A Comprehensive Analysis of Prekindergarten in Maryland

Prepared for
Maryland State Department of Education

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In 2002, the Maryland General Assembly enacted Chapter 288, the Bridge to Excellence in Public Schools Act. The Act established new primary state education aid formulas based on adequacy cost studies. These adequacy cost studies – conducted in 2000 and 2001 under the purview of the Commission on Education Finance, Equity, and Excellence – employed the Professional Judgment and Successful Schools methods and other education finance analytical tools. State funding to implement the Bridge to Excellence Act was phased in over six years, reaching full implementation in fiscal year 2008. Chapter 288 requires that a follow-up study of the adequacy of education funding in the State be undertaken approximately 10 years after the enactment of the Bridge to Excellence in Public Schools Act. The study must include, at a minimum, (1) adequacy cost studies that identify (a) a base funding level for students without special needs and (b) per pupil weights for students with special needs, where weights can be applied to the base funding level, and (2) an analysis of the effects of concentrations of poverty on adequacy targets. The adequacy cost study will be based on the Maryland College and Career-Ready Standards adopted by the State Board of Education. The adequacy cost study will include two years of results from new state assessments aligned with the standards. These assessments are scheduled to be administered beginning in the 2014-2015 school year.

There are several additional components mandated to be included in the study. These components include evaluations of (1) the impact of school size, (2) the Supplemental Grants program, (3) the use of Free and Reduced-Price Meals eligibility as the proxy for identifying economic disadvantage, (4) the federal Community Eligibility Provision in Maryland, (5) prekindergarten services and the funding of such services, (6) equity and the current wealth calculation, and (7) the impact of increasing and decreasing enrollments on local school systems. The study must also include an update of the Maryland Geographic Cost of Education Index.

APA Consulting, in partnership with Picus Odden & Associates and the Maryland Equity Project at the University of Maryland, will submit a final report to the State no later than October 31, 2016.

This report, required under Section 3.2.3.2 of the Request for Proposals (R00R4402342), provides (1) a detailed literature review on prekindergarten, (2) an analysis of current prekindergarten capacity, enrollment, and quality distribution in Maryland, (3) an analysis of current prekindergarten funding in Maryland, (4) a comparative analysis of prekindergarten in Maryland and prekindergarten in 11 other states and the District of Columbia, (5) a cost-benefit analysis of universal prekindergarten in Maryland, and (6) a set of recommendations for Maryland as it continues to develop its prekindergarten programs.

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Executive Summary

Early childhood education, and prekindergarten in particular, have increasingly become topics of discussion and debate in state legislatures throughout the U.S., with 40 states and D.C. currently offering state-funded prekindergarten programs. In Maryland, the 2002 Bridge to Excellence in Public Schools Act included a mandate that prekindergarten services be provided to four-year-olds from disadvantaged backgrounds. These services are regulated by the State and administered either (1) by local boards of education, as part of the K-12 public school system, or (2) by qualified vendors, such as Head Start programs, state- or nationally-accredited child care centers, or non-public schools that Maryland State Department of Education (MSDE) has approved to provide prekindergarten. In the past two years, Maryland has made significant progress on its long-term goal to expand prekindergarten access. Both Maryland's 2014 Prekindergarten Expansion Act and a federal Preschool Expansion Grant that the State won in 2014 have helped Maryland expand access to quality prekindergarten programs.

This report begins with a literature review discussing prekindergarten in the U.S. The literature review notes an increasing national interest in prekindergarten; summarizes historical and recent studies of prekindergarten programs; and highlights factors that influence prekindergarten quality and subsequent outcomes. Based on the information presented in the literature review, the study team proceeds with the assumption that prekindergarten is beneficial.

Following the literature review, the report presents an analysis of Maryland's current prekindergarten capacity, enrollment, and quality distribution. The analysis covers district services as well as private provider services. After this analysis, the report reviews Maryland's current prekindergarten funding streams.

Next, the report compares Maryland to 11 other states and D.C. in terms of statewide prekindergarten enrollment, funding, and quality standards. The study team chose comparison states based on proximity to Maryland and/or percentage of four-year-olds enrolled in state prekindergarten.

After the comparative analysis, the report presents a cost-benefit analysis. To estimate prekindergarten's impact on Maryland, the cost-benefit analysis assesses the benefits of prekindergarten attendance by Maryland four-year-olds. It estimates the costs of high-quality prekindergarten in various settings in the State, then calculates the per child ROI and the statewide ROI for universal high-quality prekindergarten.

The study concludes with five recommendations for the State:

(1) Continue to invest in early childhood data systems and use the data systems to establish targets for the number of high-quality prekindergarten slots available in each district;
(2) Understand the differences in ROI between a one-year investment and a two-year investment in prekindergarten, and target expenditures accordingly.
(3) Increase the ROI of prekindergarten by increasing investment to support child care centers and family homes in reaching the highest levels of Maryland EXCELS.

(4) Increase the ROI of prekindergarten by encouraging providers to participate in Maryland EXCELS and by encouraging parents to enroll their children in quality programs.
(5) Offer universal prekindergarten in Maryland, providing funding for 80 percent of Maryland's four-year-olds to attend either a public prekindergarten program or a private program that has received a rating of Level 5 in Maryland EXCELS or has national or state accreditation.

Following these recommendations, the report summarizes three additional considerations for Maryland to consider as the State moves forward. These considerations include options for creating the additional capacity needed to expand prekindergarten access, an approach to phase in universal access, and two options for funding universal prekindergarten.

Table of Contents

Introduction

The 2002 Bridge to Excellence in Public Schools Act included a mandate that prekindergarten services be provided to "all 4-year-old applicants who are from families with economically disadvantaged backgrounds or who are homeless" (Md. Code, §13A.06.02). Economically disadvantaged is defined based on eligibility for Free and Reduced-Price Meals (FARMs), being those children whose family household income is at or below 185 percent of the Federal Poverty Level (FPL). If capacity is available after serving all FARMs-eligible children seeking prekindergarten services, districts can enroll four-year-old children who do *not* meet the family income requirements for mandated services, but who represent student populations that may exhibit a lack of school readiness (e.g. English Language Learner students). Public prekindergarten services are regulated by the State and are administered either (1) by local boards of education, as part of the K-12 public school system, or (2) by qualified vendors, such as Head Start programs, state- or nationally accredited child care centers, or non-public schools that Maryland State Department of Education (MSDE) has approved to provide prekindergarten (MSDE, 2009).

In early 2014, Maryland passed the Prekindergarten Expansion Act, which provides resources for prekindergarten providers to establish additional prekindergarten slots for four-year-olds whose family household incomes are at or below 300 percent of the FPL. MSDE created a competitive grant program to identify prekindergarten providers to receive funding under the Act. Eligible applicants could fall into three categories: (1) community-based programs that have reached Level 5 in Maryland EXCELS – the State's early childhood Quality Rating and Improvement System (QRIS) – and that have either national accreditation, state accreditation, or a certificate of approval from MSDE; (2) local school systems that intend to turn a half-day prekindergarten classroom into a full-day prekindergarten classroom; or (3) local school systems that intend to establish a Judith P. Hoyer Early Child Care and Family Educational Center (Judy Center). A total of 24 providers received grants in the 2014-15 school year, serving 1,563 children.

In late 2014, Maryland was awarded a $15 million federal Preschool Expansion Grant to provide additional prekindergarten slots for four-year-olds and to improve the quality of current slots. In the 2015-16 school year, the grant will fund 1,210 new slots and 1,601 improved slots. This federal grant employs a mixed-delivery model, adopting the same eligibility criteria for grantees as the State's Prekindergarten Expansion Act.

Maryland has taken significant steps to increase prekindergarten access in recent years, with a long-term goal of providing universal access (Maryland Federal Preschool Expansion Grant Application, 2014). This report begins with a literature review that explores the benefits of prekindergarten, as well as the potential fadeout of prekindergarten effects over time. The literature review concludes that, despite the potential for some fadeout, prekindergarten is valuable. Accordingly, the remainder of the report focuses on questions of *how* Maryland can best provide prekindergarten, not *if* Maryland should provide prekindergarten. The report analyzes Maryland's current prekindergarten capacity, enrollment, and

quality distribution. It also analyzes the current funding provided for prekindergarten services. The report then presents a comparative analysis of Maryland and 11 other states plus the District of Columbia (D.C.). Following the comparative analysis is a cost-benefit analysis of prekindergarten services in Maryland. The cost-benefit analysis includes an estimate of the cost of providing quality prekindergarten in different settings and at different quality levels, plus an estimate of the per child return on investment (ROI) of prekindergarten. The report concludes with a number of recommendations for increasing access to high-quality prekindergarten programs, including options for phasing in universal access for four-year-olds and options for funding universal prekindergarten.

The report is organized into six sections:

- **Section I** presents a literature review on prekindergarten, which describes historical and recent studies of prekindergarten and concludes with support for prekindergarten as a beneficial investment for society.
- **Section II** analyzes Maryland's current prekindergarten capacity, enrollment, and quality distribution. This section estimates the additional slots needed to achieve universal access.
- **Section III** analyzes Maryland's current prekindergarten funding streams.
- **Section IV** analyzes Maryland in comparison to a number of other areas that have implemented universal prekindergarten. This section highlights how Maryland compares with these other places in terms of quality standards, enrollment, and funding.
- **Section V** presents a cost-benefit analysis of providing prekindergarten services in Maryland. This section includes a report on the cost of providing high-quality prekindergarten in various settings and a calculation of the per child ROI of prekindergarten for Maryland.
- **Section VI** makes a number of recommendations for how Maryland can implement universal, high-quality prekindergarten, and includes funding options within the recommendations.

I. Prekindergarten Literature Review

In recent years, U.S. national and state governments have magnified their focus on education issues like school readiness and opportunity gaps between students from different socioeconomic, racial, and ethnic backgrounds. As a result, public attention towards prekindergarten has grown dramatically. Prekindergarten has been promulgated as a key way to increase educational and social preparation, academic and personal achievement, and social equality. However, the lasting efficacy and benefits of prekindergarten have been called into question, especially in two recent, high-profile evaluations: the Lipsey et al. (2015) evaluation of the Tennessee Voluntary Prekindergarten Program (TN-VPK) and the Puma et al. (2010, 2012) evaluations of Head Start. This section describes research on the multifaceted benefits of prekindergarten, research on the potential fadeout of those benefits over time, and responses to research on fadeout.

Based on the information presented in this section, the remainder of the report (Sections II through VI) proceeds with the assumption that prekindergarten is, indeed, valuable. Therefore, instead of focusing on the question of *if* prekindergarten is valuable, Sections II through VI of this report focus on the secondary questions of *how* quality prekindergarten can be implemented on a larger scale and *what* the ROI will be.

What is Prekindergarten, and Why is it Important?

Prekindergarten is a broad term for pre-elementary school programs targeted towards three- and four-year-old children. Parents, educators, journalists, researchers, and policymakers alike are increasingly interested in prekindergarten as a means of investing in the future and, as Lamy (2013, p. ix) puts it, untangling the "complicated knots" of chronic poverty.

Prekindergarten is important because, as research shows, the development that occurs between birth and age five is critical to "establishing the foundations of thinking, behaving, and [maintaining] emotional security" (Scrivner & Wolfe, 2002, p. 3). In early childhood, children create neural pathways and systems that affect them far into their futures (Leak et al., 2010; Sapolsky, 2004; Knudsen et al, 2007). They also undergo synaptic pruning – a process of synapse elimination that is responsive to environmental factors. This synaptic pruning influences future development, functioning, and learning (Craik & Bialystok, 2006). In short, early childhood is a time for massive developments in terms of language; cognition; social and emotional competence; and self-regulation, or executive functioning (EF) (Shonkoff & Phillips, 2000). Prekindergarten occurs at a critical time in a child's life:

> Early skills matter, and preschool can help children build these skills. … Robust evidence suggests that a year or two of center-based ECE for three- and four-year-olds, provided in a developmentally appropriate program, will improve children's early language, literacy, and mathematics skills when measured at the end of the program or soon after. (Camilli et al.; Yoshikawa et al., 2013, p. 3-4)

Prekindergarten leverages the developmental and neurological sensitivity of early childhood to create a range of positive outcomes. In addition to influencing academic skills like literacy and math, prekindergarten also influences social and emotional competence and overall health (Yoshikawa et al., 2013).

Research on Positive Effects of Prekindergarten

Across the U.S., the short- and long-term benefits of prekindergarten are rapidly gaining recognition and garnering social, economic, and political support. Prekindergarten has been proven to have positive impacts that can reverberate throughout a child's school years, and even into his or her adult life and career. Yoshikawa et al. (2013, p. 13) assert that "high-quality early childhood education programs are among the most cost-effective educational interventions and are likely to be profitable investments for society as a whole." This subsection discusses prekindergarten's impacts and explores how they are tethered to certain variables, such as program quality, duration, populations served, financial resources.

Prekindergarten creates a wide range of benefits, from gains in individual levels of academic achievement (and decreases in special education service needs) to widespread societal improvements. Put simply, "quality preschool education is a profitable investment" (Yoshikawa et al. 2013, p. 1). Because "later skills—in schooling and employment—build cumulatively upon […] early skills," an "investment in early learning and development is more efficient and can generate more benefits than costs relative to investment later in the life cycle" (p. 4). For each dollar spent on prekindergarten, Yoshikawa et al. (2013, p. 1) mark the ROI at between three and seven dollars.

Academic gains are perhaps the most obvious benefits of universal prekindergarten. For a year spent in prekindergarten, children get an average gain of "about a third of a year of additional learning across language, reading, and math skills," though gains have been shown to be as high as one full year of additional learning in math and reading (Yoshikawa et al. 2013, p. 1). Universal prekindergarten can also help close achievement and educational attainment gaps between children of different socioeconomic and racial and ethnic backgrounds (Karoly & Bigelow, 2005).

In a study of universal prekindergarten in California, Karoly & Bigelow (2005, p, xxvi) separate the benefits of prekindergarten into four domains:

- **child welfare** benefits that result from "the savings to government and victims associated with reduced child abuse and neglect;"
- **criminal justice** benefits that result from "the savings to government and victims of crime [associated with] the reduction in juvenile crime;"
- **compensation and taxes** benefits that result from higher educational attainment and lifetime earnings among individuals who attended prekindergarten; and
- **value of child care** benefits that result from added time when parents can do paid work or other activities because their children are being cared for in prekindergarten.

Prekindergarten also creates a number of indirect benefits, particularly in terms of workforce recruitment, participation, and performance. Karoly & Bigelow (2005) explain that quality universal prekindergarten, like quality K-12 education, could (1) help a state draw in educated and skilled employees, (2) encourage mothers of young children to work, and (3) improve working parents' productivity.

First, consider how high-quality prekindergarten helps a state draw a better workforce. Any state trying to create a larger workforce should consider how to make itself more attractive to potential employees, and research shows that workers are increasingly taking quality of life into consideration as they choose places to live and work (Karoly & Bigelow, 2005, p. 123; Florida, 2000; Florida, 2002; Love & Crompton, 1999). High-quality, universal prekindergarten is a major "quality-of-life" boon that can attract potential employees to an area (Karoly & Bigelow, 2005, p. xxxiv). Since the growth rate of the labor force is slowing and will continue to slow in the future, it is particularly important for states to consider workforce issues and quality of life issues right now (p. 122).

Second, high-quality prekindergarten could encourage parents of young children – especially mothers of young children – to be more involved in the workforce, instead of opting out of workforce opportunities to provide care for young children in the absence of high-quality prekindergarten. Public kindergarten programs have been correlated with higher workforce participation rates among mothers of young children, so it is "reasonable to hypothesize that a universal preschool program would have a similar benefit" (Karoly & Bigelow, 2005, p. xxxiv). And, as Robin et al. (2006, p. 2) point out, "many families need full-day programs for their four-year-olds to accommodate parent work schedules." Reducing the costs of high-quality prekindergarten by 10 percent has been shown to increase mothers' workforce participation rates by two percent, with larger effects for lower-income mothers and for single mothers (Karoly & Bigelow, 2005, p. 124; Blau, 2001; Anderson & Levine, 2000; Han & Waldfogel, 2001).

Finally, the availability of universal prekindergarten could reduce disruption and stress for working parents.

> A high-quality preschool program that is available half-day or for an extended day offers working parents access to stable, convenient, high-quality care for their preschool-age children. By minimizing disruptions due to unreliable child care providers and by providing a safe, secure, and stimulating environment, such high-quality care allows working parents to experience less disruption in their work schedules, lower levels of stress, and diminished concern about the well-being of their children during working hours. Such changes could lead to a corresponding reduction in absenteeism and job turnover and an associated improvement in productivity. (Karoly & Bigelow, 2005, p. 125).

More research is needed to "explicitly consider such benefits in the context of a universal [prekindergarten] program" (p. 125). With that said, it is still clear that improving the workforce in general can help boost economic growth, income levels, and quality of life.

While the literature cited above discussed the overall benefits of prekindergarten, the specific benefits for an individual child can be affected by (1) the quality of the prekindergarten program the child attends; (2) the length of time the child attends; and (3) the demographic profile of the enrolled child. The remainder of this is subsection discusses the impacts that these three variables can have on the benefits of prekindergarten.

Several landmark studies, described below, have shown prekindergarten to have lasting positive effects.

Landmark Studies on Positive Effects of Prekindergarten

Abecedarian Project

In the early 1970s, the Abecedarian Project offered high-quality child care and prekindergarten for children from low-income families. Researchers followed up with former program participants at ages 12, 15, 21, 30, and 35. (See Campbell & Ramey, 1995; Campbell et al. 2001; Masse & Barnett, 2002; Campbell et al., 2002; and Campbell et al., 2012.) At 30 years old, compared to non-participants, former Abecedarian Project program participants were more likely to have held employment in the two years before the follow-ups (75 percent compared to 53 percent); were less likely to have used welfare for nine months or more (3.9 percent compared to 20.4 percent); were much more likely to have graduated college (23 percent compared to 6.1 percent); had completed, on average, 1.2 more years of education (13.5 total years compared to 12.3); and were older, on average, when they had children (21.8 years old compared to 20 years old) (Coalition for Evidence-Based Policy, 2015a).

Chicago Child-Parent Center Program

The Chicago Child-Parent Center (CPC) program offered high-quality interventions to three- to nine-year-old children from low-income families. Programming included support for families (e.g. parent workshops, parent-teacher conferences, required classroom volunteering) and other comprehensive services like healthcare and free meals (Reynolds et al., 2001). Compared to non-participants, CPC participants had 29 percent higher high school graduation rates, 41 percent lower rates of enrollment in special education, 33 percent lower rates of juvenile detention, 42 percent lower rates of "violent offense" arrests, and 51 percent lower rates of child maltreatment (Rice University Center for Education, 2012, para. 4). The CPC study

> hones in on the economic incentive for investing in high-quality early childhood intervention. For the 1,000 children who enrolled in the program from 1983 to 1986 alone, $26 million was generated. Furthermore, because the CPC program has continued, over 100,000 children have benefitted from its services, leading to $2.6 billion in public savings. (para. 6)

HighScope Perry Preschool Project

From 1962 to 1967, the HighScope Perry Preschool Project (the Perry Project) offered high-quality prekindergarten to three- and four-year-old black children from low-income families. Schweinhart et al. (1993) used a randomized controlled trial (RCT) to evaluate the impacts of the Perry Project over time, following up with former program participants at age 27. Schweinhart (2004) then followed up with former program participants again at age 40. At the age 27 follow-ups, compared to non-participants, Perry Project participants had finished, on average, one more year of school than non-participants (11.9 years compared to 11 years); had spent, on average, 1.3 fewer years in special education (3.9 years compared to 5.2 years); had higher graduation rates (65 percent compared to 45 percent); and had half as many teenage pregnancies (Coalition for Evidence-Based Policy, 2015b). At the age 40 follow-ups, they had 42 percent higher median monthly incomes ($1,856 compared to $1,308) and were much less likely to have used government assistance in the past decade (59 percent compared to 80 percent) (Coalition for Evidence-Based Policy, 2015b).

Recent Studies on Positive Effects of Prekindergarten

More recent studies have also shown prekindergarten to have positive effects.

Boston Public Schools K1 Program

Boston Public Schools (BPS) offers a free prekindergarten program – the K1 program – to children in the district. Weiland and Yoshikawa (2013) used a regression discontinuity (RD) to evaluate the program's effects on children's math, language, literacy, self-regulation or executive functioning, and social and emotional skills. They found that "a prekindergarten program that combines evidence-based curricula with trained B.A.- and Master's-level teachers and coaching support produced positive effects on multiple domains of school readiness" (p. 2125). In terms of specific effects, the researchers reported statistically significant effects on student achievement in literacy, language, math, and emotional development – areas the BPS K1 curricula specifically targeted. There were also significant effects on executive functioning, a non-targeted area. At least 27 percent of K1 students went on to score "proficient" or higher on the Massachusetts Comprehensive Assessment System (MCAS) in grade three (Kirp, 2015, para. 8).

Colorado Preschool Program

The Colorado Preschool Program (CPP) gives children with risk factors (e.g. homelessness, eligibility for free or reduced-price meals, parents without high school degrees, etc.) the opportunity to attend free, high-quality, half- or full-day prekindergarten (Colorado Department of Education, 2015). Since the 2003-2004 school year, the Colorado Department of Education (CDE) has been tracking longitudinal academic outcomes for a cohort of CPP participants. Compared to non-participants who also have risk factors, CPP participants perform better academically up to grade nine. "In other words," the CPP 2015 Legislative Report explains, "academic improvements relative to similar peers do *not* fade out" (Colorado Department of Education, 2015, p. 8).

Research on Fadeout of Prekindergarten Positive Effects

Some studies have found that prekindergarten's positive effects may fade over time. These studies describe how, as children who attended prekindergarten grow older and progress through school, their math and reading test scores tend to converge with those of children who did not attend prekindergarten. Over time, it becomes more difficult to distinguish between children who participated in prekindergarten and children who did not, in terms of pure academic measures (Yoshikawa et al., 2013, p. 9). This is termed "fadeout" or "convergence." Despite fadeout effects,

> evidence from long-term evaluations of both small-scale, intensive interventions and Head Start suggest that there are long-term effects [from prekindergarten] on important societal outcomes such as high school graduation, years of education completed, earnings, and reduced crime and teen pregnancy, even after test score effects decline to zero (p. 2).

This section of the literature review describes fadeout research, then offers responses to that research.

Leak et al. (2010) used a meta-analytic database from the National Forum on Early Childhood Policy and Programs to examine cross-study variability and prekindergarten program effect sizes. The researchers

looked at 117 different studies with data covering 1,978 effect sizes. They found that prekindergarten effects "generally persisted at close to full strength" for the first one or two years after children exited prekindergarten, then faded (p. 1).

Researchers have hypothesized a plethora of reasons why prekindergarten effects may fade over time. For example, prekindergarten might just speed up the already-occurring process of child development instead of providing children with an independent, lasting benefit (Leak et al., 2010, p. 2). Under this hypothesis, children who did not attend prekindergarten will quickly "catch up" to children who did attend prekindergarten (p. 2). Low-quality elementary schools may also factor into fadeout, "particularly for students in disadvantaged areas, [where elementary schools] may fail to build on the gains created by early childhood education" (Yoshikawa et al., 2013, p. 9; Magnuson et al., 2007). Yoshikawa et al. (2013, p. 9) also point out a conundrum wherein children who start elementary school as high performers can end up getting less attention from teachers:

> Having students who attended and benefitted from preschool may permit elementary-school teachers to focus more on the non-attenders, and this extra attention may explain the convergence or catch-up pattern.

While researchers have not pinned down causal factors behind fadeout, they have documented the occurrence and timing of fadeout. The Perry Project saw its large IQ impacts fade by the time treatment students had completed grade three (Schweinhart et al., 1993; Leak et al., 2010). A recent evaluation of Head Start found that most impacts had faded by grade one (Puma et al., 2010; Leak et al., 2010). Other studies have had similar findings. This section describes and unpacks some existing research on fadeout.

Studies on Fadeout of Prekindergarten Positive Effects

Several high-profile studies published over the last decade have questioned prekindergarten's long-term impacts. These studies have suggested that the positive effects of prekindergarten may be reduced over time. This fadeout research raises questions about the cost-effectiveness of prekindergarten, the replicability of high-performing programs, the implementation of programs across large and diverse areas, and the meaning of "quality" across different programs.

Tennessee Voluntary Pre-K for All

Lipsey et al. (2015) conducted an RCT study of Tennessee's statewide, voluntary prekindergarten program, Tennessee Voluntary Pre-K for All (TN-VPK). The researchers tracked 1,076 children through grade three. Of the 1,076 children, 773 attended TN-VPK and 303 were on TN-VPK waitlists but did not get admitted. The researchers measured how TN-VPK affected behavior (non-cognitive outcomes) and academic achievement (cognitive outcomes, specifically emergent literacy, language, and math).

Lipsey et al. (2015) found that TN-VPK children were more prepared for kindergarten than control group children. The researchers report that TN-VPK children had "significantly higher achievement scores on all [six] of the [achievement battery] subtests, with the largest effects on the two literacy outcomes" (p. 4). However, these positive effects were not sustained: "By the end of kindergarten, the control children had caught up to the TN-VPK children and there were no longer significant differences between them on

any achievement measures" (p. 4-5). In one year, the control group children had advanced as much as the treatment group children had in two years (p. 38). When children were tested again at the end of grade one, the researchers again found that there were no significant differences between treatment and control group children in terms of achievement. By grade two, however, the control group children actually *outperformed* the treatment group children on most of the achievement measures.

The researchers' takeaway from these findings is "that the term pre-k or even 'high-quality' pre-k does not convey actionable information about what the critical elements of the program should be" (p. 5). They note that the findings, though disappointing to early childhood advocates, should be discussed with honesty and straightforwardness. As with any other well-designed study, results should be taken, but taken with some caution:

> [N]o single study, no matter how carefully done, produces definitive results (Campbell, 1969; Cook, 2003). But we would also note that, just because the results of an evaluation do not support a currently popular view, it does not mean that they are wrong. (p. 39)

More implications of, and responses to, this study are discussed further in this section. With funding from the Institute for Educational Sciences (IES), researchers will continue to track the TN-VPK treatment and control group students through grade seven.

Head Start

Puma et al. (2010) conducted an RCT study to determine Head Start's impacts on (1) children's school readiness and (2) parent practices to support child development. (Parent practices are not discussed here because they are outside the scope of this report.) The researchers compared children who participated in Head Start to children who participated in "alternative care settings" (p. xxxvi). The control group was not a "no services" group, though "about 40 percent of the control group did not receive formal preschool education" (p. xxxvi). Several years after the initial Head Start study in 2010, researchers conducted a follow-up study to investigate the sustainability of Head Start's impacts on children (see Puma et al., 2012). This follow-up study looked at impacts through grade three.

Puma et al. (2012, p. xvi) found Head Start "improved children's preschool outcomes across developmental domains, but had few impacts on children through [grade three]." Similarly, on health measures, children who attended Head Start saw positive effects early on, but no lasting effects at the end of grade three. Social and emotional outcomes differed depending on the cohort of children (three-year-olds versus four-year-olds) and on the person reporting the outcomes. For example, at the end of grade one and at the end of grade three, parents whose children attended Head Start as four-year-olds reported positive behavioral effects. At the same time, for the same group of children, teachers reported "unfavorable" behavioral effects (p. xvi). The researchers acknowledge that, while the results of their study show effects of Head Start fading out at the end of grade three, "'sleeper effects' may present years after exposure to early education" (p. xxxvi).

Table 1, below, summarizes the studies covered thus far in the report, including (1) landmark studies on positive effects of prekindergarten, (2) recent studies on the positive effects of prekindergarten, and (3) studies on the fadeout of prekindergarten effects.

TABLE 1: SUMMARY OF MAJOR RESEARCH STUDIES ON PREKINDERGARTEN BENEFITS AND FADEOUT

Program	Years Active	Population	Study Type, Year	Findings	Caveats
Abecedarian	1972-	Children zero to five (majority black) from low-income families	RCT evaluation (longitudinal) of 120 families; early 1970s treatment, later follow-ups	Participants had higher rates of employment, lower rates of welfare use, much higher college graduation rates, more education, and were older when they had children.	Study departed from random assignment: Eleven percent of treatment group quit, possibly leaving more committed families in the study. (Two percent of control group quit.)
Boston Public Schools	2007-2008 was first year to use OWL literacy and Building Blocks math; now ongoing	Four-year-old children in BPS district	RD evaluation of 2,018 four- and five-year olds; 2008-2009 treatment year	Program had moderate to large effects on language, literacy, math, and number skills; it had small effects on self-regulation and social emotional skill.	Causal elements behind effects are unclear, especially considering the specific blend of curricula and coaching in BPS. RD design means results are generalized to children near the cutoff. Testing was in English.
Chicago Child-Parent Center	1985-	Three- to nine-year old children in low-income areas	Longitudinal study of 989 kids in 24 programs compared to 550 peers in other programs; 1983-1986 treatment, later follow-ups	Participants had higher high school graduation rates, lower special education enrollment, lower juvenile detention rates, lower arrest rates, and lower child maltreatment rates. The program showed a large ROI.	Heavy levels of family support and comprehensive services may not be feasible at larger scales or in diverse settings.
Colorado Preschool Program	1988-	Three- and four-year-olds with risk factors	Formative assessments track progress and readiness indicators.	Participants performed better on state tests than non-participants who also had risk factors. This was true up to grade nine.	Researchers did not match children *before* prekindergarten entry, so other unknown factors may contribute to results. Data is weaker than in an RCT.
Head Start	1965-	Three- and four-year-old children from low-income families	RCT evaluation (longitudinal); data collection 2002-2008, follow-up reports in 2010 and 2012	Participants performed better at the end of prekindergarten but effects faded by the end of grade three.	Possible variation in quality across programs. "Sleeper effects" may still present.
Perry Preschool	1962-1967	Preschool-aged black children from low-income families	RCT evaluation (longitudinal) of 128 children, 64 treatment and 64 control; mid-1960s treatment, later follow-ups	Participants had higher graduation rates and finished more schooling, spent fewer years in special education, earned more, and relied less on governmental assistance.	This was a demonstration project, so broad-scale replicability is uncertain; there were three deviations from random assignment.
Tennessee Voluntary Pre-K for All	2005-	Four-year-old children from low-income families	RCT evaluation (longitudinal) or 1,076 children, 773 treatment group and 303 control group	Participants were more prepared for kindergarten, but effects faded by the end of kindergarten and grade one. By grade two, control kids outperformed treatment kids.	Possible variation in quality across programs. Programs may not have enough guidance on what creates "high quality." Children likely attended high-poverty, low-quality K-5 schools.

Sources: Boston Public Schools, 2014; Campbell et al., 1994, 2001, 2002, 2012; Center for Evidence-Based Policy, 2015a, 2015b; Colorado Department of Education, 2015; Lipsey et al., 2015; Puma et al., 2010, 2012; Reynolds et al., 2001; Rice University Center for Education, 2012.

Understanding and Responding to Fadeout Research

There have been a number of responses to the Lipsey et al. (2015) and Puma et al. (2010, 2012) studies on fadeout. These responses have provided additional considerations and counterarguments, including the following:

- Prekindergarten effects depend on certain variables that vary widely and are difficult to control for in research:
    - Variable I: prekindergarten program quality and implementation,
    - Variable II: prekindergarten program financial resources,
    - Variable III: prekindergarten program duration,
    - Variable IV: prekindergarten program populations served, and
    - Variable V: elementary school quality and continuing attention from teachers.
- Despite apparent fadeout, prekindergarten may still have "sleeper" effects.

These variables and the research behind them is discussed in detail below.

Variable I: Prekindergarten Program Quality and Implementation

Prekindergarten effects depend on prekindergarten program quality and implementation. In terms of quality, gains – measured via effect sizes – are greatest for high-quality prekindergarten programs (Nores et al., 2015; Yoshikawa et al., 2013). High-quality programs are more likely than lower-quality programs to have lasting impacts on children. Higher-quality programs are typically able to provide children with more individualized attention from more responsive and more highly educated and credentialed staff. Higher-quality programs also tend to be more attractive to potential teachers, who may receive more professional development (PD), compensation, and support than they would in a lower-quality program.

While a study of the BPS K1 program (Weiland & Yoshikawa, 2013) found prekindergarten gains persisting through the end of grade three, a study of the TN-VPK program (Lipsey et al., 2015) found gains fading by the end of kindergarten. Kirk (2015, para. 9) explains the apparent disconnection between these studies as follows:

> What's the difference between Boston and Tennessee? In a word, quality. "Tennessee doesn't have a coherent vision," Dale Farran, a Vanderbilt professor and the Tennessee study's co-author, [explained]. "Left to their own devices, each teacher is inventing pre-K on her own."

With this kind of reinvention happening in every prekindergarten classroom, quality and implementation are shaky, even within one program, like Head Start. Puma et al. (2012, p. xxxvi) note that, in their study of Head Start's lasting impacts, "the findings do not differentiate impacts for children who received services of differing quality [even within] Head Start." The authors further note that

> Head Start programs varied in terms of academic instruction in the key areas measured as part of [the] study, i.e., early development of language and literacy and mathematics skills. … This variation in quality may have contributed to the lack of statistically significant differences in the cognitive domain in the early elementary grades. (p. xxxvi)

Despite differing quality of instruction, a recent empirical evaluation of Head Start's cost-effectiveness found the program to be "about as effective at raising test scores as competing preschools," with more benefits for children from more disadvantaged backgrounds (Kline & Walters, 2015, p. 1).

In addition to the quality control issues in the TN-VPK and Head Start studies, there are also research design and consistency issues. In both studies, some of the control group children also attended prekindergarten, thereby blurring the comparison between treatment and control groups. Lipsey et al. (2015, p. 37) explain that, while the majority of control group children in the TN-VPK study did *not* attend formal prekindergarten, roughly 27 percent of them *did* participate in Head Start or in a private program. In the Head Start study, even more control group children attended prekindergarten. Puma et al. (2012, p. xxxvi) evaluated Head Start "against a mixture of alternative care settings rather than against a 'no services' condition." As a result, roughly 60 percent of the control group in the Head Start study *did* attend formal prekindergarten programs, though the quality of those programs is uncertain. Additionally, control group children who *did* receive non-parental care got four to five more hours of this care per week compared to the treatment group children in Head Start programs (Puma et al., 2012). "Consequently, to achieve measurable impacts, Head Start … had to outperform what control group children received" (Puma et al., 2012, p. xxxvi).

State-funded prekindergarten programs vary in quality, as do individual classrooms within programs. Lipsey et al. (2015, p. 39) caution that there are "many dimensions of implementing scaled up publicly funded pre-k programs." Program directors and teachers may be uncertain about what makes a program high-quality. Lipsey et al. (2015, p. 41) write that

> If we are to continue offering pre-k through the public school system, fundamental empirical work may be required to identify specific behaviors and instructional practices important for young children's development in that environment. … States need guidance beyond what is presently available in order to establish pre-k classrooms that indeed have "high quality" and positive outcomes.

It follows, then, that states scaling up their prekindergarten programs should stipulate the elements of quality as clearly as possible. Linda Smith – Deputy Assistant Secretary and Inter-Departmental Liaison for Early Childhood Development at the Administration for Children and Families (ACF) within the U.S. Department of Health and Human Services (DHHS) – also calls for a closer look at the quality of early education. Smith (2015) explains that there have already been some positive steps towards clarifying quality: Since the Puma et al. (2012) study of Head Start, there have been multiple efforts to streamline and improve the quality of Head Start programs, including "significant improvements … in teacher qualifications, curriculum, classroom assessment and overall monitoring," though "the impact of these and other improvements have yet to be studied" (Smith, 2015, p. 1).

Quality Rating Improvement Systems (QRIS) and classroom rating systems like the Early Childhood Environmental Rating Scale (ECERS) and the Classroom Assessment Scoring System (CLASS) can help efforts to streamline and improve the quality and implementation of prekindergarten programs. However, the usefulness of these systems depends on the rating or scoring instrument. One study found little or no relationship between CLASS and ECERS ratings and BPS K1's effects on children (Weiland et al., 2013). In a response to the TN-VPK study, Barnett (2015, para. 4) notes that, while quality benchmarks are useful tools, they do not guarantee quality. States scaling up should choose a system of benchmarks or a rating instrument that makes sense for their particular context, while realizing that systems and instruments are not catch-all quality indicators.

States should also be as clear as possible with program directors and teachers about the elements of quality that produce the greatest and longest-lasting benefits. Citing a meta-analysis by Camilli et al. (2010), Barnett (2013, p. 1-2) writes that prekindergarten programs that

> focus on intentional teaching, small group learning, and individualized teaching one-on-one … are estimated to produce long-term cognitive effects equivalent in size to one half or more of the achievement gap between minority and white children or low-income and other children through the end of high school.

Barnett also points out that lasting gains depend on quality up front:

> The average long-term cognitive effect in the United States is about half the size of the average initial effect, suggesting that relatively large initial effects are required to produce substantial long-term gains. The bottom line is that pre-K does produce substantial long-term gains, particularly when programs are properly designed.

Before exploring ROI at different levels of quality, it is important to first describe why the quality of a prekindergarten program is so important. Research shows different impacts for different quality levels of prekindergarten, and suggests that positive impacts are specific to high-quality prekindergarten. Put differently, high-quality prekindergarten is correlated with stronger benefits and returns (Nores et al., 2015; Yoshikawa et al., 2013).

> Research finds that state and local public pre-K programs, almost without exception, improve readiness for school and produce long-term effects. However, effect sizes vary not just by type of outcome measure, but also by type of program. High-quality, well-defined education programs provided by public schools have been found to produce the largest effects on child development among typical large-scale programs for 3- and 4- year olds (Consortium for Longitudinal Studies, 1983; Deutsch, Deutsch, Jordan, & Grallow, 1983; Deutsch, Taleporos, & Victor, 1974; Frede, 1998; Jordan, Grallo, Deutsch, & Deutsche, 1985; Schweinhart, Montie, Xiang, Barnett, Belfield, & Nores, 2005; Kay & Pennucci, 2014). (Nores et al., 2015, p. 5)

> Higher-quality preschool programs have larger impacts on children's development while children are enrolled in the program and are more likely to create gains that are sustained after the child leaves preschool. (Yoshikawa et al., 2013, p. 6)

Gains are greatest for high-quality prekindergarten programs because such programs are able to provide desirable features, including but not limited to (1) smaller class sizes, (2) smaller student-to-teacher ratios (and, as a result, warmer and more responsive teacher-student interactions), (3) higher teacher qualifications and credentials, (4) higher teacher and staff pay, and (5) greater professional support for teachers and staff (Yoshikawa et al., 2013, 6).

Variable II: Prekindergarten Program Financial Resources

Prekindergarten effects depend on prekindergarten program financial resources, which vary widely. States may have inadequate funding for prekindergarten, making it difficult for them to achieve quality benchmarks and/or to serve all children in need of prekindergarten services (Schimke, 2015). To fully implement NIEER's 10 quality benchmarks,

> Tennessee, which spends about $85 million on preschool, would need to spend an additional $3,200 per child … Colorado, which spends about $75 million on preschool, would need to spend an additional $1,000 per child. (Schimke, 2015, p. 5-6)

Thus, the TN-VPK results may look different from more positive results in places like Colorado because of variables like program quality and monetary resources:

> Some believe preschool quality suffered [in Tennessee] because of a rushed statewide expansion. The 18,000-student program ramped up far faster than the similarly sized Colorado Preschool Program, launching statewide [in Tennessee] in 2005 compared to 1988 for Colorado. (Schimke, 2015, p. 4)

This would indicate that, compared to Tennessee, Colorado has done a better job of controlling for implementation quality through things like QRIS (e.g. Qualistar ratings). However, the authors of the Tennessee study assert that, while the quality of TN-VPK can certainly stand to improve, the program is comparable to other statewide programs. In fact, TN-VPK scores a nine out of 10 on NIEER quality benchmarks while Colorado only scored a six out of 10 (Schimke, 2015). This reiterates the earlier point that benchmarks are not everything, and that quality implementation depends on many other factors.

Variable III: Prekindergarten Program Duration

Program duration refers to both half-day versus full-day programs and one-year versus two-year programs.

Half-Day vs. Full-Day

There is evidence to show that there are different impacts for part-day versus full-day prekindergarten programs. Half-day programs, while still beneficial, tend to have smaller effect sizes than more time-intensive full-day programs.

The CPC study is one example of a half-day program that produced smaller effects than full-day programs. The CPC study, which started in the 1980s, investigated the impacts of part-day preschool for around 1,000 three- and four-year-olds from lower-income households. The CPC program promoted high quality by (1) ensuring reasonable student-to-teacher ratios, (2) requiring teachers to hold college degrees and prekindergarten certifications, (3) providing PD for staff, (4) using a structured curriculum, (5) encouraging parental participation, and (6) providing free meals for students, among other things.

