboratory At CNA

West Virginia's progress toward universal prekindergarten

ies NATIONAL CENTER FOR EDUCATION EVALUATION AND REGIONAL ASSISTANCE
Institute of Education Sciences
U.S. Department of Education

ISSUES & ANSWERS REL 2009–No. 070

REL APPALACHIA
Regional Educational Laboratory
At CNA

West Virginia's progress toward universal prekindergarten

April 2009

Prepared by

Linda Cavalluzzo
CNA Education

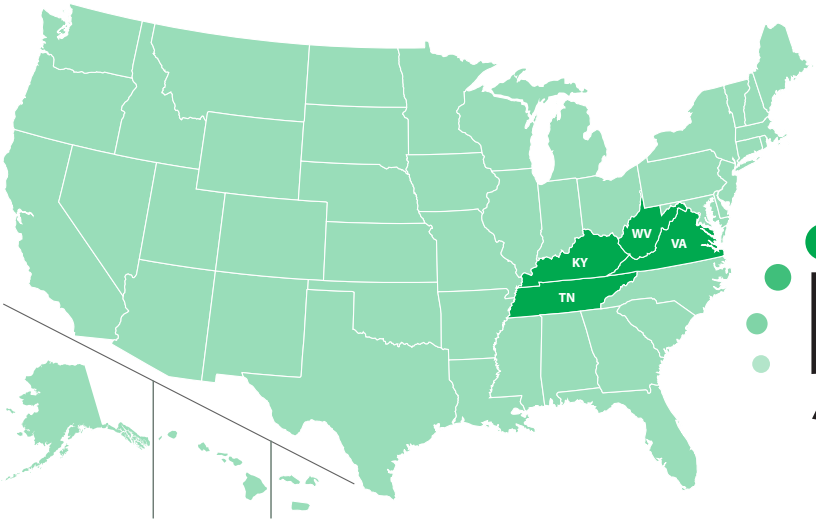
Yvette Clinton
CNA Education

Laura Holian
CNA Education

Linda Marr
CNA Education

Lydotta Taylor
The EdVenture Group

ies NATIONAL CENTER FOR EDUCATION EVALUATION AND REGIONAL ASSISTANCE
Institute of Education Sciences
U.S. Department of Education



REL APPALACHIA
At CNA

Issues & Answers is an ongoing series of reports from short-term Fast Response Projects conducted by the regional educational laboratories on current education issues of importance at local, state, and regional levels. Fast Response Project topics change to reflect new issues, as identified through lab outreach and requests for assistance from policymakers and educators at state and local levels and from communities, businesses, parents, families, and youth. All Issues & Answers reports meet Institute of Education Sciences standards for scientifically valid research.

April 2009

This report was prepared for the Institute of Education Sciences (IES) under Contract ED-06-CO-0021 by Regional Educational Laboratory Appalachia administered by CNA. The content of the publication does not necessarily reflect the views or policies of IES or the U.S. Department of Education nor does mention of trade names, commercial products, or organizations imply endorsement by the U.S. Government.

Cavalluzzo, L., Clinton, Y., Holian, L., Marr, L., and Taylor, L. (2009). *West Virginia's progress toward universal prekindergarten* (Issues & Answers Report, REL 2009–No. 070). Washington, DC: U.S. Department of Education, Institute of Education Sciences, National Center for Education Evaluation and Regional Assistance, Regional Educational Laboratory Appalachia. Retrieved from http://ies.ed.gov/ncee/edlabs.

This report is available on the regional educational laboratory web site at http://ies.ed.gov/ncee/edlabs.

Summary

REL 2009–No. 070

West Virginia's progress toward universal prekindergarten

The report examines rates of participation in West Virginia's universal, voluntary prekindergarten program from 2002/03 to 2006/07. It describes the share of seats provided by collaborative partners and public school systems and analyzes participation rates by demographic and socioeconomic subgroup and county characteristics.

Many states use targeted prekindergarten (PreK) programs to help qualifying children get a better start in school. Targeted programs admit only children who meet specific criteria, such as low household income. In contrast, West Virginia's voluntary PreK program is universal—it is open to all four-year-olds. Only a few other states have such programs, including Georgia and Oklahoma.

In 2006/07 West Virginia's program was halfway into the 10-year period set for reaching its goal of making PreK available to all four-year-olds. (The program will have met that objective, as defined by West Virginia educators, if in 2012/13 it has an 80 percent participation rate and no waiting list.) Since participation in the program is voluntary, West Virginia state policymakers wondered whether certain factors had been associated with differences in participation rates over 2002/03–2006/07. Had children from all subgroups participated in the program equally? Had participation varied across counties? Similarly, had participation varied across subgroups within counties—children qualifying for free or reduced-price lunch, children of a racial/ethnic minority, children receiving special education services? Finally, had participation varied between rural and nonrural counties?

Responding to those concerns, this study was designed to answer four questions:

1. What was the rate of participation in West Virginia's universal, voluntary PreK program by the eligible population (defined as all four-year-olds) in 2006/07—and by how much had that rate increased since 2002/03?

2. What share of program participant seats was provided by collaborative partner programs rather than public school systems in 2006/07—and by how much had that share increased since 2002/03?

3. From 2002/03 through 2006/07 did children in certain subgroups—children qualifying for free or reduced-price lunch, children of a racial/ethnic minority (race/ethnicity other than White), and children receiving special education services—participate in West Virginia's program at

similar, higher, or lower rates compared with other children?

4. From 2002/03 through 2006/07 did program participation rates in West Virginia counties vary with the demographic or socioeconomic characteristics of a county's eligible children, with counties' rural or nonrural status, or with the socioeconomic status of county residents?

The report answers these questions using data on public school enrollments and county PreK program characteristics provided by the West Virginia Department of Education. In addition, 2000 Census data on education, income, and poverty prevalence were used. The Common Core of Data (a program of the U.S. Department of Education's National Center for Education Statistics) was used for information on county urbanization. To measure the size of the eligible population, the average of reported enrollment totals in grades K–2 was used as a proxy. To measure the size of three subgroups within the eligible population—children qualifying for free or reduced-price lunch, children receiving special education services, and children of a racial/ethnic minority—the reported percentage of kindergarten students in each subgroup was used as a proxy. (This difference between the two proxies was made necessary by limitations in the data for subgroup membership in grades 1 and 2.)

The report finds that:

1. Statewide participation in West Virginia's PreK program rose from 26 percent in 2002/03 to 43 percent in 2006/07—an average annual increase of 4.2 percentage points. To reach the program's objective of universal access in 2012/13 (defined as 80 percent statewide participation), participation would have to continue increasing by 6 percentage points annually, on average, from 2006/07 through 2012/13.

2. Although in 2002/03 the only documented providers of publicly funded PreK seats under the program were public school systems, in 2006/07 nearly a third of the seats were provided by approved collaborative partners.

3. Participation in the West Virginia PreK program varied by subgroup.

   - In 2002/03 children qualifying for free or reduced-price lunch participated in the PreK program at the same rate as the eligible population (all four-year-olds). However, from 2003/04 participation by children in this subgroup began to lag behind the rate for the eligible population. In 2006/07, 37 percent of children qualifying for free or reduced-price lunch participated in the PreK program, compared with 43 percent for the eligible population.

   - Children of a racial/ethnic minority were a small but growing fraction of the eligible population from 2002/03 (1.5 percent) through 2006/07 (3 percent). They participated in the PreK program each year at rates similar to those for the eligible population. For example, in 2006/07 their participation rate was 45 percent, compared with 43 percent for the eligible population.

- Participation in the PreK program by children receiving special education services began in 2002/03 at 42 percent—much higher than the 26 percent rate for the eligible population. That difference had narrowed by 2006/07, when participation by children receiving special education services was 49 percent (the highest for any subgroup in 2006/07) compared with 43 percent for the eligible population.

- Rural counties (as classified in 2000/01) had consistently higher PreK program participation rates, on average, than nonrural counties. In 2002/03 the average participation rate for rural counties was 33 percent, compared with 14 percent for nonrural counties. By 2006/07 the average participation rate for rural counties had grown to 48 percent, compared with 35 percent for nonrural counties.

4. Further statistical analysis of participation rates, using multiple covariates to control for other factors, showed that membership in certain demographic and socioeconomic subgroups (children qualifying for free or reduced-price lunch, children of a racial/ethnic minority, and children receiving special education services) was not associated with participation in the PreK program. However, differences in certain county characteristics were associated with PreK program participation:

- Participation rates were higher in counties with higher percentages of high school graduates in 2000.

- Participation rates were higher in smaller counties measured in terms of public school enrollments in grades K–12.

- Participation rates were higher in counties classified as rural in 2000/01.

There was also some evidence of an inverse association between countywide income levels and PreK program participation rates.

Two data limitations mean that this report's findings must be interpreted with caution. First, the West Virginia Department of Education suppressed its data on PreK program participants wherever there were fewer than 10 participants in a given data cell (county, year, or subgroup). That weakens the report's conclusions about subgroups—especially in the small, often rural counties where data were most likely to be suppressed. Second, data were not available on private PreK program participation or on the use of other (non-PreK) early education programs. Because of these limitations, the results do not provide an overall measure of the extent of participation in early education programs in West Virginia.

It is not possible to infer from this report's findings that a causal relationship exists between a particular child, classroom, or county attribute and the extent of participation in West Virginia's universal, voluntary PreK program.

TABLE OF CONTENTS

The report examines rates of participation in West Virginia's universal, voluntary prekindergarten program from 2002/03 to 2006/07. It describes the share of seats provided by collaborative partners and public school systems and analyzes participation rates by demographic and socioeconomic subgroup and county characteristics.

WHY THIS STUDY?

In March 2002 West Virginia enacted Code Section 18-5-44, Early Childhood Education Programs, to establish a universal, voluntary publicly funded prekindergarten (PreK) program. The law defines approved PreK participating programs to include public schools and approved collaborative partners, such as private schools, childcare programs, and federally funded Head Start programs (West Virginia State Board of Education 2007).

The 2002 law calls for counties to offer a publicly funded PreK program to every four-year-old by 2012/13.[1] Participation is voluntary. West Virginia educators have defined the 2012/13 goal, in practice, as 80 percent participation with no waiting list (West Virginia Department of Education, personal communication, September 4, 2007).

In addition to creating universal but voluntary access to PreK, the 2002 law also mandates that 50 percent of PreK program participants attend collaborative partner programs (defined in box 1).

Both in West Virginia and across the United States, PreK programs have drawn interest because of their demonstrated ability to increase school readiness and to eliminate gaps in school readiness among racial/ethnic, socioeconomic, and other subgroups. Such gaps have been shown to exist as children enter kindergarten (Lee and Burkham 2002; West Virginia State Board of Education 2007). Studies have shown that participation in high-quality PreK programs can increase school readiness for all subgroups (the literature on PreK programs and school readiness and achievement is reviewed in appendix A). Yet gaps in school readiness among subgroups are not likely to narrow if the children in subgroups that need PreK programs most do not participate, if such children receive fewer services, or if such children receive lower quality services than other children.