CPC produced positive cognitive, academic, and behavioral outcomes, but its effect sizes were smaller than the effect sizes seen in other renowned studies of prekindergarten impacts, such as the HighScope Study and the Abecedarian Study. The HighScope Study and the Abecedarian Study are two frequently cited RCT studies of prekindergarten's impacts on children from lower-income households. In both studies, the prekindergarten programs under scrutiny were more time-intensive than the part-day CPC program. In the HighScope Study, children attended half-day classes five days per week, and also received one-on-one, in-home tutoring once per week (adding educational hours). In the Abecedarian Study, children attended full-day centers (eight hours per day).

Another example of a half-day program producing smaller effects than a full-day program can be found in a Robin et al. (2006) RCT study. The researchers assigned four-year-olds from low-income

backgrounds to either full-day prekindergarten (eight hours per day for 45 weeks) or half-day prekindergarten (2.5 to three hours per day for 41 weeks). The prekindergarten programs, aside from differences in the lengths of their school days, were "quite similar: all had teachers with college degrees, a low ratio of children to teachers, and used the same curriculum" (Robin et al., 2006, p. 1). The researchers found that children who received full-day prekindergarten outperformed their half-day prekindergarten peers in vocabulary and math in follow-up tests at the end of kindergarten and at the end of grade one. The achievement gains for full-day prekindergarten participants versus half-day prekindergarten participants were evident. The authors further noted:

> Results of this study indicate that even students who are far behind at entry to preschool can develop vocabulary, math, and literacy skills that approach national norms if provided with extended-duration preschool that maintains reasonable quality standards. (p. 2)

Compared to half-day prekindergarten, full-day prekindergarten also offers benefits for families and parents. Sending children to full-day prekindergarten can free up time for parents to pursue their own education and/or careers. It can also increase access to prekindergarten for families who might not be able to enroll their children unless the prekindergarten is full-day (Reynolds et al., 2014). Robin et al. (2006, p. 2) explain:

> The evidence that full-day preschool education can meet child care needs and benefit children's learning should be of high interest to parents and policymakers. Indeed, some children, particularly those in low-income working families, will miss out on high-quality preschool education altogether if only a half-day public program is available.

Robin et al. (2006, p. 3) also note, however, that the research on the length of the prekindergarten day is still "elusive," and full-day prekindergarten has been associated with some potential downsides (e.g. decreased positive social and emotional development). That said, literature still largely suggests that "the most intensive, earliest starting and longest lasting programs" provide the greatest benefits of any type of prekindergarten (Robin et al., 2006, p. 3; Barnett, 1998). Indeed, a plethora of researchers have provided support for more prekindergarten, in terms of hours per day, days per school year, and/or years of school:

> [R]esults from research conducted with model preschool programs such as the Abecedarian Project (Campbell & Ramey, 1994), the Chicago CPC program (Reynolds, 1993), and the High/Scope Perry Preschool Project (Schweinhart, Barnes, Weikart, Barnett, & Epstein, 1993) and numerous short-term studies provide some support for an "increased intensity and duration" hypothesis that longer lasting interventions are more effective for disadvantaged children (Frede, 1998). (Robin et al., 2006, p. 3)

Other researchers, including Clark and Kirk (2000) and Gullo (2000) have also found that full-day prekindergarten creates positive academic and social results.

A study published in *JAMA* in 2014 looked at a nonrandomized, matched group cohort of children who had been enrolled in CPC either full-day (seven hours) or half-day (average of three hours). Nearly all of the children studied came from low-income backgrounds and were racial minorities. Researchers used the readiness standards outlined in the Teaching Strategies GOLD (TS GOLD) Assessment System to evaluate half-day versus full-day prekindergarten in terms of effects on children's school readiness,

children's school attendance, and parents' levels of involvement in their children's educations. (More specifically, TS GOLD includes domains to investigate socio-emotional development, linguistics, literacy, math, and cognitive development.) Children were evaluated at the end of prekindergarten. Researchers found that "a full-day preschool intervention was associated with increased school readiness skills in 4 of 6 domains, attendance, and reduced chronic absences compared with a part-day program" (Reynolds et al., 2014). Children who attended full-day prekindergarten scored higher than children who attended half-day prekindergarten on a number of TS GOLD measures: social and emotional development, language, math, physical health, and total score. Literacy and cognitive development scores were not significantly different between the full-day and half-day children. Full-day children had higher attendance rates and lower chronic absence rates. There were no noted differences in parental involvement (Reynolds et al., 2014).

One Year vs. Two Years

One-year programs tend to show much stronger benefits than two-year programs (Yoshikawa et al., 2013; Karoly & Bigelow, 2005; Barnett & Lamy, 2006). While a second year of prekindergarten does create benefits, these gains are not as strong as the ones created during the first year. Initially, children graduating from two-year programs do tend to perform better in vocabulary, literacy, and math than children graduating from one-year programs. However, these improved performances are not statistically significant except in vocabulary. (When compared to the vocabulary, literacy, and math scores of children who received no prekindergarten at all, scores for both one-year and two-year program attendees are higher at a statistically significant level.)

Yoshikawa et al. (2013, p. 2) hypothesize that "this may be because children who attend two years of preschool are not experiencing a sequential building of instruction from the first to the second year." Karoly & Bigelow (2005) also back the claim that a second year of prekindergarten has a narrower range of benefits than the first year. Using CPC as an example of a program that served children for two years instead of one, Karoly & Bigelow explain:

> It appears from evidence collected to date that the second year generates smaller benefits than what is gained from the first year. In other words, benefit-cost analyses show a higher return per dollar invested for a one-year program than for a two-year program. This suggests that, when resources are limited, it is more beneficial to serve a greater number of children in a high-quality one-year program rather than serving a smaller number of children for two years (Karoly & Bigelow, 2005, p. xxxviii).

Barnett & Lamy (2006) conducted covariate analyses of 1,372 children who had attended state-funded Abbott prekindergarten programs in New Jersey for either one year or two years. The children were assessed on vocabulary, literacy, and math just after they entered kindergarten. Compared to children who only received one year of prekindergarten, children who received two years had slightly higher scores in print awareness and math skills, but not at a statistically significant level. Children who received two years of prekindergarten instead of one also had higher vocabulary scores, which was at a statistically significant level. Researchers explain:

> The idea is that the earlier a child knows more – more words, more concepts – the more time they have with which to learn something else, and the broader a foundation they have from which to build more

> knowledge. The earlier a child learns words, the greater the conceptual basis for later learning more generally (Barnett & Lamy, 2006, p. 6-7).

Thus, while an extra year of prekindergarten can create gains – particularly in terms of vocabulary development, and particularly for less advantaged children compared to more advantaged children – these gains are not as broad or dramatic as those created in one year of prekindergarten (Barnett & Lamy, 2006).

Variable IV: Prekindergarten Program Populations Served

Prekindergarten offers benefits to children across socioeconomic and racial and ethnic backgrounds. That said, the benefits are greater for lower-income or at-risk students (where students from low-income households are classified as "at-risk") and for ELL students (Nores et al., 2015; Sawhill, 2014; Thompson & Haskins, 2014; Karoly & Bigelow, 2005). While there are "significant positive effects […] present for boys and girls, for all ethnicities, and for children from families at all income levels," the effects "tend to be larger for children from lower-income backgrounds and from homes where English is not the first language" (Nores et al., 2015, p. 5). These children may benefit especially from stable, enriching prekindergarten environments.

Effects Across Socioeconomic Groups

"The impacts of preschool are generally larger for at-risk children" (Karoly & Bigelow, 2005, p. xxxviii). At-risk children have been shown to reap stronger benefits from prekindergarten than children from middle- or higher-income backgrounds (Yoshikawa et al., 2013, 2, p. 11). Children from lower-income backgrounds are more "vulnerable to the pernicious effects of chronic stress" than their wealthier counterparts (Thompson & Haskins, 2014). For children at risk of chronic stress (which stems from factors like poverty, lack of home stability or homelessness, abuse, and/or neglect), stress can "undermine [the] ability to succeed in school and in life" (Sawhill, 2014; Thompson & Haskins, 2014). For children in such difficult situations, "high-quality childcare can offer a safe, warm, and predictable environment amid otherwise chaotic lives" (Thompson & Haskins, 2014).

Effects Across Racial and Ethnic Groups

Research indicates that preschool has similar positive effects across racial and ethnic groups, though effects may be slightly stronger for black and Latino children. Historically renowned prekindergarten studies (HighScope Perry, Abecedarian, and CPC) have involved mostly black populations, limiting the capacity for comparisons of effects across racial and ethnic groups (Yoshikawa et al., 2013). However, more recent studies, like the Head Start Impact Study, which began in fall 2002, have been able to compare effects across racial and ethnic groups. Among three-year-olds, the Head Start Impact Study found the most positive effects for black and Latino children compared to white children (Puma et al., 2005). Gormley et al. (2011) found that, across racial and ethnic groups, Tulsa children who attended prekindergarten were more prepared for school. These effect sizes were moderate to large for white, black, Latino, and Native American children, and particularly strong for Latino children.

Effects Across Linguistic Groups

Yoshikawa et al. (2013, p. 12) report that "positive impacts of preschool can be as strong or stronger for dual language learners and children of immigrants, compared with their English-speaking or native-born counterparts." In the Tulsa prekindergarten study, Gormley et al. (2011) found larger prekindergarten effects for Latino children who came from primarily Spanish-speaking homes than for Latino children who came from primarily English-speaking homes. In the National Head Start Impact Study, Puma et al. (2005) measured prekindergarten's effects using end-of-kindergarten assessments. Compared to native English speakers, ELL students had "significantly stronger positive impacts of Head Start on language and school performance" (Yoshikawa et al., 2013, p. 12). ELL students were able to simultaneously develop their English vocabularies and their home language vocabularies, strengthening their overall language skills. Yoshikawa et al. (2013, p. 12) conclude:

> There is emerging research that preschool programs that systematically integrate both the children's home language and English language development promote achievement in the home language as well as English language development. […] Home language development does not appear to come at the cost of developing English language skills, but rather strengthens them.

Effects Across Different Levels of Student Need

There is little research comparing the effects of prekindergarten across students with varying levels of need (e.g. academic need, social and emotional need). The Head Start Impact Study and the Tulsa prekindergarten study both looked at special needs student gains. Both studies showed the special needs children making "significant gains," though "there is a need to test these patterns in other studies" (Yoshikawa et al., 2013, p. 12; Puma et al., 2005; Gormley et al., 2011).

Variable V: Elementary School Quality and Teacher Attention

Even if a child attends high-quality prekindergarten, the benefits of that early education can fade without proper upkeep: "[E]arly investments not followed up with high-quality subsequent investments may produce only ephemeral impacts" (Leak et al, 2010, p. 3). In the TN-VPK study, for example, most participants in the prekindergarten program went on to high-poverty elementary schools (Lipsey et al., 2015). The persistence of prekindergarten effects over time depends on elementary school quality and continuing teacher attention. These factors, Smith (2015, p. 1) explains, are still "largely unstudied."

Smith (2015, p. 1) hypothesizes that prekindergarten effects may fade "because there is no alignment between the Pre-K and elementary school approaches to learning or curriculum." Other researchers, however, "caution against making early childhood education … more and more academic [like elementary school]" (Halpern, 2013; Lipsey et al., 2015, p. 41). Instead, states may "need to focus on making the full K-3 instructional spectrum richer and more instructionally deep" (p. 41).

To maintain prekindergarten's benefits on school readiness and student performance, students need continuing attention and quality instruction. Unfortunately, teachers have a finite amount of attention, and they may end up "directing their attention to the children who need it the most, thus allowing them to catch up with those who have been in pre-k" (Lipsey et al., 2015, p. 41). Smith (2015, p. 1) calls this "catch-up." Barnett (2013, p. 2) writes,

> It seems that at least some of the decline in effect sizes over time is due to the compensatory efforts of public schools that help the children who are most behind catch up. These greater efforts by the schools for children who did not benefit from preschool education are reflected in the benefit-cost analyses that document the cost savings from prevention. (Barnett, 2013, p. 2)

Yoshikawa et al. (2013) also note this problem, where children who start out academically and socially "ahead" may get less teacher attention than children who start out "behind." Elementary schools may need to do a better job of ensuring that *all* students get quality attention and instruction – not just students who enter kindergarten without formal preparation. More research is needed "to clarify and distinguish among [these] multiple possibilities" (Yoshikawa et al., 2013, p. 20).

Sleeper Benefits of Prekindergarten

Finally, despite apparent fadeout, prekindergarten may still have "sleeper" effects that benefit prekindergarten attendees much later in their lives (Puma et al., 2012; Yoshikawa et al., 2013). As Schimke (2015, p. 2-3) notes, in studies like the TN-VPK evaluation,

> [w]hat's sometimes missing from the discussion … is that other studies have shown preschool participants reap significant non-academic benefits later in life. These include things like increased earnings, better health, and reduced criminal activity.

For example, cognitive benefits from the Perry Project faded by the time children were eight, but "impacts on achievement, attainment and, eventually, crime and earnings, persisted" (Schweinhart et al., 1993; Leak et al., 2010, p. 3). Yoshikawa et al. (2013, p. 2) writes that, despite fadeout,

> evidence from long-term evaluations of both small-scale, intensive interventions and Head Start suggest that there are long-term effects [from prekindergarten] on important societal outcomes such as high school graduation, years of education completed, earnings, and reduced crime and teen pregnancy, even after test score effects decline to zero.

Support for Prekindergarten

Overall, the literature shows that prekindergarten is highly beneficial, both for individual children and for society at large. However, the value of prekindergarten depends on how well states define quality of implementation and quality of programming; fund quality programming; support students after prekindergarten, into elementary school and beyond; and recognize later-in-life benefits of prekindergarten, outside of purely academic results. The five variables mentioned earlier in the literature review (prekindergarten program quality and implementation; prekindergarten program financial resources; prekindergarten program duration; prekindergarten program populations served; and elementary school quality and continuing attention from teachers) all affect the benefits and the ROI of prekindergarten.

With the robust research on prekindergarten benefits in mind, along with the aforementioned five variables, the rest of the study proceeds with the assumption that prekindergarten, especially high-quality, universal prekindergarten, is valuable and should be sought after in Maryland.

II. Prekindergarten Capacity Analysis

To estimate the cost and return on investment (ROI) of universal prekindergarten in Maryland, it is necessary first to assess the current landscape. This section begins by analyzing current prekindergarten enrollment and capacity in the State, in each district, and across the various settings. Following this, the distribution of program quality within the current capacity. In order to fully understand the current landscape, it is important to know the level of quality of the prekindergarten slots in the State, as well as where programs are succeeding and struggling on the quality rating matrix. This section concludes with a gap analysis which estimates the unmet need for prekindergarten services in Maryland as a whole as well as in specific districts.

Prekindergarten Enrollment and Capacity

Prekindergarten services in Maryland are offered through the State's 24 districts as well as through private providers. Public prekindergarten is provided primarily to four-year-olds, but also serves some three-year-olds. Private providers are licensed through the Office of Child Care within MSDE. Private providers include child care centers, family child care homes (with up to eight children), large family child care homes (between nine to 12 children), and letter of compliance facilities (certain centers operated by tax-exempt religious organizations). These private providers usually serve a mix of age groups, including four-year-olds. Head Start programs also offer prekindergarten services, in addition to more comprehensive services, and serve three- and four-year-olds. For the purposes of this analysis, the child care center category includes capacity and enrollment from child care centers, Head Start sites, letter of compliance facilities, and large family child care homes (which operate more like centers than family homes). Throughout this report, the term prekindergarten is used to refer to the education provided to children in the year before they enter kindergarten. Uniquely, Maryland also has Judith P. Hoyer Early Child Care and Family Education Centers (known as "Judy Centers"), which provide services to children from birth through kindergarten in specific Title I school districts across the State. As part of their comprehensive services, Judy Centers offer prekindergarten either through a public school or community program. Therefore, Judy Center prekindergarten is not a separate category in the capacity analysis in this study, as Judy Center enrollments are already counted in either the public prekindergarten programs or community-based programs.

MSDE collects data on program enrollment through annual inspection site visits, which are part of the State's licensing requirements for child care programs. Center enrollment numbers are collected for each individual year of age (e.g. three-year-old enrollment, four-year-old enrollment). In family child care homes however, enrollment is collected based on broader age categories (e.g. under two years old, two to five years old, etc.). To estimate the number of four-year-old children enrolled in family child care homes, the study team took the total enrollment for the two to five years old category and applied a population distribution to estimate the number of four-year-olds in this category.

Table 2, below, shows estimated prekindergarten enrollment by district, across the different types of providers.

TABLE 2: ESTIMATED FOUR-YEAR-OLD PREKINDERGARTEN ENROLLMENT, BY DISTRICT

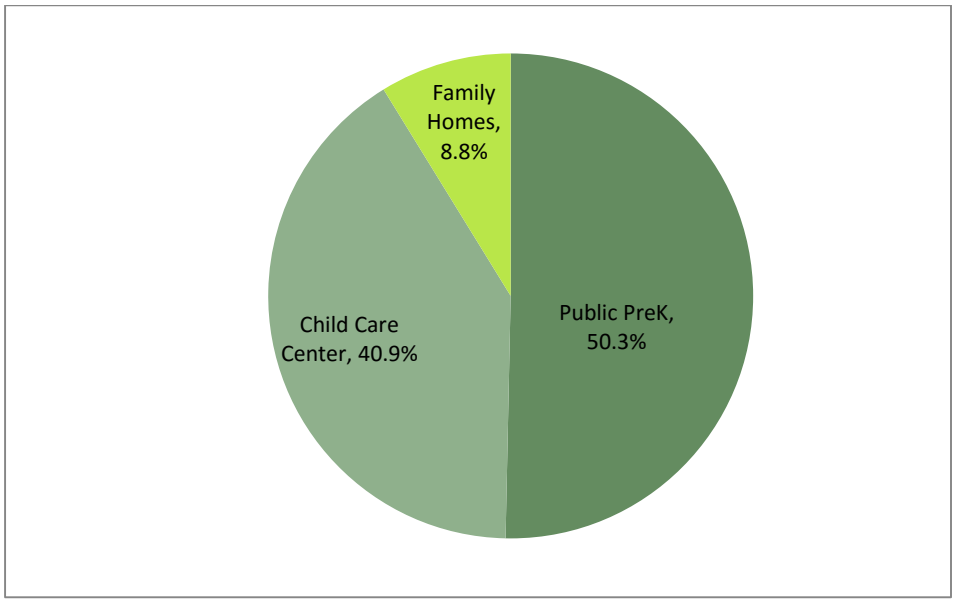
	Public PreK	Child Care Centers	Family Homes	Totals
Allegany	467	258	76	**801**
Anne Arundel	1,928	2,012	424	**4,364**
Baltimore City	4,597	1,775	378	**6,750**
Baltimore	3,244	3,229	658	**7,131**
Calvert	352	296	99	**747**
Caroline	279	177	70	**526**
Carroll	324	783	126	**1,233**
Cecil	639	164	75	**878**
Charles	778	553	155	**1,486**
Dorchester	210	40	42	**292**
Frederick	975	857	268	**2,100**
Garrett	148	34	16	**198**
Harford	724	1,072	238	**2,034**
Howard	858	1,708	214	**2,780**
Kent	136	34	17	**187**
Montgomery	3,311	4,983	601	**8,895**
Prince George's	4,841	1,827	553	**7,221**
Queen Anne's	222	117	76	**415**
Saint Mary's	771	260	146	**1,177**
Somerset	193	219	30	**442**
Talbot	230	157	42	**429**
Washington	514	566	196	**1,276**
Wicomico	532	332	106	**970**
Worcester	358	176	43	**577**
Statewide Total	**26,631**	**21,629**	**4,648**	**52,908**

Source: MSDE Enrollment data 2014-15.

As shown in Table 2, across public and private providers, there are currently an estimated 52,908 four-year-olds enrolled in prekindergarten in Maryland. The counties with the highest enrollment are Baltimore, Montgomery, and Prince George's, as well as Baltimore City. For the public prekindergarten programs, the information above represents only the number of four-year-olds enrolled in programs, and includes half-day and full-day slots. For private programs (centers and homes) the enrollment is based on annual inspection site visits, conducted as part of licensing requirements, and includes full- and part-day enrollment.

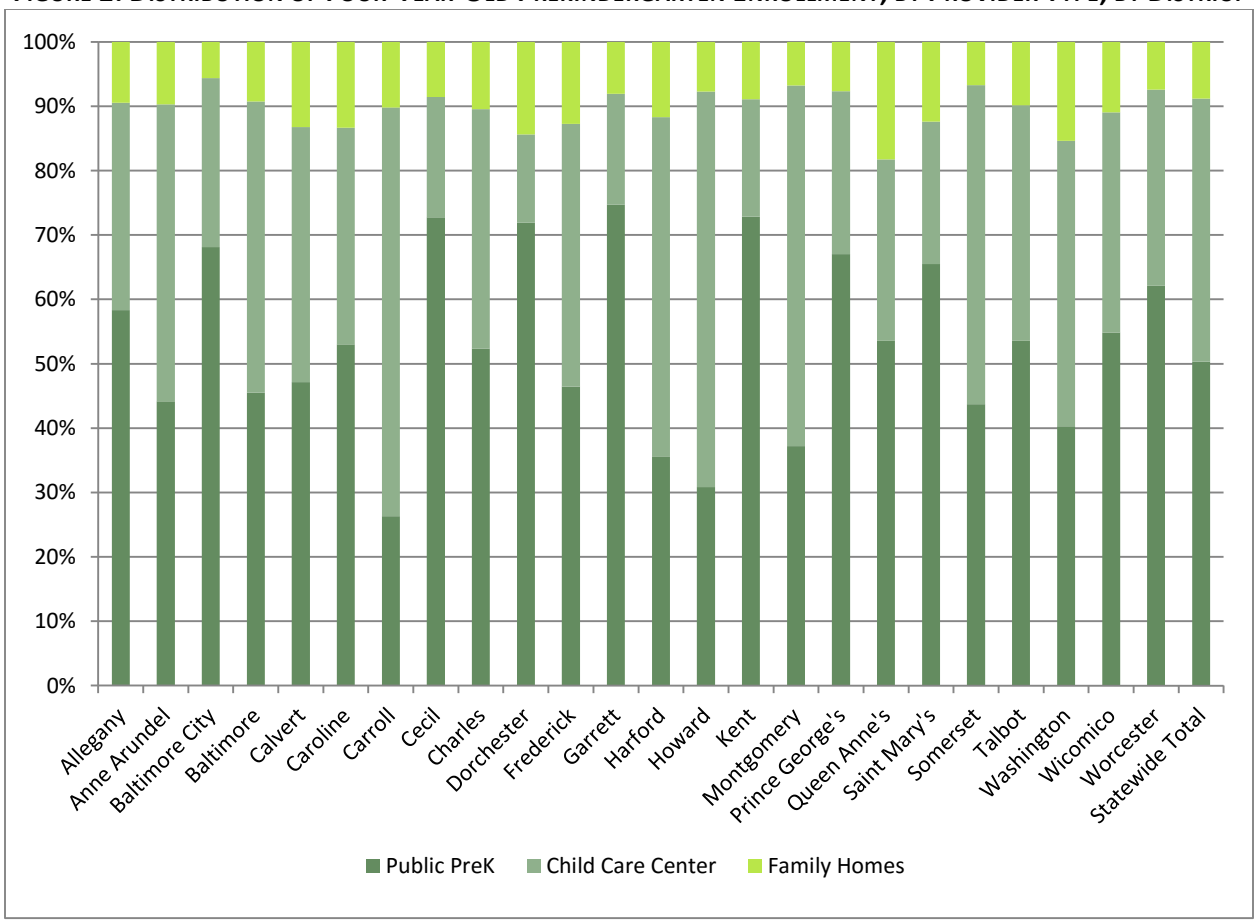
Figure 1, below, illustrates the distribution of four-year-old enrollment by provider type. As shown, public prekindergarten accounts for over 50 percent of all four-year-old enrollment in Maryland, with private child care centers comprising just under 41 percent. Figure 2 illustrates the distribution of enrollment by district.

FIGURE 1: DISTRIBUTION OF FOUR-YEAR-OLD PREKINDERGARTEN ENROLLMENT, BY PROVIDER TYPE



Source: MSDE Enrollment data 2014-15.

FIGURE 2: DISTRIBUTION OF FOUR-YEAR-OLD PREKINDERGARTEN ENROLLMENT, BY PROVIDER TYPE, BY DISTRICT



Source: MSDE Enrollment data 2014-15.

When a child care program is licensed, it is licensed with a total capacity and a capacity by age group. These age groups are (1) six weeks up to 17 months, (2) 18 months up to 23 months, (3) two years up to five years, and (4) five years up to 15 years. While programs are licensed to serve a maximum number of children, the actual number of children they enroll will vary from month to month (and even day to day in some cases). Programs may be under-enrolled, at capacity, or over-enrolled (meaning children may attend on a part-time basis and, therefore, more than one child might fill a single capacity slot).

MSDE calculates a "utilization rate" for all licensed programs on a regular basis to help track the use of licensed care throughout Maryland. The utilization rate is calculated by taking the last known child enrollment (from inspection visits) and dividing it by the total maximum child capacity. It is possible for a program to have a utilization rate above 100 percent if more than one child uses a single capacity slot. For example, a child care center may be licensed to serve 100 children in the two-, three-, or four-year-old age group. However, of these 100 licensed slots, 90 may be used for full-day care, but the remaining 10 slots could be used by 10 children for a morning half-day program, and then by 10 different children for an afternoon half-day program. In this way, the center never exceeds its licensed capacity of 100 children at any one time; however, the enrollment count for that day would include 110 children, resulting in a utilization rate of 110 percent.

The utilization rate does not apply to public prekindergarten programs, since they are assumed to be enrolled at full capacity, given the provision that districts can make available any additional capacity they have to four-year-olds who exceed the 185 percent family income limit.

Table 3, below, shows the estimated four-year-old capacity in prekindergarten programs. The capacity of child care centers and family homes is calculated based on the utilization rate.

TABLE 3: ESTIMATED FOUR-YEAR-OLD CAPACITY IN PREKINDERGARTEN PROGRAMS, BY PROVIDER TYPE, BY DISTRICT

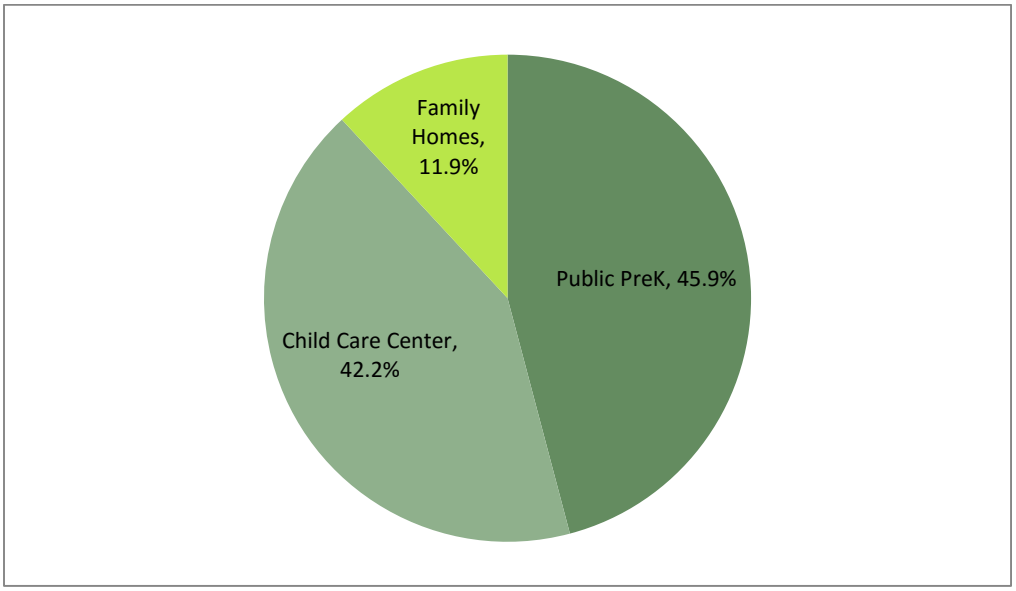
	Public PreK	Child Care Center	Utilization Rate - Centers	Family Home	Utilization Rate - Homes	Totals
Allegany	467	276	94%	65	116%	**808**
Anne Arundel	1,928	1809	111%	598	71%	**4334**
Baltimore City	4,597	2409	74%	615	61%	**7621**
Baltimore	3,244	3616	89%	985	67%	**7845**
Calvert	352	363	82%	127	78%	**842**
Caroline	279	122	145%	84	84%	**485**
Carroll	324	793	99%	168	75%	**1285**
Cecil	639	169	97%	102	74%	**909**
Charles	778	589	94%	234	66%	**1601**
Dorchester	210	50	80%	53	79%	**313**
Frederick	975	1038	83%	362	74%	**2375**
Garrett	148	32	105%	13	124%	**193**
Harford	724	1189	90%	345	69%	**2258**

	Public PreK	Child Care Center	Utilization Rate - Centers	Family Home	Utilization Rate - Homes	Totals
Howard	858	1913	89%	356	60%	**3127**
Kent	136	37	91%	21	80%	**194**
Montgomery	3,311	5342	93%	1017	59%	**9670**
Prince George's	4,841	2611	70%	977	57%	**8429**
Queen Anne's	222	139	84%	88	86%	**449**
Saint Mary's	771	326	80%	193	75%	**1291**
Somerset	193	304	72%	35	85%	**531**
Talbot	230	163	96%	59	71%	**452**
Washington	514	640	88%	235	83%	**1389**
Wicomico	532	416	80%	130	81%	**1078**
Worcester	358	165	107%	46	92%	**570**
Statewide Total	**26,631**	**24,511**	-	**6,908**	-	**58,050**

Source: MSDE Enrollment data 2014-15.

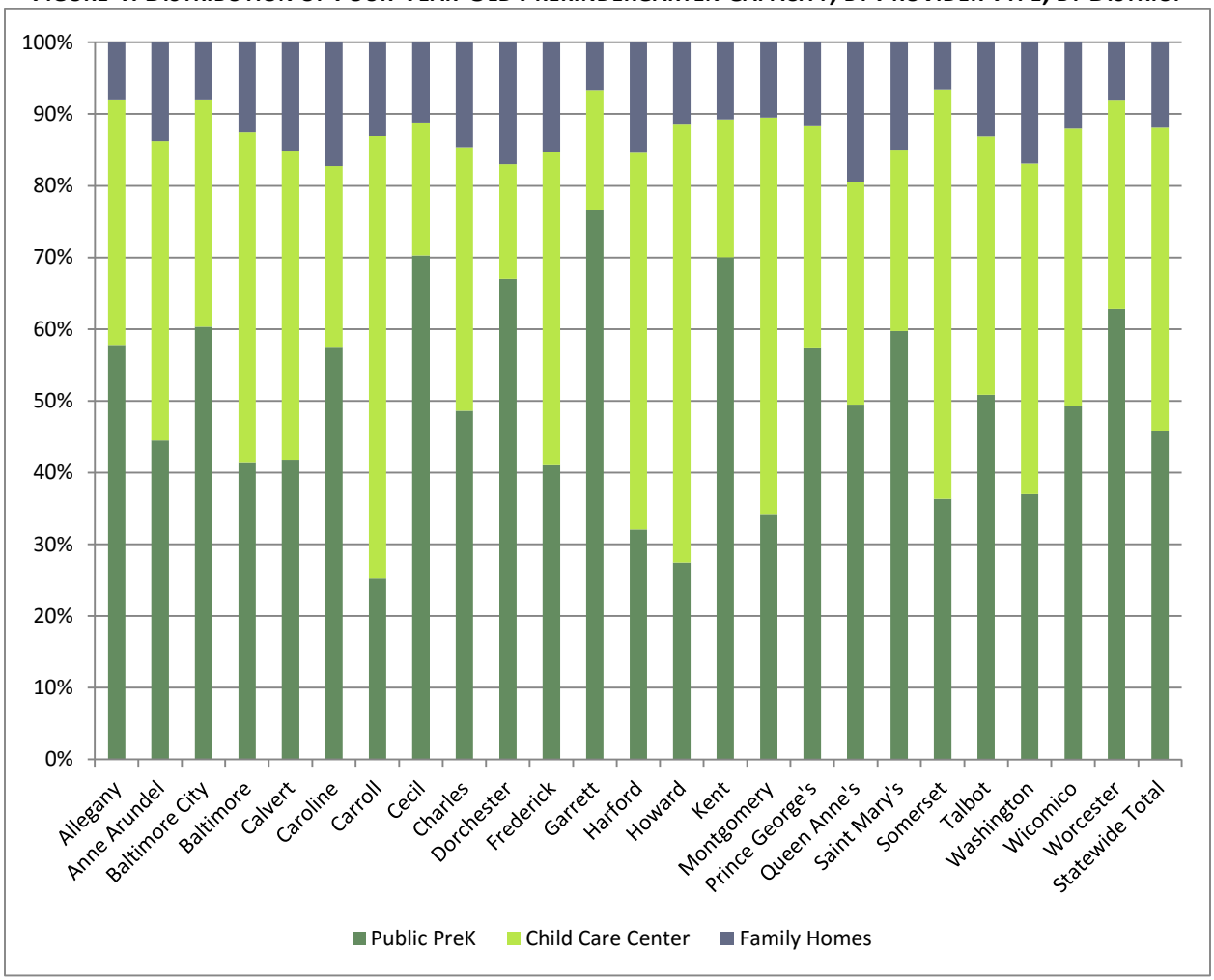
Figure 3 shows the distribution of capacity across provider types. Forty-six percent of the capacity is in public prekindergarten programs, 42 percent is in private center-based programs, and 12 percent is in family homes. Figure 4 shows the distribution of capacity for each district.

FIGURE 3: DISTRIBUTION OF FOUR-YEAR-OLD PREKINDERGARTEN CAPACITY, BY PROVIDER TYPE



Source: MSDE Enrollment data 2014-15.

FIGURE 4: DISTRIBUTION OF FOUR-YEAR-OLD PREKINDERGARTEN CAPACITY, BY PROVIDER TYPE, BY DISTRICT



Source: Data from MSDE.

As shown in Figure 4, in many districts, public prekindergarten holds the largest percentage of prekindergarten capacity, with total capacity in public prekindergarten exceeding 50 percent of all capacity in 11 districts. Family child care homes account for under 20 percent of total capacity in all districts.

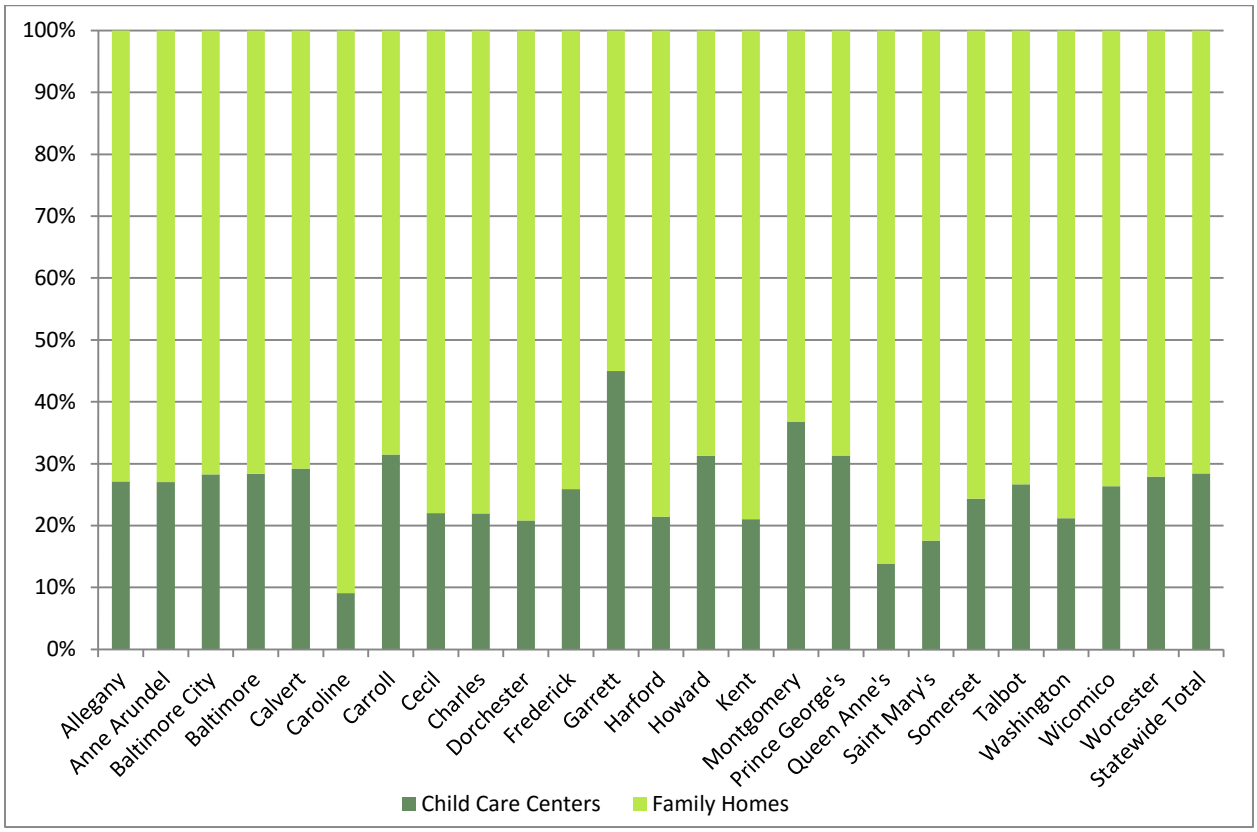
There are 7,226 private providers in Maryland that offer prekindergarten. While family homes only cover a small percentage of the total prekindergarten capacity, there are over 5,200 home providers, comprising over 70 percent of the private providers that serve four-year-olds in the State. Table 4, below, shows the number of licensed providers serving four-year-olds, by provider type, in each district. Figure 5, which follows Table 4, illustrates the distribution of providers by provider type, by district.

TABLE 4: PRIVATE PROGRAMS SERVING FOUR-YEAR-OLDS, BY DISTRICT, BY PROVIDER TYPE

	Child Care Centers	Family Homes	Total
Allegany	19	51	**70**
Anne Arundel	158	427	**585**
Baltimore City	191	484	**675**
Baltimore	291	735	**1,026**
Calvert	47	114	**161**
Caroline	8	80	**88**
Carroll	63	137	**200**
Cecil	24	85	**109**
Charles	56	199	**255**
Dorchester	10	38	**48**
Frederick	102	292	**394**
Garrett	9	11	**20**
Harford	70	256	**326**
Howard	117	257	**374**
Kent	4	15	**19**
Montgomery	416	715	**1,131**
Prince George's	312	684	**996**
Queen Anne's	12	75	**87**
Saint Mary's	38	178	**216**
Somerset	9	28	**37**
Talbot	16	44	**60**
Washington	46	171	**217**
Wicomico	34	95	**129**
Worcester	12	31	**43**
TOTAL	**2,064**	**5,202**	**7,266**
Percent	***28.4%***	***71.6%***	

Source: *MSDE Enrollment data 2014-15.*

FIGURE 5: DISTRIBUTION OF PRIVATE PROGRAMS SERVING FOUR-YEAR-OLDS, BY PROVIDER TYPE, BY DISTRICT



Source: MSDE Enrollment data 2014-15.

Quality Distribution Analysis

Research shows the importance of high-quality early childhood programs (Yoshikawa et al., 2013). Like many states, Maryland has developed a QRIS to measure the quality of child care programs and help programs increase their quality. Maryland's QRIS, called EXCELS, rates programs on a five-point check mark scale. Programs can get points in five categories: (1) Administrative Policies and Practices; (2) Licensing and Compliance; (3) Developmentally Appropriate Learning Practice; (4) Accreditation and Rating Scale; and (5) Staff Qualifications and Professional Development. A program's overall quality rating is equal to its lowest rating among the five areas. In other words, programs need to meet Level 5 in all five categories areas in order to receive a Level 5 overall. In addition to EXCELS, Maryland offers state accreditation and recognizes a number of national accreditations, such as the National Association for the Education of Young Children Accreditation (NAEYC) and the National Family Child Care Accreditation (NAFCC). Providers can be enrolled in EXCELS and also hold accreditations. EXCELS includes separate standards for child care centers, family child care homes, and public prekindergarten programs. For public programs, EXCELS only provides standards at Levels 4 and 5.

Participation in EXCELS is required for private programs receiving Child Care Subsidy (CCS) Program funds, but is voluntary for all other programs. EXCELS voluntarily enrolled programs can choose whether to have their ratings published. Thus, while a large number of programs may be participating in EXCELS,

only programs that have had their documentation reviewed and verified receive a "published" rating. This report uses data for the "published" EXCELS programs. In this section, programs that have received a published EXCELS rating or are nationally accredited will be referred to as "quality" programs, to indicate that they have met the State's minimum quality standards either through EXCELS or accreditation. As noted, EXCELS is a voluntary program for most providers and therefore some non-EXCELS programs could also meet the quality standards, but they have not been assessed and verified and therefore are not included in counts of quality programs in this report.

Table 5, below, shows the total number of providers who serve four-year-olds, have published EXCELS ratings, and/or have a state or national accreditation. For each district, the table shows these providers as a percentage of all sites serving four-year-olds in the district. Table 6 shows the four-year-old capacity of these EXCELS published providers.

TABLE 5: PROGRAMS SERVING FOUR-YEAR-OLDS, WITH PUBLISHED EXCELS RATINGS OR ACCREDITATION, BY DISTRICT

	EXCELS Published Sites	Accredited Sites	Accredited and Not EXCELS Published	Total Sites in EXCELS or Accredited	EXCELS or Accredited sites as a percentage of all sites
Allegany	16	6	2	18	26%
Anne Arundel	85	42	7	92	16%
Baltimore City	370	35	8	378	56%
Baltimore	219	36	13	232	23%
Calvert	36	11	0	36	22%
Caroline	13	4	0	13	15%
Carroll	40	18	3	43	22%
Cecil	32	2	0	32	29%
Charles	31	12	1	32	13%
Dorchester	10	3	0	10	21%
Frederick	77	29	6	83	21%
Garrett	9	7	1	10	50%
Harford	63	17	5	68	21%
Howard	121	30	7	128	34%
Kent	4	2	2	6	32%
Montgomery	169	139	48	217	19%
Prince George's	122	37	8	130	13%
Queen Anne's	12	6	1	13	15%
Saint Mary's	12	3	3	15	7%
Somerset	15	7	0	15	41%
Talbot	14	8	3	17	28%
Washington	36	12	1	37	17%
Wicomico	33	10	3	36	28%
Worcester	15	11	4	19	44%
TOTALS	**1,554**	**487**	**126**	**1680**	**23%**

Source: Data from MSDE Maryland EXCELS files 4/17/15, licensing data 2014-15 and accreditation data 2014-15.

TABLE 6: FOUR-YEAR-OLD CAPACITY IN EXCELS PUBLISHED PROGRAMS OR ACCREDITED PROGRAMS, BY DISTRICT

	EXCELS Published	Accredited and Not EXCELS Published	Total Capacity in EXCELS or Accredited*	EXCELS or Accredited Capacity as a Percentage of Total Capacity
Allegany	161	27	187	55%
Anne Arundel	519	173	692	29%
Baltimore City	654	342	996	33%
Baltimore	1,197	372	1569	34%
Calvert	97	0	97	20%
Caroline	122	0	122	59%
Carroll	207	21	228	24%
Cecil	101	0	101	37%
Charles	200	3	203	25%
Dorchester	31	0	31	30%
Frederick	370	78	448	32%
Garrett	8	9	17	37%
Harford	417	103	521	34%
Howard	667	289	956	42%
Kent	6	20	25	44%
Montgomery	1,210	848	2,058	32%
Prince George's	451	143	594	17%
Queen Anne's	34	27	62	27%
Saint Mary's	86	47	133	26%
Somerset	72	0	72	21%
Talbot	68	43	110	50%
Washington	288	21	310	35%
Wicomico	133	241	374	68%
Worcester	101	56	157	74%
TOTAL*	**7,200**	**2,862**	**10,061**	**32%**

Source: Data from MSDE Maryland EXCELS files 4/17/15, licensing data 2014-15 and accreditation data 2014-15.
**Note: Capacity data based on enrollment reports from licensing visits. Excludes 413 programs for which no licensing data was available.*

As shown in the tables above, 23 percent of all the private programs in Maryland that serve four-year-olds meet either the EXCELS quality standards or are accredited, and this 23 percent accounts for 32 percent of the State's private prekindergarten capacity. However, there are some large variations between districts. In Worcester County for example, 74 percent of private prekindergarten slots are in programs that meet the quality standards. In four other districts, over 50 percent of total private prekindergarten slots are in programs that meet the quality standards. At the other end of the spectrum, in eight districts, less than 30 percent of the private prekindergarten capacity is in programs that meet the quality standards.

Given that district-operated prekindergarten programs are required to meet higher quality standards than licensed private providers, it is logical to also include district-provided capacity in the category of

providers that meet quality standards. Table 7, below, presents the total prekindergarten capacity in programs that meet the quality standards, including public prekindergarten. Including the public programs, 63 percent of all available prekindergarten capacity in the State is in quality programs. In Allegany, Caroline, Cecil, Garrett, Kent, Wicomico, and Worcester Counties, quality programs account for over 80 percent of total capacities.

TABLE 7: FOUR-YEAR-OLD CAPACITY IN EXCELS PUBLISHED PROGRAMS, ACCREDITED PROGRAMS, OR PUBLIC PREKINDERGARTEN, BY DISTRICT

	Total Capacity in EXCELS, Accredited or Public PreK	Percent of total capacity in EXCELS, Accredited or Public PreK
Allegany	654	81%
Anne Arundel	2,620	60%
Baltimore City	5,593	73%
Baltimore	4,813	61%
Calvert	449	53%
Caroline	401	83%
Carroll	552	43%
Cecil	740	81%
Charles	981	61%
Dorchester	241	77%
Frederick	1,423	60%
Garrett	165	85%
Harford	1,245	55%
Howard	1,814	58%
Kent	161	83%
Montgomery	5,369	56%
Prince George's	5,435	64%
Queen Anne's	284	63%
Saint Mary's	904	70%
Somerset	265	50%
Talbot	340	75%
Washington	824	59%
Wicomico	906	84%
Worcester	515	90%
TOTAL	**36,692**	**63%**

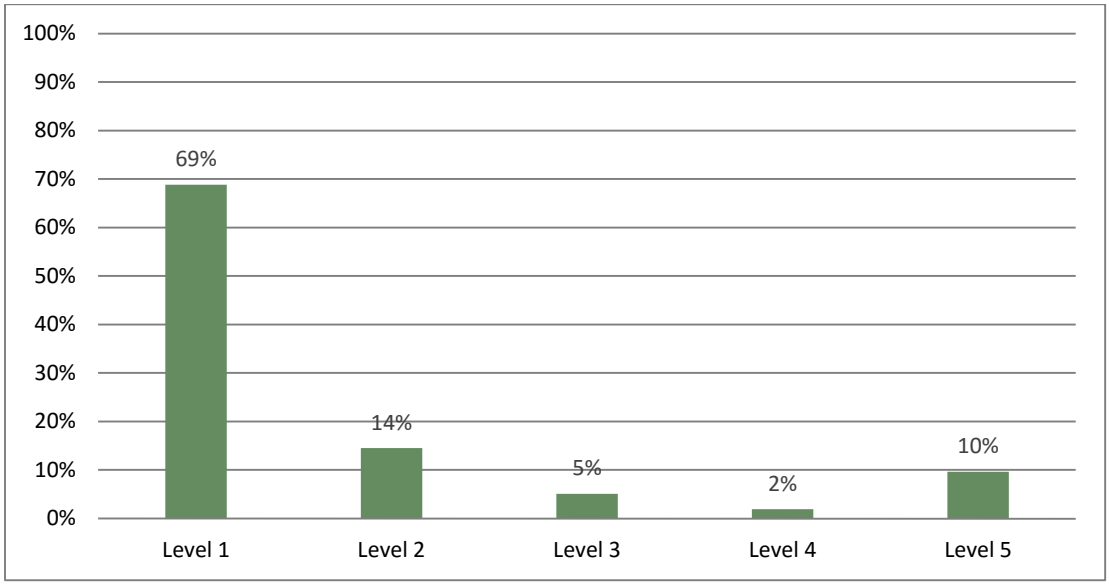
Source: APA Consulting calculations, based on MSDE data.

While participating in EXCELS denotes a level of quality above just being licensed, it is important to note that there are still five levels of quality within EXCELS. Programs at the higher levels of the QRIS (3-5) are generally referred to as "high-quality," since Levels 3-5 incorporate many of the key drivers of quality (e.g. higher teacher qualifications and expanded developmentally appropriate practices). QRIS are designed to provide a pathway to quality and therefore, in addition to giving ratings QRIS emphasize providing supports to programs as they progress towards higher levels of quality. As EXCELS has only

been operational since 2013, there has been little time for the benefits of quality improvement initiatives to be fully realized. It is to be expected, then, that most programs are still at the lower levels of quality. Figure 6, below, illustrates the distribution of EXCELS-rated private programs, by EXCELS level. As shown, nearly 70 percent of private prekindergarten programs participating in EXCELS are at Level 1, compared to 14 percent at Level 2 and 10 percent at Level 5.

This distribution is in line with what might be expected for a relatively new QRIS, where many programs have entered the system and completed basic requirements (earning them a Level 1 rating), but are not yet showing the benefits of quality improvement supports. The larger number of programs at Level 5 indicates that these programs were likely already operating at high quality before EXCELS codified this quality.

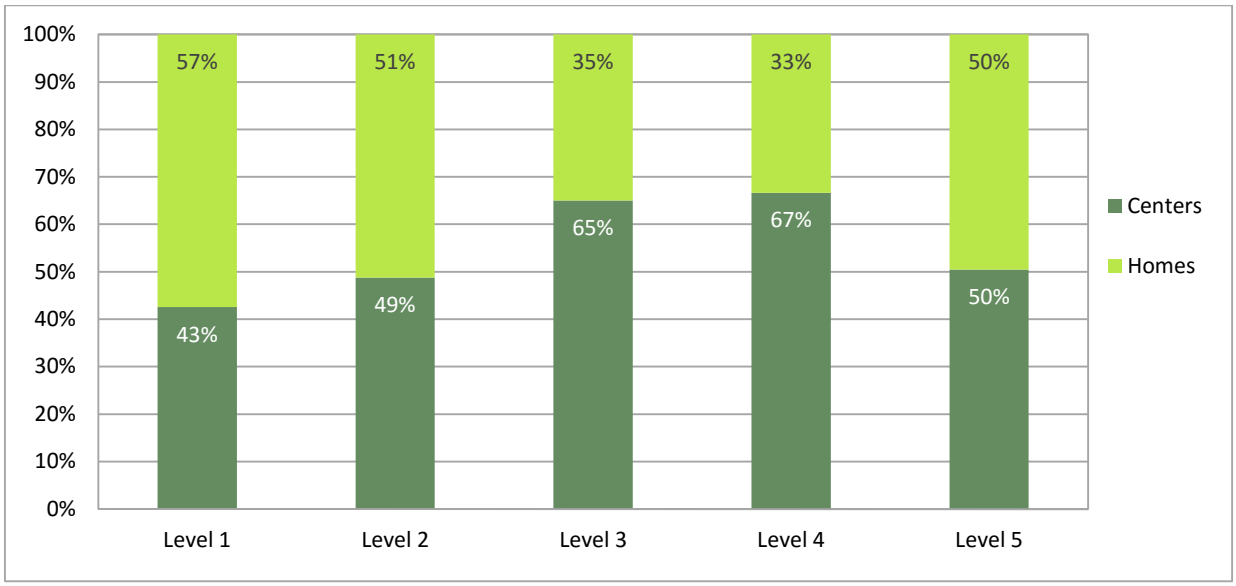
FIGURE 6: DISTRIBUTION OF EXCELS-RATED PREKINDERGARTEN PROGRAMS, BY EXCELS LEVEL



Source: Data from MSDE, EXCELS division.

Figure 7, below, show the distribution of child care centers and family homes at each EXCELS level. As shown in Figure 7, child care centers make up a larger percentage of the programs at the higher EXCELS levels (3-5), and family child care homes make up a larger percentage of the programs at the lower EXCELS levels (1-2). Programs at Level 5 are more evenly split between homes and centers. However, as shown in Figure 6, above, only 10 percent of all rated programs are at Level 5, compared to 69 percent at Level 1.

FIGURE 7: DISTRIBUTION OF PRIVATE PREKINDERGARTEN PROVIDERS, BY EXCELS LEVEL



Source: APA Consulting calculations, based on MSDE data.

Before private providers can receive funding through the Prekindergarten Expansion Act or the federal Preschool Expansion Grant, MSDE requires that a private provider is either state- or nationally accredited *or* has achieved EXCELS Level 5. Table 8, below, details the number of private prekindergarten providers rated Level 5 in each district. Table 8 also illustrates the number of four-year-olds that private providers in each district are licensed to serve. In addition, Table 8 shows the four-year-old capacity in accredited programs, not already captured in the EXCELS capacity, and the public prekindergarten capacity, to demonstrate the total capacity in the highest-quality (Level 5) programs in the State.

TABLE 8: EXCELS LEVEL 5, ACCREDITED, AND PUBLIC PREKINDERGARTEN PROGRAMS SERVING FOUR-YEAR-OLDS, AND CAPACITY, BY DISTRICT

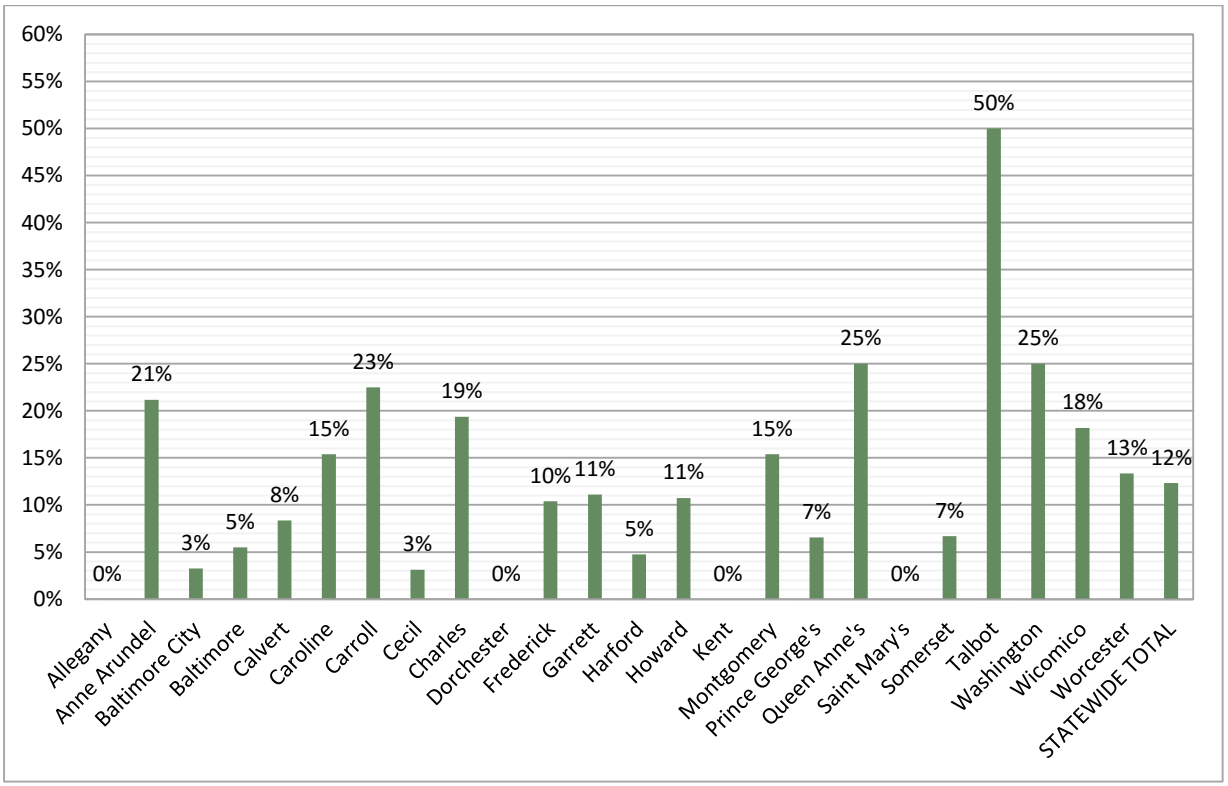
	EXCELS Level 5		Accredited (not EXCELS Level 5)		Public Prekindergarten	Total	Total as % of all Capacity
	Sites	Four-Year-Old Capacity	Sites	Four-Year-old Capacity	Four-Year-Old Capacity		
Allegany	0	0	6	69	467	536	66%
Anne Arundel	18	173	15	288	1,928	2,389	55%
Baltimore City	12	31	13	440	4,597	5,068	67%
Baltimore	12	217	20	443	3,244	3,904	50%
Calvert	3	5	7	60	352	417	50%
Caroline	2	0	2	24	279	303	62%
Carroll	9	86	7	60	324	470	37%
Cecil	1	0	0	0	639	639	70%
Charles	6	58	6	46	778	882	55%

	EXCELS Level 5		Accredited (not EXCELS Level 5)		Public Prekindergarten	Total	Total as % of all Capacity
	Sites	Four-Year-Old Capacity	Sites	Four-Year-old Capacity	Four-Year-Old Capacity		
Dorchester	0	0	0	0	210	210	67%
Frederick	8	93	16	170	975	1,237	52%
Garrett	1	0	3	10	148	158	82%
Harford	3	22	11	191	724	937	41%
Howard	13	326	15	425	858	1,608	51%
Kent	0	0	2	20	136	156	80%
Montgomery	26	233	93	1316	3,311	4,860	50%
Prince George's	8	33	19	301	4,841	5,175	61%
Queen Anne's	3	6	3	30	222	258	57%
Saint Mary's	0	0	5	60	771	831	64%
Somerset	1	1	1	65	193	259	49%
Talbot	7	53	3	43	230	325	72%
Washington	9	174	2	22	514	710	51%
Wicomico	6	56	4	253	532	841	78%
Worcester	2	42	6	78	358	477	84%
TOTAL	**150**	**1,607**	**259**	**4,413**	**26,631**	**32,651**	**56%**

Source: APA Consulting calculations, based on MSDE data.

A total of 150 sites are rated Level 5, representing 10 percent of all EXCELS-rated programs. These high-quality programs have capacity for 1,607 four-year-olds, representing 22 percent of the total capacity for four-year-olds in all EXCELS-rated programs. As shown in Table 8, above, and Figure 8, below, four districts have zero programs rated EXCELS Level 5. There are only five districts where more than 20 percent of all EXCELS-participating programs are rated at a Level 5.

FIGURE 8: PERCENTAGE OF ALL EXCELS-RATED PREKINDERGARTEN PROGRAMS RATED LEVEL 5, BY DISTRICT



Source: Data from MSDE.

As shown in Table 8, above, there are an additional 4,413 four-year-old slots in accredited programs that are not also rated EXCELS Level 5 (the remaining 1,620 accredited slots with an EXCELS rating are at Level 5 and are therefore already counted in the EXCELS Level 5 column). Combining these totals with the public prekindergarten slots gives a total of 32,651 four-year-old slots at the highest level of quality. These 32,651 slots represent 56 percent of the total four-year-old capacity available in Maryland in public and private settings. While this is a significant percentage of total capacity at the highest-quality level, nearly 82 percent of this capacity is in public prekindergarten. Among private programs, there are only 6,020 four-year-old slots at the highest quality level, with just over a quarter of this number being at EXCELS Level 5 (1,607).

With only 10 percent of programs participating in EXCELS rated at Level 5, the study team analyzed the data for each of the five elements within EXCELS to determine if there were specific elements where programs generally scored higher or lower. Figure 9, below, shows the average EXCELS rating for each of the five EXCELS elements and the average overall EXCELS score. On average, programs score much higher on the Licensing and Compliance element of the EXCELS rating, with an average score across all programs of 4.78. This is compared to a statewide average of 1.86 on the Accreditation and Rating Scale element of the EXCELS rating, and a statewide average of 1.88 on the Administrative Policies and Practices element of the EXCELS rating.

FIGURE 9: AVERAGE EXCELS LEVEL, BY EXCELS ELEMENT, STATEWIDE

Source: Data from MSDE.

Table 9, below, shows the average rating for each element, by district. These data show that the trends are similar across all districts, with Licensing and Compliance being the highest scoring element across all districts. However, there are large variations between the districts, with a difference of approximately two points (on a five-point scale) between the lowest and highest averages for all elements, apart from Licensing and Compliance. (For Licensing and Compliance, the range between averages is less than one point.) This data indicates that programs need to focus on multiple areas of the EXCELS standards to achieve the higher levels of quality.

TABLE 9: AVERAGE EXCELS LEVELS OF PREKINDERGARTEN PROVIDERS, BY EXCELS ELEMENT, BY DISTRICT

	Administrative Policies and Practices	Licensing and Compliance	Developmentally Appropriate Learning Practice	Accreditation and Rating Scale	Staff Qualifications and Professional Development	Overall Score
Allegany	1.8	4.8	1.5	1.6	1.6	1.4
Anne Arundel	2.6	4.9	3.0	2.6	2.9	2.4
Baltimore City	1.4	4.8	1.4	1.4	1.7	1.3
Baltimore	1.6	4.7	1.6	1.6	1.9	1.5
Calvert	2.1	4.9	2.2	2.0	2.8	1.8
Caroline	2.3	5.0	2.6	2.5	2.8	2.2
Carroll	3.0	4.9	2.8	2.7	3.4	2.5
Cecil	1.5	4.5	1.5	1.6	1.7	1.4
Charles	2.2	4.6	2.2	2.2	2.8	2.0
Dorchester	1.7	5.0	2.0	1.6	2.3	1.4
Frederick	2.0	5.0	2.1	2.0	2.4	1.8
Garrett	3.1	4.1	3.2	3.1	2.9	2.6
Harford	1.6	4.8	1.6	1.6	1.8	1.4
Howard	1.7	4.6	1.8	1.7	2.0	1.6
Kent	1.8	5.0	1.5	1.8	1.8	1.5
Montgomery	2.4	4.8	2.5	2.3	2.7	2.1
Prince George's	1.7	4.9	1.7	1.7	2.2	1.5
Queen Anne's	2.8	4.3	2.8	2.8	3.1	2.5
Saint Mary's	1.6	4.2	1.4	1.3	2.3	1.1
Somerset	1.6	5.0	1.9	2.0	2.1	1.6
Talbot	3.5	5.0	3.6	3.3	3.6	3.3
Washington	2.9	5.0	2.8	2.4	3.1	2.4
Wicomico	2.3	4.8	2.5	2.2	2.9	2.1
Worcester	2.5	5.0	2.5	2.3	2.8	2.1
AVERAGE	**1.88**	**4.78**	**1.93**	**1.86**	**2.20**	**1.69**
Minimum	1.40	4.10	1.40	1.30	1.60	1.08
Maximum	3.50	5.00	3.60	3.30	3.60	3.29

Source: Data from MSDE.

Gap Analysis

The prior sections have provided an overview of Maryland's current prekindergarten capacity and enrollment, and current quality distribution across programs. To determine if the current capacity is sufficient to meet the needs of Maryland's four-year-olds, it is necessary to first estimate the number of four-year-olds in the State. According to data from MSDE, drawn from the 2010 U.S. Census and 2014 population estimates, there were 75,455 four-year-olds in Maryland in 2014. Table 10, below, details the number of four-year-olds in each district in 2014.

TABLE 10: ESTIMATED POPULATION OF FOUR-YEAR-OLDS, BY DISTRICT

District	Four-Year-Old Population
Allegany	921
Anne Arundel	7,072
Baltimore City	10,440
Baltimore	7,863
Calvert	1,144
Caroline	411
Carroll	2,119
Cecil	1,293
Charles	1,954
Dorchester	411
Frederick	3,077
Garrett	375
Harford	3,158
Howard	3,905
Kent	250
Montgomery	13,010
Prince George's	11,419
Queen Anne's	616
Saint Mary's	1,394
Somerset	326
Talbot	475
Washington	1,888
Wicomico	1,282
Worcester	652
Total State	**75,455**

Source: Data from MSDE.

To estimate need for extra four-year-old prekindergarten slots, it is necessary to compare the estimated four-year-old population with the estimated four-year-old capacity presented in the prior pages. Table 11, below, presents this data, with an estimate of unmet need for prekindergarten services in each district. As shown, there are an estimated 58,050 four-year-old prekindergarten slots in Maryland. With the estimated 75,455 four-year-olds in the State, this leaves a gap of 17,405 between capacity and potential need. Table 11 also shows the percentage of four-year-olds covered by current capacity, by district. It should be noted that the 58,050 slots include both full-day and half-day slots. The unmet need in Table 11 therefore identifies the unmet need to serve four-year-olds in any prekindergarten program, and does not provide a calculation of the unmet need for families who are currently enrolled in a half-day program but would like to be enrolled in a full-day program. Although data on the number of full-day and half-day slots is available for public prekindergarten programs, these data are not available for private slots. Thus, it is impossible to estimate the total number of the 58,050 slots that are half-day.

TABLE 11: ESTIMATED UNMET NEED FOR FOUR-YEAR-OLD PREKINDERGARTEN SLOTS, BY DISTRICT

	Estimated Four-Year-Old Capacity	Estimated Four-Year-Old Population	Estimated Unmet Need	Capacity as Percentage of Population
Allegany	808	921	113	88%
Anne Arundel	4334	7,072	2,738	61%
Baltimore City	7621	10,440	2,819	73%
Baltimore	7845	7,863	18	100%
Calvert	842	1,144	302	74%
Caroline	485	411	-74	118%
Carroll	1285	2,119	834	61%
Cecil	909	1,293	383	70%
Charles	1601	1,954	353	82%
Dorchester	313	411	98	76%
Frederick	2375	3,077	701	77%
Garrett	193	375	181	52%
Harford	2258	3,158	900	72%
Howard	3127	3,905	778	80%
Kent	194	250	56	78%
Montgomery	9670	13,010	3,340	74%
Prince George's	8429	11,419	2,990	74%
Queen Anne's	449	616	167	73%
Saint Mary's	1291	1,394	103	93%
Somerset	531	326	-205	163%
Talbot	452	475	23	95%
Washington	1389	1,888	499	74%
Wicomico	1078	1,282	204	84%
Worcester	570	652	83	87%
Statewide Total	**58,050**	**75,455**	**17,405**	**77%**

Source: APA calculations, based on MSDE data.

As shown, there are large disparities across districts in terms of need: Montgomery County has the highest unmet need, with a need for 3,340 more slots. Somerset County has the lowest unmet need, with an excess capacity of 205 slots. Looking at capacity as a percentage of population, the data show that three counties have capacity to serve fewer than 65 percent of their four-year-olds, with Garrett County only having capacity for 52 percent of its four-year-olds. Seven counties have capacity to serve more than 85 percent of their four-year-olds. Two of these counties, Somerset and Caroline, have excess capacity (at 163 percent and 118 percent, respectively). This means that estimates indicate there are more slots available than there are four-year-olds to fill them. However, since the slots are not defined by length of day, it is possible that some of the capacity is in half-day programs and that the actual need

could be for more full-day slots. In addition, the capacity and population figures are both relatively small (under 600), so the excess capacity could be a result of the margin of error within the estimates.

Although data show that the State only has capacity for 77 percent of its four-year-olds, it is unlikely that all four-year-olds would enroll in a formal prekindergarten program, since a percentage of parents will choose to opt their children out of prekindergarten. As discussed in Section IV, on average, states that offer universal prekindergarten report enrollments around 80 percent of all four-year-olds. For this reason, it is unlikely that capacity would be required for the total population (75,455) of Maryland four-year-olds. Table 12, below, estimates the additional slots needed based on serving 80, 90, or 100 percent of four-year-olds. Serving 80 percent of four-year-olds would require around 2,314 more slots.

TABLE 12: ESTIMATED ADDITIONAL CAPACITY REQUIRED TO SERVE 80, 90, AND 100 PERCENT OF MARYLAND'S FOUR-YEAR-OLD POPULATION

Setting	Four-Year-Old Capacity		
Public Programs	26,631		
Licensed Private Programs	31,419		
Total 4-year-old Capacity, Public or Licensed Private Programs	**58,085**		
Percent of Four-Year-Old Population	**80%**	**90%**	**100%**
4-Year-Old Population	60,364	67,910	75,455
Unmet 4-Year-Old Need	**2,314**	**9,859**	**17,405**

Source: APA Consulting calculations, based on MSDE data.

Maryland's efforts to expand prekindergarten access to have focused on providing extra capacity in public schools or in the highest-quality private programs. For that reason, the study team analyzed data to estimate additional capacity needed if all prekindergarten capacity were provided through public schools or high-quality private programs. In line with the requirements of the 2014 Prekindergarten Expansion Act, the study team defined "high-quality" programs as public prekindergarten programs, state- or nationally accredited community programs, or community programs with an EXCELS rating of Level 5. Table 13, below, presents the additional capacity needed to serve 60, 70, and 80 percent of four-year-olds in public prekindergarten or an EXCELS Level 5 community prekindergarten program.

TABLE 13: ESTIMATED ADDITIONAL CAPACITY REQUIRED TO SERVE 60, 70 AND 80 PERCENT OF FOUR-YEAR-OLD POPULATION IN PUBLIC PREKINDERGARTEN, ACCREDITED COMMUNITY PROGRAMS, OR EXCELS LEVEL 5 PRIVATE PREKINDERGARTEN PROGRAMS

Setting	Four-Year-Old Capacity		
Public Programs	26,631		
Accredited Private Programs	4,413		
EXCELS Level 5 Private Programs	1,607		
Total 4-year-old Capacity, Public, Accredited or EXCELS Level 5	**32,651**		
Percent of Four-Year-Old Population	**60%**	**70%**	**80%**
4-Year-Old Population	45,273	52,819	60,364
Unmet 4-Year-Old Need	**12,622**	**20,167**	**27,713**

Source: APA Consulting calculations, based on MSDE data.

As shown in the table above, there are approximately 32,651 four-year-old prekindergarten slots available in public programs, or private programs that are accredited or are at EXCELS Level 5. Due to the low number of Maryland programs rated EXCELS Level 5, to serve the State's four-year-old population in the highest-quality programs requires a significantly larger number of additional slots. For example, to serve 80 percent of the four-year-old population in these programs requires 27,713 additional slots, compared to fewer than 2,314 slots if they can be served in any licensed program (as shown in Table 12). While the state has enough capacity in licensed programs to serve nearly 77 percent of four-year-olds, there is only enough capacity to serve 43 percent of four-year-olds in the highest quality programs.

III. Prekindergarten Funding Analysis

State Prekindergarten

Prekindergarten in Maryland is funded through several different sources at the state, federal, and local levels. The 2002 Bridge to Excellence in Public Schools Act included increases in education funding intended, in part, to cover the expense of mandated public prekindergarten for disadvantaged populations. However, the State does not provide a dedicated prekindergarten funding source. To estimate the statewide expenditure for prekindergarten slots under the Bridge to Excellence requirement, Maryland uses an FTE (full-time equivalent) formula based on all mandated programs. Under this calculation, total state expenditures in 2014 were $108.5 million, funding 26,631 four-year-olds in public prekindergarten. Table 14, below, details Maryland's expenditures for four-year-old prekindergarten services and enrollments by district.

TABLE 14: STATE PREKINDERGARTEN EXPENDITURES AND ENROLLMENT, FOUR-YEAR-OLDS, BY DISTRICT

District	Four-Year-Old Enrollment			Four-Year-Old State PreK Expenditures		
	Half-Day Program	Full-Day Program	Total	Half-day Program	Full-Day Program	Total
Allegany	467	0	467	$1,425,284	$0	$1,425,284
Anne Arundel	1,189	739	1,928	$3,628,828	$4,510,117	$8,138,945
Baltimore City	0	4,597	4,597	$0	$28,055,491	$28,055,491
Baltimore	3,244	0	3,244	$9,900,688	$0	$9,900,688
Calvert	352	0	352	$1,074,304	$0	$1,074,304
Caroline	243	36	279	$741,636	$219,708	$961,344
Carroll	324	0	324	$988,848	$0	$988,848
Cecil	583	56	639	$1,779,316	$341,768	$2,121,084
Charles	506	272	778	$1,544,312	$1,660,016	$3,204,328
Dorchester	210	0	210	$640,920	$0	$640,920
Frederick	975	0	975	$2,975,700	$0	$2,975,700
Garrett	0	148	148	$0	$903,244	$903,244
Harford	724	0	724	$2,209,648	$0	$2,209,648
Howard	858	0	858	$2,618,616	$0	$2,618,616
Kent	0	136	136	$0	$830,008	$830,008
Montgomery	2,861	450	3,311	$8,731,772	$2,746,350	$11,478,122
Prince George's	2,788	2,053	4,841	$8,508,976	$12,529,459	$21,038,435
Queen Anne's	222	0	222	$677,544	$0	$677,544
Saint Mary's	714	57	771	$2,179,128	$347,871	$2,526,999
Somerset	176	17	193	$537,152	$103,751	$640,903
Talbot	230	0	230	$701,960	$0	$701,960
Washington	390	124	514	$1,190,280	$756,772	$1,947,052
Wicomico	289	243	532	$882,028	$1,483,029	$2,365,057
Worcester	354	4	358	$1,080,408	$24,412	$1,104,820
State Totals	**17,699**	**8,932**	**26,631**	**$54,017,348**	**$54,511,996**	**$108,529,344**

Source: Data from MSDE, Prekindergarten Students by LEA and Age as of 9/30/14.

The 2014 Maryland Prekindergarten Expansion Act, which expanded access to prekindergarten services to four-year-old children from families whose income is at or below 300 percent of federal poverty guidelines, included $4.3 million in the state budget for fiscal year (FY) 2015. Table 15, below, details the number of grants, children served, and grant amount, by district, for the $4.3 million allocated from the Prekindergarten Expansion Act in FY 2015. The study team understands that the same grants are also being provided in FY 2016. However, this section of the report uses the FY 2015 data for consistency across expenditures and funding sources.

TABLE 15: PREKINDERGARTEN EXPANSION GRANTS FY 2015, BY DISTRICT

	Number of Grants	Children Served	Grant Amount
Allegany	0	0	0
Anne Arundel	0	0	0
Baltimore City	1	100	$112,000
Baltimore	5	180	$720,532
Calvert	0	0	0
Caroline	1	102	$330,000
Carroll	1	20	$111,403
Cecil	0	0	0
Charles	0	0	0
Dorchester	0	0	0
Frederick	4	85	$293,644
Garrett	2	120	$442,000
Harford	1	20	$56,000
Howard	1	76	$268,800
Kent	0	0	0
Montgomery	3	60	$336,000
Prince George's	1	420	$571,621
Queen Anne's	1	40	$112,000
St. Mary's	0	0	0
Somerset	1	140	$330,000
Talbot	0	0	0
Washington	1	100	$336,000
Wicomico	1	100	$280,000
Worcester	0	0	0
Total	**24**	**1,563**	**$4,300,000**

Source: Maryland Legislative Handbook Series, Volume IX: Education in Maryland (2014).

The five-year federal Preschool Expansion Grant that Maryland received in 2014 provides $15 million annually to create 1,210 new and 1,578 improved prekindergarten slots. Ninety-five percent of this funding is allocated to subgrantees as follows:

- Community-based early learning providers: $5,785,728

- Public prekindergarten: $6,154,272
- Prekindergarten at Judy Centers: $2,310,000

In addition to the federal funds, as part of this grant the State will make a match of $3,672,000 in state fiscal year (SFY) 2018 and $7,344,000 in SFY 2019, with the specific goal to expand access to four-year-olds from families with incomes between 200 and 300 percent of the federal poverty level.

In addition to this funding, prekindergarten services are also funded through Head Start and the Child Care Subsidy Program, both of which include state and federal funding sources.

Child Care Subsidy Program

The Child Care Subsidy (CCS) Program provides qualifying families with financial assistance for child care costs. CCS applicants must be (1) Maryland residents who are working, are in an approved training program, or are in public school, (2) recipients of Temporary Cash Assistance or Supplemental Security Income, or within CCS income guidelines, (3) willing to have their child immunized according to Maryland State Standards, and (4) pursuing child support, if applicable. Eligible families receive a voucher that can be used to purchase child care from a participating provider, either a registered family day care home or a licensed child care center. Funding for the program is a combination of federal and state funds, with approximately $37.2 million in state funds and $44.4 million in federal funds expended in SFY 2014. In that same year, the program served 18,019 children, supporting 10,509 families, at an average cost of $4,601 per child and $7,888 per family (MSDE Division of Early Childhood Development, 2015).

The CCS Program serves more than just prekindergarten-age children and, therefore, the figures above include payments to families with infants, toddlers, pre-kindergarteners, and school-age children. Table 16, below, details subsidy funding broken down by age and district. As shown in the table, an average of approximately 40 percent of all subsidy payments are to prekindergarten-age children, totaling $32.7 million. Assuming the same divide between federal and state dollars as noted above, of this $32.7 million, approximately $17.8 million (54.4 percent) comes from federal sources and $14.9 million (45.6 percent) comes from state sources.

TABLE 16: CHILD CARE SUBSIDY PROGRAM AMOUNTS PAID IN STATE FY 2014, BY AGE GROUP, BY DISTRICT

	Subsidy Payments as Percentage of Total	Total Payments	Infant/ Toddler Payments as Percentage of Total	PreK Payments as Percentage of Total	School-Age Payments as Percentage of Total	PreK Payments
Allegany	1.0%	$800,730	18.9%	39.4%	41.7%	$315,570
Anne Arundel	2.3%	$1,858,913	17.3%	39.3%	43.4%	$730,562
Baltimore City	30.6%	$24,946,119	29.7%	41.2%	29.1%	$10,273,357
Baltimore	16.2%	$13,195,596	22.7%	38.0%	39.3%	$5,018,222
Calvert	1.0%	$831,231	17.4%	38.3%	44.3%	$318,001
Caroline	0.6%	$520,491	21.0%	38.0%	40.9%	$197,984
Carroll	1.5%	$1,239,925	28.8%	39.1%	32.1%	$484,780

	Subsidy Payments as Percentage of Total	Total Payments	Infant/ Toddler Payments as Percentage of Total	PreK Payments as Percentage of Total	School-Age Payments as Percentage of Total	PreK Payments
Cecil	1.4%	$1,172,066	23.6%	41.5%	34.9%	$486,992
Charles	2.9%	$2,330,723	30.4%	39.8%	29.9%	$926,574
Dorchester	0.8%	$629,977	16.0%	45.8%	38.3%	$288,455
Frederick	1.5%	$1,248,363	18.4%	41.7%	39.9%	$520,123
Garrett	0.1%	$72,884	16.7%	44.5%	38.8%	$32,460
Harford	2.7%	$2,224,415	25.1%	38.4%	36.5%	$853,901
Howard	5.2%	$4,222,102	23.1%	36.4%	40.5%	$1,534,938
Kent	0.2%	$155,449	19.9%	51.0%	29.1%	$79,266
Montgomery	8.8%	$7,209,613	21.6%	43.4%	35.0%	$3,129,579
Prince George's	16.0%	$13,073,585	25.4%	40.0%	34.7%	$5,228,549
Queen Anne's	0.2%	$199,331	24.7%	30.7%	44.6%	$61,246
St. Mary's	1.3%	$1,058,758	16.3%	39.4%	44.3%	$416,874
Somerset	0.9%	$772,902	30.3%	40.9%	28.7%	$316,446
Talbot	0.5%	$439,658	9.9%	45.0%	45.1%	$197,771
Washington	1.5%	$1,232,504	19.7%	39.1%	41.1%	$482,316
Wicomico	1.9%	$1,557,061	26.4%	39.0%	34.6%	$607,242
Worcester	0.7%	$532,994	16.7%	39.9%	43.4%	$212,793
Unidentified	0.1%	$62,965	-	-	-	-
Total	**100.0%**	**$81,588,354**	**21.7%**	**40.4%**	**37.9%**	**$32,714,000**

Source: Data from MSDE "PreK Adequacy Study data 715.xls," communication with Dr. Rolf Grafwallner, 7/31/15.

Head Start

Total funding for Head Start in FY 2015 was $74.7 million, with approximately $1.8 million, or about two percent, coming from state funds. Table 17, below, details the amount of state aid spent on Head Start programs, by district. Baltimore City received the largest amount of state aid, at 35.4 percent of total state aid. Nine counties receive no state aid for Head Start.

TABLE 17: STATE AID FOR HEAD START, FY 2015, BY DISTRICT

	State Aid for Head Start	As a Percentage of Total
Allegany	$52,325	2.9%
Anne Arundel	$66,520	3.7%
Baltimore City	$637,297	35.4%
Baltimore	$296,117	16.5%
Calvert	$97,881	5.4%

	State Aid for Head Start	As a Percentage of Total
Caroline	$73,783	4.1%
Carroll	$31,539	1.8%
Cecil	$0	0.0%
Charles	$0	0.0%
Dorchester	$0	0.0%
Frederick	$44,950	2.5%
Garrett	$49,519	2.8%
Harford	$9,904	0.6%
Howard	$43,576	2.4%
Kent	$11,885	0.7%
Montgomery	$131,236	7.3%
Prince George's	$171,828	9.5%
Queen Anne's	$0	0.0%
St. Mary's	$0	0.0%
Somerset	$0	0.0%
Talbot	$0	0.0%
Washington	$80,055	4.4%
Wicomico	$0	0.0%
Worcester	$0	0.0%
Unidentified	$1,585	0.1%
Total	**$1,800,000**	**100.0%**

Source: Maryland Legislative Handbook Series, Volume IX: Education in Maryland (2014).

It should be noted that Head Start funds support more than just prekindergarten services. Head Start provides a comprehensive set of services to support low-income families, including but not limited to prekindergarten.