Because participation in West Virginia's publicly funded universal PreK is voluntary, state policymakers want to know whether certain factors

BOX 1

Definitions of key terms

Achievement. A cumulative process of mastering new skills and improving existing skills (Entwisle and Alexander 1990; Pungelo et al. 1996).

Children of a racial/ethnic minority. Children of a racial/ethnic group other than White. To measure the number of children of a racial/ethnic minority within the eligible population, the reported percentage of kindergarten students who were of a racial/ethnic minority was used as a proxy.

Children qualifying for free or reduced-price lunch. To measure the number of children qualifying for free or reduced-price lunch within the eligible population, the reported percentage of kindergarten students who qualified for free or reduced-price lunch was used as a proxy.

Children receiving special education services. To measure the number of children within the eligible population receiving special education services (students with an individualized education program), the reported percentage of kindergarten students receiving special education services was used as a proxy.

Collaborative partner program. Defined under West Virginia law as a PreK program funded by at least two sources, including an approved collaborative partner.

County. West Virginia's public school system comprises 55 counties, each constituting one school district.

Eligible population. West Virginia Code 18-5-44 defines children eligible for the publicly funded PreK program as children who are four years old by September 1 of the year in which they are to enroll. Because data were not available on the number of four-year-olds in West Virginia, researchers used the average of statewide reported enrollment totals in grades K–2 as their proxy for the eligible population.

Participants. Also called enrolled students, participants are defined for this study as students (head counts, not full-time equivalents) who are enrolled in and attending a school at the end of the second month of the school year.

Participation rate. The ratio of enrolled students to the estimated eligible population or the ratio of enrolled students in a given subgroup to the estimated percentage of the eligible population in that subgroup. (For the different proxies used for different estimates, see *eligible population, children of a racial/ethnic minority, children qualifying for free or reduced-price lunch,* and *children receiving special education services.* All participation rates are based on the proxy used for the eligible population unless otherwise specified.)

Prekindergarten (PreK) program. A PreK program is a school program that includes a curriculum designed to increase school readiness. West Virginia's state guidelines call for PreK to provide a cognitive experience using a state-approved curriculum for at least 12 hours weekly.

Preschool. Any center-based preschool experience, with or without a curriculum designed to increase school readiness. Examples include PreK programs, private preschools, nursery schools, childcare centers, and Head Start programs.

Rural counties. Rural counties are defined to include both counties designated by the U.S. Census Bureau as rural territories and towns and territories within an urban cluster but 10–35 miles from an urbanized area (Common Core of Data new geography codes 32, 33, 41, 42, and 43).

School readiness. Also called kindergarten readiness, school readiness is the combination of linguistic, cognitive, attention, and socioemotional skills needed for success in kindergarten and beyond.

Targeted PreK programs. State-funded or federally funded PreK programs—such as Head Start—that limit participation to children who meet certain eligibility criteria (for example, having household income below a specified level or having special needs).

Universal PreK programs. PreK programs that are open without cost to all children of a specified age, regardless of income or other need-based criteria. States with such programs include Georgia, Oklahoma, and West Virginia.

are associated with differences in participation rates. Do children from all subgroups participate in the program equally? Or does participation vary—either across counties, between rural and nonrural counties, or across subgroups within counties (such as children qualifying for free or

reduced-price lunch, children of a racial/ethnic minority, and children receiving special education services)?

This report examines PreK program participation rates in West Virginia from 2002/03, the program's first full year, through 2006/07, when it was halfway into its 10-year period for reaching its goal. The report finds that between 2002/03 and 2006/07 statewide PreK program participation by the eligible population (see definition in box 1) rose from 26 percent to 43 percent. The report also documents growth over 2002/03–2006/07 in the share of program seats provided by collaborative partners rather than by public school systems.

In addition, the report analyzes West Virginia PreK program participation rates over 2002/03–2006/07 for three subgroups: children qualifying for free or reduced-price lunch, children of a racial/ethnic minority, and children receiving special education services. Finally, the report explores variations in PreK participation rates among the 55 counties that make up West Virginia's public school system, including by county geography (rural or nonrural) and other county characteristics.

Four questions drove the report:

1. What was the rate of participation in West Virginia's universal, voluntary PreK program by the eligible population (defined as all four-year-olds) in 2006/07—and by how much had that rate increased since 2002/03?

2. What share of program participant seats was provided by collaborative partner programs rather than public school systems in 2006/07—and by how much had that share increased since 2002/03?

3. From 2002/03 through 2006/07 did children in certain subgroups—children qualifying for free or reduced-price lunch, children of a racial/ethnic minority (race/ethnicity other than White), and children receiving special education services—participate in West Virginia's program at similar, higher, or lower rates compared with other children?

4. From 2002/03 through 2006/07 did program participation rates in West Virginia counties vary with the demographic or socioeconomic characteristics of a county's eligible children, with counties' rural or nonrural status, or with the socioeconomic status of county residents?

(The study methodology is summarized in box 2 and described fully in appendix B, with detailed results of the participation analysis in appendix C.)

STATEWIDE PREKINDERGARTEN PARTICIPATION RATES INCREASED OVER 2002/03–2006/07

From 2002/03 through 2006/07 statewide rates of participation by four-year-olds in West Virginia's universal, voluntary PreK program increased 65 percent—from 26 percent in 2002/03 to 43 percent in 2006/07 (figure 1). The only year-to-year decline in participation occurred in 2004/05. The cause of that decline is unknown but may be associated with a cut in program funding for that year.

The rising trend in statewide PreK program participation rates seen in figure 1 masks variation in participation rates among counties. Box plots for 2002/03 and for 2006/07 show the distribution of county participation rates (figure 2). A comparison of the two plots reveals an upward shift in participation for the interquartile range (range of participation rates between 25th and 75th percentiles), from 20–51 percent participation in 2002/03 to 37–67 percent participation in 2006/07. (In the bottom quartile the lowest county participation rate began at 3 percent in 2002/03, but rose to 20 percent by 2006/07.)

Statewide rates of participation by four-year-olds in West Virginia's universal, voluntary PreK program increased from 26 percent in 2002/03 to 43 percent in 2006/07

BOX 2

Methodology

The report examines overall trends in participation rates for West Virginia's universal, voluntary PreK program; participation rates for specific subgroups; and the association of county participation rates with county characteristics. The participation rate was defined as the ratio of children enrolled in publicly funded PreK programs (that is, registered and attending at the end of the second month of the school year) to all eligible children.

Three data sources were used:

- The West Virginia Education Information System (West Virginia Department of Education 2007) provided summary data on student public school enrollments by county, grade level (PreK–12), and subgroup (for example, students qualifying for free or reduced-price lunch) for each year from 2002/03 through 2006/07. All participation rates and enrollments in this study are based on these data.

- The U.S. Census web site (U.S. Census Bureau 2000) provided 1999 data on income and poverty, and 2000 data on education levels, for each West Virginia county. Data indicators included median income, the percentage of families with a child under age 18 living in poverty, and the percentage of adults age 18 and older with a high school diploma. (The data come from the Census long form and are subject to sampling error, which could affect reported estimates of the associations between county characteristics and PreK program participation and estimates of the statistical significance of those associations.)

- The Common Core of Data (U.S. Department of Education, National Center for Education Statistics 2007) contains information on county attributes and public school student demographic and socioeconomic characteristics by school and grade level, based originally on U.S. Census data. It provided data on the extent of urbanization in each West Virginia county for 2000/01.

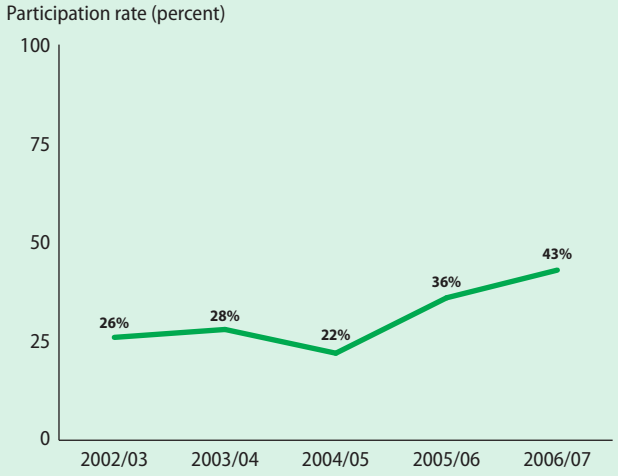
Analysis occurred in three stages. First, the overall statewide trend in rates of participation by the eligible population was examined (defined in box 1). Second, trends in participation rates for specific subgroups were examined. Third, county participation rates were analyzed to determine whether county characteristics were associated with participation rates when other factors were held constant. (To measure the size of the eligible population, the average of reported enrollment totals in grades K–2 was used as a proxy. To measure the size of three subgroups within the eligible population—children qualifying for free or reduced-price lunch, children of a racial/ethnic minority, and children receiving special education services—the reported percentage of kindergarten students in each subgroup was used as a proxy. This difference between the two proxies was made necessary by limitations in the data for subgroup membership in grades 1 and 2.)

The study had two data limitations. First, the West Virginia Department of Education did not include counts for subgroups with fewer than 10 students in its reports. The suppression, which affects subgroup totals only, not county totals or grade-level totals, weakens the conclusions on subgroups—especially in the small, often rural counties where data were most likely to be suppressed. Second, data were not available on private PreK program participation or on the use of other (non-PreK) early education programs. Because of these limitations, the results do not provide an overall measure of the extent of participation in early education programs in West Virginia.

County PreK program participation rates grew 16 percentage points, on average, between 2002/03 and 2006/07. That increase varied inversely with a county's starting participation rate. For example, the average increase was 30 percentage points for counties that began in the bottom quartile for participation, but only 8 percentage points for counties that began in the top quartile. Further, four of the five counties with the highest starting participation rates saw an average 5 percentage point (7 percent) decline over the period. Those four counties were the only ones in West Virginia to show declines.[2]

FIGURE 1

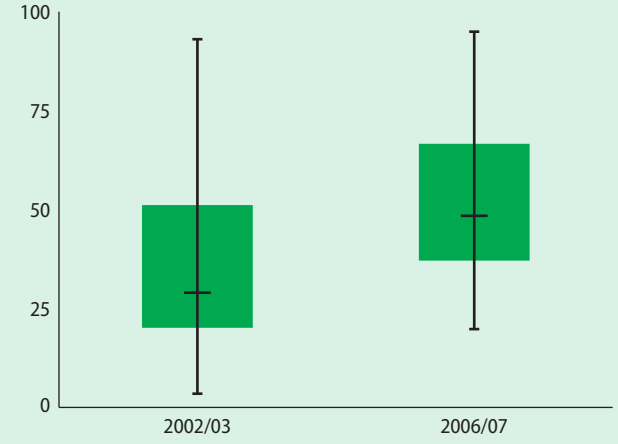
State prekindergarten program participation for West Virginia four-year-olds, 2002/03–2006/07



Source: Authors' calculations based on data from West Virginia Department of Education 2007.

FIGURE 2

Distribution of county participation rates in state prekindergarten program by West Virginia four-year-olds, 2002/03 and 2006/07



Note: Vertical lines show the range in participation rates for all counties. Horizontal lines indicate the median participation rate for all counties (half of all county participation rates are below the median, half above). Boxes represent the interquartile range—the range of county participation rates that fall between the 25th and 75th percentiles. For 2002/03 the West Virginia Department of Education received participation data from 53 of 55 counties; for 2006/07 it received such data from all 55 counties.

Source: Authors' calculations based on data from West Virginia Department of Education 2007.

COLLABORATIVE PROGRAMS PROVIDED AN INCREASING SHARE OF SEATS IN THE PREKINDERGARTEN PROGRAM OVER 2002/03–2006/07

West Virginia aimed to provide 50 percent of PreK seats through collaborative partners, including Head Start, preschool, and childcare centers. To become approved collaborative partners, preschool programs were required to receive funds from at least two sources, such as Head Start federal funds and public school funds, and to meet certain other requirements, such as having a certified teacher and an approved curriculum. Many West Virginia preschool programs that existed before the universal PreK program had only recently become approved collaborative partners at the time of this study.

In 2002/03, the first full year of West Virginia's universal PreK program, public school systems were the only documented providers of publicly funded PreK seats. But in the next year, 2003/04, 13 counties had approved collaborative partners, and such partners accounted for 24 percent of PreK seats in those counties—8 percent of all seats across the state (table 1).

After 2003/04 the number of counties with approved collaborative partners continued to increase annually through 2006/07. So did the share of seats provided in those counties by collaborative partners. Even in 2004/05, when statewide PreK program participation declined, the number of counties with approved collaborative partners increased from 13 to 31 and the number of participants in collaborative partner programs increased by more than 80 percent. By 2006/07 nearly a third of all PreK program participants statewide (32 percent) were in collaborative partner programs.

The number of PreK seats provided by collaborative programs thus grew at a faster rate than that of seats provided by public school systems. One explanation is that many of the approved collaborative partners already existed when West Virginia's universal, voluntary PreK program was created. That might have made it easier for the partners

TABLE 1
State prekindergarten program participation in West Virginia counties (including in collaborative partner programs), 2002/03–2006/07

Participation category	2002/03	2003/04	2004/05	2005/06	2006/07
Number of counties	53	54	54	55	55
Number of counties with collaborative partner programs	0	13	31	42	44
Number of prekindergarten (PreK) program participants statewide	5,293	5,758	4,438	7,396	9,008
Number of PreK program participants in counties with collaborative partner programs	0	1,968	2,674	6,151	7,774
Number of PreK program participants in collaborative partner programs	0	473	859	1,888	2,886
Percentage of PreK program participants in counties with collaborative partner programs who were in collaborative partner programs	na	24	32	31	37

na is not applicable.

Source: Authors' calculations based on data from West Virginia Department of Education 2007.

to provide seats than for the public schools to do so—though the partners might have had to make changes (for example, in their curriculums) to gain program approval.

Because enrollment data were lacking for participants in West Virginia early education programs other than the state's universal, voluntary PreK program, it is not known how much of the increased participation in collaborative partner programs resulted from the transformation of preexisting early education programs into approved collaborative partners. Still, it seems reasonable to assume that the growth of participation in collaborative partner programs—and in overall PreK program participation—might slow after most of West Virginia's preexisting early education programs have become approved collaborating partners.

PREKINDERGARTEN PARTICIPATION RATES INCREASED ACROSS ALL DEMOGRAPHIC AND SOCIOECONOMIC SUBGROUPS EXAMINED—THOUGH NOT AT THE SAME PACE

Proponents of universal, as opposed to targeted, PreK programs, argue that such programs benefit all eligible children. Critics charge that universal programs could drain resources from children in certain subgroups—such as those who are eligible for free or reduced-price lunch and those who receive special education services. What has been the case with West Virginia's universal, voluntary PreK program?

Participation rates for children from four West Virginia subgroups who were eligible to participate in the PreK program were analyzed:[3]

- Children qualifying for free or reduced-price lunch.
- Children of a racial/ethnic minority.
- Children receiving special education services with individualized education programs.
- Children from rural counties.

Over 2002/03–2006/07 PreK program participation rates rose across all these subgroups. (In addition, the rates rose for children from nonrural counties.)

But the growth in PreK program participation rates was not uniform across all subgroups. Notably,

growth in participation by children qualifying for free or reduced-price lunch did not keep pace with that for other children (table 2). That gap in participation, first seen in 2003/04, widened thereafter. In contrast, the PreK program participation rates of children from other subgroups—children of a racial/ethnic minority, children receiving special education services, and children in rural counties—were the same as, or higher than, overall PreK program participation rates for each year. The percentage of all eligible children statewide who participated in the PreK program constitutes an important baseline against which to compare the rate of PreK program participation by subgroup.

According to these estimates, children receiving special education services participated in the PreK program at higher rates than any other subgroup over 2002/03–2006/07—rates much higher than the overall participation rate for the eligible population. Children in rural counties, too, participated at rates higher than the eligible population. And children of a racial/ethnic minority participated at rates close to those of the eligible population.

Children qualifying for free or reduced-price lunch appear to have participated in the PreK program at lower rates than other children. In 2002/03 this subgroup participated at the same rate as all eligible children statewide. But in 2003/04 their participation began to fall compared with that of other children. And as statewide participation rates increased in 2005/06 and 2006/07, children qualifying for free or reduced-price lunch continued to fall farther behind the average for the eligible population.

To better understand the higher than average PreK program participation rates for children receiving special education services, the percentage of PreK program participants receiving special education services was compared with the percentage of kindergarten students receiving special education services. Similarly, to better understand the lower than average participation rates for children qualifying for free or reduced-price lunch, the percentage of qualifying PreK program participants was compared with the percentage of kindergarten students who qualified (figure 3).

TABLE 2

Annual rates of participation in West Virginia's universal, voluntary prekindergarten program, by subgroup, 2002/03–2006/07

Participation category	2002/03	2003/04	2004/05	2005/06	2006/07
Percentage of the eligible population statewide that participated in the program[a]	26	28	22	35	43
Percentage of children in specific subgroups statewide that participated in the program, by subgroup					
Children qualifying for free or reduced-price lunch[b]	26	26	19	30	37
Ethnic-minority children (racial/ethnic group other than White)[b]	24	27	21	34	45
Children receiving special education services[b]	42	39	31	44	49
Children in rural counties	33	35	27	41	48

Note: The West Virginia Department of Education suppressed enrollment data when there were fewer than 10 participants in a given cell (county, year, or subgroup).

a. The proxy for the eligible population is the average of enrollment totals in grades K–2.

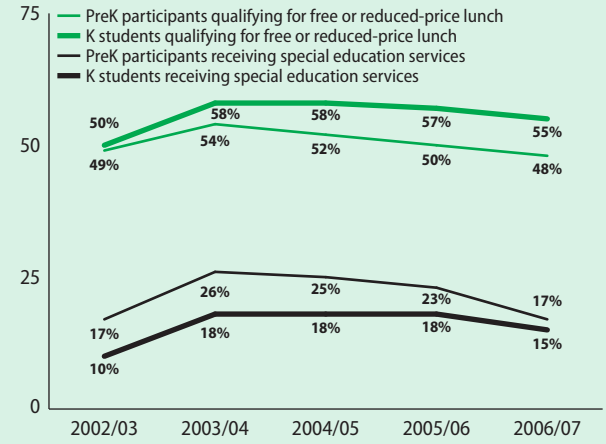
b. The West Virginia Department of Education suppressed data from grades 1 and 2 for more than 20 percent of all counties. As a result, the average enrollment totals for grades K–2 could not be used as a proxy for the eligible population when measuring the percentage of the eligible population in each of these three subgroups. Prekindergarten (PreK) program participation by four-year-olds in these three subgroups was instead estimated as the ratio of enrolled PreK program participants in that subgroup to enrolled kindergarten students in that same subgroup for each school year as these data were available for more counties. (Table C5 in appendix C shows overall participation rates for the eligible population using three different methods.)

Source: Authors' calculations based on data from West Virginia Department of Education 2007 and U.S. Department of Education, National Center for Education Statistics 2007.

FIGURE 3

Comparison of prekindergarten program participants who qualified for free or reduced-price lunch or received special education services with kindergarten students in the same subgroups, 2002/03–2006/07

Share of prekindergarten (PreK) participants and kindergarten (K) students in each subgroup (percent)



Note: For each school year, PreK program participation by four-year-olds in each of the two specified subgroups was estimated as the ratio of enrolled PreK program participants in that subgroup to enrolled kindergarten students in that same subgroup. If children from all subgroups participated in the PreK program at equal rates, the proportion of PreK program participants receiving special education services would be similar to the proportion of kindergarten students receiving special education services. In the same way, if children from all subgroups participated in the PreK program at equal rates, the proportion of PreK program participants qualifying for free or reduced-price lunch would be similar to the proportion of kindergarten students qualifying for free or reduced-price lunch. However, the use of a proxy to measure the eligible population means that the PreK program participation rates shown here might be imprecise. Estimates of participation rates by subgroup are even more likely to be imprecise—especially for counties with small school enrollments—because the West Virginia Department of Education suppressed enrollment data whenever there were fewer than 10 participants in a given cell (county, year, or subgroup).

Source: Authors' calculations based on data from West Virginia Department of Education 2007.

In 2002/03 roughly equal percentages of PreK program participants and kindergarten students qualified for free or reduced-price lunch. But in 2003/04 a higher percentage of kindergarten students than PreK program participants qualified. This gap continued to widen: by 2005/06 it had reached 7 percentage points.

In 2005/06 and 2006/07 both the number of PreK program participants who qualified for free or reduced-price lunch and the number of PreK program participants who did not had increased (table 3). However, growth in PreK program participation for these years came disproportionately from students who did not qualify.

In 2002/03, 17 percent of PreK program participants were receiving special education services, compared with 10 percent of kindergarten students. Both percentages increased in 2003/04. Still, the gap between the two percentages remained nearly constant through 2004/05 (see figure 3). That supports the claims of West Virginia Department of Education staff members, who said that the state worked hard to make special education preschool programs available to students identified as having special needs.