Prekindergarten Funding Summary

Table 18, below, details the total state and federal expenditures for prekindergarten services in Maryland. As shown, the estimated total state expenditure is $129.5 million, which is comprised of $108.5 million for district prekindergarten programs, $4.3 million for the prekindergarten expansion grants, $1.8 million for Head Start, and $32.7 million for the CCS Program. Federal expenditure totals $105.7 million, but the bulk of that total is federal Head Start funds, which provide support for comprehensive services, not just prekindergarten.

TABLE 18: PREKINDERGARTEN EXPENDITURES IN MARYLAND

Program	Estimated State Expenditures (Millions)	Estimated Federal Funding (Millions)
Estimated Public Prekindergarten (FY 2015)	$108.5	-
Prekindergarten Expansion Act (FY 2015)	$4.3	-
Federal Preschool Expansion Grant (FY 2015)	*	$15.0
Head Start (FY 2015)	$1.8	$72.9
Child Care Subsidy (FY 2014)	$14.9	$17.8
Total	**$129.5 million**	**$105.7 million**

**Maryland has committed to provide a total State match of $11,016,000 in years 3 and 4 of the grant (SFY 2018 and SFY 2019)*

The totals above do not include any additional local funding districts may allocate to serve all eligible four-year-olds in their areas. Totals also do not include expenditures related to Judy Centers. Judy Center expenditures in FY 2015 totaled $10.6 million. Judy Center's covers a variety of services, and the study team was told by MSDE that it is not possible to disaggregate prekindergarten-specific expenditure from totals.

IV. Prekindergarten Comparative Analysis

The prior sections of this paper have analyzed current prekindergarten enrollment, capacity, quality levels, and funding in Maryland. Sections IV and V will provide estimates of the cost to expand prekindergarten participation and the associated benefits. However, before addressing those critical issues, the study team believes it is useful to put Maryland's data in context with comparisons to other, nearby states, and to states that have successfully expanded prekindergarten access. This section provides that context.

Table 19, below, compares Maryland to 11 other states, and D.C. The comparison areas are split into two categories: places with high prekindergarten enrollments (more than 60 percent of the total four-year-old population) and places that are geographically close to Maryland. These are not mutually exclusive and therefore some locations appear in both categories. In addition to looking at the number of four-year-olds served, the comparison also looks at state funding and required program quality standards in each place.

To simplify comparisons and ensure that comparisons use similar data points (both in terms of data sources and data collection periods), the comparison tables that follow draw heavily on the National Institute for Early Education Research (NIEER) *2014 State Preschool Yearbook* for prekindergarten enrollment and funding data. This does mean, however, that the data in Tables 19 and 20 and Figures 10 and 11 may not exactly match data presented elsewhere in this report for Maryland because of different data sources or data collection periods. For example, the NIEER state expenditure figure for Maryland of $4,500 per child is based on district prekindergarten programs only, and includes both three and four-year-olds, as opposed to the data in this report that only covers four-year-olds.

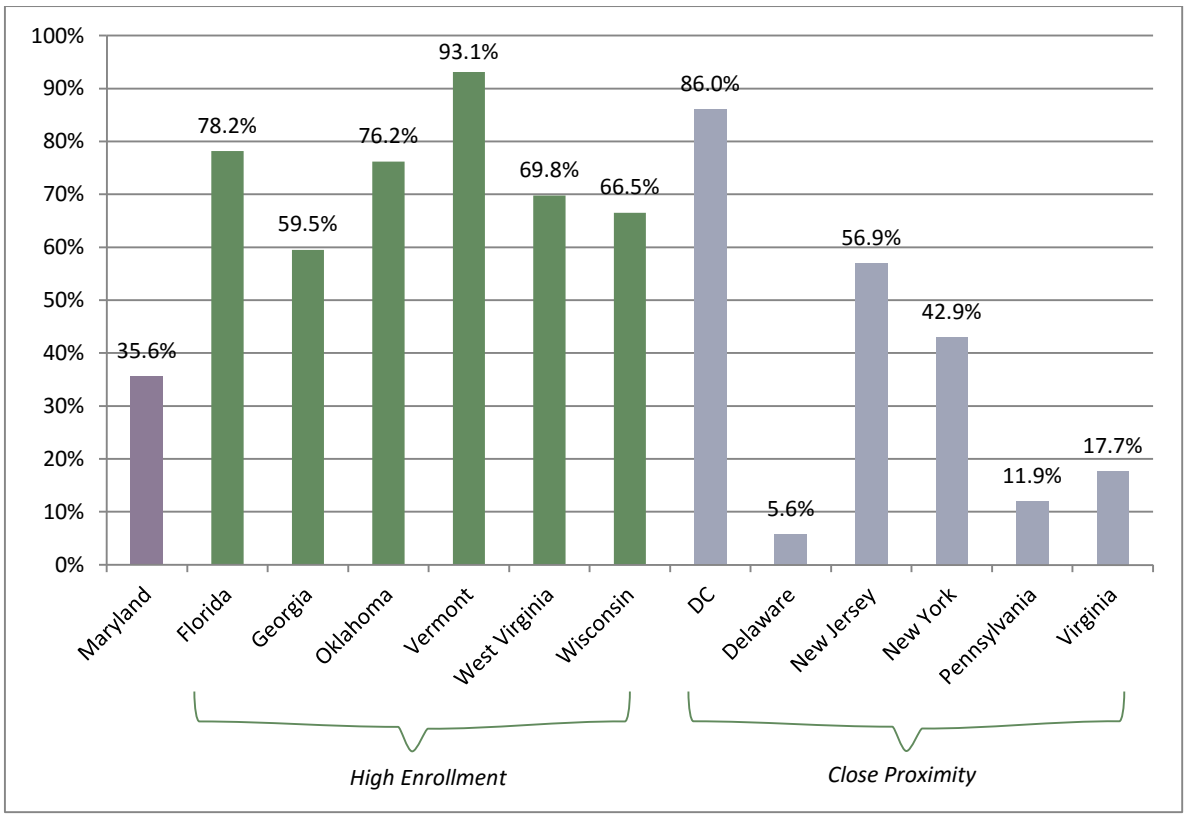
TABLE 19: MARYLAND PREKINDERGARTEN ENROLLMENT, QUALITY, AND FUNDING, COMPARISON WITH 11 STATES AND D.C.

	Total Population	Population Under 5	Percentage of Total Population Under 5	4-Year-Old Population	Number of 4-Year-Olds in State PreK	Percentage of 4-Year-Olds in State PreK	Per Child, State PreK Funding	Total State PreK Funding
Maryland	**5,976,407**	**369,754**	**6.2%**	**74,077**	**26,358**	**35.58%**	**$4,500**	**$132,889,099**
Geographic Proximity								
Delaware	935,614	56,351	6.0%	11,267	635	5.64%	$7,295	$6,149,300
D.C.	658,893	42,894	6.5%	7,695	6,616	85.98%	$15,372	$191,016,442
New Jersey	8,938,175	532,519	6.0%	54,708	31,138	56.92%	$12,157	$629,798,393
New York	19,746,227	1,184,591	6.0%	229,959	98,695	42.92%	$3,820	$377,870,536
Pennsylvania	12,787,209	715,084	5.6%	142,984	17,025	11.91%	$5,788	$145,553,522
Virginia	8,326,289	514,893	6.2%	101,926	18,021	17.68%	$3,741	$67,424,295
West Virginia	1,850,326	102,485	5.5%	20,271	14,149	69.80%	$5,766	$97,069,726
High Prekindergarten Enrollment								
D.C.	658,893	42,894	6.5%	7,695	6,616	85.98%	$15,372	$191,016,442
Florida	19,893,297	1,084,349	5.5%	217,731	170,266	78.20%	$2,238	$381,108,517
Georgia	10,097,343	662,675	6.6%	136,855	81,453	59.52%	$3,746	$305,084,448
Oklahoma	3,878,051	265,274	6.8%	53,576	40,823	76.20%	$3,671	$149,856,677
Vermont	626,562	30,417	4.9%	6,005	5,592	93.12%	$4,273	$30,999,300
West Virginia	1,850,326	102,485	5.5%	20,271	14,149	69.80%	$5,766	$97,069,726
Wisconsin	5,757,564	341,368	5.9%	69,627	46,323	66.53%	$3,577	$175,264,100

Source: Population data from U.S. Census Population Estimates, Single Year of Age and Sex Population Estimates: April 1, 2010 to July 1, 2014 - Civilian. 6 race groups. Downloaded from: https://www.census.gov/popest/data/state/asrh/2014/index.html. State PreK enrollment and funding data from Barnett, W.S., Carolan, M.E., Squires, J.H., Clarke Brown, K., & Horowitz, M. (2015). The state of preschool 2014: State preschool yearbook. New Brunswick, NJ: National Institute for Early Education Research. Downloaded from: http://nieer.org/yearbook

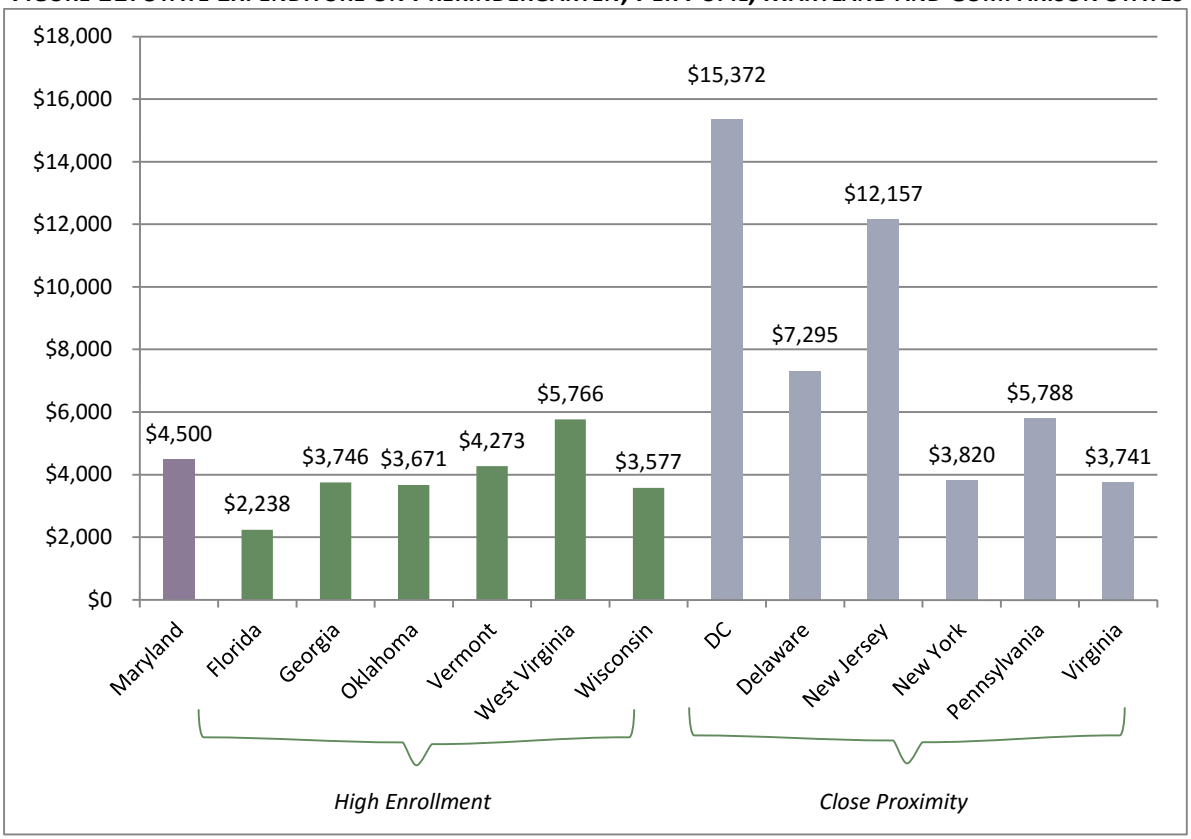
Figures 10 and 11, below, illustrate how Maryland compares to other states and to D.C., both in terms of the percentage of four-year-olds enrolled in state prekindergarten and the per child state funding for prekindergarten services. As shown in Table 19, above, and Figure 10, below, when compared with states in close proximity, Maryland enrolls a higher percentage of its four-year-olds (35.6 percent) than Delaware, Pennsylvania, or Virginia, but a lower percentage than New Jersey, New York, or D.C. When compared to these other states on per pupil expenditures, Figure 11 shows that Maryland actually spends more per child on prekindergarten than all but two of the high prekindergarten enrollment areas (West Virginia and D.C.). Among close proximity areas, only New York and Virginia spend less than Maryland per child. These data imply that states with the highest prekindergarten enrollment are able to achieve this distinction with lower per pupil state expenditures than states with lower enrollment.

FIGURE 10: PERCENTAGE OF FOUR-YEAR-OLDS ENROLLED IN STATE PREKINDERGARTEN, MARYLAND AND COMPARISON STATES



Source: U.S. Census Population Estimates, NIEER State of Preschool 2014.

FIGURE 11: STATE EXPENDITURE ON PREKINDERGARTEN, PER PUPIL, MARYLAND AND COMPARISON STATES



Source: NIEER State of Preschool 2014.

In addition to comparing enrollment and funding, the quality standards of different programs must also be compared to account for the wide variations among locations. While many states have QRIS, such as Maryland EXCELS, these QRIS vary widely across states, making it impossible to directly compare QRIS standards. As part of its *2014 State of Preschool Yearbook*, NIEER rates states based on the number of NIEER quality standards they meet. The NIEER quality standards are research-based standards that track progress toward higher quality for state prekindergarten programs. While NIEER's quality standards are not guarantees of quality, and some states might argue that they are not all equally important or important at all, they serve as useful benchmarks for comparisons across states. Given the differences among state QRIS, the NIEER standards provide the best-available standard for comparison across states. For more information on the NIEER quality standards, please refer to the *2014 State of Preschool Yearbook.*

Table 20, below, compares Maryland to the same states based on the NIEER quality standards.

TABLE 20: STATE PREKINDERGARTEN QUALITY STANDARDS COMPARISON

	State QRIS	Early Learning Standards	Teacher has BA	Specialized Training in PreK	Assistant Teacher has CDA or Equivalent	At Least 15 hrs/yr in-service	Class Size 20 or Smaller	Staff-Child ratio 1:10 or Smaller	Screening/ Referral Services	At Least One On-Site Meal	Site Visits	Total Quality Standards
Maryland	X	X	X	X		X	**	X	X	X	X	8
Geographic Proximity												
Delaware	X	X		X		X	X	X	X	X	X	8
D.C.	X	X	X	X		X	X	X	X	X		8
New Jersey*	X	X	X	X		X	X	X	X	X	X	9
New York	X	X	X	X		X	X	X	X			7
Pennsylvania*	X	X	X	X	X	X	X	X	X	X	X	10
Virginia	X	X		X		X	X	X	X			6
West Virginia		X	X	X		X	X	X	X	X	X	9
High Prekindergarten Enrollment												
D.C.	X	X	X	X		X	X	X	X	X		8
Florida		X					X				X	3
Georgia	X	X	X	X	X	X			X	X	X	8
Oklahoma	X	X	X	X			X	X	X	X	X	8
Vermont*	X	X		X			X	X				4
West Virginia		X	X	X		X	X	X	X	X	X	9
Wisconsin*	X	X	X	X	X	X	X	X	X	X	X	10

*For states with multiple prekindergarten programs, quality standards are included if any of the state programs achieve the standard.

**State policy stipulates an average of 20 students per classroom. Exceptions may occur where individual classrooms exceed this ratio, provided an overall program average of 20 is maintained.

Source: Barnett, W.S., Carolan, M.E., Squires, J.H., Clarke Brown, K., & Horowitz, M. (2015). The state of preschool 2014: State preschool yearbook. New Brunswick, NJ: National Institute for Early Education Research. Downloaded from: http://nieer.org/yearbook; BUILD initiative QRIS Compendium, available at: http://qriscompendium.org/

As shown in Table 20, above, Maryland meets eight of the 10 standards, similar to many neighboring states and actually higher than many of the high prekindergarten enrollment states. Comparing data between Tables 19 and 20, there appears to be little correlation between total number of NIEER quality standards that programs meet and the state expenditures per child. For example, both Wisconsin and Pennsylvania meet all 10 benchmarks, but there is a $2,000 difference between those two places in terms of per child expenditures, and Wisconsin actually spends less than all but one of the comparison states. Similarly, Florida and Vermont only meet three and four benchmarks respectively, but Vermont spends almost double the per child amount that Florida spends, $4,273 compared to $2,238.

V. Cost-Benefit Analysis and Return on Investment for Universal High-quality Prekindergarten in Maryland

This section of the report (1) estimates the cost to provide quality prekindergarten services in Maryland; (2) estimates the benefits accrued to prekindergarten through grade 12 education expenditures, postsecondary education expenditures, and many other expenditures that are incurred beyond school walls, as a result of prekindergarten attendance; and (3) calculates the return on investment (ROI) of prekindergarten attendance.

For this report, the study team was asked to estimate the cost and benefit of offering high-quality universal prekindergarten in the state of Maryland. While Section I (literature review) of this report acknowledges research that questions the long-term value of prekindergarten, this section proceeds with the assumption that prekindergarten is valuable for both children and families. Thus, instead of weighing research on the value of prekindergarten against research on the potential weaknesses of prekindergarten, this section focuses only on literature that espouses the positive impacts of prekindergarten in order to estimate the return on investment of prekindergarten attendance.

Estimate of Prekindergarten Costs

To estimate the costs of prekindergarten, the study team conducted a review of Maryland EXCELS and utilized the Provider Cost of Quality Calculator (PCQC) – a tool APA developed in partnership with Anne Mitchell of Early Childhood Policy Research (ECPR) and with the U.S. Office of Child Care – to calculate the costs of providing prekindergarten in centers, homes, and public schools, at different quality levels. The PCQC includes defaults for non-personnel and personnel costs. Where appropriate, these defaults were updated for the Maryland context. For example, non-personnel costs, such as rent, were adjusted for the cost of living in Maryland. In addition, as the PCQC was not originally developed to estimate the cost of public prekindergarten, the study team modified the occupancy costs for public school-based prekindergarten programs. Because public schools do not have rent or lease costs, the study team replaced the occupancy figures in the PCQC with estimates of the costs to construct a prekindergarten classroom, based on the school size study recently completed as part of the overall Maryland adequacy study (Humann, Palaich, & Griffin, 2015). This construction cost was discounted over 20 years to calculate the cost per square foot for new or repurposed space for public prekindergarten in Maryland. The full cost of quality report is available in Appendix A, and includes a full explanation of any adjustments to the PCQC defaults.

The key cost drivers at the higher levels of quality (EXCELS Levels 4 and 5) are nearly all related to teacher/provider skills and knowledge. Increasing teacher compensation is the primary way to attract and retain teaching staff with high quality skills. Some Level 4 and 5 items in the QRIS are related to time (e.g. time for planning, developmental assessments, staff meetings, family conferences, and family engagement activities), so the cost model also estimates the additional time and extra compensation needed for such tasks. These additional cost drivers primarily affect providers at Levels 4 and 5. With that in mind, the cost model uses Level 3 program costs to calculate a foundational prekindergarten cost amount in centers and homes, with the costs of more teacher time and higher teacher compensation

added to calculate the cost at Levels 4 and 5. Compensation and time are also primary cost drivers within public schools. Taking all this into account, the study team used the PCQC to determine the cost of offering prekindergarten in three settings (centers, homes, and schools), at three levels of quality (Levels 3, 4, and 5 for centers and homes, and Level 5 for schools), and at two levels of dosage (half-day for school year, and full-day for the school year). A half-day is defined as 2.5 hours. Half-days can be delivered most efficiently as double sessions during a school day, where teachers/providers serve two distinct groups of students over the course of one full school day. Full-day is defined as 6.5 hours, and covers an entire school day. The school year is defined as 180 days.

Distinctions between the costs of half-day care versus full-day care are easily applied in a public school setting. The cost of full-day care is the total cost of prekindergarten divided by the number of children (20 per classroom). The cost of half-day care is 50 percent of the cost of full-day care. In contrast, centers and family homes usually operate full working day and full calendar year programs. Both are therefore assumed to offer full-day prekindergarten. To adjust full-day, full-year (12 months) costs for centers and family homes to a school year (10 months) cost, the model takes 85 percent of full-year costs to approximate costs of a 180-day, 10-month school year. The adjustment ensures that the estimated cost of prekindergarten in public schools and in private programs is a true comparison, using the same program length for both settings. The cost of half-day prekindergarten is calculated as 50 percent of the full-day prekindergarten cost. To account for differences in sizes of centers and age mixes of children enrolled, the estimate is based on the average cost per child among four configurations: (1) a moderately sized, mixed age center; (2) a moderately sized center only enrolling preschoolers; (3) a large center only enrolling preschoolers; and (4) a very large center only enrolling preschoolers.

The cost of quality study resulted in estimated per child costs for delivering prekindergarten at Levels 3, 4, and 5 in centers and family homes, and at Level 5 for public schools. These estimates include all costs to operate a program at the defined level of quality, including costs that vary by program quality, such as teacher salaries, as well as operational costs that do not vary by quality, such as rent, utilities and maintenance. In this way, the estimates below are all-inclusive costs to provide quality prekindergarten. Note that these figures do not include any start-up costs, or costs to move up to this level of quality; these are the operating costs once programs are already at the specified level of quality.

Per child prekindergarten cost estimates for licensed centers, family homes, and public schools are shown below in Tables 21, 22, and 23.

TABLE 21: COST OF PROVIDING QUALITY PREKINDERGARTEN IN LICENSED CENTERS, AT EXCELS LEVELS 3, 4, AND 5

Centers	*Level 3*	*Level 4*	*Level 5*
Full-Day/Full Year	$9,294	$11,321	$12,334
School Day/School Year	$7,900	$9,622	$10,484
Half-Day/School Year	$3,950	$4,811	$5,242

Source: APA 'cost of quality' calculations. See Appendix A.

TABLE 22: COST OF PROVIDING QUALITY PREKINDERGARTEN IN LICENSED FAMILY HOMES, AT EXCELS LEVELS 3, 4, AND 5

Family Homes	*Level 3*	*Level 4*	*Level 5*
Full-Day/Full Year	$8,492	$11,057	$11,838
School Day/School Year	$7,218	$9,398	$10,063
Half-Day/School Year	$3,609	$4,699	$5,031

Source: APA 'cost of quality' calculations. See Appendix A.

TABLE 23: COST OF PROVIDING QUALITY PREKINDERGARTEN IN PUBLIC SCHOOLS, AT EXCELS LEVEL 5

Public Schools	*Level 5, with median salaries*	*Level 5, with salaries 5% above median**
Full-Day/Full Year	N/A	N/A
School Day/School Year	$12,111	$12,633
Half-Day/School Year	$6,056	$6,331

Source: APA 'cost of quality' calculations. See Appendix A.

* Wages in schools are calculated for Level 5 at two salary levels. The first uses the mean annual wage for the Bureau of Labor Statistics (BLS) occupational category, relevant to each position. The second is five percent higher to allow for the possibility of needing to attract prekindergarten and/or ECE-certified teachers, who may be in short supply. For the purposes of estimating system costs in this report, the median salaries figures will be used.

In addition to these per child costs, there may be system costs such as support for higher education (scholarships) and prekindergarten teacher professional development. The U.S. Office of Child Care recently released a tool that can help calculate the costs of professional development. (The *Professional Development System Cost Analysis Tool* is available at https://earlyeducatorcentral.acf.hhs.gov/pdtool/.) Maryland data on the cost of professional development and the current distribution of qualifications among teachers can be inputted or national data from the National Survey of Early Care and Education can be used as a default.

In addition, regarding the length of the prekindergarten day and the associated costs, the cost to provide half-day prekindergarten may be lower if a part-time qualified teacher leads the prekindergarten class, rather than a full-time teacher leading two half-day classes in one day. This is because a part-time teacher is unlikely to receive the same level of benefits as a full-time teacher. However, the calculations assume one full-time teacher because traditionally it is difficult to hire and retain part-time teachers.

To calculate total systems costs, it was necessary to estimate costs of operating prekindergarten programs either (1) not enrolled in EXCELS or (2) operating at EXCELS Levels 1 and 2. The study team used data from Child Care Aware of America's Maryland state profile on average annual fees for full-time care in centers and homes for four-year-olds (Child Care Aware of America, 2015). These data were multiplied by 85 percent to replicate costs of a school-day, school year (6.5-hour day, 180-day year) program. The Child Care Aware average is inclusive of all child care centers, including both high- and low-quality programs, so the study team took the 75 percentile figure to better reflect lower-quality programs. This resulted in a per child annual cost of $6,050 for licensed centers, and $4,971 for licensed family homes.

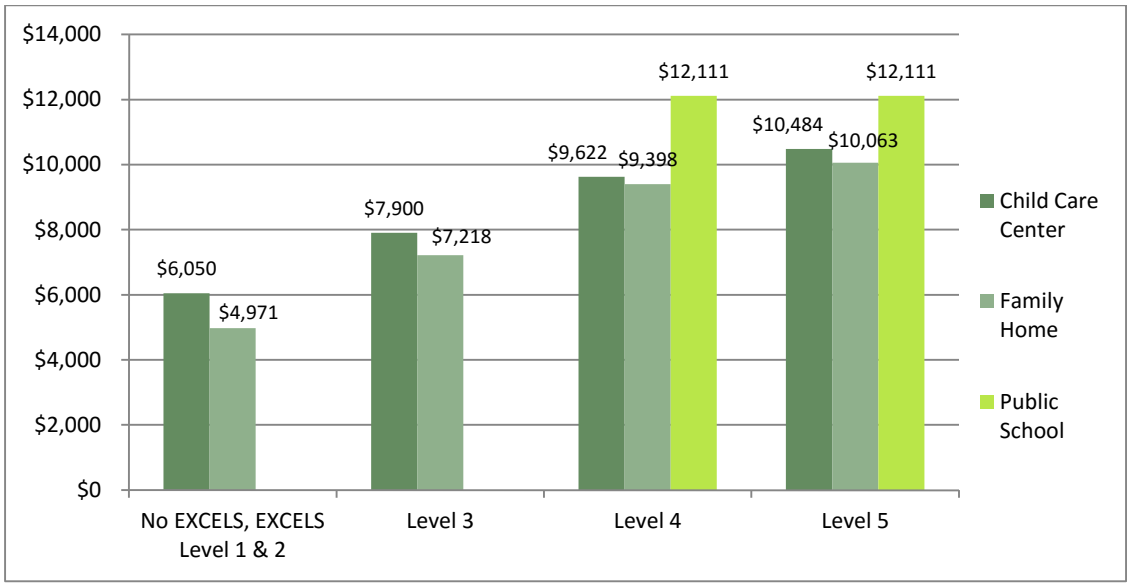
Table 24 summarizes the costs for prekindergarten services for all settings. Figure 12 displays these data graphically.

TABLE 24: COST OF PREKINDERGARTEN SERVICES, BY SETTING AND QUALITY

Setting	No EXCELS, EXCELS Level 1 & 2	Level 3	Level 4	Level 5
Child Care Center	$6,050	$7,900	$9,622	$10,484
Family Home	$4,971	$7,218	$9,398	$10,063
Public School	N/A	N/A	$12,111	$12,111

Source: APA 'cost of quality' calculations. See Appendix A.

FIGURE 12: COST OF PREKINDERGARTEN SERVICES, BY SETTING AND QUALITY



Source: APA 'cost of quality' calculations. See Appendix A.

As part of the larger adequacy study currently being conducted in Maryland, a prekindergarten professional judgment (PJ) panel was held in fall 2015. The panel included elementary school principals and prekindergarten teachers, as well as district and state staff. This panel used the EXCELS standards for public prekindergarten, included in this report as Appendix C, to estimate the resources required to provide prekindergarten services in public school settings. The required resources identified by the panel will be compared with the resource needs that are included in the cost of quality study for public prekindergarten. If differences exist, these will be reconciled as part of the final adequacy study report. The analyses in this report have been constructed through a Microsoft Excel model and the online PCQC, both of which allow the underlying costs for public prekindergarten to be easily adjusted if necessary and all resulting ROI calculations will be updated automatically.

Estimate of Prekindergarten Benefits

To calculate the ROI of prekindergarten in Maryland, it is necessary to estimate the benefits received as a result of prekindergarten attendance. The study team developed a Maryland-specific ROI methodology by reviewing a number of nationally recognized cost-benefit studies and incorporating Maryland data to tailor these studies to the specific state context.

Table 25 lists the categories of return associated with prekindergarten participation, along with the estimated per child benefit of attending prekindergarten in Maryland. Appendix B describes the methodology used to calculate these benefits. The estimated per child benefit in Table 25 accrues to every child enrolled in prekindergarten. As discussed in Appendix B, these figures are discounted to reflect benefits being averaged across all participants, understanding that not all benefits will accrue to each individual prekindergarten attendee equally. For example, research indicates that prekindergarten attendance can reduce the need for special education. Clearly, not all children who attend prekindergarten are expected to need special education services when they enter the K-12 system. However, studies have tracked prekindergarten attendees into the K-12 system and analyzed the reduction in special education cases among the attendee group compared to a control group. That information can be used to calculate an average per child impact. In the Maryland methodology, the impact is equal to a 0.7 year reduction in special education per prekindergarten attendee over their K-12 experience.

TABLE 25: ESTIMATED PER CHILD BENEFIT OF PREKINDERGARTEN PARTICIPATION

Category	Estimated Per Child Benefit
K-12 System	
Reduced Special Education Costs	$8,425
Reduced Grade Retention	$2,018
Reduced Teacher Turnover Costs	$78
Reduced Teacher Salary Costs	$1,729
Reduced Teacher Absenteeism Costs	$1,859
Reduced School Support Costs	$5,226
Higher Education and Career	
Increased Costs of College Participation	($970)*
Increased Costs of High School Participation	($1,441)*
Increased Future Income	$48,324
Criminal Justice	
Reduced Juvenile Crime Costs	$7,257
Reduced Adult Crime Costs	$4,530
Reduced Tangible Victim Costs	$4,757
Child Welfare System	
Reduced Foster Care and Home Care Costs	$327
Reduced Child Welfare Quality of Life Costs	$2,016
Reduced Child Welfare Tangible Victim Costs	$230
Total	**$84,365**

Source: See Appendix B: ROI Methodology.

*The increased college participation and increased high school participation categories result in a negative ROI because they represent increased costs associated with children who participate in prekindergarten. Children who complete prekindergarten are more likely to complete high school and attend college, which creates a financial cost for the State.

As noted, these estimated returns are based on a number of nationally recognized, rigorous studies of the impacts of prekindergarten. These studies include discounting, where appropriate, to account for inflation and to for the age at which the benefit is realized (i.e. adult criminal justice benefits are realized from age 20 to 44). As shown in Appendix B, the study team modified and updated data from those studies to apply to the Maryland-specific context. For some of the data from those studies, the study team was not able to find comparable, Maryland-specific data. In these cases, the study team opted to use data from the original studies, with some updates to figures and/or data points to account for factors like monetary inflation over time. In general, the benefit amounts listed in the table above are conservative estimates of prekindergarten returns.

There are a number of benefit categories where there is not enough rigorous research available to make a valid estimate of financial returns. For example, when children attend prekindergarten, their parents may have more time available to work or to attain higher levels of education. Additionally, if universal prekindergarten were offered at no cost to parents, it may provide a benefit to parents in the form of reduced child care costs. These sorts of outcomes could create additional prekindergarten benefits, both for families and for society. However, they are not well-researched, and they are difficult to measure precisely. Therefore, the study team has only included benefits for which high-quality research exists to substantiate the return figures. In this way, the study team ensures that Maryland can be confident in the total benefit number cited in the table and in the calculations that follow.

The benefits in Table 25, above, are realized over the lifetime of the prekindergarten student. While some benefits occur almost immediately (e.g. reduced special education enrollment), others are not fully realized until a former prekindergarten attendee has retired from the workforce (e.g. estimated lifetime earnings). The study team acknowledges that not all four-year-olds who attend prekindergarten in Maryland will be lifelong Maryland residents. However, Maryland will also benefit from families who move into the State after their children have completed prekindergarten in another state. Therefore, Maryland will receive the benefit without the cost and the net estimated benefit is still valid. For example, given Maryland's proximity to D.C., which boasts prekindergarten enrollment of over 86 percent of four-year-olds, it is highly likely Maryland will receive some benefits from prekindergarten enrollment in D.C.

In addition, it is possible to estimate the benefits realized during a student's K-12 career; these can be characterized as the short-term benefits, and may be more likely than the long-term benefits to be accrued in Maryland, as it is likely children attending prekindergarten in the State will remain for much, if not all, of their K-12 career. Of the $84,365 total benefits shown in Table 25, $19,335 (23 percent) are realized during the K-12 years.

Variations to Benefits

Much of the ROI methodology is based on information from historically renowned prekindergarten studies, as discussed in the literature review above. These studies have typically focused on high-quality prekindergarten for at-risk children. While the methodology from such studies is applicable and useful for the current report, it should be noted that prekindergarten programs in Maryland are varied – more so than the prekindergarten programs discussed in some of the widely cited historical studies. For this

reason, three specific variables are incorporated into the ROI methodology to adjust the benefit, based on program and child characteristics:

(1) Program quality – In terms of quality, gains – measured via effect sizes – are greatest for high-quality prekindergarten programs (Nores et al., 2015; Yoshikawa et al., 2013). These programs are more likely than lower-quality programs to have lasting impacts on children. Higher-quality programs are typically able to provide children with more individualized attention from more responsive and more highly educated and credentialed staff. Higher-quality programs also tend to be more attractive to potential teachers, who may receive more professional development, compensation, and support than they would in a lower-quality program.
(2) Length of time the child attends – Program duration refers to both half-day versus full-day programs and one-year versus two-year programs. Half-day programs, while still beneficial, tend to have smaller effect sizes than more time-intensive full-day programs. CPC study is one example of a half-day program that produced smaller effects than the programs in the HighScope Study and the Abecedarian Study, both full-day programs (with extra one-on-one home tutoring in the HighScope Study). One-year programs tend to show much stronger benefits than two-year programs (Yoshikawa et al., 2013; Karoly & Bigelow, 2005; Barnett & Lamy, 2006). Initially, children graduating from two-year programs do tend to perform better in vocabulary, literacy, and math than children graduating from one-year programs. However, these improved performances are not statistically significant except in vocabulary. (When compared to the vocabulary, literacy, and math scores of children who received no prekindergarten at all, scores for both one-year and two-year program attendees are higher at a statistically significant level.)
(3) Demographic profile of the enrolled child – Prekindergarten offers benefits to children across socioeconomic and racial and ethnic backgrounds. That said, the benefits are greater for lower-income or at-risk students and for ELL students (Nores et al., 2015; Sawhill, 2014; Thompson & Haskins, 2014; Karoly & Bigelow, 2005). These children may benefit especially from stable, enriching prekindergarten environments.

In addition, investments in prekindergarten also yield indirect benefits. While these indirect returns may be more difficult to quantify than direct returns, they are still an important consideration in any discussion of ROI. Both direct and indirect returns are particularly strong for high-quality programs and for children from low-income backgrounds. Yoshikawa et al. (2013) and Morris and Helburn (2011) conceptualize the costs and benefits of early childhood education (ECE) as follows:

> [ECE] costs refer to all expenditures necessary to provide the program, including staff time and capital investments. Benefits typically take one of two forms. First, benefits may come from cost savings, such as reduced spending for special education and grade retention, as well as lower involvement in the child protection, welfare, and [the] criminal justice system. Second, benefits may flow from greater economic productivity, especially higher earnings as adults. It is also important to note that benefits can accrue not only to the individuals who directly participated in preschool programs, but also to society (e.g., the value of not being a crime victim) (Yoshikawa et al., 2013, p. 13).

> [There are] potential intergenerational benefits to both families and the public that promote economic growth [plus] intangible […] reductions in pain and suffering, reduced fear of crime, increases in parents' leisure, improved child-parent relations, [and] more fun for the children (Morris & Helburn, 2011, p. 2).

Adjustments for Variables

Available research does not specifically differentiate the ROI associated with different program quality levels, as measured by quality rating and improvement systems (QRIS). Therefore, based on the experience and professional judgment of the study team the following multipliers are proposed to account for differences in quality in programs in Maryland:

- EXCELS Level 5: 100%
- EXCELS Level 4: 85%
- EXCELS Level 3: 75%
- EXCELS Level 2: 0%
- EXCELS Level 1: 0%

These multipliers mean that in the calculations of ROI, 100 percent of the estimated benefit is accrued for the highest quality level programs, 85 percent of the benefit is accrued for programs at Level 4, and 75 percent of the benefit is accrued for programs at Level 3. No benefit is accrued for programs at Levels 1 and 2, given the lack of solid research on the benefits accrued to children who attend these programs. (This does not mean no benefit is realized, but rather that no research exists to provide a valid measure of the benefit.)

At-risk, lower-income children are also likely to realize greater benefits from prekindergarten than their higher-income peers, because they are receiving valuable experiences they may not otherwise experience. Children from higher-income families may already be receiving such experiences outside of the classroom and may therefore stand to gain less from prekindergarten. To account for these differences between children from different socioeconomic backgrounds, the study team suggests applying the following multipliers for children from families at different federal poverty levels (FPL). The distribution of children across these income levels can be adjusted in the ROI calculator that the study team developed for this study. These numbers represent the likely distribution of benefits for children in poverty, children just above poverty, and children at higher income levels, based on the experience and professional judgment of the study team:

- Children Below 100% of FPL: 100%
- Children Between 100% and 200% of FPL: 75%
- Children Above 200% of FPL: 50%

These multipliers are used in the ROI calculations that estimate the total system cost of providing prekindergarten. For example, the benefits of public school prekindergarten attendance are adjusted to account for the fact that these programs serve higher numbers of low-income children than licensed centers and family homes. In addition, the quality multipliers are used to adjust the benefits

calculations, based on the quality distribution of Maryland's current prekindergarten capacity. An example of how the multipliers are applied is included later in this section.

Tables 26 and 27, below, apply the previously described quality and income multipliers to the total, per child benefit figure, shown in Table 25. These tables show how the quality rating of a program and the family income level of a child impacts the amount of benefit received from prekindergarten attendance.

TABLE 26: PER CHILD BENEFIT OF PREKINDERGARTEN PARTICIPATION, ADJUSTED FOR QUALITY MULTIPLIERS

Quality Level	Multiplier	Adjusted Benefit
Level 1	0%	$0
Level 2	0%	$0
Level 3	75%	$63,274
Level 4	85%	$71,710
Level 5	100%	$84,365

Source: APA Consulting calculations based on ROI Methodology (see Appendix A)

TABLE 27: PER CHILD BENEFIT OF PREKINDERGARTEN PARTICIPATION, ADJUSTED FOR INCOME MULTIPLIERS

Income Level	Multiplier	Adjusted Benefit
< 100% of FPL	100%	$84,365
100% - 200% of FPL	75%	$63,274
>200% of FPL	50%	$42,183

Source: APA Consulting calculations based on ROI Methodology (see Appendix A)

The quality multipliers are applied to the program setting first, and then the income level multipliers are applied for each child. For example, in a program rated at EXCELS Level 3, it is assumed that the maximum per child benefit is 75 percent of the overall benefit calculated through the ROI methodology. This is because the ROI methodology is based on a high-quality program and it is assumed that not all of these benefits will be realized by programs operating at a lower quality level. As shown in Table 26 above, this results in a maximum per child benefit in the Level 3 program of $63,274. Then the income multipliers are applied for each individual child. So, a child at or below 100 percent of FPL will receive 100 percent of this benefit ($63,274), whereas a child whose family income is above 200 percent of FPL will only receive 50 percent of the benefit ($31,637).

ROI of Maryland Prekindergarten

The estimates of prekindergarten costs and benefits discussed above were used by the study team to develop an ROI methodology specific to the Maryland context. This methodology is informed by Maryland-specific benefit data, and adjusted according to the variables discussed above (distribution of quality, distribution of children by income levels, etc.). The study team developed an ROI calculator in Microsoft Excel to run different scenarios to estimate the cost, benefit, and ROI of expanded prekindergarten in Maryland. The calculator is informed by the current prekindergarten landscape in Maryland and as such incorporates distributions across provider type and distributions by quality level.

These distributions are converted into percentages. Given the relatively large numbers in the calculator the inclusion of these percentages to five decimal points results in non-whole numbers. These numbers are used for funding calculations but in all tables and charts in this section these numbers are rounded to whole numbers for simplicity.

ROI of Current System

To estimate the total ROI of the current prekindergarten programs in Maryland, the study team used the ROI calculator with data from Section II of this report. As per Table 11 in Section II, Maryland prekindergarten programs currently have capacity for 77 percent of Maryland four-year-olds. Of this total capacity, 46 percent is in public schools, 42 percent is in licensed centers and 12 percent is in family homes. Applying these distributions to the total number of four-year-olds in Maryland (75,455), results in an estimated 58,050 four-year-olds prekindergarten slots. Table 28, below, calculates the total cost to serve these 58,050 four-year-olds based on the current program distribution and current quality distributions, as detailed in Section II, and based on the cost of quality calculations as detailed in Table 23, above. Table 28 also calculates the total benefit of the current system and the average per child ROI, based on the ROI methodology.