However, in 2006/07 the number of PreK program participants receiving special education services declined. That decline occurred as the number of PreK program participants not receiving special education services increased in both 2005/06 and 2006/07 (table 4). By 2006/07 children receiving special education services made up an estimated 17 percent of total PreK program participants, compared with 15 percent of kindergarten students (see figure 3).

PREKINDERGARTEN PARTICIPATION RATES VARIED WITH COUNTY CHARACTERISTICS

This section explores variability in Pre-K participation rates among the 55 counties in West Virginia's public school system.

Participation rates among children qualifying for free or reduced-price lunch were lower than county averages, especially in counties with high qualification rates

To further understand participation patterns for children qualifying for free or reduced-price lunch, countywide percentages of PreK program participants in this subgroup were compared with the countywide percentages of kindergarten students in this subgroup over 2002/03–2006/07. West Virginia's counties were arranged into three

TABLE 3

Prekindergarten program participants qualifying for free or reduced-price lunch compared with participants who did not, 2002/03–2006/07

Participation category	2002/03	2003/04	2004/05	2005/06	2006/07
Total number of prekindergarten program participants	5,293	5,758	4,438	7,396	9,008
Number of participants qualifying	2,596	3,114	2,307	3,697	4,318
Number of participants not qualifying	2,697	2,644	2,131	3,699	4,690
Percentage of participants qualifying	49	54	52	50	48

Note: Because the West Virginia Department of Education suppressed enrollment data whenever there were fewer than 10 participants in a given cell (county, year, or subgroup), the table may understate PreK program participation rates. Counts of students qualifying for free or reduced-price lunch were suppressed for seven West Virginia counties in 2002/03, though they were suppressed for only one county in 2006/07.

Source: Authors' calculations based on data from West Virginia Department of Education 2007.

TABLE 4

Prekindergarten program participants who received special education services compared with participants who did not, 2002/03–2006/07

Participation category	2002/03	2003/04	2004/05	2005/06	2006/07
Total number of prekindergarten program participants	5,293	5,758	4,438	7,396	9,008
Number of participants receiving services	8,93	1,473	1,131	1,703	1,565
Number of participants not receiving services	4,400	4,285	3,307	5,693	7,443
Percentage of participants receiving services	17	26	25	23	17

Note: Because the West Virginia Department of Education suppressed enrollment data whenever there were fewer than 10 participants in a given cell (county, year, or subgroup), the table may understate prekindergarten (PreK) program participation rates. The dataset used for this study includes 46 data cells with suppressed counts for PreK program participants receiving special education services. Seventeen of those cells are for 2002/03, a school year for which two counties reported no data. By 2006/07 totals were reported for all counties, but 10 counties had no data reported for students receiving special education that year. The pattern of suppressed data suggests that this report's underestimate of PreK program participation rates among children receiving special education services may be greater for 2002/03 than for later school years.

Source: Authors' calculations based on data from West Virginia Department of Education 2007.

equal-size groups (low, medium, high) based on countywide rates of qualification among all public school students enrolled in grades K–12 for 2002/03.

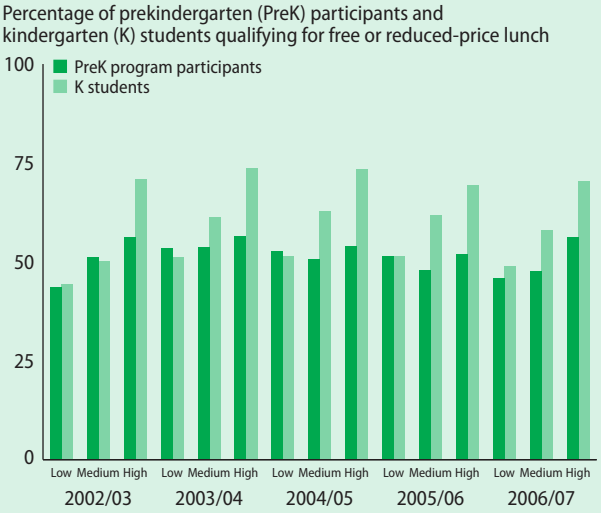
The analysis showed that counties with low rates of qualification for free or reduced-price lunch in K–12 for 2002/03 tended to have similar percentages of PreK program participants and kindergarten students who qualified for free or reduced-price lunch over 2002/03–2006/07 (figure 4). However, counties with high qualification rates tended to have higher percentages of kindergarten students than PreK program participants who qualified for free or reduced-price lunch. For example, in 2006/07, in counties with high qualification rates, 70 percent of kindergarten students qualified compared with 56 percent of PreK program participants.

Participation rates were consistently higher in rural counties than in nonrural counties

Children in rural counties often face greater obstacles to PreK program participation than children in nonrural counties. In rural counties travel distances can be greater, and program options fewer, than in nonrural counties. Of West Virginia's 55 counties, 44 (80 percent) were classified as rural in 2000/01 in the Common Core of Data

FIGURE 4

Prekindergarten program participants and kindergarten students qualifying for free or reduced-price lunch, by overall county prevalence of qualification (low, medium, or high), 2002/03–2006/07



Note: For county prevalence of qualification for free or reduced-price lunch, low is 13–45 percent; medium is 46–55 percent; high is 56–82 percent. Equal numbers of counties were designated low, medium, and high. Of the 275 potential observations for this analysis, 19 (6.9 percent) were excluded because the data for PreK students qualifying for free or reduced-price lunch were suppressed by the West Virginia Department of Education because there were fewer than 10 participants in a given cell (county, year, or subgroup). These exclusions may affect the reported results.

Source: Authors' calculations based on data from West Virginia Department of Education 2007.

(U.S. Department of Education, National Center for Education Statistics 2007; see box 1).

Over 2002/03–2006/07 West Virginia's 44 rural counties consistently accounted for approximately 62 percent of the eligible population for the PreK program. In 2002/03 children from rural counties accounted for 79 percent of total PreK program participants statewide, and in 2006/07 children from rural counties accounted for 69 percent of participants statewide. Moreover, rates of PreK program participation by children in both rural and nonrural counties followed a similar trend over 2002/03–2006/07 (table 5). Rural and nonrural participation rates rose together in 2002/03 and 2003/04, fell together in 2004/05, and rose together in 2005/06 and 2006/07.

Rural counties had higher PreK program participation rates than nonrural counties in every year from 2002/03 through 2006/07. In 2002/03 rural counties started at 33 percent participation, compared with 14 percent in nonrural counties. The gap in later years narrowed—but was not eliminated or reversed. Moreover, a breakdown of rural county PreK program participation rates by county population size (figure 5) shows that, in every year from 2002/03 through 2006/07, the rates for smaller than average rural counties exceeded those for larger than average rural counties.

According to staff members for early education at the West Virginia Department of Education, rural communities may rely more on public programs than do nonrural ones. The staff members said that parents in nonrural communities are likely to have greater access to noncollaborating private preschools or to church-operated early childhood programs. The lack of such private options could be most pronounced in the smallest rural counties, further encouraging parents to use universal PreK in those counties. If the educators are correct, then the gap between rates of PreK program participation in rural and nonrural counties should exceed the overall gap in participation rates for all types of preschool.

Regression analysis showed no statistically significant association between subgroups and prekindergarten participation rates—except in rural counties

A regression analysis of participation rates in the PreK program was run to control for multiple factors, including county size (measured by K–12 enrollments), the demographic and socioeconomic mix of eligible children, and indicators of county characteristics including income, education, and rural or nonrural classification. The analysis found a statistically significant association between three county characteristics and PreK program participation rates:

- *Education levels.* Participation rates were higher in counties with higher percentages of high school graduates in 2000.

TABLE 5

Participation rates in prekindergarten program, by county rural or nonrural status, 2002/03–2006/07

Participation category	2002/03	2003/04	2004/05	2005/06	2006/07
Rural counties					
Number of children in the eligible population[a]	12,552	12,491	12,607	12,749	12,883
Number of PreK program participants	4,179	4,428	3,346	5,283	6,210
Rate of PreK program participation (percent)	33	35	27	41	48
Nonrural counties					
Number of children in the eligible population[a]	7,931	7,871	7,903	7,929	7,948
Number of PreK program participants	1,114	1,330	1,092	2,113	2,798
Rate of PreK program participation (percent)	14	17	14	27	35

a. Eligible population is proxied by the average of reported enrollment totals in grades K–2 (see appendix B).

Source: Authors' calculations based on data from West Virginia Department of Education 2007 and U.S. Department of Education, National Center for Education Statistics 2007.

- *County size.* Participation rates were higher in counties with lower total public school enrollments in grades K–12.

- *Rural status.* Participation rates were higher in counties classified as rural in 2000.

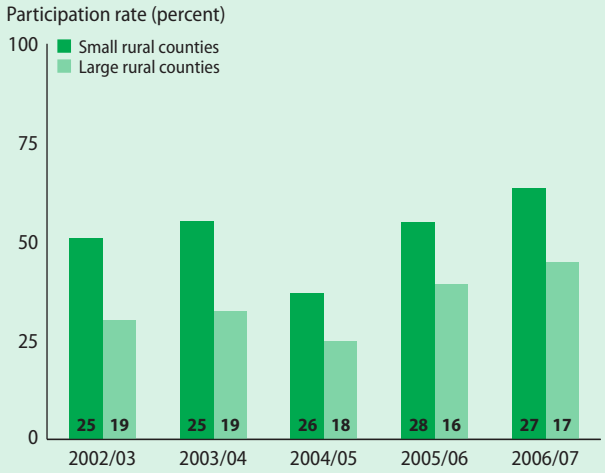
In addition, the analysis suggested an inverse association between countywide income levels and PreK program participation rates. (See appendix C for a detailed account of the regression analysis.)

After controlling for the factors addressed above—education levels, county size, rural status, and countywide income levels—the regression analysis found no statistically significant association between rates of PreK program participation and membership in any other demographic or socioeconomic subgroup examined for this study.

Statistical associations between county characteristics measured at the county level and PreK program participation rates do not imply that those rates and characteristics are causally related. Furthermore, such statistical associations could differ at the community or household level (for example, although rates of PreK program participation were greater in counties with higher percentages of high school graduates in 2000, it is not known whether rates of participation were higher for children of high school graduates).

FIGURE 5

Rural county participation rates in prekindergarten program, by county population size (small or large), 2002/03–2006/07



Note: Small counties are defined for each school year as counties with less than the mean number of children eligible for the prekindergarten (PreK) program in rural counties that year. Large counties have more than that number. Numbers of small and large counties are noted inside the bars.

Source: Authors' calculations based on data from West Virginia Department of Education 2007 and U.S. Department of Education, National Center for Education Statistics 2007.

NOTES

The authors of this report would like to thank the West Virginia Department of Education for providing the documents and data that made the study possible. They also would like to thank Margaret Burchinal for her advice; Laura Munley for helping to develop the literature review; Michael Hansen and Cathy Jones for reviewing an early draft and providing helpful comments; and all the editors for their assistance. Finally, the authors thank the anonymous referees for their helpful comments. Any remaining errors are the authors' own.

1. Although three-year-olds with individualized education programs are also eligible for West Virginia's PreK program, this study examines participation by four-year-olds only.

2. In constructing changes in county participation rates nonreporting counties were assumed to have zero enrollment. This assumption has a negligible effect on the reported results.

3. Students who qualified for free or reduced-price lunch and who were receiving special education services were identified as members of those subgroups either by their teachers or by their parents. The report's discussion of those subgroups must be read with caution, for two reasons. First, methods used to identify students in these two subgroups might have differed by county or year. Second, because members of the two subgroups must be identified by others to show up in the enrollment counts, students in these subgroups may have been undercounted. These cautions pertain both to PreK program participant counts and to the measure of the eligible population (defined in box 1). The direction of bias in reported participation rates from possible undercounts is unknown, as is the magnitude of error. However, the impact of underidentification on reported participation rates is mitigated by possible underreporting of counts used for both the numerator and denominator of the participation rate ratio.

APPENDIX A
RESEARCH ON KINDERGARTEN READINESS AND ON THE BENEFITS OF PREKINDERGARTEN

Studies have shown that children's readiness for kindergarten varies by socioeconomic and ethnic subgroup. Studies have shown, too, that high-quality prekindergarten (PreK) programs can increase kindergarten readiness across subgroups. However, studies disagree on the benefits of universal PreK programs compared with targeted PreK programs. Some studies suggest that rates of participation in preschool and PreK programs are associated with certain socioeconmic and demographic factors.

Children's readiness for kindergarten varies by socioeconomic subgroup and ethnic subgroup

Researchers have found that children come to school with different levels of readiness to learn. Such differences in readiness and achievement can be demonstrated for children as young as age three. For example, a 1995 study found that three-year-olds of professional-class parents had vocabularies 50 percent larger than those of three-year-olds with working-class parents and twice as large as those of three-year-olds with parents receiving welfare (Hart and Risley 1995). And a 1998 study attributed half the academic achievement gap between Black grade 12 students and White grade 12 students to the academic achievement gap between Black grade 1 students and White grade 1 students (Phillips, Crouse, and Ralph 1998).

According to an analysis of 1998 data, performance by children in middle-income households on cognitive tests was higher than that of children qualifying for free or reduced-price lunch and lower than that of higher-income children. The same analysis found a similar pattern for social skills, which are considered important for children's success in school (Schulman and Barnett 2005). Finally, a 2002 study of cognitive assessments conducted at entry into kindergarten found that children from the highest socioeconomic status group scored 60 percent higher than children from the lowest socioeconomic status group (Lee and Burkham 2002).

High-quality prekindergarten can increase kindergarten readiness across subgroups

Several studies have shown that participating in high-quality PreK can increase school readiness across subgroups. For example, an analysis of Oklahoma's universal PreK program in Tulsa found that the program increased school readiness, both within each racial/ethnic group and across economic subgroups (Gormley et al. 2005). A more recent study measuring the effects of public PreK programs on school readiness in five states found statistically significant positive effects on early language, literacy, and mathematics development—as well as evidence of positive effects on print awareness skills—in both targeted and universal PreK programs (Barnett, Lamy, and Jung 2005b).

The benefits of PreK have been documented by researchers using various methodologies in various settings. The widely cited High/Scope Perry preschool experiment used a randomized design to evaluate a small-scale demonstration program in Ypsilanti, Michigan, in which three- and four-year-olds in low-income households participated for 2.5 hours a day, five days a week, for up to two years. The program ran for 30 weeks during the school year. Teachers made one 90-minute visit per week to the children's homes to involve mothers in their children's education (Schweinhart et al. 1993). The effects of the program on participating children were tracked over time, and the staff members who gathered outcome data were blind to the treatment condition. Benefits of the program included an immediate boost to intelligence quotient, which faded by grade 2; improved achievement test scores through age 14; higher grades; higher high school graduation rates; lower crime rates; and higher earnings. A recent analysis of the benefit-cost ratio found a social gain of $9 for every $1 invested, with an estimated 18.4 percent rate of private-plus-public return for

participants through age 40 (Barnett, Belfield, and Nores 2004).

Despite the documented benefits of the preschool program, the research design in the High/Scope Perry experiment left four questions unanswered. First, because children in the control group participated in no early childhood program, one cannot rule out the possibility that a less intensive or different program could have yielded similar long-term benefits. Second, it is possible that the long-term benefits observed during the experiment were enhanced by participants' awareness of their treatment condition and that the ongoing monitoring caused them to make more careful life choices that improved their outcomes. Third, it remains to be shown whether the small demonstration program used in the experiment could be applied successfully in classrooms of a larger, more typical size. Fourth, it also remains to be shown whether the measured outcomes will withstand external evaluation, as opposed to evaluation conducted by the original program designers (Schweinhart 2004).

In a different study the Chicago Child-Parent Center Project selected matched pairs of impoverished neighborhoods in Chicago to evaluate the effects of a half-day PreK program for three- and four-year-olds. The program was accompanied by services including health care, social services, and free meals for children. Parental participation was encouraged. The effects from the Chicago Child-Parent Center Project included reductions in enrollments in special education, reductions in grade retention, increases in graduation rates, and reductions in juvenile arrests. The estimated benefit-cost ratio for the intervention was 8:1 (Reynolds, Temple, and Ou 2003).

Positive findings also have been obtained in large-scale programs. Researchers used a regression discontinuity design to measure the effects of PreK program participation in five states: Michigan, New Jersey, Oklahoma, South Carolina, and West Virginia (Barnett, Lamy, and Jung 2005b). The team took advantage of strict age criteria for enrollment in PreK programs and in kindergarten to create their comparison groups. Children completing a PreK program were compared with children close in age who were just entering one. Outcomes on cognitive skills including vocabulary, early math skills, phonologic skills, and print awareness were measured. Positive, statistically significant results were found in each case. For example, results based on a sample of 720 children from across West Virginia revealed that the state-funded prekindergarten program was associated with a 30 percent higher vocabulary growth rate—equal to about three additional months of progress. Participants also increased their print awareness and early math skills, though no significant effects were found for phonological awareness (Barnett, Lamy, and Jung 2005a).

Targeted prekindergarten or universal prekindergarten: arguments and evidence

Universal programs are available without cost to all age-appropriate children. In contrast, targeted programs use means-test criteria—such as having household income below a specified level—to limit services to the children likely to benefit most.

West Virginia has fully embarked on a multiyear implementation plan toward a universal PreK program. So have Florida, Georgia, Massachusetts, New York, and Oklahoma (in addition to Washington, D.C., and Los Angeles County, California). Many other states have targeted programs for children from households with incomes below a specified level. Yet, while interest in publicly funded PreK programs grows, eligibility criteria are loosening and state funding levels are rising (Barnett et al. 2006). As West Virginia approaches universal access, its experience can yield insights for other states contemplating program expansion.

Advocates of universal PreK cite empirical research on preschool experiences to show that:

- Children across a wide range of income groups benefit from early education (Gormley et al. 2005; Larsen and Robinson 1989).

- Opportunities for children in middle-income households are more limited, and resources for this group can be of lower quality than for children in higher- or lower-income households (Bainbridge et al. 2005; Phillips et al. 1994).

- Children in lower-income households can benefit from the presence in their classrooms of children with greater economic advantages (Pianta et al. 2005).

Benefit-cost studies show that universal programs are good social investments (Belfield 2006). In addition, simulations based on empirical research show that a policy postponing remediation until adolescence would cost 35 percent more than a Perry-like PreK program that yields comparable education outcomes. Returns on later investments are higher if they follow earlier investments (Cunha and Heckman 2006).

Advocates of targeted PreK programs offer evidence that children eligible for free or reduced-price lunch, children of a racial/ethnic minority, and children receiving special education services stand to benefit most from PreK programs and that the benefit to these high-needs groups increases with program quality and intensity (Robin, Frede, and Barnett 2006). According to the advocates of targeted PreK programs, universal PreK programs shrink the services dedicated to children in the same high-needs groups (Education Sector 2006). In contrast, the advocates of universal PreK programs argue that broad-based programs will draw more political support and raise PreK quality for all children (Education Sector 2006).

Socioeconomic and demographic factors associated with rates of preschool and prekindergarten participation

According to an analysis of data on attendance at private and public preschool programs drawn from the National Household Education Survey, children in poverty were less likely than others to participate in preschool—despite such government efforts as Head Start and state programs (Barnett and Yarosz 2004). The same analysis showed that children were less likely to be enrolled in preschool (including all types of school classrooms, but excluding home-based care) if they were Hispanic, if their mothers were less educated, or if their families had lower incomes. Children in families with modest incomes who were not eligible for government-subsidized PreK programs were least likely to be enrolled in preschool.

Even though children in poverty and those with less educated mothers have low overall rates of preschool participation, a multistate PreK study finds that children in lower-income households and Hispanic, Asian, and Black children were more likely to be enrolled in PreK than children in higher-income households and White children (Clifford et al. 2005). Another study finds that Black and Hispanic children were more likely to participate in publicly funded preschool programs, such as Head Start and targeted PreK programs (Magnuson and Waldfogel 2005).

The studies cited suggest that observed participation rates might be influenced by the predominance of targeted, rather than universal, PreK programs. Alternatively, or in addition, PreK program participation rates might differ by socioeconomic and demographic subgroup because of a predisposition in certain subgroups to participate.

APPENDIX B METHODOLOGY

This report examines rates of participation in West Virginia's universal, voluntary prekindergarten (PreK) program over 2002/03–2006/07. The report describes the share of program seats provided by collaborative partners rather than by public school systems alone. It also analyzes West Virginia PreK program participation rates over 2002/03–2006/07 for three subgroups: children qualifying for free or reduced-price lunch (low-income households), children of a racial/ethnic minority (race/ethnicity other than White), and children receiving special education services. Finally, the report explores variations in PreK program participation rates among the 55 counties that make up West Virginia's public school system, including by county geography (rural or nonrural) and other county characteristics.

A PreK participation rate was defined for this study as the ratio of children enrolled in publicly funded PreK programs to eligible children. To be counted as enrolled a child had to be registered in and attending the PreK program at the end of the second month of the school year.

The number of four-year-olds in West Virginia was not known, so the average of reported enrollment totals in grades K–2 was used as a proxy. Throughout this report the term *eligible population* denotes that average. (The reasons for choosing this proxy over alternatives appear in the methodology for the participation analysis, below.)