TABLE 28: ESTIMATED CAPACITY, COST, AND BENEFIT OF CURRENT PREKINDERGARTEN SYSTEM

Capacity	No EXCELS/ Level 1&2	Level 3	Level 4	Level 5 or Accredited	Total
Child Care Center	18,028	461	211	5,812	24,511
Family Home	6,653	35	12	209	6,908
Public PreK	0	0	0	26,631	26,631
Total Capacity	**24,681**	**495**	**223**	**32,651**	**58,050**
Cost	**No EXCELS/ Level 1&2**	**Level 3**	**Level 4**	**Level 5**	**Total**
Child Care Center	$109,069,665	$3,640,415	$2,028,289	$60,929,062	$175,667,430
Family Home	$33,071,205	$249,300	$110,362	$2,099,275	$35,530,142
Public PreK	$0	$0	$0	$322,525,574	$322,525,574
Total Cost	**$142,140,870**	**$3,889,714**	**$2,138,650**	**$385,553,911**	**$533,723,146**
Benefit	**No EXCELS/ Level 1&2**	**Level 3**	**Level 4**	**Level 5**	**Total**
Child Care Center	$0	$17,662,036	$9,156,701	$296,997,788	$323,816,525
Family Home	$0	$1,323,798	$510,104	$10,660,990	$12,494,893
Public PreK	$0		$0	$1,988,335,811	$1,988,335,811
Total Benefit	**$0**	**$18,985,835**	**$9,666,805**	**$2,295,994,589**	**$2,324,647,229**
				ROI	**$4.36**

Source: APA calculations, based on MSDE data.

As shown in Table 28, for an investment of $534 million, prekindergarten attendance results in a benefit of $2.32 billion – a return of $4.36 for every dollar invested. This compares to an ROI of between $2.50 and $17.10 for various programs that have been studied across the U.S. (Hechinger Report, 2010). It should be noted that the total system cost is not state expenditure. Rather, the total system cost

includes all funds that cover prekindergarten (e.g. federal, state, and local funding; parent-paid tuition), and is also calculated based on the cost of quality figures described above. The rationale for using data on the total cost of prekindergarten, rather than the state expenditure, is that although the State may pay less than the cost of quality, the study team assumes that parent-paid tuition or other funds make up the difference; if other funds did *not* make up the difference, then providing quality child care for four-year-olds would not be a sustainable business model. Analysis conducted with the PCQC tool has demonstrated the revenue required to provide quality prekindergarten to operate a sustainable business.

As discussed above, a number of the benefits are realized during the student's K-12 career. These can be characterized as the short-term benefits. In the scenario from Table 28 above, the amount of the $2.32 billion benefit that is realized during the K-12 years is approximately $532 million, or 23 percent.

The ROI in Table 28 is the combined ROI for all four-year-olds enrolled, based on the distribution of prekindergarten slots by program type and quality level. However, each level of quality and each program type has a specific ROI, as shown in Table 29, below. The highest return is seen in public school prekindergarten programs, at $6.16 per $1 invested. Public schools benefit from receiving the full estimated benefit per child, as all programs are assumed to be operating at the highest level of quality, and all attendees are assumed to be under 185 percent of the federal poverty level. Family homes at Level 5 are seen to have a slightly higher return than centers at that same level. This is due to the higher cost to operate a Level 5 center compared to a Level 5 family home, while the benefits remain the same.

TABLE 29: ESTIMATED PER CHILD ROI, BY SETTING, AND QUALITY LEVEL

	Level 1 & 2	Level 3	Level 4	Level 5
Center	$0.00	$4.85	$4.51	$4.87
Family Homes	$0.00	$5.31	$4.62	$5.08
Public School	*N/A*	*N/A*	*N/A*	$6.16

**N/A denotes no programs operating at this level and therefore no ROI is calculated.*

ROI of Universal Four-Year-Old High-Quality Prekindergarten

To model various options for providing universal prekindergarten in Maryland, this subsection details the costs and benefits, and distribution of capacity, to serve 60, 70, and 80 percent of Maryland four-year-olds in high-quality prekindergarten. In this context, a high-quality program is defined as being an EXCELS Level 5 private program, or a public school program, and the cost of quality is based on a program than runs on a school day and school year schedule (6.5 hours per day, 180 days per year).

Table 30 details the cost and benefit of providing high-quality prekindergarten to 60, 70, and 80 percent of four-year-olds in Maryland. Figures 13, 14 and 15, following further illustrate this data.

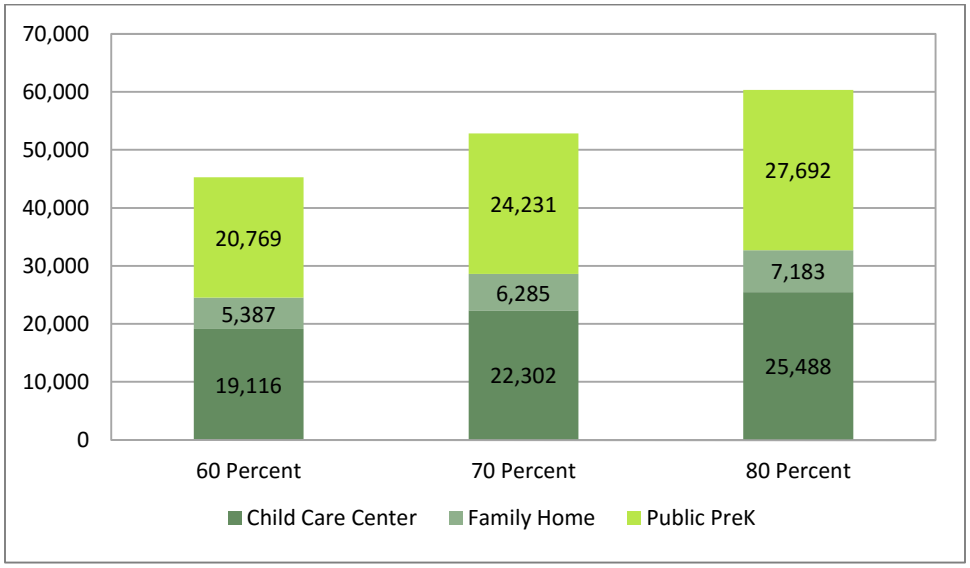
TABLE 30: ESTIMATED CAPACITY, COST AND BENEFIT OF HIGH-QUALITY PREKINDERGARTEN FOR 60, 70, AND 80 PERCENT OF MARYLAND FOUR-YEAR-OLDS

Capacity	60 Percent	70 Percent	80 Percent
Child Care Center	19,116	22,302	25,488
Family Home	5,387	6,285	7,183
Public PreK	20,769	24,231	27,692
Total Capacity	**45,273**	**52,819**	**60,364**
Cost	**60 Percent**	**70 Percent**	**80 Percent**
Child Care Center	$200,415,599	$233,818,199	$267,220,799
Family Home	$54,212,687	$63,248,135	$72,283,583
Public PreK	$251,537,500	$293,460,416	$335,383,333
Total Cost	**$506,165,786**	**$590,526,750**	**$674,887,715**
Benefit	**60 Percent**	**70 Percent**	**80 Percent**
Child Care Center	$976,922,794	$1,139,743,260	$1,302,563,726
Family Home	$275,314,570	$321,200,332	$367,086,093
Public PreK	$1,550,701,892	$1,809,152,207	$2,067,602,523
Total Benefit	**$2,802,939,256**	**$3,270,095,799**	**$3,737,252,342**
ROI	**$5.54**	**$5.54**	**$5.54**

Source: APA calculations, based on MSDE data.

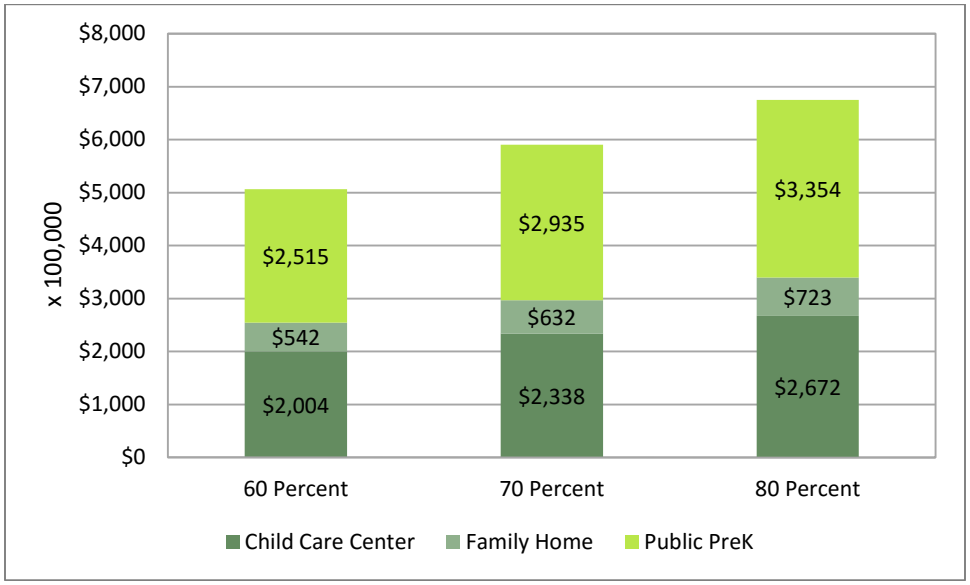
Note: The study team made cost-benefit calculations using the ROI calculator APA developed for MSDE as a companion to this study. The calculator uses percentages with five numbers after the decimal, resulting in child counts that also include multiple place values. For simplicity, figures in Table 30 are rounded to the nearest whole number. Cost-benefit calculations in Tables 30-31 and Figs. 13-14 are based on per child costs of serving children at EXCELS Level 5. Those costs can be seen in Table 24.

FIGURE 13: ESTIMATED TOTAL FOUR-YEAR-OLD CAPACITY REQUIRED, BY PROGRAM TYPE, TO SERVE 60, 70, AND 80 PERCENT OF MARYLAND FOUR-YEAR-OLDS IN HIGH-QUALITY PROGRAMS



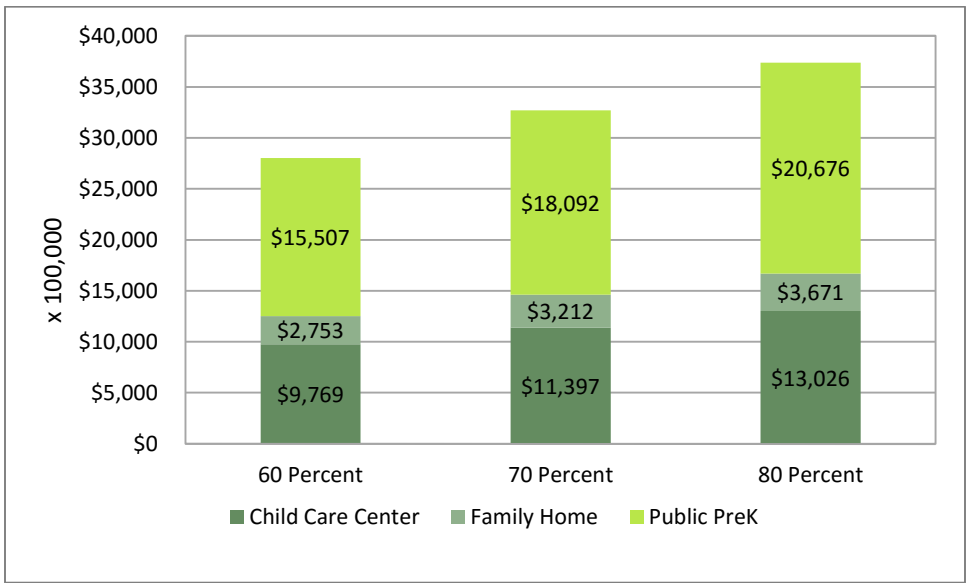
Source: APA calculations, based on MSDE data.

FIGURE 14: ESTIMATED COST, BY PROGRAM TYPE, TO SERVE 60, 70, AND 80 PERCENT OF MARYLAND FOUR-YEAR-OLDS IN HIGH-QUALITY PROGRAMS



Source: APA calculations, based on MSDE data.

FIGURE 15: ESTIMATED BENEFIT, BY PROGRAM TYPE, TO SERVE 60, 70, AND 80 PERCENT OF MARYLAND FOUR-YEAR-OLDS IN HIGH-QUALITY PROGRAMS



Source: APA calculations, based on MSDE data.

As shown in the data above, serving 80 percent of Maryland's four-year-olds in the highest-quality programs would cost just under $675 million, compared to the $506 million cost of serving 60 percent of Maryland's four-year-olds in these high-quality programs. The average ROI of serving four-year-olds in high-quality prekindergarten, across centers, family homes, and public prekindergarten programs, is $5.54 for each $1 invested. This figure ($5.54) is the average ROI of a high-quality system, with prekindergarten slots distributed across centers, family homes, and public prekindergarten programs.

The average ROI figure is lower than the $6.16 ROI figure associated with public prekindergarten participation, but higher than the $4.87 and $5.05 ROI figures for participation in high-quality centers and family homes, respectively. This average ROI figure is also higher than the $4.36 return that the current system generates, which is a result of the higher returns that are realized for participation in higher quality programs.

While Maryland currently has enough prekindergarten capacity to serve 77 percent of all four-year-olds, only 43 percent of this capacity is in the highest quality programs. Therefore, while no additional slots would be needed to serve up to 77 percent of four-year-olds in prekindergarten, the quality of existing slots would need to be improved before Maryland could serve more than 43 percent of four-year-olds in the highest quality programs would require improving the quality level of existing slots.

Table 31, on the following page, presents the data from Table 30 broken down by county. The capacity number for each county represents the actual number of high-quality slots needed in that county. The total cost and benefit numbers are calculated based on the current distribution of prekindergarten capacity by program type. Therefore, the total cost for each county is based on a mix of center, family home, and public prekindergarten slots. (It would be incorrect to simply take the total cost for each county, then divide that cost figure by the number of four year olds slots in the county.) The costs and benefits would change if the distribution of children across settings were modified.

TABLE 31: ESTIMATED CAPACITY, COST AND BENEFIT OF HIGH-QUALITY PREKINDERGARTEN FOR 60, 70, AND 80 PERCENT OF MARYLAND FOUR-YEAR-OLDS, BY COUNTY

District	60 Percent of 4-Year-Olds			70 Percent of 4-Year-Olds			80 Percent of 4-Year-Olds		
	Capacity	Cost	Benefit	Capacity	Cost	Benefit	Capacity	Cost	Benefit
Allegany	630	$7,179,451	$40,792,787	735	$8,376,027	$47,591,584	840	$9,572,602	$54,390,382
Anne Arundel	3,380	$37,689,599	$208,172,950	3,944	$43,971,199	$242,868,442	4,507	$50,252,799	$277,563,934
Baltimore City	5,944	$67,945,291	$388,212,605	6,934	$79,269,506	$452,914,705	7,925	$90,593,721	$517,616,806
Baltimore	6,118	$67,934,417	$372,260,442	7,138	$79,256,819	$434,303,850	8,157	$90,579,222	$496,347,257
Calvert	656	$7,286,920	$40,013,571	766	$8,501,406	$46,682,500	875	$9,715,893	$53,351,428
Caroline	378	$4,291,895	$24,455,255	441	$5,007,211	$28,531,131	504	$5,722,527	$32,607,007
Carroll	1,002	$10,860,206	$57,156,047	1,169	$12,670,240	$66,682,055	1,336	$14,480,275	$76,208,063
Cecil	709	$8,212,313	$47,981,778	827	$9,581,032	$55,978,741	946	$10,949,751	$63,975,704
Charles	1,249	$13,999,689	$78,098,348	1,457	$16,332,970	$91,114,740	1,665	$18,666,252	$104,131,131
Dorchester	244	$2,811,682	$16,350,318	285	$3,280,296	$19,075,371	326	$3,748,910	$21,800,424
Frederick	1,853	$20,540,989	$112,590,045	2,161	$23,964,487	$131,355,052	2,470	$27,387,986	$150,120,060
Garrett	151	$1,763,510	$10,420,625	176	$2,057,428	$12,157,396	201	$2,351,346	$13,894,167
Harford	1,761	$19,267,803	$103,297,472	2,055	$22,479,104	$120,513,717	2,348	$25,690,404	$137,729,962
Howard	2,438	$26,536,898	$140,380,296	2,845	$30,959,714	$163,777,012	3,251	$35,382,531	$187,173,728
Kent	151	$1,753,871	$10,240,239	177	$2,046,183	$11,946,945	202	$2,338,495	$13,653,652
Montgomery	7,542	$82,936,105	$446,253,746	8,799	$96,758,789	$520,629,371	10,056	$110,581,473	$595,004,995
Prince George's	6,574	$74,739,035	$424,880,899	7,669	$87,195,541	$495,694,382	8,765	$99,652,047	$566,507,865
Queen Anne's	350	$3,922,799	$21,967,628	408	$4,576,599	$25,628,900	467	$5,230,399	$29,290,171
Saint Mary's	1,006	$11,466,760	$65,601,166	1,174	$13,377,887	$76,534,693	1,342	$15,289,014	$87,468,221
Somerset	414	$4,577,904	$24,723,021	483	$5,340,888	$28,843,525	553	$6,103,872	$32,964,029
Talbot	353	$3,969,207	$22,246,180	411	$4,630,741	$25,953,877	470	$5,292,276	$29,661,573
Washington	1,083	$11,934,152	$64,813,896	1,264	$13,923,177	$75,616,211	1,445	$15,912,202	$86,418,527
Wicomico	841	$9,449,873	$52,755,559	981	$11,024,852	$61,548,152	1,121	$12,599,831	$70,340,745
Worcester	444	$5,096,399	$29,279,965	518	$5,945,799	$34,159,959	592	$6,795,198	$39,039,953
Statewide Total*	**45,273**	**$506,166,769**	**$2,802,944,837**	**52,819**	**$590,527,897**	**$3,270,102,310**	**60,364**	**$674,889,026**	**$3,737,259,783**

Source: APA calculations, based on ROI Methodology and MSDE data.

**Note: The sum of county costs and benefits differ slightly from the statewide total, due to rounding errors. All errors are less than 0.001%. Also, total cost and benefit numbers reflect a mix of center, family home, and public prekindergarten slots, based on the current distribution of slots across these three categories.*

Table 32, below, shows the number of additional high-quality slots that would be needed to serve 60, 70 or 80 percent of four-year-olds in high-quality programs, broken out by program type, using the current distribution of children across program types. As shown, for the 60 and 70 percent option, public prekindergarten actually has more slots than required under the current distribution. Therefore, by utilizing this additional capacity, the number of slots needed in child care centers or family homes could be reduced. It is important to note that when reviewing Tables 30 and 31, the distribution of slots across program types is a guide, based on the current distribution of slots. The total line represents the actual number of additional high quality slots needed, but these could be distributed across settings in any configuration. Table 32 illustrates the additional slots needed under the current distribution. As shown, to serve 80 percent of four-year-olds in the highest-quality programs would require 27,713 new or improved slots.

TABLE 32: ADDITIONAL HIGH-QUALITY CAPACITY REQUIRED TO SERVE 60, 70 AND 80 PERCENT OF FOUR-YEAR-OLDS IN EXCELS LEVEL 5 PRIVATE PROGRAMS OR IN PUBLIC PREKINDERGARTEN PROGRAMS

Additional Capacity	60 Percent	70 Percent	80 Percent
Child Care Center	13,305	16,491	19,677
Family Home	5,179	6,077	6,974
Public Prekindergarten	-5,861	-2,400	1,062
Total Additional High-Quality Slots	**12,622**	**20,167**	**27,713**

Source: APA calculations, based on MSDE data.

The cost calculations shown above include the costs to operate a prekindergarten program at the given level of quality. They do not include start-up costs for new private providers or any additional costs to move up from a lower level of quality to a higher level of quality. Therefore, an additional cost would likely be incurred by a provider to increase their level of quality, or for a new provider to begin operations. However, as noted elsewhere in this report, the per child cost of prekindergarten includes a rent/lease/construction estimate. For public prekindergarten slots, which do not pay rent in the same sense that a child care center or family child care home does, this line covers the cost of construction, and is included in the per child figure, spread across 20 years, based on school construction data. This amounts to $17.35 per square foot, or $1,388 per child per year (based on 1,600 sq. ft. classroom and 20 children per classroom). This $1,388 is included in the cost for new public prekindergarten slots as part of the per child figure.

ROI of Universal Three- and Four-Year Old High-Quality Prekindergarten

As noted in the literature review, studies into the different effects of one year versus two years of prekindergarten have not shown significant differences in child outcomes. While two years of prekindergarten creates some additional gains, those gains are not as broad as the gains created by just one year of prekindergarten (Barnett & Lamy, 2006). When reviewing the ROI methodology, very few of the benefits that the study team was able to quantify are benefits that would increase for a two-year prekindergarten program compared to a one-year program. Enrolling three- and four-year-olds in prekindergarten does have benefits. For example, parents might benefit from having increased time to work a job and/or attend school (see the literature review in Section I for more information). Both of these activities produce benefits for the individual parent and for society as a whole. In addition, in a

tuition-free model, the parent would also realize a benefit of reduced child care costs. These benefits exist at age four, but double if children are able to attend prekindergarten at ages three and four. However, due to the lack of rigorous research on these areas of benefits, the study team is unable to assign a dollar amount to these additional benefits.

For illustration purposes, the study team ran scenarios in the ROI calculator that included three-year-olds in addition to four-year-olds. There are an estimated 76,635 three-year-olds in Maryland, for a total three- and four-year-old population of 152,090. Table 33, below, estimates the total cost and benefit of providing high-quality prekindergarten to 60, 70, and 80 percent of three- and four-year-olds in Maryland.

TABLE 33: ESTIMATED CAPACITY, COST AND BENEFIT OF HIGH-QUALITY PREKINDERGARTEN FOR 60, 70, AND 80 PERCENT OF MARYLAND THREE- AND FOUR-YEAR-OLDS

Capacity	60 Percent	70 Percent	80 Percent
Child Care Center	38,532	44,954	51,375
Family Home	10,859	12,669	14,479
Public Prekindergarten	41,863	48,841	55,818
Total Capacity	**91,254**	**106,463**	**121,672**
Cost	**60 Percent**	**70 Percent**	**80 Percent**
Child Care Center	$403,965,390	$471,292,955	$538,620,520
Family Home	$109,273,177	$127,485,373	$145,697,570
Public Prekindergarten	$507,008,658	$591,510,101	$676,011,544
Total Cost	**$1,020,247,225**	**$1,190,288,429**	**$1,360,329,634**
Benefit	**60 Percent**	**70 Percent**	**80 Percent**
Child Care Center	$976,922,794	$1,139,743,260	$1,302,563,726
Family Home	$275,314,570	$321,200,332	$367,086,093
Public Prekindergarten	$1,550,701,892	$1,809,152,207	$2,067,602,523
Total Benefit	**$2,802,939,256**	**$3,270,095,799**	**$3,737,252,342**
ROI	**$2.75**	**$2.75**	**$2.75**

Source: APA calculations, based on MSDE data.

As shown in Table 33, above, serving 80 percent of Maryland three- and four-year-olds costs approximately $1.36 billion, around double the cost to only serve four-year-olds. However, the total benefit remains the same as the benefit for serving four-year-olds, at $3.74 billion as the ROI methodology does not include additional benefits for two years of prekindergarten. Despite the increased costs, the ROI is still positive, with a return of $2.75 per $1 invested. As noted previously, this scenario, with two years of prekindergarten, does not take into account possible additional benefits, such as reduced child care costs, increases in parent incomes, and/or increases in parent education levels due to children attending prekindergarten for two years instead of one. These are also conservative estimates because they assume that the same percentage of three-year-olds would enroll as four-year-olds. It is highly likely that the number of parents choosing *not* to enroll their children in

prekindergarten at age three would be higher than the number of parents making the same choice for children at age four. As the number of three-year-olds served decreases, the total system cost will go down, but the total system benefit will not change. This is because the total system benefit is driven by one year of prekindergarten attendance so is not impacted by three-year-old enrollment.

VI. Recommendations

The study team has developed a number of recommendations covering topics discussed throughout this report. While some of these recommendations are concrete others are dependent on several policy decisions that would need to be made by Maryland. The study team summarizes the evidence to support particular policy choices when such evidence exists. Many of these choices have fiscal implications and the study team summarizes those implications in terms of child counts and costs. Following these recommendations, the study team presents three additional considerations concerning the cost to create the required additional slots, an approach to phase in universal access, and two options for funding prekindergarten expansion.

Recommendation 1

Continue to invest in early childhood data systems, and use them to establish targets for the number of high-quality prekindergarten slots available in each district.

As demonstrated in Sections I and V, there is a large body of literature concerning the ROI of prekindergarten. As this report has outlined, the literature shows that prekindergarten is highly beneficial, both for individual children and for society at large. However, the effects of prekindergarten vary according to a number of variables, including program quality, program duration, and program populations served. The literature suggests that certain populations of children, depending on socioeconomic background, benefit more from an investment in prekindergarten than other children. Furthermore, the size of the benefit depends on the duration and quality of the program.

Understanding which populations are being served and where those populations are being served – and, therefore, understanding the total benefits accrued from prekindergarten attendance – requires the integration of data across all types of prekindergarten programs, including both private and public programs. Given the multiple types of providers that offer prekindergarten in Maryland, it is important that **Maryland continue to invest in early childhood data systems** to ensure that the State can accurately track capacity, participation, service gaps, and program quality distribution.

Maryland has already implemented three structural changes that support investing in early childhood data systems. First, the State created the Division of Early Childhood Development and the Office of Child Care, nested under MSDE. This enables one office (the Office of Child Care) within one agency to be charged with collecting data from the different types of prekindergarten sites. Second, the State has already implemented an Early Childhood Data Warehouse (ECDW) as a component of the MSDE P-12 Longitudinal Data System, with unique statewide student identifiers. Third, the State is including family homes and child care centers in its recently developed QRIS, Maryland EXCELS (which provides ratings for program quality and offers supports to improve quality), and is requiring participation from providers who receive Child Care Subsidy funds.

Within the recommendation to invest in early childhood data systems, there are two sub-recommendations:

a. Using the structural supports that Maryland has in place, the State should **continue to invest in the capacity of the Office of Child Care** to maintain and expand the data collection process. This is a challenging task because the prekindergarten sites are distributed across multiple provider types, each of which has different jurisdictions and reporting requirements. However, these challenges can be overcome in time and would ensure the State had a robust understanding of all prekindergarten services offered in Maryland.
b. This report has established the connection between the quality of prekindergarten programs and the return for children who participate. Based on an ongoing capacity analysis and the distribution of sites across EXCELS ratings, the State should **establish targets of the number of high-quality slots available to children and families**. These targets should be reviewed every other year.

As noted in Table 30, above, to serve 80 percent of Maryland four-year-olds requires 60,364 prekindergarten slots, an increase of 2,314 slots. To serve 80 percent in high-quality programs requires improving the quality of over 27,700 of the current available slots. Therefore, it is important that Maryland fully understand the distribution of prekindergarten slots, and the quality of those slots, so that the State can make informed decisions about where to target investments to increase the quality of the currently available slots, or to add additional quality slots. To further illustrate this, Table 34, below, shows the additional high-quality prekindergarten capacity required to serve 60, 70, and 80 percent of four-year-olds, broken down by district. As shown in the table, some districts already have enough capacity to serve 60 or 70 percent of their four-year-olds in high-quality programs (denoted by the negative numbers in parenthesis), while no district has enough capacity to serve 80 percent in high-quality programs.

TABLE 34: ADDITIONAL HIGH-QUALITY CAPACITY REQUIRED TO SERVE 60, 70 AND 80 PERCENT OF FOUR-YEAR-OLDS IN HIGH-QUALITY PROGRAMS, BY DISTRICT

District	Current High-Quality Slots *(Public, EXCELS 5, or Accredited)*	60% of 4-Year-Old Population	70% of 4-Year-Old Population	80% of 4-Year-Old Population	Additional Capacity to Serve 60% in High-quality PreK	Additional Capacity to Serve 70% in High-quality PreK	Additional Capacity to Serve 80% in High-quality PreK
Allegany	536	553	645	737	16	108	200
Anne Arundel	2389	4,243	4,950	5658	1,854	2,561	3,269
Baltimore City	5068	6,264	7,308	8,352	1,196	2,240	3,284
Baltimore	3904	4,718	5,504	6,290	814	1,600	2,386
Calvert	417	686	801	915	269	384	498
Caroline	303	246	288	329	(57)	(16)	26
Carroll	470	1,271	1,483	1,695	801	1,013	1,225
Cecil	639	776	905	1,034	136	265	395
Charles	882	1,172	1,368	1,563	290	486	681
Dorchester	210	247	288	329	37	78	119
Frederick	1237	1,846	2,154	2,461	609	916	1,224

District	Current High-Quality Slots *(Public, EXCELS 5, or Accredited)*	60% of 4-Year-Old Population	70% of 4-Year-Old Population	80% of 4-Year-Old Population	Additional Capacity to Serve 60% in High-quality PreK	Additional Capacity to Serve 70% in High-quality PreK	Additional Capacity to Serve 80% in High-quality PreK
Garrett	158	225	262	300	67	104	142
Harford	937	1,895	2,210	2,526	958	1,274	1,589
Howard	1608	2,343	2,733	3,124	735	1,125	1,516
Kent	156	150	175	200	(6)	19	44
Montgomery	4860	7,806	9,107	10,408	2,946	4,247	5,548
Prince George's	5175	6,851	7,993	9,135	1,676	2,818	3,960
Queen Anne's	258	370	431	493	112	174	235
Saint Mary's	831	836	976	1,115	6	145	284
Somerset	259	196	229	261	(63)	(30)	2
Talbot	325	285	333	380	(40)	7	55
Washington	710	1,133	1,322	1,511	423	612	801
Wicomico	841	769	897	1,026	(72)	56	185
Worcester	477	391	457	522	(86)	(21)	45
Statewide Total*	**32,651**	**45,273**	**52,819**	**60,364**	**12,622**	**20,167**	**27,713**

Source: APA Consulting calculations, based on MSDE data.
**Totals may not add up due to rounding error.*

Recommendation 2

Understand the differences in ROI between a one-year investment and a two-year investment in prekindergarten, and target expenditures appropriately.

As discussed earlier in this report, research generally shows much larger benefits for the first year of prekindergarten compared to the second year (Yoshikawa et al., 2013). While a second year of prekindergarten does create benefits – particularly in terms of vocabulary development, and particularly for less advantaged children compared to more advantaged children – these gains are not as strong as the ones created in one year of prekindergarten (Barnett & Lamy, 2006).

In other words, cost-benefit analyses show a higher return, per dollar invested, for a one-year program than for a two-year program. This suggests that, when resources are limited, it is more beneficial to serve a greater number of children in high-quality, one-year programs than to serve a smaller number of children in two-year programs (Karoly & Bigelow, 2005, p. xxxviii).

The study team's recommendation is that **the best use of scarce resources is to fund high-quality prekindergarten for four-year-olds first**. If resources are available after all four-year-olds have been served in high-quality programs, then the next investment should be in high-quality prekindergarten for three-year-olds, targeted at low-income families, who are likely to see the largest benefits (e.g. ability to work, ability to work longer hours, etc.) from state-supported prekindergarten. Given that Maryland has

recently expanded access to prekindergarten to four-year-old children from families at or below 300 percent of FPL, the study team believes that if expanded prekindergarten access were to be offered to three-year-olds, priority should be given to three-year-olds at or below the 300 percent threshold.

Recommendation 3

Increase the ROI of prekindergarten by providing increased investment to support child care centers and family homes to reach the highest levels of Maryland EXCELS.

As described earlier in this report (and again in Appendix A), Maryland EXCELS is a critically important component in the drive to improve the quality of early childhood programs in the State. First, through the process of rating prekindergarten sites, EXCELS provides Maryland's definition of a quality prekindergarten experience. Second, EXCELS provides quality improvement supports to providers as they look to increase the quality of their programs. Third, by codifying the quality of programs, EXCELS gives Maryland a framework to calculate the ROI for particular students in particular programs, as well as for the State as a whole.

By codifying providers' levels of quality, EXCELS provides a way for the State to know the number of high-quality prekindergarten slots available in Maryland. Analyzing EXCELS requirements also makes it possible to estimate the cost for a provider to meet each of the different quality levels (see Cost of Quality methodology in Appendix A). The first recommendation above discussed target quality levels, and it is EXCELS data that can help the State verify whether licensed sites are achieving target quality levels and evaluate the returns on those investments.

Table 35, below, shows the current number of providers in Maryland, distributed by provider type and EXCELS level.

TABLE 35: PREKINDERGARTEN PROVIDERS IN MARYLAND EXCELS, BY SETTING AND EXCELS LEVEL

Provider Type	Level 1	Level 2	Level 3	Level 4	Level 5	Total
Child Care Center	629	142	58	22	95	**946**
Family Home	441	83	21	8	55	**608**
Total	**1,070**	**225**	**79**	**30**	**150**	**1,554**

Source: Data from MSDE.

Table 36, below, shows the current number of prekindergarten slots in Maryland, distributed by provider type and EXCELS level.

TABLE 36: PREKINDERGARTEN SLOTS IN MARYLAND EXCELS, BY SETTING, AND EXCELS LEVEL

Provider Type	Level 1	Level 2	Level 3	Level 4	Level 5	Total
Child Care Center	3,178	1,008	461	212	1,506	6,365
Family Home	577	111	34	11	101	835
Total	**3,755**	**1,119**	**495**	**223**	**1,607**	**7,200**

Source: Data from MSDE. Totals may not add up due to rounding.

As shown in Tables 35 and 36, of the 7,200 private prekindergarten slots in EXCELS, the majority are in Level 1 or 2 programs, with only 32 percent in Levels 3, 4, or 5, and 22 percent at Level 5. These data indicate that there is significant scope for improving the quality of programs currently enrolled in EXCELS, in addition to encouraging more programs to participate in EXCELS.

Until June 2015, Maryland EXCELS had been a voluntary system, with sites choosing whether or not their EXCELS rating would be published. As of June 2015, providers that participate in the Child Care Subsidy Program are required to participate in EXCELS. This is a good step towards ensuring that programs serving low-income children receive supports to improve or maintain quality.

Sites that initially receive lower ratings need support to move up the EXCELS rating scale. While supports are currently offered through EXCELS, the study team recommends that Maryland **establish an expanded prekindergarten quality improvement fund for child care centers and family homes**. Maryland has provided additional quality improvement supports to providers in recent years through the federal preschool expansion grant and through the state Prekindergarten Expansion Act. The purpose of a prekindergarten quality improvement fund would be to help providers improve their quality (as opposed to supporting them only after they have achieved a certain level of quality). Funds could be available for short-term improvements (e.g. grants for new learning materials or refurbishments) or longer-term improvements (e.g. grants for continuing education to increase teachers' and program directors' credentials). The EXCELS sub-score data presented in Section II of this report (Table 9) could help identify where programs need most support and target funds in these areas.

The study team proposes that a quality improvement fund should focus on private providers. Given that a large number of slots are required to achieve universal quality prekindergarten in Maryland, it is likely that the most cost-effective, most easily implemented approach to expanding the number of high-quality slots is to improve the quality of current private slots. Expanding the number of slots in public schools to serve all four-year-olds is likely to involve significantly higher expenses than investing in improving currently available private slots. Providing a specific source of funds to help private providers improve program quality will act as an incentive to these providers to make program improvements.

In addition to the prekindergarten-specific improvement fund, Maryland should **continue to invest in Maryland EXCELS**, even after the federal Race to the Top – Early Learning Challenge (RTT-ELC) grant expires. As EXCELS expands and involves more providers, Maryland needs to ensure that funds are available to provide the ongoing quality improvement supports, which are critical components of a QRIS. The ROI analysis in this report may be used to justify the investment.

Recommendation 4

Increase the ROI of prekindergarten by encouraging providers to participate in Maryland EXCELS and by encouraging parents to enroll their children in quality prekindergarten programs.

While Recommendation 3, above, focused on supporting additional quality improvement efforts for providers currently participating in EXCELS, a large number of prekindergarten slots are in programs that are *not* currently participating in EXCELS. Only 23 percent of current private prekindergarten slots are in EXCELS-rated programs. Of these 23 percent, the majority (68 percent), are in programs rated at EXCELS Levels 1 or 2. Therefore, in addition to investing in quality improvement for current EXCELS participants, it is also important for the State to encourage wider participation in EXCELS.

Maryland prekindergarten programs currently have enough capacity for 77 percent of Maryland four-year-olds. Of this capacity, 46 percent is in public schools, 42 percent is in licensed centers, and 12 percent is in family homes. Table 37, below, calculates the total current spending on prekindergarten in Maryland, and the estimated existing ROI. As shown, for an investment of $534 million (comprised of state, federal, local, and private expenditures), prekindergarten attendance results in a benefit of $2.3 billion – a return of $4.36 for every $1 invested.

TABLE 37: ESTIMATED COST AND BENEFIT OF CURRENT PREKINDERGARTEN SYSTEM

Current Prekindergarten Enrollment (57,696 Four-Year-Olds)	
Total System Cost	$533,723,146
Total System Benefit	$2,324,647,229
ROI	$4.36

Source: APA Calculations, based on ROI Methodology and data from MSDE.

Table 38 shows the specific ROI per $1 invested, at each level of quality, and in each setting. As shown, the highest return is realized for programs at Level 5 in EXCELS. Note, data does not exist to calculate an ROI for EXCELS Level 1 and 2 programs, as studies on benefits have focused on high-quality programs.

TABLE 38: ESTIMATED PER CHILD ROI, BY SETTING AND BY QUALITY LEVEL

Setting	Levels 1 & 2	Level 3	Level 4	Level 5
Center	$0.00	$4.85	$4.51	$4.87
Family Homes	$0.00	$5.31	$4.62	$5.08
Public School	*N/A**	*N/A*	*N/A*	$6.16

**N/A denotes that no programs are operating at this level and, therefore, that no ROI is calculated.*
Source: APA Calculations, based on ROI Methodology and data from MSDE.

Given the increased ROI for the high-quality programs, Maryland should consider two initiatives that would drive more private programs to participate in EXCELS, and drive more children into higher-quality programs. These sub-recommendations are as follows:

a. **Undertake a public information campaign** that describes the EXCELS system, explains its ratings, and encourages parents to use these ratings as they select a prekindergarten program for their children. This campaign should focus on communities with low-income families. The campaign should drive the demand for EXCELS ratings among parents, and over time, among providers.
b. Provide additional financial resources to help prekindergarten providers achieve and maintain higher levels of quality. These additional resources could be provided in either of the following ways: (1) Expand the Child Care Subsidy Program and **increase the per child subsidy amount to cover the cost of prekindergarten at EXCELS Level 5**. This would ensure that the providers serving the lowest-income children, where parents are unlikely to be able to pay higher tuition, will receive support (and therefore an incentive) to operate at the highest quality level; or (2) **Establish a differentiated funding system that gives tuition credits to providers according to the cost of quality at each EXCELS level**, and ensure the funding system takes into consideration family size and family income of enrolled children. This approach allows families that can afford

to make a contribution to quality to do so, while assuring that low-income families are well-subsidized. It also provides incentives to providers to operate at higher quality levels, as the additional cost of quality will be covered either by tuition credits or by increased parent paid tuition. This system has been operating successfully in Denver for the past eight years and it can be implemented in a way that provides different levels of tuition credits for the different prekindergarten settings (e.g. centers, family homes, public schools).

Both of these options can use the cost of quality calculations in Section V of this report for the amount of funding providers need at each level of quality and in each type of setting. In this way, the State can implement a prekindergarten per pupil funding system, with the amount of funding varying by quality level, provider type, and family income level. This is discussed in more detail later in this section.

Recommendation 5

Offer universal prekindergarten in Maryland, providing funding for 80 percent of Maryland's four-year-olds to attend a high-quality prekindergarten program.

Program quality has a large impact on the ROI of prekindergarten. Therefore, it is important not only to expand prekindergarten access, but also to ensure that prekindergarten programs are operating at a high level of quality. Given the importance of prekindergarten as discussed in the literature review earlier in this paper, the study team recommends that Maryland target a prekindergarten participation rate of 80 percent of all four-year-olds. The 80 percent target is at the higher end of what can be considered 'universal,' when comparing with other states that have implemented universal prekindergarten.

Table 39, below, summarizes the costs and benefits of serving 80 percent of four-year-olds in high-quality programs, and compares this to the estimated cost and benefits of the current system.

TABLE 39: ESTIMATED COST & BENEFIT OF SERVING 80% OF FOUR-YEAR-OLDS IN HIGH-QUALITY PREKINDERGARTEN FOR FOUR-YEAR-OLDS

Universal (80%) High-Quality Prekindergarten Enrollment (60,364 Four-Year-Olds)	
Current System Cost	$533,723,146
Additional Cost for 80% High-Quality	$141,164,568
Total Updated System Cost	**$674,887,715**
Current System Benefit	$2,324,647,229
Additional System Benefit	$1,412,605,113
Total Updated System Benefit	**$3,737,252,342**
Current ROI	$4.36
Updated ROI	**$5.54**

Source: APA Calculations, based on ROI Methodology and data from MSDE.