For three subgroups—students qualifying for free or reduced-price lunch, students of a racial/ethnic minority, and students receiving special education services—the West Virginia Department of Education suppressed data; this affected reporting for grades 1 and 2 for more than 20 percent of all counties. When there were fewer than 10 students per county in a given cell (county, year, or subgroup), researchers could not use the average of enrollment totals for grades K–2 as their proxy for the eligible population when measuring the percentage of the eligible population in each of these three subgroups. Instead, because data for kindergarten on these three subgroups was available for more counties, PreK participation by four-year-olds in each of these three subgroups was estimated as the ratio of enrolled PreK program participants in that subgroup to enrolled kindergarten students in that same subgroup for each school year. (To compare these estimates with overall participation rates for the eligible population when the proxy for the eligible population is the number of kindergarten students—rather than the average of enrollment totals in grades K–2—see appendix C, table C5.)

All the analyses are based on the number of participants in publicly funded PreK programs and do not include participants in private, noncollaborating PreK programs.

Data sources and sample

Three data sources were used. First, the West Virginia Education Information System (West Virginia Department of Education 2007) provided summary data on student public school enrollments for each county, by grade level (PreK–12) and by student subgroup (for example, qualifying for free or reduced-price lunch), for each year from 2002/03 through 2006/07. All participation rates and enrollments in this study are based on these data, which do not include private school enrollment figures. (The suppression by the West Virginia Department of Education of reported counts for subgroups with fewer than 10 students does not affect reported overall enrollment totals.)

Second, the Common Core of Data (U.S. Department of Education, National Center for Education Statistics 2007), which contains information on county attributes and public school student demographic and socioeconomic characteristics by school and grade level (based originally on U.S. Census data), provided data on the extent of urbanization in each West Virginia county for 2000/01.

Third, the U.S. Census web site (U.S. Census Bureau 2000) provided 1999 data on income and poverty for 1999, and 2000 data on education levels, for each West Virginia county. The data indicators included median income, the percentage of families with a child under age 18 living in poverty, and the percentage of adults age 18 and older with a high school diploma. (The data come from the Census long form and are subject to sampling error. That could affect reported estimates of the associations between county characteristics and PreK program participation, and it could affect reported estimates of the statistical significance of those associations.)

Methodology for the regression analysis

The regression analysis of county participation rates for 2002/03–2006/07 involves estimation of single-equation statistical models where the dependent variable is the log of the odds that children in a given county will participate in PreK, or,

$$\ln(P/(1-P)_{j,t})$$

where P is the proportion of four-year-olds who participated in publicly funded PreK in county j ($j = 1, \ldots, 55$) and school year t ($t = 0, 1 \ldots, 4$).

The participation rate, P, measured by the ratio of participants to the eligible population, was constructed from enrollment data provided by the West Virginia Department of Education (2007). The eligible population was the number of all four-year-olds in West Virginia, but because this number was unknown, a proxy for it had to be found. Three alternative proxies were considered:

1. The number of kindergarteners enrolled in public schools in county j in year t.

2. The average number of children in grades K–2 in county j in year t.

3. The number of kindergarteners in county j in year t+1.

These three measures tracked each other very closely. Proxy 1 was the easiest to construct but had the potential to err as a result of year-to-year changes in population. Proxy 2 smoothed those fluctuations. Proxy 3 had the potential to be the most accurate, since both the numerator and denominator reflected the same children, albeit at two different times. Yet error would enter into this proxy if net movements into or out of a county affected the count of eligible children. Proxy 3 had the further disadvantage of forcing the last year of data—2006/07—to be dropped from the analysis, since information to construct the covariate for that year was not yet available.

Proxy 2 was chosen for the construction of the dependent variable in their analyses (except for three subgroups—children qualifying for free or reduced-price lunch, children of a racial/ethnic minority, and children receiving special education services, as explained above). The reason was that only the construct based on proxy 2 did not result in any actual participation rates greater than one. The results were not sensitive to this choice of proxy. (Additional results, using each of the alternative constructs from proxies 1 and 3 are given in appendix C, tables C3 and C4.)

The log of the odds is assumed to be linearly related to the independent variables, defined as follows:

- $ln\ of\ K–12\ enrollments_{j,t}$ is the natural log of county j and year t K–12 enrollments as reported by the West Virginia Education Information System.

- $Median\ Income\ in\ Thousands_j$ is the median household income in county j in year 1999, as reported in the 2000 U.S. Census.

- $Percent\ HS\ Graduates_j$ is the percentage of adults, age 18–65, with a high school diploma in county j on April 1, 2000, as reported in the 2000 U.S. Census.

- $Percent\ Households\ in\ Poverty_j$ is the percentage of households with children under 18

living in poverty in county *j* in year 1999, as reported by the U.S. Census.

- *Percent K FRL Eligible*$_{j,t}$ is the percentage of kindergarten students enrolled in public schools in county *j* and year *t* who qualify for free or reduced-price lunch.

- *Percent K Minority*$_{j,t}$ is the percentage of kindergarten students enrolled in public schools in county *j* and year *t* who are of a racial/ethnic minority (race other than White).

- *Percent K Special Education*$_{j,t}$ is the percentage of kindergarten students enrolled in public schools in county *j* and year *t* who have individualized education programs.

- *Rural*$_j$ is a zero-one indicator, equal to one if county *j* has urban-centric locale codes equal to 32 (town, distant), 33 (town, remote), 41 (rural, fringe), 42 (rural, distant), or 43 (rural, remote), as reported in the Common Core of Data for school year 2000/01.

Because the study examined participation rates over time, it controlled for time as well, using two different constructs for time. Two distinct models were specified:

- Model 1 included a set of dichotomous variables that would capture annual shifts in the log-odds of participation.

- Model 2 replaced this construct with the continuous variable, *time* (where 2002/03 = 0, . . ., 2006/07 = 4), as well as the dichotomous variable 2004/05 school year, equal to one in 2004/05 and zero otherwise. This specification was more restrictive, but it provided an average annual measure of growth in participation while capturing the dip in participation for 2004/05. It also appears to be a reasonable reflection of growth (as seen in figure 1 in the main text).

The log-odds function was chosen to model participation rates because of the bounded nature of participation rates—they cannot fall below zero or exceed one. The log-odds model bounds predictions for *P* between this interval. The residual associated with a log-odds model is given by ej,t and has zero mean and variance equal to

$$1/n_{jt}\, P_{jt}\, (1–P_{jt}),$$

where n_{jt} is the population of eligible participants (proxied by the average enrollment in grades K–2 in county *j* in year *t*). In the present model the error term is further complicated by clustering of the residuals associated with the county-level fixed effects parameters. Because of the heteroskedastic nature of the error term, the model was estimated using ordinary least squares with Huber-White robust standard errors adjusted for clustering at the county level.

The odds for each covariate are reported in appendix C. The coefficients measure the degree of association between the dependent and each of the independent variables, holding constant other factors included in the model. For example, the coefficients on county descriptors such as *Rural* tell the direction and magnitude of association between the covariate (relative to its counterfactual, in this case, nonrural) and the odds of participation. To determine statistical significance the researchers used two-tailed t-tests with $\alpha = .05$. However, standard errors and *p*-values are reported for the interested reader.

APPENDIX C
DETAILED RESULTS FROM THE PARTICIPATION ANALYSIS

In analyzing prekindergarten (PreK) program participation rates, 263 complete county-year observations were used to estimate models 1 and 2 (defined in appendix B). Descriptive statistics for those county-year observations are provided in table C1.

PreK program enrollments over 2002/03–2006/07 averaged 120 children per county. County program participation rates averaged 39 percent. The average eligible population in each county was 386. The average county enrollment in grades K–12 was 5,234.

Of West Virginia's 55 counties, 44 (80 percent) were considered rural in 2000/01. Based on data reported in the 2000 Census (U.S. Census Bureau 2000), the average median annual household income across West Virginia counties for 1999 was $28,330. On average, 22.7 percent of families with children in each county lived in poverty in 1999. About 73 percent of adults age 18 and older, on average, held high school diplomas in each county in 2000. These data come from the Census long form and are subject to sampling error.

In each county-year the share of kindergarten students qualifying for free or reduced-price lunch averaged 58.9 percent, the share of kindergarten students of a racial/ethnic minority averaged 4.1 percent, and the share of kindergarten students receiving special education services averaged 17.8 percent.

Compared with the full set of 275 county-years (55 counties times 5 years), the estimation sample had larger enrollments per county: 386 on average in grades K–2 (compared with 374 for the full set of county-years) and 5,234 in grades K–12 (compared with 5,077 for the full set of county-years). The estimation sample lost 12 observations because the West Virginia Department of Education suppressed data when there were fewer than 10 students per county in a given cell (county, year,

TABLE C1
Descriptive statistics for county-year observations used in participation rate analysis

Variable	Number of county year observations	Mean	Standard deviation
Participation rate	263	0.39	0.22
Four-year-old enrollment	263	119.75	102.27
Average enrollment in grades K–2	263	386.06	361.11
Enrollment in grades K–12	263	5,234.15	4,680.73
Percentage of kindergarten students qualifying for free or reduced-price lunch	263	58.88	11.54
Percentage of kindergarten students of a racial/ethnic minority	263	4.10	4.35
Percentage of kindergarten students receiving special education services	263	17.86	6.01
Rural classification	55	0.80	0.40
Median income (thousands of dollars)	55	28.33	5.01
Percentage of high school graduates[a]	55	72.62	7.02
Percentage of households living in poverty in 1999	55	22.73	7.22

a. The percentage of adults age 18 and older with a high school diploma.

Note: The sample comprised records for 55 counties observed in each of five years, less 12 records with suppressed data. Four-year-old enrollment is enrollment in West Virginia's universal, voluntary prekindergarten (PreK) program.

Source: Authors' calculations based on data from West Virginia Department of Education 2007; U.S. Department of Education, National Center for Education Statistics 2007; and U.S. Census Bureau 2000.

or subgroup). Four observations were lost because of low overall enrollment. Eight were lost because the number of students receiving special education services was suppressed.

Average PreK enrollment in the estimation sample (119.8) was similar to that for the full sample of 271 county-years that reported PreK enrollment (117.7). Four county characteristics—median income, high school graduation rate, percentage of households in poverty, and rural classification) were measured for a single year and controlled for a "fixed effect" of those characteristics on the log-odds of participation over the period studied.

The results from models 1 and 2 are shown in table C2. Coefficients greater than one show that the covariate is associated with greater odds of participation. Coefficients smaller than one show that the covariate is associated with lower odds of participation.

Model 1

Model 1 found that for 2002/03–2006/07 there were statistically significant differences in participation rates among:

- *Counties with different income levels in 1999.*

TABLE C2

Ordinary least squares regression with robust standard errors, county data for each school year (2002/03–2006/07), models 1 and 2

	Model 1			Model 2		
Variable	Odds ratio	Robust standard error	$P > t$	Odds ratio	Robust standard error	$P > t$
Log of enrollment in grades K–12	0.60	0.18	0.006	0.59	0.18	0.004
Percentage of kindergarten students qualifying for free or reduced-price lunch	1.00	0.01	0.987	1.00	0.01	0.755
Percentage of kindergarten students of a racial/ethnic minority	1.01	0.02	0.564	1.01	0.02	0.667
Percentage of kindergarten students receiving special education services	1.02	0.02	0.141	1.02	0.01	0.260
Rural classification	2.86	0.29	0.001	2.83	0.29	0.001
Median income (thousands of dollars)	0.95	0.03	0.083	0.94	0.03	0.050
Percentage of high school graduates[a]	1.07	0.03	0.024	1.07	0.03	0.026
Percentage of households living in poverty in 1999	1.04	0.03	0.166	1.04	0.03	0.179
2003/04 school year	0.92	0.15	0.574			
2004/05 school year	0.60	0.18	0.006	0.48	0.08	0.000
2005/06 school year	1.38	0.19	0.102			
2006/07 school year	2.13	0.13	0.000			
Time				1.22	0.03	0.000
R-squared	0.56			0.55		
Number of observations	263			263		
$P > F$	0			0		

a. The percentage of adults age 18 and older with a high school diploma.

Note: Dependent variable: log-odds of prekindergarten (PreK) program county participation rate.

Source: Authors' calculations based on data from West Virginia Department of Education 2007; U.S. Department of Education, National Center for Education Statistics 2007; and U.S. Census Bureau 2000.

- *Counties with different education levels in 2000.* Counties with higher percentages of high school graduates in 2000 were associated with higher PreK program participation rates.

- *Counties considered rural and nonrural in 2000/01.* All else equal, children in counties that were considered rural in 2000/01 had odds of participating in PreK that were, on average, much higher (approximately 2.86 to 1, or 186 percent greater) than did children from counties considered nonrural in 2000/01.

- *Counties of different size, measured in terms of (the log of) K–12 enrollments in each county year.* Living in a county with larger enrollment in grades K–12 was associated with lower odds of participation.

Neither median income in 1999 nor the percentage of households living in poverty in 1999 was a statistically significant indicator when both were included. But when, in two additional models, just one of these indicators—median income or poverty—was included, in each case the included coefficient was significant. Conducting an F-test of the joint significance of these two covariates, the two were jointly significant ($p = .013$). These findings together suggested a negative association between income in 1999 and PreK program participation rates over 2002/03–2006/07.

The coefficients on the percentages of children from each subgroup showed that after controlling for county income levels in 1999, county education levels in 2000, and county enrollments in grades K–12, there was no association between PreK program participation and the percentage of children in each county who qualified for free or reduced-price lunch, who were of a racial/ethnic minority, or who received special education services.

Because the data on county characteristics are subject to sampling error, the estimated coefficients in models 1 and 2 might be biased and should be interpreted with caution.

Model 2

Model 2 differs from model 1 only in how time is modeled (see appendix B). Point estimates of the associations between county characteristics and participation are robust to the specification change. After controlling for time, county income levels in 1999, county education levels in 2000, and county enrollments in grades K–12, the demographic and socioeconomic characteristics of the eligible population remained statistically insignificant.

The time covariates provided insight on growth rates across counties in the state. Each model told a similar story. Compared with county participation rates in 2002/03, results from model 1 showed no significant difference in county participation rates in 2003/04 after other factors were taken into account. Participation dipped significantly in 2004/05. Then, participation in 2006/07 made gains that were statistically significant compared with 2002/03. From model 2 there were 22 percent greater odds of participation per year, on average (except in 2004/05, when participation rates dipped below those for 2002/03).

The regression results from models 1 and 2 are shown in tables C3 and C4 for each method of calculating the eligible PreK population:

- Method 1 uses the number of kindergarteners in year *t*.

- Method 2 uses the average number of children in grades K–2.

- Method 3 uses the number of kindergarteners in year *t*+1.

All three methods produced similar results, with some variation in the significance of median income in models 1 and 2 and in the control for 2005/06 in model 1.

Average county participation rates for each year are shown in table C5.

TABLE C3

Ordinary least squares regression with robust standard errors from model 1, using county data for 2002/03–2006/07, by method of measuring the eligible population for prekindergarten

	Method 1			Method 2			Method 3		
Variable	Odds ratio	Robust standard error	*P* > *t*	Odds ratio	Robust standard error	*P* > *t*	Odds Ratio	Robust standard error	*P* > *t*
Log of enrollment in grades K–12	0.60	0.20	0.013	0.59	0.19	0.007	0.58	0.18	0.004
Percentage of kindergarten students qualifying for free or reduced-price lunch	1.00	0.01	0.931	1.00	0.01	0.948	1.00	0.01	0.904
Percentage of kindergarten students of a racial/ethnic minority	1.01	0.03	0.749	1.01	0.02	0.583	1.02	0.02	0.540
Percentage of kindergarten students receiving special education services	1.01	0.02	0.459	1.03	0.02	0.152	1.02	0.01	0.180
Rural classification	3.11	0.31	0.001	2.83	0.29	0.001	2.87	0.29	0.001
Median income (thousands of dollars)	0.94	0.03	0.050	0.95	0.03	0.149	0.95	0.03	0.070
Percentage of high school graduates[a]	1.07	0.03	0.031	1.07	0.03	0.023	1.07	0.03	0.026
Percentage of households living in poverty in 1999	1.04	0.03	0.293	1.05	0.03	0.140	1.04	0.03	0.243
2003/04	0.97	0.16	0.856	0.88	0.19	0.490	0.92	0.14	0.538
2004/05	0.66	0.18	0.024	0.55	0.22	0.009	0.62	0.16	0.003
2005/06	1.52	0.17	0.019	1.30	0.23	0.261	1.40	0.17	0.052
2006/07				1.99	0.15	0.000	2.15	0.13	0.000
R-squared	0.56			0.54			0.56		
Number of observations	210[b]			211			211		
P > *F*	0.00			0.00			0.00		

a. The percentage of adults age 18 and older with a high school diploma.

b. One observation is omitted because the participation rate was greater than 100 percent.

Note: Dependent variable: log-odds of prekindergarten (PreK) county participation rate. The log of the odds is used (rather than *P*) as the dependent variable because *P* is bounded by zero and one. The transformed variable bounds the predicted values for *P* to that range (Greene 2000). Method 1 measures participation as the ratio of PreK enrollment to kindergarten enrollment in year *t*. Method 2 measures participation as the ratio of PreK enrollment to the average enrollment for grades K–2 in year *t*. Method 3 measures participation as the ratio of PreK enrollment in year *t* to kindergarten enrollment in year *t*+1.

Source: Authors' calculations based on data from West Virginia Department of Education 2007; U.S. Department of Education, National Center for Education Statistics 2007; and U.S. Census Bureau 2000.

Table C6 shows the descriptive statistics for the 211 county-years in the estimation sample for the models. Because 2006/07 data were deleted (because the dependent variable could not be constructed for method 3), the resulting enrollment and participation rates were lower than those in the sample of 263 used for the base models. Other characteristics are similar in the 2002/03–2005/06 sample and the 2002/03–2006/07 sample.

TABLE C4

Ordinary least squares regression with robust standard errors from model 2, using county data for 2002/03–2006/07, by method of measuring the eligible population for prekindergarten

	Method 1			Method 2			Method 3		
Variable	Odds ratio	Robust standard error	$P > t$	Odds ratio	Robust standard error	$P > t$	Odds Ratio	Robust standard error	$P > t$
Log of enrollment in grades K–12	0.60	0.20	0.011	0.58	0.18	0.005	0.57	0.18	0.003
Percentage of kindergarten students qualifying for free or reduced-price lunch	1.00	0.01	0.800	1.00	0.01	0.787	1.00	0.01	0.650
Percentage of kindergarten students of a racial/ethnic minority	1.01	0.03	0.786	1.01	0.02	0.695	1.01	0.02	0.634
Percentage of kindergarten students receiving special education services	1.01	0.01	0.609	1.02	0.02	0.250	1.01	0.01	0.445
Rural classification	3.10	0.31	0.001	2.81	0.29	0.001	2.84	0.29	0.001
Median income (thousands of dollars)	0.93	0.03	0.037	0.95	0.03	0.095	0.94	0.03	0.042
Percentage of high school graduates[a]	1.07	0.03	0.032	1.07	0.03	0.025	1.07	0.03	0.028
Percentage of households living in poverty in 1999	1.03	0.03	0.312	1.05	0.03	0.150	1.04	0.03	0.259
Time	1.18	0.05	0.001	1.21	0.03	0.000	1.23	0.03	0.000
2004/05	0.53	0.06	0.000	0.47	0.09	0.000	0.49	0.07	0.000
R-squared	0.55			0.53			0.53		
Number of observations	210[b]			211			211		
$P > F$	0.00			0.00			0.00		

a. The percentage of adults age 18 and older with a high school diploma.

b. One observation is omitted because the participation rate is greater than 100 percent.

Note: Dependent variable: log-odds of prekindergarten (PreK) county participation rate. The log of the odds is used (rather than *P*) as the dependent variable because *P* is bounded by zero and one. The transformed variable bounds the predicted values for *P* to that range (Greene 2000). Method 1 measures participation as the ratio of PreK enrollment to kindergarten enrollment in year *t*. Method 2 measures participation as the ratio of PreK enrollment to the average enrollment for grades K–2 in year *t*. Method 3 measures participation as the ratio of PreK enrollment in year *t* to kindergarten enrollment in year *t*+1.

Source: Authors' calculations based on data from West Virginia Department of Education 2007; U.S. Department of Education, National Center for Education Statistics 2007; and U.S. Census Bureau 2000.

TABLE C5

Average county rates of prekindergarten program participation, by method of measuring eligible population, 2002/03–2006/07 (percent)

Average county prekindergarten program participation rate	2002/03	2003/04	2004/05	2005/06	2006/07
Method 1	36	37	27	44	53
Method 2	36	39	28	44	52
Method 3	36	37	28	45	—[a]

— is not available (see note a).

a. Participation rate using kindergarten enrollment in the next school year as the eligible population cannot be calculated for the study's final year of data.

Note: Method 1 measures participation as the ratio of PreK enrollment to kindergarten enrollment in year *t*. Method 2 measures participation as the ratio of PreK enrollment to the average enrollment for grades K–2 in year *t*. Method 3 measures participation as the ratio of PreK enrollment in year *t* to kindergarten enrollment in year *t*+1.

Source: Authors' calculations based on data from West Virginia Department of Education 2007.