As shown in Table 39, compared to the current system, the universal high-quality prekindergarten scenario costs an additional $141 million and benefits increase by $1.4 billion dollars. An estimated $856 million of this additional benefit will be realized by the K-12 system. Therefore, although achieving universal prekindergarten access with all slots in high-quality programs will cost $675 million, the

benefits will total over $3.7 billion, with an ROI of $5.54 for every $1 invested, a 27 percent increase over the current system ROI. The study team believes that the increased ROI justifies the increased investment in quality prekindergarten.

It is important to note that the $675 million cost is the total cost of providing high-quality prekindergarten to 60,364 four-year-olds. The amount of this total that would come from state expenditures would depend on a number of policy decisions, as outlined earlier in these recommendations. For example, if the State implemented a 100 percent tuition-free universal prekindergarten policy, the cost to the State would be $675 million, based on the cost of quality calculations in this report, and based on the current distribution of children by program type. This figure would be reduced by taking into account additional federal or local funding sources. If the State adopted a blended funding model, including parent paid tuition, then this $675 million figure would be further reduced, depending on the parent share. The annual per child cost of quality for each setting, as shown again in Table 40, below, would be the driver in any of these funding calculations. An approach to funding universal prekindergarten is discussed in the next sub-section of this report.

TABLE 40: PER CHILD COST OF QUALITY, BY EXCELS LEVEL, BY SETTING

Setting	No EXCELS/ EXCELS Levels 1 & 2	Level 3	Level 4	Level 5
Center	$6,050	$7,900	$9,622	$10,484
Family Home	$4,971	$7,218	$9,398	$10,063
Public School	N/A*	N/A*	$12,111	$12,111

**N/A denotes programs of this type do not operate at this level.*

Additional Considerations

In addition to the five recommendations above, the study team has developed some additional considerations for Maryland to consider as it moves forward. These considerations address the need for creating a significant number of additional prekindergarten slots, an approach to phasing in universal access to prekindergarten, and two options for funding increased prekindergarten participation.

Creating Space for Prekindergarten Programs

As discussed earlier in this report, if Maryland were to serve 80 percent of all four-year-olds in the State, it would need capacity for 60,364 children. Under this scenario, with all children served in public prekindergarten programs or private providers at EXCELS Level 5 or accredited, the State would need an additional 2,314 slots, and would need to improve the quality of 25,399 current slots. Of these additional slots, the public prekindergarten system would need to provide an additional 1,062 slots, child care centers would need to provide 977 additional spaces, and licensed family homes need an additional 275 slots. For the purpose of providing financial support for the capital needs associated with accommodating these additional children, the 2,314 figure breaks into two groups, those that will likely need to find space in the private marketplace (1,253, centers and homes), and those that must build space in public school districts (1,062). Based on this estimate of the type of slots needed, the study team offers two additional recommendations to Maryland policy makers for consideration.

Create an application based loan guarantee program that can be accessed by prekindergarten centers and homes (for 1,253 spaces) that would be available over a multi-year period. The study team would suggest a five-year application period and a 15-year maximum life of any loan issued. This would significantly reduce the interest rate faced by the applying providers. Significant penalties for provider defaults would also need to be built into the terms of the loan.

The study team based the cost estimate for this loan program on the rent/lease figure ($15.17 per square foot) developed for Maryland using the PCQC estimation model. The study team believes that significantly fewer than half of the sites charged with accommodating the additional children would consider applying for a loan guarantee that would help build an addition. Most sites would simply rent or lease the needed additional space. For the purpose of costing out this recommendation, the study team determined that sites associated with 25 percent of the 1,436 spaces would apply for some type of construction loan. In addition to the administrative cost of operating a loan guarantee program (which could be integrated into existing state support for capital construction), it is the study team's estimate that the State would have to guarantee a maximum of $6.4 million worth of loans under this program.

Second, **institute a competitive matching construction grant program for local school districts** to support the construction of elementary schools or the renovation of existing elementary school buildings to accommodate the additional prekindergarten classrooms needed for the 1,062 new children in public prekindergarten. This grant program is needed to accelerate the provision for prekindergarten space in the public schools.
The study team estimates that the 1,062 new prekindergarten students would need approximately 53 new prekindergarten classrooms built across the State. As noted above in Table 33, the need for these classrooms are not distributed evenly across districts in the State.

Using the cost per square foot figure of $347 discussed in the cost of quality report (Appendix A), the estimated square footage of a quality prekindergarten classroom at 1,600 square feet, and the incentive of the State matching the local district commitment based on the current cost share, the study team estimates that $29.5 million would need to be set aside, split between the State and local districts, to meet the total obligation represented by this competitive matching construction grant program. Like the loan guarantee program, the administration of this matching grant could be integrated into the portfolio of the Public Schools Construction Program office. This program could operate similarly to how full-day kindergarten was implemented in Maryland, where the State gave priority to kindergarten space requests.

The costs of implementing this part of the public preschool construction will vary significantly depending on the following factors:

(1) The proportion of construction/renovation costs the State elects to cover from state revenue sources. To move these construction projects along quickly, the study team recommends matching proposed local funds dollar for dollar;
(2) The number of grant applications submitted and approved per year. The study team anticipates that the number of application per year would equal approximately one third of the needed prekindergarten classrooms; and

(3) The number of approved grants for the cost of constructing new prekindergarten classrooms that are essentially renovation of existing buildings. The study team anticipates that 80 percent of the prekindergarten classrooms will be built as a result of existing building renovation.

In addition, Maryland may find it difficult to reach the number of required high-quality slots in family child care homes. As shown above, a total of 275 additional prekindergarten slots would be needed in family homes, and with only 209 of the current slots currently at the highest quality level, almost all of the current slots would need to improve their level of quality. A number of the requirements of EXCELS Level 5 may be difficult for independent family homes to achieve. Therefore, it may not be possible to increase the number of quality family home slots as required under the scenarios in this report. One way to help family homes succeed is to encourage the development of family child care networks (note, this is not the same as the Maryland Child Care Resource Network, operated by Maryland's Family Network, which is the State's child care resource network). These networks, which consist of 15 to 20 family child care providers and one to three child care centers, in close proximity to each other, are created and overseen by a nonprofit agency. The nonprofit agency provides oversight, training, technical assistance, substitute pools, and evaluations. The network acts as a support system for providers, enabling them to "share" children within their network to meet higher standards of quality. For example, one provider could take all the pre-kindergarteners for 2.5 hours to implement a prekindergarten curriculum, while a neighboring provider could simultaneously provide care for all the infants, toddlers, and three-year-olds. The study team understands that there is currently one family child care network operating in Maryland. This network should be engaged by MSDE to understand if the model can be replicated across the State.

If the additional capacity required of family homes was not possible, even with this network model, then the study team recommends reallocating these slots to child care centers. As shown in Table 39, there is only a small difference in the cost of quality between center and family home settings. Therefore, moving slots from family homes to center-based programs would not fundamentally change system costs and benefits.

Phasing in Universal Access

The target calls for universal prekindergarten. However, fiscal constraints could require the target to be phased in over multiple years. Although serving 80 percent of all four-year-olds only requires an additional 2,314 prekindergarten slots, serving all those four-year-olds in *high-quality pr*ekindergarten programs requires a significant increase in the quality level of the current prekindergarten slots in Maryland. For example, of the current capacity of approximately 31,000 center and family home slots, only 7,200 of these slots are in EXCELS-rated programs. Of these 7,200, only 1,607 are at EXCELS Level 5. As the State expands EXCELS and more programs enroll in the QRIS, a clearer picture will emerge of the actual quality distribution of the 24,000 slots that are not currently participating in EXCELS. Many of the slots may be at programs already operating at high levels of quality, but the programs have not yet had their quality verified through a system like EXCELS. Other slots will be at programs in need of significant support to achieve higher levels of quality. Either way, it will take a significant amount of time and money to move all 31,000 slots into the higher EXCELS quality levels.

One approach to phase in universal access would be to focus on low-income children. As shown in the ROI literature review, low-income children reap the highest benefits from prekindergarten attendance.

There are an estimated 39,144 four-year-olds in Maryland in families with household incomes at or below 300 percent of the federal poverty level (MSDE, 2014). As shown in Table 39, above, there are currently 32,651 high-quality prekindergarten slots in Maryland (including public prekindergarten and private programs rated EXCELS Level 5 or accredited). If all of these slots were made available for four-year-olds at or below 300 percent of the federal poverty level, there would be enough capacity to serve 83 percent of this group. In reality, however, it is not possible to make all of the current capacity available only to one income group, as this would require displacing children from families with income levels above the 300 percent threshold – children who also require quality prekindergarten programming.

To conduct the analysis in this report, the study team created a spreadsheet model to estimate the capacity, cost, and ROI implications of various scenarios. Maryland can use this spreadsheet to model the impacts of various phase-in options, based on state policy decisions. The study team recommends a three-stage approach to phasing in universal access to quality prekindergarten:

(1) Continue to expand prekindergarten access to children living in families with household **incomes at or below 300 percent of the federal poverty level**, and to "high-need" communities, as defined by the federal expansion grant. This should be a continuation of the progress the State has made with the 2014 Prekindergarten Expansion Act and federal Preschool Expansion Grant. Unused capacity or new space created in prekindergarten programs should give priority to this group.
(2) Expand the number of prekindergarten slots to achieve enough capacity to serve **80 percent of all four-year-olds**. This requires an additional 2,314 slots. The ROI methodology does not count a benefit for programs unless they are rated EXCELS level 3 or above, public prekindergarten, or accredited. For this reason, priority for expansion should be given to these program types, to ensure a return on the investment in these new slots. In addition, priority should be given to converting current half-day slots to full-day slots, given the increased ROI seen for full-day programs.
(3) Following the recommendations in this section of the report, **engage in systematic quality improvement efforts** to increase the quality of programs currently offering prekindergarten in Maryland. This effort could take the form of direct quality improvement support to programs, as per Recommendation 3, as well as incentivizing parents to choose quality programs, through a tiered tuition credit system, where higher quality providers receive a larger tuition credit, as per Recommendation 4.

If Maryland wanted to expand prekindergarten access to three-year-olds, the study team recommends that this expansion should occur after access to high-quality programs has been secured for all four-year-olds in the state. Priority should then be given to three-year-olds from families at or below 300 percent of the federal poverty level. The rationale for serving four-year-olds first is based on (1) the literature suggesting the higher ROI for one year of prekindergarten compared to two years; and (2) many three-year-olds are likely to be enrolled in programs alongside four-year-olds, and therefore quality improvement initiatives targeted at prekindergarten programs serving four-year-olds will likely also impact the quality of care experienced by three-year-olds.

The ROI analysis provided in this report demonstrates that the greatest return for prekindergarten spending comes when low-income children participate in high-quality programs. Any phase in of universal prekindergarten in Maryland needs to balance the financial cost of providing universal access with the needs to serve children from low-income families and to offer high-quality programs. The study team believes the three steps outlined above achieves this balance by expanding access to the lowest income four-year-olds first, then ensuring that all four-year-olds who want prekindergarten are able to access it, and then finally ensuring that all programs are operating at the highest level of quality.

Funding Universal Prekindergarten

As shown in Section V, the total estimated cost to serve 60, 70, or 80 percent of Maryland four-year-olds in high-quality prekindergarten is between $506 and $675 million (see Table 30, above). These figures represent the total estimated cost, but in order to understand the additional financial obligations that Maryland could face as a result of prekindergarten expansion, it is important to first consider the current federal-, state-, and district-level prekindergarten funding. Table 41, shows these existing commitments.

TABLE 41: CURRENT FEDERAL, STATE, AND LOCAL PREKINDERGARTEN FUNDING

Funding Category	Amount
Head Start - Federal	$72,916,062
Head Start - State	$1,800,000
Child Care Subsidy – Federal	$17,796,146
Child Care Subsidy – State	$14,917,584
Prekindergarten Expansion Grant – State	$4,300,000
Preschool Expansion Act – Federal	$15,000,000
PreK Bridge to Excellence Estimate – State	$108,529,344
Total	**$235,259,136**

Source: APA calculations based on MSDE data.

The $235 million of existing funding shown in Table 41 can be applied to the totals identified in Table 30 to determine the actual additional funding needed under each of the three participation scenarios (60, 70, and 80 percent). Table 42, below, shows the amount of additional funding required under each scenario for the state as a whole, and for individual counties. The county estimates are based on the current distribution of prekindergarten slots between public and private providers, with the associated cost per child estimates from the cost of quality study, described in Section V. As shown in the table, the revised additional costs now range from $271 to $440 million.

TABLE 42: ADDITIONAL FUNDING REQUIRED TO SERVE 60, 70 OR 80 PERCENT OF FOUR-YEAR-OLDS IN HIGH-QUALITY PREKINDERGARTEN, AFTER ACCOUNTING FOR EXISTING FUNDING, BY COUNTY

District	60 Percent Coverage	70 Percent Coverage	80 Percent Coverage
Allegany	$3,842,544	$5,039,119	$6,235,695
Anne Arundel	$20,172,008	$26,453,608	$32,735,208
Baltimore City	$36,365,283	$47,689,498	$59,013,714
Baltimore	$36,359,463	$47,681,866	$59,004,269
Calvert	$3,900,063	$5,114,549	$6,329,036
Caroline	$2,297,083	$3,012,399	$3,727,715
Carroll	$5,812,536	$7,622,571	$9,432,605
Cecil	$4,395,347	$5,764,065	$7,132,784
Charles	$7,492,832	$9,826,114	$12,159,395
Dorchester	$1,504,852	$1,973,466	$2,442,080
Frederick	$10,993,829	$14,417,327	$17,840,825
Garrett	$943,855	$1,237,774	$1,531,692
Harford	$10,312,401	$13,523,702	$16,735,002
Howard	$14,202,924	$18,625,740	$23,048,557
Kent	$938,697	$1,231,009	$1,523,321
Montgomery	$44,388,579	$58,211,263	$72,033,948
Prince George's	$40,001,392	$52,457,898	$64,914,403
Queen Anne's	$2,099,538	$2,753,338	$3,407,138
Saint Mary's	$6,137,173	$8,048,299	$9,959,426
Somerset	$2,450,159	$3,213,143	$3,976,127
Talbot	$2,124,376	$2,785,910	$3,447,445
Washington	$6,387,327	$8,376,353	$10,365,378
Wicomico	$5,057,706	$6,632,685	$8,207,664
Worcester	$2,727,665	$3,577,065	$4,426,465
Statewide Totals	**$270,907,633**	**$355,268,761**	**$439,629,890**

Source: APA calculations based on MSDE data

The study team modeled two approaches that Maryland could pursue in order to fund this expansion of high-quality prekindergarten. In addition to these two models, the expansion could be entirely funded by the State. In that case, the additional funding required would be the 'statewide total' figures shown in Table 42. In the first model, the costs of prekindergarten expansion are shared between the State and local school districts. In the second model the costs are shared between the State, local school districts, and participating families, based on means testing. These two models are discussed in detail below.

Model 1: State-Local Share

To determine an appropriate allocation between state and local funding responsibilities, the study team proposes using the same equalized allocation used in Maryland's foundation, (or total program), funding. This is determined by the following formula:

Total Program Revenue – Local Effort (local share) = State Aid (State share)

Under this formula the local effort or share is determined by multiplying a district's total wealth by a uniform statewide foundation mill rate established in statute. The State's share is the difference between total revenue per student (foundation or total program amount) minus the local share. Districts with a higher total wealth pay a greater share of the total revenue amount than those with less total wealth. Because this is an established and equalized sharing of costs between local districts and the State, the study team uses the same percentages for determining the State and local shares of the increased costs of the proposed prekindergarten expansion.

The State and local shares used in this analysis have been modified in three ways from the shares used in the foundation (Total Program) calculation. First, in two districts, Talbot and Worcester, the local wealth is great enough that the local share calculation (total wealth times the statewide mill rate) results in a local share amount that exceeds the total foundation amount, resulting in a negative state share. To address this, the study team set the local share to 100 percent and the state share to zero percent in these two districts. Second, in the foundation program the State guarantees that each district will receive a minimum amount of State aid equal to 15 percent of the foundation amount.[1] No minimum State aid amount is assumed for the calculations completed here. Finally, the State aid amount in the foundation formula is adjusted by a Geographical Cost of Education Index (GCEI) to account for geographic difference in costs across districts. No GCEI adjustment is made here. However, as a matter of policy, the State could elect to apply both a minimum State aid guarantee and the GCEI to the revenue calculations proposed here.

Table 43, below, shows the results of this allocation, with the local share of funding required by each school district at each of the three participation rates.

TABLE 43: LOCAL CONTRIBUTION REQUIRED UNDER MODEL 1, TO SERVE 60, 70, OR 80 PERCENT OF FOUR-YEAR-OLDS IN HIGH-QUALITY PREKINDERGARTEN, BY COUNTY

District	60 Percent Coverage (Local Contribution)	70 Percent Coverage (Local Contribution)	80 Percent Coverage (Local Contribution)
Allegany	$1,193,125	$1,564,666	$1,936,208
Anne Arundel	$12,490,226	$16,379,705	$20,269,183
Baltimore City	$10,458,710	$13,715,571	$16,972,432
Baltimore	$18,192,155	$23,857,225	$29,522,295
Calvert	$1,864,495	$2,445,103	$3,025,710
Caroline	$690,590	$905,641	$1,120,693
Carroll	$2,720,285	$3,567,386	$4,414,488
Cecil	$1,727,557	$2,265,521	$2,803,485
Charles	$3,000,729	$3,935,161	$4,869,593
Dorchester	$567,839	$744,665	$921,492
Frederick	$4,667,619	$6,121,124	$7,574,629
Garrett	$620,903	$814,253	$1,007,603
Harford	$4,805,859	$6,302,412	$7,798,965

[1] In FY 2015 the minimum State aid guarantee affected only Talbot and Worcester counties.

District	60 Percent Coverage (Local Contribution)	70 Percent Coverage (Local Contribution)	80 Percent Coverage (Local Contribution)
Howard	$8,043,185	$10,547,848	$13,052,510
Kent	$773,081	$1,013,820	$1,254,558
Montgomery	$30,765,741	$40,346,248	$49,926,756
Prince George's	$15,823,986	$20,751,604	$25,679,222
Queen Anne's	$1,239,934	$1,626,052	$2,012,170
Saint Mary's	$2,760,808	$3,620,529	$4,480,249
Somerset	$750,896	$984,727	$1,218,557
Talbot	$2,124,376	$2,785,910	$3,447,445
Washington	$2,251,539	$2,952,672	$3,653,805
Wicomico	$1,481,570	$1,942,933	$2,404,297
Worcester	$2,727,665	$3,577,065	$4,426,465
Local Total	*$131,742,872*	*$172,767,841*	*$213,792,810*
State Total	*$139,164,762*	*$182,500,921*	*$225,837,080*
State and Local Total	**$270,907,633**	**$355,268,761**	**$439,629,890**

Source: APA calculations based on MSDE data.

While the funding split between state and local varies by each county, when looking at the total funding numbers, the State pays 51 percent of totals costs and local school districts pay 49 percent of total costs.

Under this model, the study team recommends disbursements to public prekindergarten sites and high-quality (EXCELS Level 5 and accredited) private prekindergarten providers be made through the local school districts. Under this structure the State share would be passed through the school district to the providers, creating a streamlined process for providers who would then receive funding from a single source.

The benefits of this model are:

- It is relatively easy to administer and to budget.
- Provider funding is based on provider quality levels, which are determined via a well-respected QRIS, Maryland EXCELS.
- Funding allocations are aligned with Maryland's current K-12 funding system.
- Public and private providers are funded through a single system.
- Prekindergarten costs are shared between the State and school districts, encouraging both jurisdictions to support the prekindergarten expansion.

Model 2: State-Local-Family Share

The second model builds on Model 1, but adds contributions from families participating in high-quality prekindergarten, based on means testing. Adding a means tested family contribution into the sources of revenue creates two complications: First, from a modeling point of view, there is a need to estimate household income distributions by county and apply those distributions to the estimated number of

four-year-olds in each county. Second, from an administration point of view, there would be a need for family income verification in order to accurately determine the individual family contribution.

Regarding the need for family income verification, while it is clear that household income must be verified for this funding model to work, it is unclear which level of government should be responsible for the verification. For the purposes of creating this model, the study team assumes that local school districts would conduct the verifications, and that the resulting family contributions would flow to the school districts to offset the costs of the local contribution.

Regarding the need to obtain estimates of household income distributions by county, the study team used two U.S. Census sources to obtain income distributions by county: (1) the American Community Survey (ACS) 2014 Estimated Household Income Table for Maryland Counties and (2) a similar Table for 2009, for the smallest eight counties in the State (for which 2014 data was not available). (The estimate of the number of four-year-olds by county is taken from Table 10 in Section II of this report.)

The study team selected four income categories for this model: (1) Under $74,999 (approximately 300 percent of FPL for a family of four), (2) $75,000 to $99,999, (3) $100,000 to $149,999, and (4) $150,000 and above. As shown in Table 44, below, just over 50 percent of Maryland four-year-olds fall into the lowest income tier, 13 percent fall into Tier 2, 18 percent are in Tier 3, and 18 percent fall into the highest income tier.

TABLE 44: ESTIMATED NUMBER OF FOUR-YEAR-OLDS AT DIFFERENT HOUSEHOLD INCOME LEVELS, BY COUNTY

District	Number of 4-Year-Olds	Number of 4-Year-Olds in Households Below 300% of FPL (approx. $74,999)	Number of 4-Year-Olds in Households $75,000 – $99,999	Number of 4-Year-Olds in Households $100,000 – $149,999	Number of 4-Year-Olds in Households Above $150,000
Allegany	921	703	83	106	28
Anne Arundel	7,072	2,938	1,114	1,425	1,595
Baltimore City	10,440	7,581	1,097	994	768
Baltimore	7,863	4,255	1,064	1,374	1,170
Calvert	1,144	457	162	275	250
Caroline	411	253	76	68	14
Carroll	2,119	918	329	422	451
Cecil	1,293	792	140	244	117
Charles	1,954	820	302	442	391
Dorchester	411	278	62	48	24
Frederick	3,077	1,361	465	697	554
Garrett	375	264	57	39	16
Harford	3,158	1,473	480	638	568
Howard	3,905	1,229	532	857	1,287
Kent	250	146	42	37	24
Montgomery	13,010	4,996	1,628	2,522	3,863
Prince George's	11,419	5,902	1,588	2,192	1,737
Queen Anne's	616	252	110	152	102
Saint Mary's	1,394	631	201	311	250
Somerset	326	235	38	33	21

District	Number of 4-Year-Olds	Number of 4-Year-Olds in Households Below 300% of FPL (approx. $74,999)	Number of 4-Year-Olds in Households $75,000 – $99,999	Number of 4-Year-Olds in Households $100,000 – $149,999	Number of 4-Year-Olds in Households Above $150,000
Talbot	475	245	81	85	63
Washington	1,888	1,274	225	230	160
Wicomico	1,282	835	169	187	90
Worcester	652	385	98	98	71
Totals	**75,455**	**38,223**	**10,143**	**13,475**	**13,615**

Source: For the 16 largest counties plus the City of Baltimore, Household Income Distribution was obtained from the U.S. Census Bureau, 2010-2014 American Community Survey 5-Year Estimates. For the 8 smallest counties, Household Income Distribution was obtained from Public Use Microdata Areas (PUMAs) that provide most detail from the 2009 American Community Survey (ACS) for which current year demographic-economic data is available.

Maryland has shown a commitment to fully fund prekindrgarten for families whose household income is under 300 percent of FPL (approximately $74,999 or below, for a family of four). For this reason, this model assumes that no family contribution would be required from this group of families. There is no direct guidance in the literature or in practice for setting the level of tuition required of families whose household income is above 300 percent of FPL. Therefore, for the purposes of this model, families with combined household incomes between $75,000 and $99,999 are required to pay around 10 percent of the cost of high-quality prekindergarten ($10,484, based on the cost of quality for an EXCELS Level 5 child care center). Families with combined household incomes between $100,000 and $149,999 are required to pay 33 percent of the cost. Finally, families with combined household incomes above $150,000 are required to pay 66 percent of the cost.

In order to calculate the total family contribution under each of the three scenarios (60, 70 and 80 percent of population served), it is necessary to estimate the number of four-year-olds who would participate from each income level. The study team believes there are strong incentives for families from the higher income households (above 300 percent) to participate in prekindergarten as even the highest earners would receive a subsidy for prekindergarten. However, it is unlikely that all four-year-olds would participate at these levels. With this in mind, the study team has built the following family participation rates into the estimates for those families above 300 percent of FPL: In the 60 percent scenario, 65 percent of higher-income families participate. In the 70 percent scenario, 75 percent of higher-income families participate. And finally, in the 80 percent scenario, 85 percent of higher-income families participate.

Table 45 shows the results of this model, identifying the total family contribution for each county, and the revised local contribution, net of this family contribution.

TABLE 45: FAMILY CONTRIBUTION AND REVISED LOCAL CONTRIBUTION REQUIRED UNDER MODEL 2 TO SERVE 60, 70, OR 80 PERCENT OF FOUR-YEAR-OLDS IN HIGH-QUALITY PREKINDERGARTEN, BY COUNTY

District	60% Coverage		70% Coverage		80% Coverage	
	Revised Local Contribution	Family Contribution	Revised Local Contribution	Family Contribution	Revised Local Contribution	Family Contribution
Allegany	$770,944	$422,181	$1,077,534	$487,132	$1,384,125	$552,083
Anne Arundel	$1,388,576	$11,101,649	$3,570,109	$12,809,595	$5,751,642	$14,517,541
Baltimore City	$4,041,876	$6,416,833	$6,311,532	$7,404,038	$8,581,188	$8,391,244
Baltimore	$9,144,771	$9,047,384	$13,417,936	$10,439,289	$17,691,101	$11,831,195
Calvert	$16,835	$1,847,660	$313,187	$2,131,916	$609,539	$2,416,171
Caroline	$424,558	$266,033	$598,681	$306,961	$772,804	$347,889
Carroll	($468,635)	$3,188,920	($112,136)	$3,679,523	$244,363	$4,170,126
Cecil	$561,057	$1,166,499	$919,560	$1,345,960	$1,278,063	$1,525,422
Charles	$54,721	$2,946,008	$535,921	$3,399,239	$1,017,122	$3,852,471
Dorchester	$311,316	$256,524	$448,677	$295,989	$586,038	$335,454
Frederick	$308,287	$4,359,332	$1,091,126	$5,029,998	$1,873,964	$5,700,665
Garrett	$425,830	$195,072	$589,170	$225,084	$752,509	$255,095
Harford	$506,201	$4,299,657	$1,341,269	$4,961,143	$2,176,336	$5,622,629
Howard	($10,832)	$8,054,017	$1,254,751	$9,293,096	$2,520,334	$10,532,176
Kent	$552,554	$220,527	$759,366	$254,454	$966,177	$288,381
Montgomery	$6,686,415	$24,079,326	$12,562,411	$27,783,838	$18,438,406	$31,488,349
Prince George's	$2,044,892	$13,779,095	$4,852,649	$15,898,955	$7,660,406	$18,018,816
Queen Anne's	$367,155	$872,780	$618,998	$1,007,053	$870,842	$1,141,327
Saint Mary's	$805,525	$1,955,283	$1,364,432	$2,256,096	$1,923,340	$2,556,909
Somerset	$556,169	$194,728	$760,041	$224,686	$963,913	$254,644
Talbot	$1,594,459	$529,917	$2,174,468	$611,443	$2,754,476	$692,968
Washington	$867,143	$1,384,395	$1,355,293	$1,597,379	$1,843,442	$1,810,363
Wicomico	$542,221	$939,349	$859,070	$1,083,864	$1,175,918	$1,228,379
Worcester	$2,121,422	$606,243	$2,877,553	$699,512	$3,633,685	$792,780
Family Total		$98,129,411		$113,226,244		$128,323,076
Revised Local	*$33,613,460*		*$59,541,597*		*$85,469,734*	
State Total	*$139,164,762*		*$182,500,921*		*$225,837,080*	
Family, State, and Local Total		$270,907,633		$355,268,761		$439,629,890

Source: APA calculations

While the funding split between state, local, and family varies by each county, when looking at the total funding numbers, the state pays 51 percent of totals costs, local school districts pay 12 percent, and family contributions make up 36 percent.

Under this model, local school districts would be responsible for verifying family income and collecting the family contribution. As in Model 1, state funds would flow through the school districts, and then the school districts would be responsible for disbursing the family contribution, the state contribution, and the local contribution, directly to the high-quality prekindergarten provider. In this way, the provider does not have to collect tuition directly from families and they would receive funding from one single source (the school district).

The benefits of this model include the following:

- The system is relatively easy to administer, once family income information is available.
- Provider funding is based on provider quality levels, which are determined via a well-respected QRIS, Maryland EXCELS.
- Funding allocations are aligned with Maryland's current K-12 funding system.
- Families contribute according to their ability to pay, with a significant number of families receiving prekindergarten services for free.
- Costs are shared between the State, local school districts, and participating families, encouraging all stakeholders to support the prekindergarten expansion.

Appendix A: Cost Drivers in Maryland EXCELS

Cost Drivers in Maryland EXCELS: Centers, Homes, and Schools and Their Impacts on Cost of Prekindergarten

Prepared by Anne Mitchell, Early Childhood Policy Research, for APA Consulting

August 2015

The purpose of this paper is to inform the return on investment (ROI) methodology used to estimate the costs and returns of universal prekindergarten in Maryland, including variations in costs and returns by provider types and quality levels. This paper focuses on integrating quality levels from Maryland EXCELS and using the results to estimate the cost of operating in various settings at the highest EXCELS levels.

Maryland is committed to a diverse delivery prekindergarten program; centers and family child care homes as well as public schools are included. The Maryland federal Preschool Expansion Grant application (2014, 45) states that prekindergarten teachers must hold state certification in ECE. The State's Prekindergarten Expansion Act of 2014 requires community-based organizations and schools that provide prekindergarten to meet EXCELS standards at the highest level (Maryland Public Schools, 2014). Thus, both the EXCELS center and EXCELS public prekindergarten standards are included in this analysis. Family child care providers may also deliver prekindergarten; the EXCELS standards for homes are reviewed below.

Cost Drivers of Quality

Constructing a model of the cost of operating a center at different levels of quality begins by distinguishing between one-time costs and continuous, or recurring, costs. The cost model is informed by the progressive requirements of a state's Quality Rating Improvement System (QRIS). The cost drivers in a QRIS tend to fall into three categories:

(1) **Qualifications:** Nearly all QRIS have increasing qualifications by level; some QRIS require employee benefits. Both the increased wages and any additional or expanded benefits are ongoing costs.
(2) **Ratios:** Reduced ratios for all, or for younger age children, are in some QRIS; these are often at the higher levels. Reducing ratios reduces revenue (increases cost per child), since costs are spread among fewer children.
(3) **Time**: Most QRIS include some criteria that add staff time beyond what basic regulations require (e.g., staff meetings, paid planning time, child assessment, parent engagement, and transition activities). In addition to time, some QRIS requirements have ongoing costs (e.g., child assessment systems have an annual cost per child and take time for staff to conduct/record/report the assessments).

Maryland EXCELS

Maryland EXCELS is a block structured QRIS with 5 levels. Block means all items at one level must be met before proceeding to the next level. The 5 levels are called Check Levels; the first Level is essentially the same as being licensed. Cost drivers for Maryland EXCELS are primarily at Levels 4 and 5 and are related to qualifications and to time. Ratios and group/class sizes set in Maryland's child care regulations are reasonable, all preschool classes are 20 children with one teacher and an assistant (or second teacher) and thus ratios and group size are not addressed in EXCELS. Teaching staff qualifications required in regulation and in EXCELS are minimal except for Public Prekindergarten which requires a degree in ECE and a state teaching certificate.

EXCELS relies heavily on program accreditation (for centers and homes, not schools), and on Environment Rating Scales (ERS) and/or Classroom Assessment Scoring System (CLASS) scores in all settings. All of these are associated with the skills, abilities and intentional practices of practitioners. Scores on both assessments may be somewhat related to practitioner qualifications (education levels and specificity of preparation and continuing education). Accreditation generally, but not always, includes qualification requirements.

EXCELS Costs by Level

At Level 1, costs are associated with meeting licensing requirements (i.e. requirements for group sizes and staffing ratios by child ages). Staff qualifications specified in center and home regulation are minimal. This level establishes the foundation of a cost-of-quality model.

At Level 5, the center or home must be accredited by a recognized organization; centers, homes and schools must achieve specific scores on either the Early Childhood Environment Rating Scale (ERS) or the Classroom Assessment Scoring System (CLASS) and be engaged in continuous quality improvement guided by a program improvement plan with school readiness goals. These characteristics are likely to require well-educated, knowledgeable teaching staff. The cost of compensation to attract and retain such staff is the major cost factor. As noted, Level 5 for schools requires certified ECE teachers.

EXCELS Standards and Associated Costs for Centers, Homes, and Schools

The chart below summarizes the standards and criteria for Maryland EXCELS, focusing on those items that have cost implications beyond meeting Maryland child care center and family child care home regulations.

Licensing and Compliance (LIC)

Item	Check Levels 1 & 2	CENTER Check Levels 3-5	FCC HOME	SCHOOL Check Level 5	Comments on Cost Implications
Licensing Compliance	Licensed, and operating	Fully Licensed, in substantial compliance, no enforcement actions pending	Same as centers	School facility meets educational specifications	No cost implications, basic legal program MD child care regulations require reasonable group sizes/ratios* and minimal staff qualifications: for director a high school diploma (Associates degree if > 40 children); for teacher a high school diploma.

* Infants 1:3 (group of 6); toddlers 1:3 (9); 2-year-olds 1:6 (12); 3s and 4s 1:10 (20). Mixed age groups permitted with lower ratios (more staff).

Staff Qualifications and Professional Development (STF)

Item	Check Levels 1 & 2	CENTER Check Levels 3-5	FCC HOME	SCHOOL Check Level 5	Comments on Cost Implications
Director & staff qualifications	Director has Associates; teachers have high school diploma	Director and 60% of staff at or above Staff Credential level 3, 4 or 5 respectively. Director has Administrator Credential Level 1 (Level 2 for Level 5)	Same as centers	No requirements for administrator; teacher has degree in ECE, MD teaching certificate and Advanced Professional Certificate	There are 4 Administrator Credential Levels; degrees not required until Level 3 (Associates) and Level 4 (Bachelors or above) There are 6 Staff Credential Levels. Levels 1-4 are hours of core knowledge training ranging from 45 to 135; degrees are not required until Level 6 (Associates and enrolled in course of study toward higher degree). All Staff Credential Levels 4 and above require 24 hours/year of continuing training; Administrator Credential Levels 2 and above require 30 hours. Center/Home Level 5 can be achieved without degrees.

Accreditation and Rating Scales (ACR)

Item	Check Levels 1 & 2	CENTER Check Levels 3-5	FCC HOME	SCHOOL Check Level 5	Comments on Cost Implications
Accreditation	NA (Not Addressed)	Exploring at Level 3 Engaged in self-study at Level 4 and accredited at Level 5	Same as centers except: NAFCC accreditation does not have qualification requirements for education or credentials	Accreditation NA; References MSDE Validation	Accreditation is a multi-faceted process with comprehensive standards and ongoing cost. Costs of maintaining accreditation are primarily related to staff compensation and staff time. All accreditations have an annual fee (and Maryland pays for these fees).
ERS or CLASS scores*	NA	Level 3 via self-assessment. Level 4 and 5 rated by approved assessor	All items the same as centers	average of 5.0 (no classroom below 4.0)	Total score not specified for centers or homes. For all, subscale scores below 4, 4.5, or 5 must be addressed in the Program Improvement Plan (PIP) for Levels 3, 4, and 5 respectively.
Program Improvement Plan	NA	Level 3 develop PIP informed by assessments, Level 4 & 5 PIP implemented. All PIP include school readiness goals and objectives.	All items the same as centers	Classroom improvement plan	Initial development of the PIP may require modest additional staff time. Updating and implementing the PIP becomes part of program practice, teachers' regular work.

*CLASS content does not present obvious cost drivers; it measures practices which may or may not be related to teachers' educational qualifications. The ERS does have some initial materials and equipment acquisition costs, which become an ongoing cost as replacement expenses for materials and equipment (indoor and outdoor). This section later describes the costs for centers related to ECERS scores and homes related to FCCERS scores.

Developmentally Appropriate Learning and Practice (DAP)

Item	Check Levels 1 & 2	CENTER Check Levels 3-5	FCC HOME	SCHOOL Check Level 5	Comments on Cost Implications
Care & Education: Environment	Developmentally appropriate environment welcoming children of all abilities that offers a balance of child initiated and teacher directed activities	Levels 1 and 2, plus reflecting interests of children, their primary language, and cultural background.	All items the same as centers	Daily schedule consistent, responsive to individual needs, indoor/outdoor daily, seamless transitions	Initial: cost of materials and equipment Ongoing: budget for annual replacement of 20-25%
Learning Materials	NA for 1 2: Support environment item	Increasing emphasis on culture and language, rotation of materials	All items the same as centers	Plan for updating, refreshing, renewing materials at LEA or school level	Initial: cost for variety and number of materials Ongoing: budget for replacement cost

Item	**Check Levels 1 & 2**	**CENTER Check Levels 3-5**	**FCC HOME**	**SCHOOL Check Level 5**	**Comments on Cost Implications**
Positive Guidance	Use positive behavioral supports and strategies (choices, redirection)	Increasing sophistication of supports and strategies	All items the same as centers	NA	Initial: establish the policy and staff development to implement Ongoing: Hire teachers with these skills and knowledge
Teaching Strategies: Curriculum & Planning	NA for 1 2: Lesson plans guided by recommended curriculum & needs, skills, interest of each child and info from IFSP/IEP	Implement recommended curriculum aligned with MMSR, lesson plans also informed by observations (Level 3), info from families (Level 4) and ongoing assessment (Level 5)	All items the same as centers	Implement approved curriculum aligned with Common Core and MMSR	Initial: PD on curriculum and time for lesson planning Ongoing: paid time for lesson planning
Implementation	1: activities individualized and informed by IFSP/IEP 2: plus small and large group, adequate transition, literacy and reading	Extend to domain-based activities	All items the same as centers	Evidence of differentiated instruction	Compensation to attract/retain teachers with skill and knowledge, paid planning time
Screen Time	1: NA 2: Media used only when directly related to facilitated learning experience, no screen time for <2	Same as 2	All items the same as centers	NA	Initial: this is policy issue, and becomes embedded practice
Assessment and Developmental Progress: Developmental Screenings	1&2: conducted on all children (Birth through age 5) within 90 days of enrollment and at scheduled intervals as determined by MSDE; results are shared with families, and referrals are made when appropriate.	Same for all	All items the same as centers	MMSR assessment and developmental screening for all students. Policy and written procedure for sharing assessment with families (including meeting with family once per year)	Initial: choose tool, train staff, establish practices (July 2016 will be required for centers and homes) Ongoing: if once per year may be little/no additional time once established, becomes part of program practice, teachers' regular work, reported as part of regular parent conferences

Item	Check Levels 1 & 2	CENTER Check Levels 3-5	FCC HOME	SCHOOL Check Level 5	Comments on Cost Implications
					If 'intervals' are more frequent may be ongoing time cost. Also may be ongoing cost for screening tool*
Developmental progress	1: NA 2: observe children's progress	3: Use developmental checklist to observe progress 4: Use checklist designed for/aligned with curriculum 5: Plus conduct ongoing assessments using observation, anecdotal records and portfolios	All items the same as centers	Same as Center 5 plus elicit diagnostic info from formative and summative assessment of student understanding	Initial: choose tools, train staff, establish practices Ongoing: assessment becomes part of program practice, teachers' regular work, more time required for recording and integrating with lesson planning and may be ongoing cost for assessment tools

*In July 2016, a regulation will take effect that will require all licensed early care and education programs (child care centers and family child care home providers) to conduct developmental screening on children aged birth through five years using one of five approved tools. The initial cost for the developmental screening tool chosen by the child care facility will be covered by MSDE.

Administrative Policies and Practices (ADM)

Item	Check Levels 1 & 2	CENTER Check Levels 3-5	FCC HOME	SCHOOL Check Level 5	Comments
Info on Policies	Health and safety, tuition, inclusion	3: plus mission/philosophy and positive behavior 4 & 5: above plus communication with families, physical fitness, nutrition, curriculum and child assessment	All items the same as centers	Same as Center 5	Initial: developing policy part of center administrator's job (no extra cost)
CACFP	NA	Participate in CACFP	All items the same as centers	NA	Cost: CACFP may increase center food revenue significantly, may require more record-keeping (time, system)

Item	Check Levels 1 & 2	CENTER Check Levels 3-5	FCC HOME	SCHOOL Check Level 5	Comments
Nutritious Food	NA	Monitor food from home and supplement for nutrition balance 3: Fresh food 2x/week, 4: 3x/week, fresh food plus whole grains, limit fat, sugar, salt 5: all above 4x/week	All items the same as centers	Same as Center 3	Food costs may be slightly higher for centers at 4 & 5
Family Engagement	1: NA 2: Two different types family engagement opportunities	3: three types 4: four types 5: five types	All items the same as centers	Same as Center 5	Cost: depends on type of activity, many are cost-neutral
Family Conferences	1 & 2: family conferences once/year	3-5: at least twice a year	All items the same as centers	Twice per year (at least one includes assessment results)	Initial: establish family conference policy Ongoing: basic good practice, may add some additional time for teachers.
IFSP/IEP	1&2: copy requested, staff work with family and other providers to support child/family outcomes in plans	3-5: same as 1&2	All items the same as centers	NA (assumes school is implementing?)	Ongoing: Cost probably depends on number of children with IFSP/IEP and intensity of needs Add cost factor based on child needs?
Staff: Meetings	2: 4 times per year	3-5: Monthly meetings	All items the same as centers	Faculty meetings held regularly	Compensation for meeting time
Staff: Performance Evaluation	2: Evaluated annually 3: in writing	4&5: In writing at least annually, as needed for professional improvement	All items the same as centers	Teachers receive instructional support and performance evaluation	Initial: establish policy and practice Ongoing: part of administrator job

Item	Check Levels 1 & 2	CENTER Check Levels 3-5	FCC HOME	SCHOOL Check Level 5	Comments
Staff: Policies	2: develop policies	3: written handbook 4&5: include specific items, given to staff at hire, with receipt	All items the same as centers	NA	Initial: develop policies and publish Ongoing: No cost
Staff: Compensation	NA	3: salary scale based on education & experience 4 & 5: plus benefits	All items the same as centers	NA	Depending on salary increments and benefits provided, may be costly
Community Resources: Information	1: NA 2: Info about resources and referral options for children with disabilities and special health care needs current and available to families and staff	3-5: same as 2	All items the same as centers	Similar (references Pupil Services Team and online community resources)	Initial: collect resource info, often available from existing community source which will update Ongoing: No cost
Use of Resources	NA	3: NA 4&5: Resources used, including local public library services	All items the same as centers	NA	No cost
Transition Plans (home to program, within program, program to school)	NA	3: Develop individual transition plans for children with disabilities and special health care needs 4&5: Above plus include policies for sharing info on child assessment and developmental progress	All items the same as centers	School implements practices for transitioning children between programs (home, school, classrooms) and shares student portfolios	Initial: Establish transition policies Ongoing: part of teacher practice, may add time

Summary of Cost Assumptions

Cost drivers for Levels 4 and 5 seem to be nearly all related to skill/knowledge of teachers/providers. Increasing teacher compensation is the primary way to attract and retain skilled teaching staff. Some Level 4 and 5 items in the QRIS are related to time (e.g. time for planning, developmental assessments, staff meetings, family conferences, and family engagement activities), so the cost model also estimates the additional time and extra compensation needed for such tasks. This leads to a cost model using Level 3 program cost as the foundation for the cost in centers and homes, with more time and higher compensation at Levels 4 and 5. School costs are also driven primarily by compensation and somewhat by time.

The PCQC was used to determine the cost of offering prekindergarten in three settings (centers, homes, and schools), at three levels of quality (Levels 3, 4, and 5 for centers and homes and Level 5 for schools), and two levels of dosage (half-day for the school year or full-day meaning school day for the school year).

Staffing Structure: Center and School Staffing Pattern

The staffing pattern in centers includes:

- Director full-time
- Education coordinator (assistant director) – 50 percent time if <60 children, 100 percent if >120 children
- Administrative assistant – 50 percent time if <40 children, then 1/40 children
- Lead teachers & assistants (one of each per classroom)
- Additional teacher assistants to cover breaks and opening and closing hours and the extra time classroom staff need at higher quality levels

The staffing pattern in schools includes:

- Principal, full-time
- Education/instructional coordinator, full-time
- Administrative assistant
- Prekindergarten teachers & assistants (one of each per classroom)
- Additional teacher assistants to cover breaks and the extra time classroom staff need at higher quality levels

Assumption: *These staffing patterns are sufficient to operate a high-quality program, given adequate compensation of staff.*

Personnel Expenses: Center and School

Compensation (salary and benefits) is the major expense category in any early education program, usually 60 to 80 percent of the total expenses. The assumption in the model is that both compensation and the amount of staff time needed to maintain quality increase with EXCELS Level.

Salaries in the estimates are based on the most recently available data (May 2014) from the U.S. Bureau of Labor Statistics (BLS) for Maryland. The model uses these occupations:

Centers

- Preschool Teachers, Except Special Education (SOC 25-2011) used for teachers
- Child Care Workers (Standard Occupational Code [SOC] 39-9011) used for assistant teachers
- Education Administrators, Preschool and Child Care Center/Program (SOC 11-9031) used for both director and education coordinator

Schools

- Kindergarten Teachers, Except Special Education (SOC 25-2012) used for teachers
- Teacher Assistants (SOC 25-9041) used for assistant teachers
- Education Administrators Elementary & Secondary (SOC 11-9032) used for director/principal
- Instructional Coordinator (SOC 25-9031) used for education coordinator

Assumption: *Compensation increases with higher EXCELS Level. Attracting and retaining staff with prekindergarten qualifications in the non-public sector will require higher wages, closer to what public school teachers receive.*

Wages in schools are calculated for Level 5 at two salary levels: one is the mean annual wage for the BLS occupational category relevant to each position and the second is five percent higher to allow for the possibility of needing to attract prekindergarten/ECE certified teachers, who may be in short supply.

Wages in centers at Level 3 are set at the mean annual wage for the BLS occupational category relevant to each position. Wages in centers at Level 4 are calculated based on the average of the center wage for Level 3 plus 10 percent and the school wage for Level 4. For Level 5, the center wages are 5 percent above Level 4. This progression is intended to reflect that some credentialed/degree-qualified staff are needed to maintain Level 3. Because the expectations (CLASS and ERS and accreditation) are much higher for programs at Level 4 and Level 5, they will likely have more staff with bachelor's degrees (Level 4) and some with master's degrees (Level 5) and ECE certification. Attracting and retaining staff in the non-public sector with these qualifications will require higher wages, closer to what public school teachers receive.

Assumption: *Benefits also increase with EXCELS Levels*.

Federal and state mandatory benefits (payroll taxes) are included in the personnel calculations in all budgets; Social Security and Medicare (FICA) are at the current federal rates, Unemployment and Workers Compensation use Maryland rates. Additional benefits in the center budgets consist of paid time off and insurance and retirement contributions.

The Level 3 center has base benefits of 10 paid holidays, 10 days of paid leave and $1,000/employee paid by the employer for other benefits (contribution to health insurance and retirement contributions). Level 4 has the base plus an additional week of paid leave, 50 percent employer contribution to health

insurance and $500 employer contribution for retirement and other benefits ($3,360/employee). Level 5 has base benefits plus 10 percent more in benefit cost per employee than the previous level ($3,696/employee).

School employee benefits are estimated at $15,000 per employee. This amount is based on 2015 data from a sample of urban and rural school districts in Ohio. This recognizes that public school employee benefits are negotiated, there are likely more benefits provided and the employer contributions are much higher than 50 percent.

Assumption: *Teaching staff time increases with EXCELS Levels.*

Any program operating full-working day and full year needs about 20 percent more staff time than the typical eight-hour work day of teaching staff to cover the typical 10-11 hour day of a program with breaks and opening and closing. The Level 3 budget includes the 20 percent base plus five percent additional assistant teacher time to provide release time for the lead and assistant classroom teachers to complete assessment recordkeeping, family conferences, etc. For Level 4, the additional time is set at 30 percent and at 35 percent for Level 5.

Non-personnel Expenses

The major categories of non-personnel expenses are occupancy, education and program-related expenses, and office/administration. The default amounts in the PCQC are based on the average annual expenditure for these items across many sizes and types of programs, collected from providers in states over many years.

For all settings, the default values were used except for the following:

- Occupancy costs were increased to reflect the cost of living in Maryland compared to the nation as a whole;
- Food and food service were increased by 10 percent to reflect the food and nutrition items in EXCELS;
- Cost of a child assessment system at $30 per child was added; and
- Education equipment was increased to reflect the ERS costs (detailed at the end of this paper).

Public Prekindergarten Non-personnel Expenses

The exact dollar amount in the rent, lease, and construction line in the ROI analysis varies by type of preschool site (public prekindergarten, licensed family homes, licensed centers, and Head Start sites), even though it covers the same resource across all sites. The differences are driven by characteristics of the site itself. For example, licensed family homes and centers are more likely to be private or semi-private enterprises that rent or lease space on the open market. It is very unlikely that any improvements to the space, or the space itself, would in the long run be publically owned. While it is possible that Head Start programs would lease space from public school districts, they typically rent from private individuals or organizations. Public prekindergarten programs, however, are typically

provided in a public school space, and improvements to that space will likely remain in the public domain.

In the ROI analysis, figures for the rent/lease cost per square foot were taken from the Provider Cost of Quality (PCQC) tool developed for the U.S. Office of Child Care and adjusted for Maryland cost differences. The figures from the PCQC for licensed family homes and centers, as well as Head Start programs were directly comparable at a rate of $15.17 per square foot and subsequently entered into the ROI cost model for Maryland.

Determining a rent/lease/construction figure to be assigned to support the cost determination for a public school district providing prekindergarten was, however, more complicated. First, the PCQC model was not originally developed for the circumstance of public provided prekindergarten. Second, after the space is constructed and paid for, it will likely remain in the public domain as the property of school districts. As a result, the study team needed a cost per square foot that reflected today's cost of construction, discounted over the functional life of the space.

The team turned to part of the analysis found in the school size study prepared as part of the overall Maryland adequacy study (Humann, Palaich, & Griffin, 2015). Based on information provided by the Public Schools Construction Program office for the latest year available, average costs per square foot for new and replacement schools in Maryland range from $260 to $434 per square foot. A part of this variation is attributed to school level: elementary, middle, and high school. However, as discussed the school size study, the cost per student is more directly related to the square footage per student which varies moderately across school levels and more dramatically across individual LEAs. The figure chosen to represent the cost of new or repurposed construction for this ROI analysis was $347 per square foot. This figure is both the simple average of the range presented in the school size study, and represents the 80th percentile of the upper end the range, $434.

Further, an adjustment was needed to discount the cost per square foot figure over the useful life of the space. Though it is not uncommon for the exterior of a school building to last between 40 to 60 years, this is not, however, the useful life of the interior space and fixtures. Fixtures, equipment, carpet, furniture, etc. are estimated by school construction specialists to need replacement in the eight to 15 year range. It is also true that school districts tend to issue bonds for school construction in the 20 to 30 year timeframe, and the State of Maryland only issues 15 year bonds. Taking all of these factors into consideration, the study team decided that the cost per square foot should be discounted over 20 years. This means that the discounted cost per square foot for new or repurposed space for public prekindergarten would equal $17.35. This figure was inserted into the cost calculation for the ROI in public prekindergarten.

Family Child Care Homes

Estimating the cost of prekindergarten in family child care homes is addressed differently than in centers and schools. Family child care homes are small for-profit businesses; the provider's income is the net revenue after expenses; the business is paying for part of the home expenses. Family child care homes have direct business expenses (education supplies and materials, food, office supplies, etc.) and shared

business expenses (cost of maintaining their home). Direct expenses are fully tax deductible; shared expenses are reduced by the 'time-space' percent. The time percent is calculated by dividing the total hours per year that the home is used for child care by the total hours in a year. Providers typically work with children (usually 50-55 hours per week) plus spend time on business activities such as purchasing food or doing bookkeeping (usually another 4-5 hours). The space percent is calculated by dividing the amount of the home used for child care in square feet by the total space in the home. Space used for child care means all the rooms that are used for child care; nearly all providers use about half of their home regardless of how large the home. Typical time percent is 36; typical space percent is 50, resulting in 18 percent of shared expenses counted as business expense.

Assumption: *Time increases with EXCELS levels for homes.*

To account for the time needed for planning, recordkeeping etc. the provider's time is set at 67 hours per week for Level 3. To account for the time needed at higher levels to do child assessment and family engagement work and for curriculum and other planning, the provider's time increases to 70 hours per week for Level 4, and 74 hours per week for Level 5. To account for coverage for the provider's sick and vacation leave time and coverage during the work day to accomplish additional planning or professional development, substitute/assistant time is set at 350 hours per year for Level 4 and 400 hours per year for level 5.

Assumption: *Compensation increases with higher EXCELS levels. Compensation for family child care providers with prekindergarten qualifications will require higher wages and benefits, closer to what public school teachers receive.*

Compensation for family child care providers is their net annual revenue plus the cost of any benefits. The provider must pay for the full cost of health insurance and other benefits (i.e., both employer and employee portions). To reflect that the work of being a family child care provider is a combination of administration and teaching, and to have net annual revenue closer to public school salaries, the average of the center director and the center teacher salaries were used at each level to set the provider's net annual revenue. Then the $4,350 for individual health insurance and $5,000 contribution to a retirement plan were added to the net revenue. To calculate the cost of full-day, full-year prekindergarten in a home, this final amount was then divided by the maximum of eight children that a home provider in Maryland can enroll.

All of the estimates assume that children with disabilities can be integrated into any classroom or home and that the costs of their additional special education are paid by early intervention/preschool special education funding sources that follow the child and may or may not pass through the program's budget. Thus these additional costs do not appear in these estimates.

Calculating the Cost Per Child of Prekindergarten

The cost of prekindergarten is influenced by three main factors: quality, setting, and dosage. Quality is defined at three levels of EXCELS (Levels 3, 4, and 5 for centers and homes and Level 5 for schools). The settings are centers, schools, and homes. Dosage is referred to as half-day or full-day for 180 days (the

school year). Half-day is defined as 2.5 hours and can be delivered most efficiently as double sessions during a school day. Full-day is defined as 6.5 hours, and it is the full school day.

These distinctions are applied easily to schools: the cost of 'full-day' is the total cost of prekindergarten divided by the number of children (20 per classroom). The cost of half-day is 50 percent of the full-day cost.

Centers and homes operate full working day, full calendar year programs. Both are assumed to offer 'full-day' prekindergarten. To adjust full-day full-year costs to the school year, the model uses 85 percent to approximate the 180 day school year (10 of 12 months). The cost of 'half-day' prekindergarten is calculated as 50 percent of the 'full-day' prekindergarten cost. To account for the differences in sizes of centers and the age mix of children that may be enrolled, the estimate is based on the average cost for per child among four configurations: a moderate size mixed age center, a moderate size center only enrolling preschoolers, a large center only enrolling pre-kindergartners, and a very large center only enrolling preschoolers.

ERS: Increased Cost Implications of Early Childhood ERS Scores Per Classroom

	Score 3 = Minimal		Score 5 = Good		Score 7 = Excellent		Source: Lakeshorelearning.com 2013 prices*	
ECERS Item #								
							$150	*workbench*
							$349	*storage unit*
2	Sufficient furniture in good repair		Most furniture child-sized	$1,489	Work bench, sand/water table	$1,639	*$300*	*table*
							$60	*per chair*
3	Some soft furnishings		More soft furnishings		Soft furnishings and cozy area			
4	2 interest centers	$1,000	3 interest centers	$1,500	5 interest areas	$2,500	*$500*	*per area*
5					More than 1 private space			
							$100	*tunnel*
8	some gross motor equipment	$199	enough so little wait-time	$299	both stationary and portable	$899	*$200*	*trike*
							$199	*set balls, hoops, ropes*
11	cots/mats 18 inch apart		cots/mats 3 feet apart					
15	10 books/20 children	$100	20 books/15 children	$200	plus relevant books	$300	*$10*	*per book*

16	Some expressive language materials	$75	Accessible materials	$150		$150	*$25*	*per set e.g., puppets*
19	Some fine-motor materials	$35	many; all 4 types, range difficulty	$280	rotated/organized	$560	*$35*	*per set*
20	art materials	$150	building, art materials, manipulatives, puzzles 3-5 types	$250	many, 3-D, relevant	$350	*$50*	*per type of art materials*
							$100	*world instruments*
21	Some music materials	$100	Many music materials	$200	Variety of musical items	$300	*$100*	*per set 15 player rhythm items*
22	Enough blocks + accessories for 2 to build independently	$588	Enough for 3 or more	$857	two types of block sets	$1,714	*$269*	*block set*
							$50	*per set accessories*
23	Sand/water	$179	sand or water	$179	sand and water indoors and outdoors	$358	*$179*	*sand/water table*
24	Some dramatic play materials	$280	Many and varied dramatic play materials	$560	rotated, and materials to represent diversity	$840	*$40*	*per set of dramatic play materials*
25	Some nature/science materials	$150	At least 3 categories of materials	$300	rotated and relevant books	$300	*$50*	*per item or display*
26	Some math materials	$75	At least 3 categories of materials	$125	rotated, engaging input	$150	*$25*	*per set*
28	3 materials showing	$90	Many materials + props	$120	inclusion of diversity is routine, daily	$150	*$30*	*per set of dolls, or books or clothing*

racial/cultural diversity		racial/cultural diversity				
INITIAL purchase cost per classroom =	$3,021		$6,509		$10,210	
ERS score of	3		5		7	

Inflation factor applied to approximate 2015 prices for both ECERS and FCCERS. See* ***http://www.bls.gov/data/inflation_calculator.htm*

ERS: Increased Cost Implications of Family Child Care ERS Scores for Homes

FCCERS Item #	**Score 3 = Minimal**		**Score 5 = Good**		**Score 7 = Excellent**		*Source: Lakeshorelearning.com 2013 prices*	
1	Enough space		Ample space		Space accessible to all w disabilities			
	Adequate lighting		Natural lighting		Adjustable window covers			
							$329	*storage unit*
2			Some storage	$329	Child size table and chairs	$868	*$219*	*table*
							$40	*per chair*
3			More soft furnishings					
6					More than 1 private space			
12			Fire inspection(in permits)					
15	6 books/age group (Assume 2 age groups)	$120	12 books/age group	$240		$240	*$10*	*per book*
16	Some fine motor materials per age group	$75	Many fine motor materials per age group	$150		$150	*$25*	*per set e.g., small trucks, shapes, bristle blocks*
							$4	*per paint apron*
17	1 drawing material	$25	8 kinds of art materials	$216	12 kinds of art materials	$324	*$25*	*per set of materials*
18	Some music materials	$40	Many music materials	$80	Variety of musical items	$120	*$40*	*per set rhythm band items*

19	Some blocks + accessories /each age group	$130	Many blocks + accessories /each age group	$180	Variety of accessories	$280	*$130* *$25*	*block set* *per set accessories*
20	Some dramatic play materials	$120	Many and varied dramatic play materials Some child-sized dramatic play furniture	$240	Materials to represent diversity	$320	*$40*	*per set of dramatic play materials*
21	Some math materials	$40	Many and varied math materials	$80		$80	*$20*	*per set*
22	Some nature materials	$20	At least 9 nature/science materials	$90		$90	*$10*	*per item or display*
23	Some sand/water toys	$60	Variety of sand/water toys	$120		$120	*$60*	*per kit*
24	3 materials showing racial/cultural diversity	$90	Many materials + 4 props racial/cultural diversity	$120		$120	*$30*	*per set of dolls, or books or clothing*
32	Adequate toys, materials, and equipment	$250	Ample, varied toys, materials, and equipment	$500		$500	*$50*	*per item*
	Materials & Equipment Acquisition TOTAL =	$970		$2,345		$2,312		

Appendix B: Maryland ROI Methodology

Table B1, below, lists the categories of return associated with prekindergarten participation, along with the estimated per child benefit of attending prekindergarten in Maryland. The methodology that follows explains how these benefits were calculated. The estimated per child benefit in Table 25 accrues to every child enrolled in prekindergarten. These figures are already discounted to reflect benefits being averaged across all participants, understanding that not all benefits will accrue to each individual prekindergarten attendee equally. For example, the research indicates that prekindergarten attendance can reduce the need for special education. Clearly, not all children who attend prekindergarten are expected to need special education support when they enter the K-12 system. However, research studies have tracked prekindergarten attendees into the K-12 system and analyzed the reduction in special education cases among the attendee group compared to a control group. That information can be used to calculate an average per child impact. In the Maryland methodology, this impact is equal to a 0.7 year reduction in special education per prekindergarten attendee over their K-12 experience.

TABLE B1: ESTIMATED PER CHILD BENEFIT OF PREKINDERGARTEN PARTICIPATION

Category	Estimated Per Child Benefit
K-12 System	
Reduced Special Education Costs	$8,425
Reduced Grade Retention	$2,018
Reduced Teacher Turnover Costs	$78
Reduced Teacher Salary Costs	$1,729
Reduced Teacher Absenteeism Costs	$1,859
Reduced School Support Costs	$5,226
Higher Education and Career	
Increased Costs of College Participation	($970)*
Increased Costs of High School Participation	($1,441)*
Increased Future Income	$48,324
Criminal Justice	
Reduced Juvenile Crime Costs	$7,257
Reduced Adult Crime Costs	$4,530
Reduced Tangible Victim Costs	$4,757
Child Welfare System	
Reduced Foster Care and Home Care Costs	$327
Reduced Child Welfare Quality of Life Costs	$2,016
Reduced Child Welfare Tangible Victim Costs	$230
Total	**$84,365**

*The increased college participation and increased high school participation categories result in a negative ROI because they represent increased costs associated with children who participate in prekindergarten. Children who complete prekindergarten are more likely to complete high school and attend college, which creates a financial cost for the State.

Reduced Special Education Costs

Special education has been identified as one of the most promising areas in which short-term returns from prekindergarten interventions might be realized. Longitudinal analyses of the CPC program have followed children who enrolled in CPC in the 1985-86 school year, measuring factors like enrollments in special education programs. Reynolds (2002) estimated that the reduction in number of years of special education required for children in the CPC study was -0.7 (effect size -0.11). This translates to average savings of about $6,000 per program participant in 2015 dollars (from $5,317 in 2007 dollars to $6,120 in 2015 dollars, using the CPI Inflation Calculator), based on the average annual costs for special education above and beyond regular instruction for the school district in which the children were enrolled, and discounting costs by three percent annually (Reynolds et al., 2002, p. 279-80; Karoly & Bigelow, 2005, p. 32).

Total special education expenditures for Maryland during the 2012-13 school year, minus the costs of nonpublic special education and other transfers, equaled $1,236,110,724, serving 102,702 students. The 2013 per student cost of special education therefore, was $12,036. The study team applied the figures from Karoly & Bigelow (2005) to the Maryland context by substituting $12,036 as the annual cost for a child in special education. This figure was multiplied by 0.7 to represent the average number of years in special education saved per child due to prekindergarten attendance, yielding an average saving of $8,425 per special education student.

Some experts suggest that these returns may be overstated when applied in the modern context, because the "control" group (i.e. those children who did not receive prekindergarten services) was different when the large longitudinal studies began. In current practice, even children who do not have access to a prekindergarten program still are entitled to receive services through the Individuals with Disabilities Education Act (IDEA) and Americans with Disabilities Act (ADA). In the 1960s and 1970s, however, when several of the most studied programs were established, fewer services were available to children who did not attend prekindergarten. Thus, differences may be more pronounced.

At least one other study, New Jersey's APPLE study (Barnett et al., 2013), has tracked reductions in special education enrollment due to prekindergarten participation, which is presented here for the sake of comparison. This study, which followed children who attended the Abbott prekindergarten program, found that the program caused a reduction in special education placement in grade four or five from 17 percent to 11 percent (Barnett et al., 2013, p. 2). Assuming that children enrolled in special education were enrolled in both grade four and grade five, the six percentage point reduction is equivalent to an average of 0.12 years per child in grades four and five, a lower estimate than that provided in the CPC study. However, this does not take into account special education placements in kindergarten through grade three, and therefore the study team has based on estimates on the CPC study calculations.

Reduced Grade Retention

Children who participated in the CPC prekindergarten program were 15.4 percentage points less likely to have been retained in a grade level by age 15 (through grade eight) (Karoly & Bigelow, 2005, p. 33). Karoly & Bigelow (2005) multiplied this 15.4 percentage point figure by California's average annual statewide K-12 public education cost of $6,961 to estimate the savings from lower instances of grade

retention. Assuming that each child is retained for an average of one year, the California figures equate to 0.154 years saved per child. These figures were applied to Maryland by substituting the average annual per pupil cost of $13,103 and multiplying this cost by 0.154, yielding an average savings of $2,018 per child.

These numbers compare to the APPLE study follow-up, which found the program caused a reduction in retention rates from 19 percent to 11 percent, or eight percentage points. Retention was measured by whether a child was behind a grade level or more through grade five (Barnett et al, 2013). The average number of retained years saved through grade five, therefore, is at least 0.08, but likely higher if children were retained more than one year, or if other children were retained later in their schooling. The analysis also assumes no difference in outcomes between children with one year of preschool versus two. This assumption is supported by the APPLE study follow-up, which found that children who completed two years of prekindergarten did not show any advantages in terms of reduced retention rates over children who were only enrolled in prekindergarten for one year.

For the purposes of this study, the study team will use the savings of $2,018 per child based on the CPC data quoted above.

Effects of Improved Student Behavior and Teacher Satisfaction

The methodology incorporates exploratory analyses that estimate the effects of increased student behavior and teacher satisfaction on future child outcomes. These estimates should be considered speculative as no empirical research has directly evaluated the cost implications of these outcomes based on child care participation.

Using Early Childhood Longitudinal Study (ECLS) data, Belfield (2006, p. 9) found that prekindergarten programs raise individual achievement by 0.14 standard deviations. This is associated with a 16 percentage point increase in measurements of student behavior, which in turn is equivalent to a 10 percentage point job satisfaction for teachers. Increased teacher satisfaction results in three types of cost savings: (1) savings due to reduced turnover; (2) offset costs of salary increases that would otherwise be required; and (3) reduced absenteeism.

Reduced Teacher Turnover

Belfield's (2006) analysis of Early Childhood Longitudinal Study (ECLS) data found that an increase in teacher satisfaction of 10 percentage points results in a 12 percent reduction in teacher turnover. Approximately nine percent of teachers quit each year, so a 12 percent reduction in that number yields a net reduction in the number of teachers quitting equal to 1.1 percent of the entire workforce.

In the 2012-13 school year, the average salary for a new teacher in Maryland was $43,235 (NEA, 2013). Barnes et al. (2007) developed estimates of the cost of teacher turnover. The estimates stemmed primarily from the hiring and induction processes for new teachers. The estimates did not include the processing costs for teachers transferring from one school to another within a district (though the study team assumes such costs would be minimal). Barnes et al. (2007, p. 4-5) reported that

> In both small and large districts, […] the costs of recruiting, hiring, and training a replacement teacher are substantial. In Granville County, North Carolina, the cost of each teacher who left the district was just under $10,000. In a small rural district such as Jemez Valley, New Mexico, the cost per teacher leaver is $4,366. In Milwaukee, the average cost per teacher leaver was $15,325. In a very large district like Chicago, the average cost was $17,872 per leaver. The total cost of turnover in the Chicago Public Schools is estimated to be over $86 million per year. It is clear that thousands of dollars walk out the door each time a teacher leaves.

The Alliance for Excellent Education (2014) explored the costs of teacher turnover in the U.S. Richard Ingersoll, a professor at the University of Pennsylvania, worked with the Alliance to estimate low and high costs of teacher turnover, by state, using costs from representative districts. In 2008-09, 4,777 Maryland teachers left the profession. Ingersoll's low estimate of the overall cost of this teacher attrition in Maryland in 2008-09 is $20,851,981. His high estimate is $45,387,096 (Alliance for Excellent Education, 2014, p. 12). Taking the average of the low estimate and the high estimate yields a total 2008-09 Maryland teacher attrition cost of $33,119,539. Dividing this $33,119,539 cost among the 4,777 teachers who left teaching in 2008-09 yields a per teacher attrition cost of $6,933. When this figure is adjusted for inflation and shown in 2014 dollars using the Consumer Price Index (CPI) calculator, the per teacher cost of attrition is $7,623. Following the Belfield (2006) data cited above, a 1.1 percent reduction across the teacher workforce results in an average cost of attrition per teacher of $84 ($7,623 x 1.1 percent).

To convert this figure into a per child number, the study team multiplied the cost per teacher by the number of K-12 teachers in Maryland, yielding a total cost of $4,847,724 (57,711 teachers x $84 per teacher). (The number of teachers comes from MSDE staff files, position code 11, the teacher/instructor statewide total FTE count for the 2012-13 school year.) The study team then divided that cost by the number of students (830,231) for an average savings per student of $6 per year. This number was multiplied by 13 years of schooling for a total saving of $78 per student.

Offset Costs of Teacher Salaries

A conservative estimate of the value of a 10 percentage point increase in teacher satisfaction is equal to a three percent increase in salary (in other words, teachers perceive the same value from a 10 percentage point increase in job satisfaction as a three percent salary increase).

A three percent salary increase in Maryland would be equal to $1,909 per teacher per year (based on an average annual teacher salary of $63,643). (The average annual teacher salary figure is based on MSDE analysis of professional salaries, cited later in this section.) This is equivalent to a total of $110,187,035 across all 57,711 K-12 teachers in the State. Dividing this savings figure by the total number of K-12 students yields a per child savings of $133 per student per year, or $1,729 (133 x 13) across a student's K-12 career. The savings are assumed to accrue evenly between kindergarten and grade 12.

Reduced Teacher Absenteeism

The study team assumed that an increase in teacher satisfaction of 10 percent would also result in a reduction in teacher absenteeism of 10 percent.

In Maryland, the average substitute teacher salary is $28,000 (based on Indeed.com salary figures for substitute teacher in Maryland) or about $105 per day for a certified teacher (based on degreetree.com resources for becoming a Maryland substitute teacher). Assuming one substitute teacher for every 15 full-time teachers, Maryland would have 3,847 K-12 substitute teachers. Multiplying the estimated number of substitute teachers by the average substitute teacher salary results in current annual state spending of approximately $107,716,000 on substitute teachers. This translates to $130 per K-12 student per year ($107,716,000/830,231), or $1,690 per pupil over 13 years of schooling (130 x 13). Applying the 10 percent reduction in teacher absenteeism that is the result of prekindergarten attendance, results in a total saving of $1,859 per student.

Reduced Pressure on School Support (Due to Increased Student Achievement)

Applying Early Childhood Longitudinal Study (ECLS) data to Massachusetts, Belfield (2006, 9) showed that the 0.14 standard deviation in individual student achievement due to prekindergarten programs should also result in savings to the state on funds being spent on Low-Scoring Student Support. A conservative estimate is that increased achievement would allow for a 30 percent redistribution of these funds spent in this area.

For Maryland, the study team estimated the number of low-scoring students using counts of students scoring Basic on the MSA (elementary and middle school) and the HSA (high school) state tests in 2012. Counts are reported by subject for reading, math, and science, so a student scoring Basic in all three subjects is counted three times. Using this method of counting, 157,501 students had Basic scores on the MSA in 2012 and 30,906 students had Basic scores on the HSA in 2012. There is a strong correlation between students scoring low on reading and scoring low in other subjects. Therefore, to avoid duplicate counts, the study team is using Basic counts for reading only. The 2012 reading-only Basic counts are 54,325 for the MSA and 11,471 for the HSA – a total of 65,796 low-scoring students in K-12. Though these figures undercount low-scoring students to a certain extent, they are used for the upcoming calculations.

At the time of this report, no data were available on total or per student expenditures for low-scoring students. The closest available data are revenues for Maryland's compensatory education program, based on free and reduced-price meals (FARMs) counts, but meant to support at-risk students. In 2012-13, total state aid for the compensatory education program was $1,146,261,309. Although 2013-14 financial data is available, the study team is using 2012-13 data to be consistent with the data available for test scores. Dividing the 2012-13 state school support funding by the number of low-scoring students in K-12 yields a result of $17,421 per pupil. Thirty percent of this total would equal $5,226 per student.

Increased Cost of High School Graduation

Karoly & Bigelow (2005, p. 34, p. 79) found an 11 percentage point increase in high school graduation for children participating in the CPC program. This results in additional cost to the K-12 system for additional children completing their K-12 education and not dropping out early. Taking the Maryland average annual per pupil cost of $13,103 and multiplying that by the 11 percent increase in high school graduation due to prekindergarten attendance, yields an increased per child cost of $1,441.

In addition, higher graduation rates are likely to contribute to an increase in college participation rates of 1.5 years per graduate. In FY 2013, Maryland state expenditure on higher education totaled approximately $1.7 billion (Legislative Handbook, 2014, p. 139). In FY 2013, the Maryland Higher Education Commission reported that 283,945 full-time equivalent students were enrolled in public or private nonprofit postsecondary education institutions in the State (Legislative Handbook, 2014, p. 149). Karoly & Bigelow's (2005) figures can be applied to the Maryland context by substituting the State's annual higher education cost per pupil of $5,876 ($1.7 billion/283,945 students). Multiplying this number by 1.5 years additional participation in higher education per student yields an increased cost of $8,814 per additional high school graduate. This figure is multiplied by the 11 percent higher graduation rate to yield an average cost of $970 per preschool participant.

Increased Future Income

Increased future income for preschool participants is based on the increased rate of high school graduation and likely higher income for high school graduates compared to non-high school graduates. Karoly and Bigelow (2005) estimated the increased high school graduation effect for children who attended preschool at 11 percent.

U.S. Census Bureau data (2007, Table B20004) for Maryland estimates median annual earnings for high school graduates in the State are $32,806, compared to $24,033 for non-high school graduates (adjusted for 2015 dollars). Assuming an average retirement age of 62 (Gallup, 2014) lifetime earnings are accrued over 44 years (from age 18 to age 62). Thus, the estimated lifetime earnings for a high school graduate in Maryland are $1,642,747 while the estimated lifetime earnings for a non-high school graduate in Maryland are $1,203,439 – a difference of $439,307 over a lifetime. These numbers were projected over a lifetime of earnings by assuming a 0.5 percent annual increase in relative earnings and a 20 percent benefit rate.

Multiplying the additional lifetime earnings of high school graduates by the increased graduation rate of 11 percent, yields an average benefit of $48,324 per prekindergarten child.

Reduced Criminal Justice Costs

Reduced Juvenile Crime Costs

Karoly & Bigelow (2005) applied results from the CPC study to a universal California prekindergarten program. The CPC study found that, at 18 years old, former CPC program participants had 0.33 fewer petitions in juvenile court, compared to non-participants. In the California context, the researchers estimated that just under 22 percent of California's juvenile petitions resulted in incarceration in county facilities, at an annual cost per inmate of $25,200 in 2003 dollars, and one percent of petitions resulted in a California Youth Authority sentence, at an annual cost of $49,200 per inmate in 2003 dollars. Greenwood et al. (1994) estimated a national average cost for all petitioned cases of $2,450 in 2003 dollars, and Miller et al. (2001) estimate the cost for probation at $2,082, in 2003 dollars. Eleven percent of cases reside in an "other" category, and 17.6 percent were dismissed. Based on the California data

cited in the Karoly & Bigelow (2005) study, there were 87,927 juvenile court petitions in 2003, resulting in a weighted cost for a juvenile petition of $9,480 in 2003 dollars.

Applying this data to the Maryland context, in FY 2014, there were 13,364 authorized formal petitions resulting from juvenile complaints (Maryland Department of Juvenile Services, 2015, p. 13). Of these, 89.1 percent were petitioned and resulted in court disposition, for a total of 11,901 court dispositions. Of these, 26 percent received probation, 10 percent were committed to a Department of Juvenile Services facility, and 64 percent were dismissed/or closed, or are part of an "other" category. The average annual cost of juvenile incarceration in state-operated facilities 2014 was $181,419 (Maryland Department of Juvenile Services, 2015, p. 191). Applying this figure and then adjusting the cost per petition and the cost per probation data cited above for 2014 dollars, results in a weighted cost per juvenile petition in Maryland of $21,990, as shown in Table B2 below.

TABLE B2: CALCULATED COST OF JUVENILE PETITIONS

Outcome	Percentage of Total	Number of Petitions	Cost Per Petition	Total Cost
Total petitions	100%	11,901	$3,152	$37,511,952
Committed to DJS facility	10%	1,190	$215,906,752	$215,906,752
Probation	26%	3,094	$8,289,523	$8,289,523
Dismissed/Closed/Other	64%	7,617	$0	$0
			Total	$261,708,226
			Average Cost Per Juvenile Petition	$21,990

Source: Maryland Department of Juvenile Services, 2014

Multiplying the average cost per juvenile petition of $21,990 by the estimate of a reduction of 0.33 cases for children who attend prekindergarten (based on the CPC program analysis) yields an average savings of $7,257 per prekindergarten program participant. Savings are applied to the ROI methodology at age 14 (the mean age of arrest for juveniles).

It is important to note that juvenile detention creates costs beyond the detention centers, including but not limited to the costs associated with recidivism, lost future earnings, and lost future government tax revenue (Justice Policy Institute, 2014). Thus, the savings associated with reducing the number of youths in juvenile detention facilities are likely to be much higher than the figures calculated here.

Reduced Adult Crime Costs

The juvenile crime figures above can be used to estimate the reduction in crime beyond the age of 19. The CPC study found that the program produced a 42 percent reduction in juvenile petitions and Karoly and Bigelow (2005, p. 162) assume a reduction in adult crime that is 80 percent of the effect on juvenile crime. Thus, the reduction in adult crime due to prekindergarten attendance is equal to 37 percent. In the absence of Maryland specific data on adult crime costs, the study team used the figures from Karoly and Bigelow (2005) converted to 2015 dollars. This results in an average reduction in adult crime costs per child of $4,530. This figure accounts for crimes committed up to age 44, with the ages of 20 to 44 being the most crime-prone years (Towson RESI p. 15).

Reduced Tangible Victim Costs

Reduction in crime lowers the costs to victims including property loss, lost productivity, medical care and mental health costs. Karoly and Bigelow (2005, p. 82) estimate that the tangible victim costs are about 1.05 times the justice system cost for adult crimes crime. Using the $4,530 figure for adult crime costs cited above, this results in a tangible victim cost of $4,757 per child.

Reduced Foster and Home Care Costs

Karoly & Bigelow (2005, p. 80) found prekindergarten participation resulted in 5.3 percent fewer cases of abuse and neglect for ages four to 17. Data from California indicate that 31 percent of cases of substantiated abuse and neglect result in foster care (at a rate of $19,000 per year in 2003 dollars, or $24,055 in 2013 dollars) and the remaining 69 percent of substantiated cases result in-home care (at $3,400 per year in 2003 dollars, or $4,305 in 2013 dollars).

The U.S. DHHS (2012, p. xiii) reported that, in 46 states that reported 2012 foster care services and in-home services, 39 percent (146,000/379,000) of victims received foster care services and 61 percent (233,000/379,000) received in-home services. In Maryland specifically, 5,665 of 14,196 (40 percent) of duplicate victims received post-response services (U.S. DHHS, 2012, p. 83). The term "duplicate" refers to the fact that counts from this report are duplicate counts unless otherwise noted. Put differently, a duplicate count means "counting a child each time he or she was a subject of a report. This count also is called a report-child pair" (U.S. DHHS, 2012, p. 112). 1,812 of 5,665 (32 percent) received foster care services (at a rate of $10,110 per year). This $10,110 figure is based on the monthly reimbursement rates for "Regular Foster Care," as published by the Maryland Department of Human Resources (2015). 3,853 of 5,665 (68 percent) received in-home services (at a rate of $4,305 per year, using the 2013-adjusted California figure in the absence of a Maryland figure) (U.S. DHHS, 2012, p. 84).

In 2012, Maryland had a total of 55,775 referrals of child maltreatment (including neglect, physical abuse, sexual abuse, and/or psychological abuse) – a rate of 41.5 total referrals per 1,000 children (U.S. DHHS, 2012, p. 11). In this context, a child is anyone below 18 years old (so ages zero to 17). Of the total maltreatment referrals in Maryland in 2012, 29,627 were screened-out, leaving 26,148 screened-in (substantiated) referrals – 47 percent of the original, total referrals. If it is assumed that the screened-in maltreatment cases were roughly evenly distributed among Maryland children ages zero to 17, then there would be roughly 1,453 (26,148/18) cases for Maryland children at each age level, or at each year of life from zero to 17. Subtracting cases for ages zero to three (the years before any prekindergarten effects could be realized) results in 23,815 cases (29,627 – (1,453 x 4)). Of these 23,815 cases, the study team assumes that 40 percent, or 9,526, received post-response services (based on the percentage of all duplicate victims zero to 17 receiving post-response services). Of the 9,526 receiving services, the team assumes that 32 percent, or 3,048, received foster care (at a cost of $10,110 per year, per child, or $30,815,280 total annually) and 68 percent, or 6,478, received in-home services (at a cost of $4,305 per child per year, or $27,887,790 total annually) (also based on the percentages of all duplicate victims receiving post-response services via foster or in-home care). The total annual costs for four to 17-year-olds in foster and in-home care, then, are $58,703,070 ($30,815,280 + $27,887,790).