TABLE C6

Descriptive statistics for the 211 county-years in the estimation sample, 2002/03–2005/06

Variable	Number of observations	Mean	Standard deviation	Minimum	Maximum
Method 1 prekindergarten participation rate	211	0.36	0.21	0.03	1.00
Method 2 prekindergarten participation rate	211	0.37	0.22	0.03	0.98
Method 3 prekindergarten participation rate	211	0.36	0.21	0.03	0.89
Enrollment in grades K–12	211	5,201.78	4,661.20	954.00	28,417.00
Four-year-old enrollment	211	107.27	88.59	11.00	537.00
Average enrollment in grades K–2	211	383.45	360.29	67.00	2,181.67
Enrollment in kindergarten	211	390.71	367.11	65.00	2,217.00
Enrollment in kindergarten, *t*+1	211	393.36	369.40	59.00	2,217.00
Percentage of kindergarten students qualifying for free or reduced-price lunch	211	59.10	11.87	2.69	89.84
Percentage of kindergarten students of a racial/ethnic minority	211	4.08	4.33	0.00	17.53
Percentage of kindergarten students receiving special education services	211	18.05	6.11	5.37	39.44
Rural classification	55	0.80	0.40	0.00	1.00
Median income (thousands of dollars)	55	28.33	5.01	16.93	44.37
Percentage of high school graduates[a]	55	72.62	7.02	50.00	83.80
Percentage of households living in poverty in 1999	55	22.73	7.22	9.80	47.50

a. The percentage of adults age 18 and older with a high school diploma.

Note: Data from 2007 are omitted from the estimation sample used for this table because the dependent variable could not be constructed for method 3. Method 1 measures participation as the ratio of PreK enrollment to kindergarten enrollment in year *t*. Method 2 measures participation as the ratio of PreK enrollment to the average enrollment for grades K–2 in year *t*. Method 3 measures participation as the ratio of PreK enrollment in year *t* to kindergarten enrollment in year *t*+1. Four-year-old enrollment is enrollment in West Virginia's universal, voluntary prekindergarten (PreK) program.

Source: Authors' calculations based on data from West Virginia Department of Education 2007; U.S. Department of Education, National Center for Education Statistics 2007; and U.S. Census Bureau 2000

REFERENCES

Bainbridge, J., Meyers, M., Tanaka, S., and Waldfogel, J. (2005). Who gets an early education? Family income and the enrollment of three-to five-year-olds from 1968 to 2000. *Social Science Quarterly,* 86(3), 724–45.

Barnett, S.W., Belfield, C.R., and Nores, M. (2004). *Cost-benefit analysis of the High/Scope Perry Pre-School Program using age 40 follow-up data.* Retrieved March 11, 2008, from http://www.highscope.org.

Barnett, S.W., Hustedt, J.T., Hawkinson, L.E., and Robin, K.B. (2006). *The state of preschool 2006: state preschool yearbook.* New Brunswick, NJ: The National Institute for Early Education Research.

Barnett, W.S., Lamy, C., and Jung, K. (2005a). *The effects of West Virginia's Early Education Program on young children's school readiness.* New Brunswick, NJ: The National Institute for Early Education Research.

Barnett, W.S., Lamy, C., and Jung, K. (2005b). *The effects of state prekindergarten programs on young children's school readiness in five states.* New Brunswick, NJ: The National Institute for Early Education Research.

Barnett, W.S., Tarr, J.E., Lamy, C., and Frede, E.C. (2001). *Fragile lives, shattered dreams: a report on implementation of preschool education in New Jersey's Abbott Districts.* New Brunswick, NJ: Center for Early Education Research, Rutgers–The State University of New Jersey.

Barnett, W.S., and Yarosz, D.J. (2004). Who goes to preschool and why does it matter? *Preschool Policy Matters,* 8(August). New Brunswick, NJ: The National Institute for Early Education Research.

Belfield, C.R. (2006). *Does it pay to invest in preschool for all? Analyzing return-on-investment in three states.* NIEER Working Paper. Brunswick, NJ: National Institute for Early Education Research.

Burchinal, M.R., Peisner-Feinberg, E., Bryant, D.M., and Clifford, R. (2000). Children's social and cognitive development and childcare quality: testing for differential associations related to poverty, gender, or ethnicity. *Applied Developmental Science,* 4(3), 149–65.

Clifford, R.M., Barbarin, O., Chang, F., Early D., Bryant, D., Howes, C., Burchinal, M., and Pianta, R. (2005). What is prekindergarten? Characteristics of public prekindergarten programs. *Applied Developmental Science,* 9(3), 126–43.

Cost, Quality, and Outcomes Study Team. (1995). *Children of the cost, quality and child outcomes in child care centers: public report.* Denver, CO: University of Colorado.

Cunha, F., and Heckman, J. (2006, November). *Investing in our young people.* Paper funded by a grant from the National Institutes of Health (R01HD43411).

Early, D., Maxwell, K., and Burchinal, M. (2007). Teacher's education, classroom quality, and young children's academic skills: results from seven studies of preschool programs. *Child Development,* 78(2), 558–80.

Education Sector. (2006, May). *Universal or targeted preschool? A debate between W. Steven Barnett and Bruce Fuller.* Washington, DC: Education Sector Debates. Retrieved March 11, 2008, from www.educationsector.org/analysis/analysis_show.htm?doc_id=374565.

Entwisle, D., and Alexander, K.A. (1990). Beginning school math competence: minority and majority comparisons. *Child Development,* 61(2), 454–71.

Epstein, A.S. (1999). Pathways to quality in Head Start, public school, and private nonprofit early childhood programs. *Journal of Research in Childhood Education,* 13(April), 101.

Espinosa, L.M. (2002). High-quality preschool: why we need it and what it looks like. *Preschool Policy Matters,* 1(March). New Brunswick, NJ: The National Institute for Early Education Research.

Gormley, W.T., Gayer, T., Phillips, D., and Dawson, B. (2005). The effects of universal Pre-K on cognitive development. *Developmental Psychology,* 41(6), 872–84.

Greene, W. (2000). *Econometric analysis.* Upper Saddle River, NJ: Prentice Hall.

Harms, T., Clifford, R.M., and Cryer, D. (1998). *Early childhood environment rating scale.* New York: Teachers College Press.

Hart, B., and Risley, T. (1995). *Meaningful differences in the everyday experience of young American children.* Baltimore, MD: Paul H. Brookes.

Holcomb, B. (2004). *Case study: public preschool in New Jersey is one roadmap to quality.* Retrieved February 24, 2009, from http://nieer.org/resources/files/NJCaseStudy.pdf.

Larsen, J.M., and Robinson, C.C. (1989). Later effects of preschool on low-risk children. *Early Childhood Research Quarterly,* 4, 133–44.

Lee, V., and Burkham, D. (2002). *Inequality at the starting gate: social background differences in achievement as children begin school.* Washington, DC: Economic Policy Institute.

Magnuson, K.A., and Waldfogel, J. (2005). Early childhood care and education: effects of ethnic and racial gaps in school readiness. *The Future of Children,* 15(1), 169–96.

National Center for Early Development & Learning. (2005). Who are the PreK teachers? What are PreK classrooms like? *Early Developments,* 9(1, spring), 15–19.

Peisner-Feinberg, E., and Burchinal, M. (1997). Relations between preschool children's child care experiences and concurrent development: the cost, quality, and outcomes study. *Merrill-Palmer Quarterly,* 43(3), 451–77.

Peisner-Feinberg, E.S., Burchinal, M.R., Clifford, R.M., Culkin, M.L., Howes, C., Kagan, S.L., and Yazejian, N. (2001). The relation of preschool child care quality to children's cognitive and social developmental trajectories through second grade. *Child Development,* 72(5), 1534–53.

Perlman, M., Zellman, G.L., and Le, V. (2004). Examining the psychometric properties of the Early Childhood Environment Rating Scale–Revised (ECERS–R). *Early Childhood Research Quarterly,* 19(3), 398–412.

Phillips, M., Crouse, J., and Ralph, J. (1998). Does the black-white test score gap widen after children enter school? In C. Jencks and M. Phillips (Eds.), *The black-white test score gap.* Washington, DC: Brookings Institution.

Phillips, D., Voran, M., Kisker, E., Howes, C., and Whitebrook, M. (1994). Child care for children in poverty: opportunity or inequity? *Child Development,* 65(2), 472–92.

Pianta, R., Howes, C., Burchinal, M., Bryant, D., Clifford, R., Early, D., and Barbarin, O. (2005). Features of prekindergarten programs, classrooms, and teachers: do they predict observed classroom quality and child-teacher interactions? *Applied Developmental Sciences,* 9(3), 144–59.

Pungello, E.P., Kuperschmidt, J.B., Burchinal, M.R., and Patterson, C. (1996). Environmental risk factors and children's achievement from middle childhood to adolescence. *Developmental Psychology,* 32(4), 755–67.

Reynolds, A., Temple, J.A., and Ou, S. (2003). School-based early intervention and child well-being in the Chicago Longitudinal Study. *Child Welfare,* 82(5), 633–56.

Robin, K.B., Frede, E.C., and Barnett, W.S. (2006). *Is more better? The effects of full-day vs. half-day preschool on early school achievement.* New Brunswick, NJ: National Institute for Early Education Research.

Schulman, K., and Barnett, W.S. (2005). *The benefits of prekindergarten for middle-income children.* NIEER Report. New Brunswick, NJ: National Institute for Early Education Research.

Schweinhart, L.J. (2004). *The High/Scope Perry Preschool Study through age 40: summary, conclusions, and frequently asked questions.* Ypsilanti, MI: High/Scope Educational Research Foundation.

Schweinhart, L.J., Barnes, H.V., Weikart, D.P., Barnett, W.S., and Epstein, A.S. (1993). *Significant benefits:*

the High/Scope Perry preschool study through age 27. Monographs of the High/Scope Educational Research Foundation no. 10. High/Scope Educational Research Foundation.

Stipek, D., Daniels, D., Galluzzo, D., and Milburn, S. (1992). Characterizing early childhood education programs for poor and middle-class children. *Early Childhood Research Quarterly,* 7(1), 1–19 (EJ 446 312).

Sylva, K., Siraj-Blatchford, I., Taggart, B., Sammons, P., Melhuish, E., Elliot, K., and Totsika, V. (2006). Capturing quality in early childhood through environmental rating scales. *Early Childhood Research Quarterly,* 21(1), 76–92.

U.S. Census Bureau. (2000).*Census 2000 Summary File 3.* Retrieved February 27, 2009, from http://factfinder.census.gov/servlet/DatasetMainPageServlet.

U.S. Department of Education, National Center for Education Statistics, Common Core of Data. (2007). *Common Core of Data (School Year 2000–01).* Washington, DC: U.S. Department of Education, National Center for Education Statistics. Retrieved October 2007 from http://nces.ed.gov/ccd/bat/.

West Virginia Department of Education. (2007). *West Virginia Education Information System.*

West Virginia Code Sec. 18-5-44. (2002). *Early childhood education programs. West Virginia's Universal Access to a Quality Early Education System (2525).* Title 126 Procedural Rule Board of Education, Series 26.

West Virginia State Board of Education. (2007). *West Virginia's Universal Access to a Quality Early Education System (2525).* Title 126 Procedural Rule Board of Education, Series 28.