The study team applied Karoly & Bigelow's (2005) findings that prekindergarten participation resulted in a 5.3 percentage point reduction in abuse and neglect cases for children ages four to 17. Applying this to the percentage to the total number of foster care cases in Maryland (3,048) results in 162 fewer cases, saving $1,633,210 (162 cases x $10,110 per case). Applying this percentage to the number of children who received in-home care (6,478), results in 343 fewer cases, saving $1,478,052 (343 cases x $4,305 per case). Between foster care savings and in-home care savings, there is a total savings of $3,111,263 Dividing this total across the number of cases that received post response services in Maryland in 2012 (9,526) yields $327 in cost savings per child receiving either foster or in-home care.

Reduced Tangible Losses Due To Child Welfare

Reductions in child maltreatment result in less harm to the victim, measured in tangible losses (medical care/treatment). Using figures estimated for these tangible loses by Karoly and Bigelow (2005, p. 81), the study team calculated a cost per child abuse case of $9,875 and a cost per child care neglect case of $1,519. Applying these figures to the distribution of Maryland cases of child abuse and neglect (34 percent for child abuse and 66 percent for neglect cases), results in an average tangible victim cost of $4,341 (U.S. DHHS, 2012, p. 39). Assuming 5.3 percent fewer cases due to prekindergarten attendance (as per Karoly & Bigelow, 2005, p. 80), results in savings of $230 per child.

In addition, Aos (2004) estimated quality of life costs incurred by victims of abuse and neglect. Aos' estimate for this cost is equivalent to $33,696 in 2013 dollars. Assuming the same 5.3 percentage point decrease in cases of abuse and neglect, this yields an average savings per prekindergarten participant of $1,786.

Appendix C: Public Prekindergarten Standards

MARYLAND EXCELS

Public Pre-Kindergarten Standards July 2013

School Approval	School Approval				
	1	2	3	4	5
				School facility is approved according to the Educational Specifications per COMAR 23.03.02.14C to operate as a public school facility	School facility is approved according to the Educational Specifications per COMAR 23.03.02.14C to operate as a public school facility
				Adequate early learning program of prekindergarten is provided by qualified, designated individuals meeting all COMAR 13A.06.02 requirements and is appropriate to the individual child's needs, while maintaining assignment of staff appropriate to both group size and age of children.	Adequate early learning program of prekindergarten is provided by qualified, designated individuals meeting all COMAR 13A.06.02 requirements and is appropriate to the individual child's needs, while maintaining assignment of staff appropriate to both group size and age of children.
				(Staffing ratio)	(Staffing ratio)

Teacher Qualifications/Professional Development	Teacher Qualifications/Professional Development				
	1	2	3	4	5
				All teachers hold a degree in early childhood education and hold a teaching certificate from the State of Maryland	All teachers hold a degree in early childhood education and hold a teaching certificate as well as an Advanced Professional Certificate (APC) from the State of Maryland.
				Meet all COMAR requirements for teacher certification renewal	Meet all COMAR requirements for teacher certification renewal. Teachers participate in additional opportunities for professional development to enhance their content knowledge and pedagogical skill.
					(Copy of the teacher professional development policy)

CLASS Rating/Validation		CLASS Rating/Validation				
		1	2	3	4	5
	VALIDATION				School has developed and completed a plan to meet all the standards for MSDE Validation or the components of the Quality framework. (MSDE Validation, Classroom Focused Improvement Plan)	School has met the MSDE Validation Standards
					(Copy of Validation improvement plan or receipt of completed improvement plan from MSDE.)	(Letter of Validation award from MSDE.)
	CLASS				CLASS assessment conducted for random sample of at least 50% of the Pre-K classrooms with average score of 4.5, and no classroom scoring less than 3.5.	CLASS assessment conducted for all Pre-K classrooms with average score of 5.0, and no classroom scoring less than 4.0.
					Improvement plan created for any subscale score below 4.5.	Improvement plan created for any subscale score below 5.0.
					(CLASS score sheet completed by MSDE-approved evaluator and improvement plan.)	(CLASS score sheet completed by MSDE-approved evaluator and improvement plan.)

CLASS = Classroom Assessment Scoring System

RED bracketed text indicates documentation required to verify that the standard has been met.

MARYLAND EXCELS

Public Pre-Kindergarten Standards

July 2013

	Developmentally Appropriate Learning and Practice/Child Assessment				
	1	2	3	4	5
DAILY SCHEDULE				Daily schedule is consistent yet responsive to the individual needs of all children, including children with disabilities, special health care needs and English learners.	Daily scheduling is consistent yet responsive to the individual needs of all children, including children with disabilities, special health care needs and English learners. Students are productively engaged at all times, with students beginning to assume responsibility for productivity.
				Daily schedule provides time and support for transitions.	Daily schedule provides time and support for transitions. Transitions are seamless, with students assuming responsibility in ensuring their efficient operation.
				Daily includes both indoor and outdoor activities on a daily basis.	Daily schedule includes both indoor and outdoor activities on a daily basis.
				(Documentation of the MSDE Validation improvement plan for Daily Schedule.)	(Documentation of the MSDE Validation Standards for Daily Schedule.)
CURRICULUM PLANNING				The LEA uses an instructional guide and pacing charts for prekindergarten in compliance with Maryland Common Core Standards and MMSR in all content areas.	The LEA uses an instructional guide and pacing charts for prekindergarten in compliance with the Maryland Common Core State Curriculum and MMSR in all content areas. The guide is clear and allows for different pathways according to diverse student needs. The progression of activities is highly coherent.
				Implementation of a LEA approved curriculum that is aligned with the Maryland Common Core State Curriculum and the MMSR	Implementation of a LEA approved curriculum that is aligned with the Maryland Common Core State Curriculum and the MMSR . Teachers display an extensive knowledge of the curriculum as well as important concepts, skills, and prerequisite relationships across disciplines.
				There is a plan for updating, reviewing and refreshing instructional materials at the LEA and/or school level.	There is a plan for updating, reviewing and refreshing instructional materials at the LEA and/or school level. All of the materials and resources are suitable for students, support the instructional outcomes, and are designed to engage students in meaningful learning. There is evidence of appropriate use of technology and of student participation in selecting and adapting materials.
				There is evidence of differentiated instruction for each age group, children with disabilities, special health care needs and/or English learners. Evidence of use of an IFSP/IEP for individualized planning for students with disabilities (if applicable).	There is evidence of differentiated instruction for each age group, children with disabilities, special health care needs and/or English learners. Evidence of use of an IFSP/IEP for individualized planning for students with disabilities (if applicable). There is evidence of student choice in selecting the different patterns of instructional groups.
				(Documentation of the MSDE Validation improvement plan for Curriculum and Instruction)	(Documentation of the MSDE Validation Standards for Curriculum and Instruction)
ASSESSMENT				The MMSR Assessment is being conducted in prekindergarten. Developmental screening instruments are used for students as part of the school's process for identifying students in need of support or interventions.	The MMSR Assessment is being conducted in prekindergarten. Developmental screening is done on all students. The results are used as part of the school's process for identifying students in need of support or interventions.
				LEA has a procedure regarding child assessment using developmental checklists or assessments designed for use with the curriculum, including formal and informal assessment measures, including developmental checklists, portfolio development, and observation/anecdotal records.	LEA has a procedure regarding child assessment using developmental checklists or assessments designed for use with the curriculum, including formal and informal assessment measures, including developmental checklists, portfolio development, and observation/anecdotal records. Teachers actively and systematically elicit diagnostic information from individual students' formative and summative assessments regarding their understanding.
				LEA has a written procedure that describes their practices for sharing assessment results with families (which includes meeting at least once a year) and/or LEA partners that may be working with the family, including early intervention or special education services.	LEA has a written procedure that describes their practices for sharing assessment results with families (which includes meeting at least once a year) and/or LEA partners that may be working with the family, including early intervention or special education services. The teacher's feedback is timely and of consistently high quality. The response to family concerns is handled with great professional and cultural sensitivity.
				(Documentation of the MSDE Validation improvement plan for Assessment)	(Documentation of the MSDE Validation for Assessment.) (Evidence of the use of a diagnostic screening tool.)

RED bracketed text indicates documentation required to verify that the standard has been met.

MARYLAND EXCELS

Public Pre-Kindergarten Standards

July 2013

Administrative Practices and Policies					
	1	2	3	4	5
FAMILIES				Families receive information about the school's philosophy or mission, eligibility requirements and enrollment procedures, and other information such as: home/school communication, health and safety information, wellness, physical fitness and nutrition, emergency plans, teaching and learning, inclusion of children with disabilities or special health care needs and behavior management.	Families receive frequent and regular information about the school's philosophy or mission, eligibility requirements and enrollment procedures, and other information such as: home/school communication, health and safety information, wellness, physical fitness and nutrition, emergency plans, teaching and learning, inclusion of children with disabilities or special health care needs and behavior management. Information is provided in hard copy and /or electronically.
				If the school provides snacks and/or meals to students, nutritional information is also provided to families.	If the school provides snacks and/or meals to students, nutritional information is provided to families. Families who are homeless or in financial need are directed to food bank resources.
				If the school provides snacks and/or meals - fresh fruits and/or vegetables are included at least twice a week. The school monitors meals provided from home to ensure that children are receiving nutritious, balanced meals.	If the school provides snacks and/or meals - fresh fruits and/or vegetables are provided at least twice a week. The school monitors meals provided from home to ensure that children are receiving nutritious, balanced meals. Students have opportunities for food choices.
				(LEA website for family/parent information and school nutrition program.)	(LEA website for family/parent information and school nutrition program.)
				Families are provided with at least four ways to be involved in the classroom, including conferences, activities, fundraising, decision-making, parent newsletters, volunteer in/and out of the classroom or parent surveys.	Families are provided with at least five ways to be involved in the classroom, including conferences, activities, fundraising, decision-making, parent newsletters, volunteer in/and out of the classroom or parent surveys. Students provide input for projects that could be enhanced by family participation.
				The school conducts parent-teacher conferences at least once a year.	The school conducts parent-teacher conferences at least twice a year. Students share portfolios with families.
				(Copy of the school's family engagement section of the School improvement Plan.)	(Copy of the school's family engagement section of the School Improvement Plan.)
STAFF				Faculty meetings are held regularly.	Faculty meetings are held regularly. Teachers take a leadership role in promoting a culture of professional learning.
				Classroom teachers receive instructional support.	All teaching staff, including classroom assistants, receive instructional support and are provided regular opportunities for collaboration.
				Performance evaluations are conducted according to state and local guidelines.	Performance evaluations are conducted according to state and local guidelines. Formative observations and walkthroughs are conducted regularly.
				The LEA provides a copy of the teacher performance expectations to all staff members.	The LEA provides a copy of the teacher performance expectations to all staff members. Teachers seek out feedback on teaching from both supervisors and colleagues.
				(Copy of staff meeting and performance evaluation schedule.)	(Copy of staff meeting agenda and performance evaluation schedule. Copy of school improvement plan showing opportunities for teacher collaboration.)
COMMUNITY				The school maintains current and accurate information from the school's interdisciplinary meetings (example- Pupil Services Team) for the purpose of supporting the students' early intervention needs, including referral and access to programs for children with disabilities and special health care needs.	The school maintains current and accurate information from the school's interdisciplinary meetings (example- Pupil Services Team) for the purpose of supporting the students' early intervention needs, including referral and access to programs for children with disabilities and special health care needs. Staff make a concerted effort to challenge negative attitudes or practices to ensure that all students, particularly those traditionally underserved, have a fair opportunity to succeed.
				The school accesses community resources and collaborates with community partners.	The school accesses community resources and collaborates with community partners including professional organizations and universities and on the Internet.
				(Sample of community resources online)	(Sample of community resources online)
				The school implements practices for transitioning children between programs (home, school, classrooms, etc), including children with disabilities or special health care needs.	The school implements practices for transitioning children between programs (home, school, classrooms, etc), including children with disabilities or special health care needs. Student portfolios are shared.
				(Copy of Pupil Services Team plan in accordance with COMAR 13A.05.05)	(Copy of pupil Services Team plan in accordance with COMAR 13A.05.05, Statement of how information is shared.)

RED bracketed text indicates documentation required to verify that the standard has been met.

For Informational Purposes Only

Title 13A STATE BOARD OF EDUCATION
Subtitle 06 SUPPORTING PROGRAMS
Chapter 02 Prekindergarten Programs

Authority: Education Article §§2-205(c) and (g) and 7-101.1, Annotated Code of Maryland

.01 Scope and Purpose.

A. This chapter applies to all publicly funded prekindergarten programs for all eligible 4-year-old children, as defined in Education Article, §7-101.1(a)(3), Annotated Code of Maryland, administered by local boards of education or qualified vendors.

B. The overall goal of the prekindergarten program is to provide learning experiences to help children develop and maintain school readiness skills necessary for successful school performance.

C. Local boards of education shall provide prekindergarten programs to accommodate all eligible 4-year-old children seeking enrollment in public school programs.

.02 Definitions.

A. In this chapter, the following terms have the meanings indicated.

B. Terms Defined.

(1) "Accredited" means meets standards of high quality set by the Department's Early Childhood Accreditation Program Standards or by an accrediting organization recognized by the Department.

(2) "Bridge to Excellence Master Plan" means the comprehensive master plan required by Education Article, §5-401, Annotated Code of Maryland.

(3) "Department" means the Maryland State Department of Education.

(4) "CDA" means the Child Development Associate Credential.

(5) "Economically disadvantaged background" means a family whose income would make a child eligible for free or reduced price meals based on eligibility requirements established by the United States Department of Agriculture if the child were in kindergarten.

(6) "Eligibility" means meeting the criteria for enrollment into prekindergarten as stated in Regulation .03A of this chapter.

(7) "Head Start" means a federally sponsored preschool program for children 3 years old to 5 years old from low income families that is licensed by Child Care Administration or administered by local boards of education.

(8) "Homeless student" means a child or youth who lacks a fixed, regular, or adequate nighttime place of residence as defined in COMAR 13A.05.09.02.

(9) "Maryland Common Core State Curriculum" means measurable statements of what students should know and be able to do within a content area as defined and approved for prekindergarten by the Department in collaboration with local school systems.

(10) "Prekindergarten" means a publicly funded program for all eligible 4-year-olds focusing on social/emotional, physical, and cognitive development as described in the Maryland Common Core State Curriculum.

(11) "Qualified vendor" means a State or nationally accredited child care program or an approved nonpublic school that:

COMAR 13A.06.02, as amended effective 10/31/11

(a) Is partnering with a local school system through a memorandum of agreement; and
(b) Meets the requirements of Regulation .05 of this chapter.

(12) "School readiness" means the stage of early development that enables an individual child to engage in and benefit from early learning experiences. As a result of family nurturing and interactions with others, a young child in this stage has reached certain levels of social and emotional development, cognition and general knowledge, language development, and physical well-being and motor development. School readiness acknowledges individual approaches toward learning as well as the unique experiences and backgrounds of each child.

.03 Student Eligibility.

A. A local school system shall enroll in prekindergarten all 4-year-old applicants who are from families with economically disadvantaged backgrounds or who are homeless.

B. For vacancies remaining after compliance with §A of this regulation a local school system may enroll 4-year-old applicants who are not from families with economically disadvantaged backgrounds but who represent a student population that exhibits a lack of school readiness.

C. Prekindergarten Programs for 3-Year-Old Children.

(1) A local school system or qualified vendor may establish a prekindergarten program enrolling 3-year-old applicants who are from economically disadvantaged or homeless families, or who represent a student population that exhibits a lack of school readiness.

(2) A local school system shall be in compliance with 34 CFR §300.115(a)(b) and COMAR 13A.05.01.10 regarding children with disabilities.

(3) A prekindergarten program for 3-year-old children shall meet the requirements of Regulation .05 of this chapter.

.04 Prekindergarten Site Selection.

A. A local school system shall develop a facilities plan identifying appropriate sites to ensure that a publicly funded prekindergarten program is available to all eligible 4-year-old children in its jurisdiction.

B. The facilities plan may include local school system memorandums of agreement with qualified vendors and Head Start to provide prekindergarten program services that meet the local school system responsibilities in accordance with Regulation .05 of this chapter.

.05 Local School System Responsibilities.

A. A local school system shall:

(1) Develop and maintain a policy for determining the eligibility and selection of prekindergarten sites as well as the eligibility of 4-year-old students for prekindergarten programs consistent with the requirements of this chapter;

(2) Develop criteria in reference to Regulation .03B and C of this chapter that establishes procedures to include children in the prekindergarten program who are not eligible under Regulation .03A of this chapter;

(3) Operate the prekindergarten educational program 5 days per week for a minimum of 2.5 hours per day consistent with the school calendar approved by the local board;

(4) Analyze the Department-approved kindergarten assessment system information described in COMAR 13A.08.01.02-3 to evaluate the effectiveness of the prekindergarten program, and make necessary adjustments to the prekindergarten instructional program;

COMAR 13A.06.02, as amended effective 10/31/11

(5) Provide data in the Bridge to Excellence Master Plan needs assessment to indicate progress on prekindergarten program goals;

(6) Provide staffing for each session of prekindergarten to include a teacher who possesses a current State professional certificate in early childhood education and a para-professional with a minimum of a high school diploma, or its equivalent, or a CDA;

(7) Align each prekindergarten program with the Maryland Common Core State Curriculum;

(8) Based on the September 30 enrollment count, maintain an average staff to student ratio of 1:10 with an average of 20 students per classroom; and

(9) Provide responses to Department requests for information and data related to the operation of the prekindergarten program.

B. A qualified vendor shall:

(1) Maintain State or national early childhood program accreditation;

(2) Have the capacity to meet the responsibilities identified in this regulation;

(3) Be licensed to operate a child care center pursuant to COMAR 13A.16; and

(4) Provide responses to Department requests for information and data related to the operation of the prekindergarten program.

COMAR 13A.06.02, as amended effective 10/31/11

References

Alliance for Excellent Education. (2014, July). On the Path to Equity: Improving the Effectiveness of Beginning Teachers. Retrieved 8/23/15 from http://all4ed.org/wp-content/uploads/2014/07/PathToEquity.pdf

Anderson, P. & Levine, P. (2000). Child Care and Mothers' Employment Decisions. In Rebecca M. Blank and David Card, eds., Finding Jobs: Work and Welfare Reform, New York, N.Y.: Russell Sage Foundation.

Barnes, G., Crowe, E., & Schaefer, B. (2007). The Cost of Teacher Turnover in Five School Districts: A Pilot Study. National Commission on Teaching and America's Future (NCTAF). Retrieved 8/23/15 from http://nctaf.org/wp-content/uploads/CTTFullReportfinal.pdf

Barnett, S. (2015, October). Lessons learned from Vanderbilt's study of Tennessee Pre-K. Preschool Matters: A blog of the National Institute for Early Education Research (NIEER). Retrieved 11/2/15 from http://preschoolmatters.org/2015/10/02/lessons-learned-from-vanderbilts-study-of-tennessee-pre-k/

Barnett, S., Jung, K., Youn, M., & Frede, E. (2013, March). Abbott Preschool Program Longitudinal Effects Study: Fifth Grade Follow-Up. National Institute for Early Education Research (NIEER). Rutgers – The State University of New Jersey. Retrieved 8/14/15 from http://nieer.org/sites/nieer/files/APPLES%205th%20Grade.pdf

Barnett, S. (2013, February). Getting the Facts Right on Pre-K and the President's Pre-K Proposal. National Institute for Early Education Research (NIEER) Policy Report. Retrieved 11/2/15 from http://www.nieer.org/sites/nieer/files/Getting%20the%20Facts%20Right%20on%20Pre-K.pdf

Belfield, C. (2006, July). The Fiscal Impacts of Universal Pre-K: Case Study Analysis for Three States. Flushing, NY: Queens College, City University of New York. Retrieved 10/1/15 from http://americasedge.s3.amazonaws.com/docs/ivk/report_ivk_belfield2005.pdf

Blau, D. (2001). The Child Care Problem: An Economic Analysis, New York, N.Y.: Russell Sage Foundation.

Boston Public Schools. (2014, March). BPS early childhood study: program helps close achievement gaps, expands learning. Retrieved 11/2/15 from http://www.bostonpublicschools.org/site/Default.aspx?PageType=3&DomainID=4&PageID=1&ViewID=047e6be3-6d87-4130-8424-d8e4e9ed6c2a&FlexDataID=3439

Brodsky, A. & Workman, S. (2012). ROI Methodology for the New York Early Childhood Cost Model. Augenblick, Palaich and Associates

BUILD Initiative. (2011, September). Quality Rating and Improvement Systems (QRIS) and Head Start Alignment: A discussion paper by Anne Mitchell and Gerry Cobb. QRIS National Learning Network. Retrieved 9/8/15 from http://www.qrisnetwork.org/sites/all/files/resources/gscobb/2011-10-06%2006%3A35/QRIS%20Head%20Start%20Alignment.pdf

Degree Tree. (2015). How to Become a Substitute Teacher in Maryland. Retrieved 9/8/15 from http://www.degreetree.com/resources/how-to-become-a-substitute-teacher-in-maryland

Camilli, G., Vargas, S., Ryan, S., & Barnett, W. S. (2010). Meta-analysis of the effects of early education interventions on cognitive and social development. *The Teachers College Record, 112*(3), 579-620

Campbell, D. (1969). Reforms as experiments. American Psychologist, 24, 409-429.

Campbell, F., Pungello, E., Burchinal, M., Kainz, K., Pan, Y., Wasik, B., Barbarin, O., Sparline, J., and Ramey, C. (2012). Adult Outcomes as a Function of an Early Childhood Educational Program: An Abecedarian Project Follow-Up. *Developmental Psychology, 48*(4), 1033-1043.

Campbell, F., Ramey, C., Pungello, E., Sparling, J., & Miller-Johnson, S. (2002). Early Childhood Education: Young Adult Outcomes From the Abecedarian Project. *Applied Developmental Science, 6*(1), 42-57.

Campbell, F., Pungello, E., Miller-Johnson, S., Burchinal, M., & Ramey, C. (2001). The Development of Cognitive and Academic Abilities: Growth Curves from an Early Childhood Educational Experiment. *Developmental Psychology, 37*(2), 231-242.

Campbell, F. & Ramey, C. (1994). Effects of early intervention on intellectual and academic achievement: A follow-up study of children from low-income families. *Child Development, 65*, 684-698.

Child Care Aware of America. (2015). Research and Reports. Child Care in America: 2015 State Fact Sheets. Maryland. Retrieved 9/8/15 from http://usa.childcareaware.org/wp-content/uploads/2015/06/2015-State-Fact-Sheets-Maryland.pdf

Clark, P. & Kirk, E. (2000). Review of recent research on all-day kindergarten. *Childhood Education 76*(4), 229-231.

Coalition for Evidence-Based Policy. (2015a). Social Programs That Work: Abecedarian Project. Retrieved 11/2/15 from http://evidencebasedprograms.org/1366-2/abecedarian-project

Coalition for Evidence-Based Policy. (2015b). Social Programs That Work: Perry Preschool Project. Retrieved 11/2/15 from http://evidencebasedprograms.org/1366-2/65-2

Colorado Department of Education. (2015). Colorado Preschool Program Legislative Report 2015. Retrieved 11/2/15 from http://www.cde.state.co.us/cpp/cpp2015legislativereport

Cook, T. (2003). Why have educational evaluators chosen not to do randomized experiments? The ANNALS of the American Academy of Political and Social Science, 589, 114-149.

Cunha, F. & Heckman, J. (2007). The Technology of Skill Formation. American Economic Review, 97, 31–47.

Craik, F. & Bialystok, E. (2006). Cognition through the lifespan: mechanisms of change. *Trends in Cognitive Sciences 10*(3), 131-138.

Florida, R. (2000). Competing in the Age of Talent: Quality of Place and the New Economy, report prepared for the R. K. Mellon Foundation, Heinz Endowments, and Sustainable Pittsburgh.

Florida, R. (2002). The Rise of the Creative Class, New York, N.Y.: Basic Books.

Gallup. (2014). Average U.S. Retirement Age Rises to 62. Younger Americans are more likely to expect to retire before age 55. Retrieved 9/8/15 from http://www.gallup.com/poll/168707/average-retirement-age-rises.aspx

Gormley, W. T., Phillips, D. A., Newmark, K., Welti, K., & Adelstein, S. (2011). Social-emotional effects of early childhood education programs in Tulsa. Child Development, 82, 2095-2109.

Greenwood, P., Rydell, C., Abrahamse, A., Caulkins, J., Model, K., & Klein, S. (1994). Three Strikes and You're Out: Estimated Benefits and Costs of California's Mandatory-Sentencing Law. Retrieved 8/23/15 from http://www.rand.org/pubs/monograph_reports/MR509.html

Gullo, D.F. (2000). The long term educational effects of half-day vs. full-day kindergarten. *Early Child Development and Care, 160*, 17-24.

Halpern, R. (2013). Tying early childhood education more closely to schooling: Promise, perilsand practical problems. *Teachers College Record, 115*, 1-28.

Han, W. & Waldfogel, J. (2001, Sept.) Child Care Costs and Women's Employment: A Comparison of Single and Married Mothers with Pre-School Aged Children. *Social Science Quarterly, 82*(3), 552–568.

Hechinger Report (2010, March). Pre-K in Depth: Preschool saves us money, but how much? Retrieved 9/8/15 from http://hechingerreport.org/how-much-money-does-preschool-save-us/

Heckman, J., Moon, S. H., Pinto, R., Savelyev, P., & Yavitz, A. (2010, July). A New Cost-Benefit and Rate of Return Analysis for the Perry Preschool Program: A Summary. IZA Policy Paper No. 17.

Heckman, J. (2006, June). Skill Formation and the Economics of Investing in Disadvantaged Children. *Science, 312,* 1900-1902.Indeed. (2015). Substitute Teacher Salary in Maryland. Retrieved 9/8/15 from http://www.indeed.com/salary/q-Substitute-Teacher-l-Maryland.html

Humann, C., Palaich, R., and Griffin, S. (2015). Final School Size Study Report: Impact of Smaller Schools. Denver, CO: Augenblick, Palaich and Associates.

Justice Policy Institute. (2014, December). Sticker Shock: Calculating the Full Price Tag for Youth Incarceration. Retrieved 8/14/15 from http://www.justicepolicy.org/uploads/justicepolicy/documents/sticker_shock_final_v2.pdf

Karoly, L. & Bigelow, J. (2005). The Economics of Investing in Universal Preschool Education in California. RAND Corporation.

Kelly, P. & Jones, D. (Revised 2007, January). A New Look at the Institutional Component of Higher Education Finance: A Guide for Evaluating Performance Relative to Financial Resources. National Center for Higher Education Management Systems (NCHEMS).

Kirk, D. (2015, October). Does Pre-K Make Any Difference? *The New York Times.* Retrieved 11/2/15 from http://www.nytimes.com/2015/10/04/opinion/sunday/does-pre-k-make-any-difference.html

Kline, P. & Walters, C. (2015, October). Evaluating Public Programs with Close Substitutes: The Case of Head Start. National Bureau of Economic Research (NBER) Working Paper Series: Working Paper 21658.

Knudsen, E., Heckman, J., Cameron, J., & Shonkoff, J. (2006). Economic, neurobiological, and behavioral perspectives on building America's future workforce. *PNAS*, *103*, 10155-10162.

Lamy, C. (2013). American Children in Chronic Poverty: Complex Risks, Benefit-Cost Analyses, and Untangling the Knot. Plymouth, UK: Lexington Books.

Leak, J., Duncan, G., Li, W., Magnuson, K., Schindler, H., & Yoshikawa, H. (2010, October). Is timing everything? How early childhood education program impacts vary by starting age, program duration and time since the end of the program. Prepared for presentation at the Association for Policy Analysis and Management meetings, November 4-6, 2010 in Boston, MA. Retrieved 10/28/15 from http://www.education.uci.edu/docs/Leak_Duncan_Li_Timing_Paper_APPAM_102810.pdf

Legislative Handbook Series, Volume IX: Education in Maryland. (2014). Retrieved 8/24/15 from http://mgaleg.maryland.gov/Pubs/LegisLegal/2014-legislativehandbookseries-vol-9.pdf

Legislative Handbook Series, Volume VIII: Maryland's Criminal and Juvenile Justice Process. (2014). Retrieved 8/14/15 from http://mgaleg.maryland.gov/Pubs/LegisLegal/2014-legislativehandbookseries-vol-8.pdf

Lipsey, M., Farran, D., & Hofer, K. (2015, September). A Randomized Control Trial of a Statewide Voluntary Prekindergarten Program on Children's Skills and Behaviors through Third Grade. Peabody Research Institute. Retrieved 10/28/15 from http://peabody.vanderbilt.edu/research/pri/VPKthrough3rd_final_withcover.pdf

Love, L., & Crompton, J. (1999, March). The Role of Quality of Life in Business (Re)Location Decisions," *Journal of Business Research, 44*(3), 211–222.

Magnuson, K., Ruhm, C., & Waldfogel, J. (2007). The persistence of preschool effects: Do subsequent classroom experiences matter? Early Childhood Research Quarterly, 22, 18-38.

Maryland Department of Juvenile Services. (2015, January). Data Resource Guide: FY 2014. Retrieved 9/8/15 from http://www.djs.maryland.gov/drg/Full_2014_DRG.pdf

Maryland Department of Juvenile Services. (2013, December). Data Resource Guide: FY 2013. Retrieved 8/14/15 from http://djs.maryland.gov/drg/Full_DRG_With_Pullouts_2013.pdf

Maryland Department of Human Resources. (2015). Financial Information: Family Foster Care Rates. Retrieved 9/8/15 from http://www.dhr.state.md.us/blog/?page_id=2935

Maryland EXCELS. (2014). 2014 Standards: Child Care Center Standards. Retrieved 9/8/15 from http://olms.cte.jhu.edu/olms2/data/ck/sites/217/files/Child%20Care%20Center%20Standards%20March%202014%20(5).pdf

Maryland EXCELS. (2014) 2014 Standards: Family Child Care Standards. Retrieved 9/8/15 from http://olms.cte.jhu.edu/olms2/data/ck/sites/217/files/Family%20Child%20Care%20Standards%20March%202014.pdf

Maryland Federal Preschool Expansion Grant Application (2014). Retrieved 9/8/15 from http://www2.ed.gov/programs/preschooldevelopmentgrants/applications/mdapplicationpdg2015.pdf

Maryland Public Schools. (2014). Prekindergarten Expansion Act of 2014: FAQ. Retrieved 9/8/15 from http://www.marylandpublicschools.org/MSDE/divisions/child_care/docs/PrekExpAct2014FAQ.pdf

Maryland State Data Center, Department of Planning. (2015). Public School Enrollment, Historical 2014 and Projections 2015 to 2024. Table 1: Summary of Historical and Projected Public School Enrollment for Maryland. Retrieved 8/14/15 from http://www.mdp.state.md.us/msdc/School_Enrollment/Table1.pdf

Maryland State Department of Education. (2014). Estimating the Number of Three and Four Year Olds in Maryland Below 300% of Poverty. Retrieved 9/8/15 from http://dlslibrary.state.md.us/publications/Exec/MSDE/SB332Ch2(3)_2014.pdf

Maryland State Department of Education (2011, October). Analysis of Professional Salaries Maryland Public Schools. Retrieved 8/23/15 from http://www.marylandpublicschools.org/NR/rdonlyres/F5B571DF-A470-47BE-9516-05DC870DEEBA/31303/analys13.pdf

Maryland State Department of Education. (2011). The Fact Book 2010-2011: A Statistical Handbook. Retrieved 8/14/15 from http://marylandpublicschools.org/NR/rdonlyres/0C24833A-9CBE-4C09-9010-B7BD88F4B1E0/31190/Fact_Book_2010_2011_1.pdf

Maryland State Department of Education. (2009, December). Maryland's Preschool for All Business Plan. Retrieved 9/8/15 from: http://www.marylandpublicschools.org/NR/rdonlyres/50E778B3-88E6-4276-8CA4-981A50B7F31D/22305/PreKBusPln1209.pdf

Maryland State Department of Education, Division of Early Childhood Development (2015). Operational Data and Reports: Office of Child Care – Licensing Branch. (2015). Child Care Subsidy Program Data – FY 2016. "Average SFY 14" tab. Retrieved 9/8/2015 from http://www.marylandpublicschools.org/MSDE/divisions/child_care/Reports.htm

Maryland State Department of Education, Division of Early Childhood Development. (2014). Early Childhood Regulations. These "subtitles and chapters of Title 13A State Board of Education under the Code of Maryland Regulations (COMAR) govern early childhood programs in Maryland." Retrieved 9/8/15 from http://www.marylandpublicschools.org/msde/divisions/child_care/regulat.htm

Masse, L. & Barnett, S. (2002). A Benefit-Cost Analysis of the Abecedarian Early Childhood Intervention. New Brunswick, N.J.: National Institute for Early Education Research (NIEER). Retrieved 11/2/15 from http://nieer.org/resources/research/AbecedarianStudy.pdf

Miller, T., Fisher, D., & Cohen, M. (2001, January). Costs of Juvenile Violence: Policy Implications. *Pediatrics, 107*(1). Retrieved 8/23/15 from http://pediatrics.aappublications.org/content/107/1/e3.full

Morris, J. & Helburn, S. (2011, January). Boulder Benefit Cost Analysis.

National Education Association (NEA). (2013, December). 2012-2013 Average Starting Teacher Salaries by State. Retrieved 8/23/15 from http://www.nea.org/home/2012-2013-average-starting-teacher-salary.html

National Institute for Early Education Research (NIEER). (2014). State of Preschool 2013. Retrieved 8/23/15 from http://nieer.org/sites/nieer/files/Maryland_2013.pdf

National Institute for Early Education Research (NIEER). (2015). State of Preschool 2014. Retrieved 8/14/15 from http://nieer.org/sites/nieer/files/Maryland_2014_0.pdf

Nores, M., Barnett, S., Friedman-Krauss, A., & Francis, J. (2015). Technical Report for the City of Seattle: A Review of the Evidence on Preschool Programs and a Comparison of Selected City and State Programs. National Institute for Early Education Research (NIEER).

Puma, M., Bell, S., Cook, R., Heid, C., Broene, P., Jenkins, F., Mashburn, A., Downer, J. (2012, October). Third Grade Follow-up to the Head Start Impact Study: Final Report. Office of Planning, Research and Evaluation (OPRE), Administration for Children and Families, U.S. Department of Health and Human Services. Retrieved 10/29/15 from http://files.eric.ed.gov/fulltext/ED539264.pdf

Puma, M., Bell, S., Cook, R., & Heid, C. (2010, January). Head Start Impact Study: Final Report. Office of Planning, Research and Evaluation (OPRE), Administration for Children and Families, U.S. Department of Health and Human Services. Retrieved 10/29/15 from http://www.acf.hhs.gov/sites/default/files/opre/hs_impact_study_final.pdf

Puma, M., Bell, S. Cook, R., Heid, C., & Lopez, M. (2005). Head Start Impact Study: First Year Findings. Washington, D.C.: U.S. Department of Health & Human Services, Administration for Children and Families.

Yoshikawa, H., Weiland, C., Brooks-Gunn, J., Burchinal, M., Espinosa, L., Gormley, W., Ludwig, J., Magnuson, K. Phillips, D., & Zaslow, M. (2013, October). Investing in Our Future: The Evidence Base on Preschool Education. Society for Research in Child Development. Foundation for Child Development.

Regional Economic Studies Institute (RESI) at Towson University for the Task Force on Universal Preschool Education. (2007, October). Voluntary Pre-Kindergarten for All: A Cost-Benefit Analysis for the State of Maryland.

Reynolds, A., Richardson, B., Hayakawa, M., Lease, E., Warner-Richter, M., Englund, M., Ou, S., & Sullivan, M. (2014, November). Association of a Full-Day vs. Part-Day Preschool Intervention with School Readiness,

Attendance, and Parental Involvement. *JAMA 312*(20), 2126-2134. Retrieved 9/28/15 from http://jama.jamanetwork.com/article.aspx?articleid=1938567

Reynolds, A., Temple, J., Robertson, D., & Mann, E. (2002). Age 21 Cost-Benefit Analysis of the Title I Chicago Child-Parent Centers. *Educational Evaluation and Policy Analysis, 24*(4), 267-303.

Reynolds, A., Temple, J., Robertson, D., & Mann, E. (2001, June). Age 21 Cost-Benefit Analysis of the Title I Chicago Child-Parent Center Program: Executive Summary. Retrieved 11/2/15 from http://www.waisman.wisc.edu/cls/cbaexecsum4.html

Rice University Center for Education. (2012). School Literacy and Culture: Chicago Child Parent Center. Retrieved 11/2/15 from http://centerforeducation.rice.edu/slc/LS/CCPC.html

Robin, K., Frede, E. & Barnett, S. (2006, May). Is More Better? The Effects of Full-Day vs. Half-Day Preschool on Early School Achievement. NIEER Working Paper. Retrieved 9/28/15 from http://nieer.org/resources/research/IsMoreBetter.pdf

Sapolsky, R. (2004). Mothering Style and Methylation. *Nature Neuroscience 7,* 791-792. Retrieved 11/2/15 from http://palgrave.nature.com/neuro/journal/v7/n8/full/nn0804-791.html

Sawhill, I. (2008). Paying for Investments in Children. Big Ideas for Children: Investing in our Nation's Future.

Sawhill, I. (2014, May). Widening the Opportunity Bottlenecks in the Early Years: Parenting is Key. From the Series "Bottlenecks: A New Theory of Educational Opportunity," Number 8 of 12. Brookings Institution. Retrieved 8/10/15 from http://www.brookings.edu/blogs/social-mobility-memos/posts/2014/05/07-widening-opportunity-bottlenecks-parenting-sawhill

Schimke, A. (2015, October). Landmark study sparks question: Do preschool effects stick in Colorado but not in Tennessee? Chalkbeat. Retrieved 10/30/15 from http://co.chalkbeat.org/2015/10/23/landmark-study-sparks-question-do-preschool-effects-stick-in-colorado-but-not-in-tennessee/#CDEdata

Schweinhart, L. (2004). The High/Scope Perry Preschool Study Through Age 40: Summary, Conclusions, and Frequently Asked Questions.

Schweinhart, L., Barnes, H., and Weikart, D. (1993). Significant Benefits: The High/Scope Perry Preschool Study Through Age 27. High/Scope Press.

Scrivner, S. & Wolfe, B. (2002, October). Universal Preschool: Much to Gain but Who Will Pay? Foundation for Child Development Working Paper Series.

Shonkoff, J. & Phillips, D. (Eds.) (2000). Committee on Integrating the Science of Early Childhood Development, Board on Children, Youth, and Families. From Neurons to Neighborhoods: The Science of Early Childhood Development. Washington, D.C.: National Academy Press.

State Higher Education Executive Officers Association (SHEEO). (2014). State Higher Education Finance: FY 2014. Retrieved 8/24/15 from http://www.sheeo.org/sites/default/files/project-files/SHEF%20FY%202014-20150410.pdf

Thompson, R. & Haskins, R. (2014, May). Early Stress Gets Under the Skin: Promising Initiatives to Help Children Facing Chronic Adversity. Brookings Institution.

U.S. Census Bureau. (2013). Table SSF008: Per Pupil Amounts for Current Spending of Public Elementary-Secondary School Systems by State: FY 2013 – United State – States. 2013 Annual Survey of School System Finances. Retrieved 8/14/15 from

http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=SSF_2013_SSF008.US01&prodType=table

U.S. Census Bureau. (2007). Table B20004: Median Earnings in the Past 12 Months (in 2007 Inflation-Adjusted Dollars) by Sex by Educational Attainment for the Population 25 Years and Over. Universe: Population 25 years and over with earnings. 2005-2007 American Community Survey 3-Year Estimates. Retrieved 9/8/15 from http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_07_3YR_B20004&prodType=table

U.S. Department of Health & Human Services (DHHS). (2012). Child Maltreatment 2012. Retrieved 8/14/15 from http://www.acf.hhs.gov/sites/default/files/cb/cm2012.pdf

Vera Institute of Justice. (2012, January). The Price of Prisons | Maryland: What Incarceration Costs Taxpayers. Retrieved 8/14/15 from http://www.vera.org/files/price-of-prisons-maryland-fact-sheet.pdf

Weiland, C., Ulvestad, K., Schs, J., & Yoshikawa, H. (2013). Associations between classroom quality and children's vocabulary and executive function skills in an urban public prekindergarten program. *Early Childhood Research quarterly, 28*, 199-209. Retrieved 11/2/15 from http://www.sciencedirect.com/science/article/pii/S0885200612001172

Weiland, C. & Yoshikawa, H. (2013, December). Impacts of a Prekindergarten Program on Children's Mathematics, Language, Literacy, Executive Function, and Emotional Skills. *Child Development, 84*(6), 2112-2130. Retrieved 10/30/15 from http://onlinelibrary.wiley.com/doi/10.1111/cdev.12099/abstract

Wong, V. C., Cook, T. D., Barnett, W. S., & Jung, K. (2008). An effectiveness-based evaluation of five state prekindergarten programs. Journal of Policy Analysis and Management, 27, 122-154.

Zhai, F., Raver, C.C., & Jones, S.M. (2012). Quality of subsequent schools and impacts of early interventions: Evidence from a randomized controlled trial in Head Start settings. *Children and Youth Services Review, 34*, 946-954.