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The Impact of Infant and Toddler Childcare Programs

Elaine Bonner-Tompkins

OLO Office of Legislative Oversight

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Executive Summary of OLO Report Number 2018-3 November 14, 2017

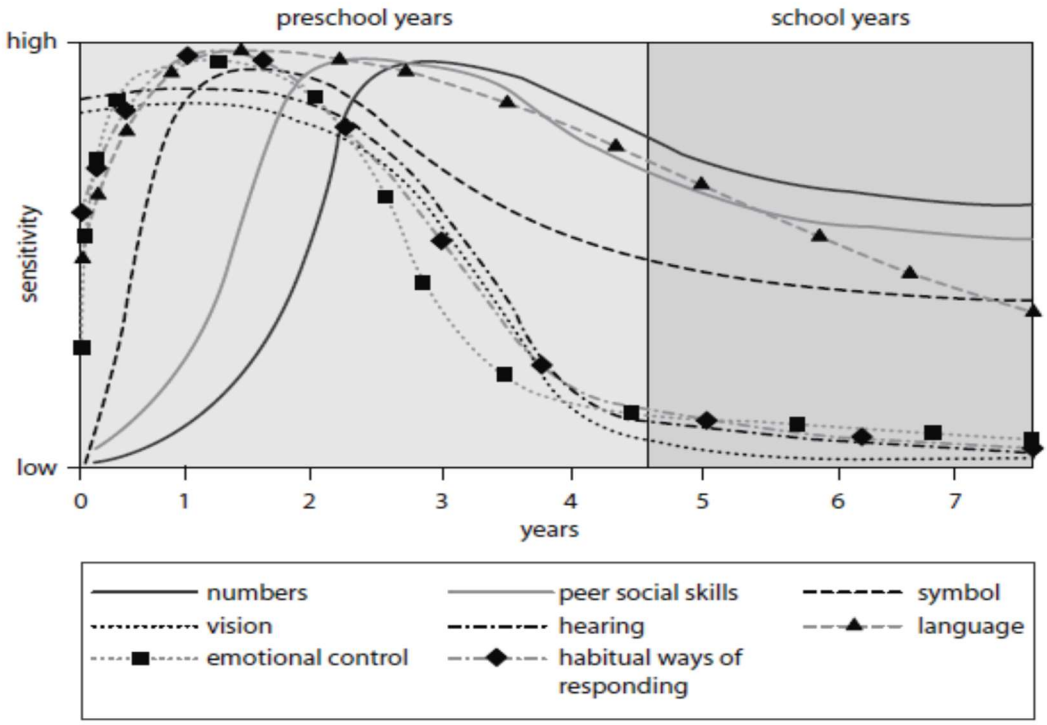
Summary: The Council tasked OLO to develop this report describing the impact of infant and toddler programs as follow up to last year's Pre-K Report. This report synthesizes the research describing the impact of high-quality infant and toddler childcare. Three major findings emerge from OLO's review:

1. High-quality infant and toddler care can help narrow the school readiness gap by income;
2. The long-term benefits of high-quality infant and toddler programs exceed their initial costs; and
3. The return on investment for high-quality infant and toddler childcare programs is on par with other early childhood education programs, including pre-k.

Early Brain Research and School Readiness

The early brain research finds that children's early experiences with caregivers help determine whether their brain's architecture will develop in ways that promote future learning, behavior and health. As shown in the figure below, children's brains are especially sensitive during the first three years of life.

Sensitive Periods in Early Brain Development



Source: Council for Early Child Development (2010).

Early brain research can help inform policymakers about the benefits of investing in high-quality childcare for infants and toddlers to reduce the school readiness gap. Evaluations of high-quality infant and toddler childcare show that such programs demonstrate a more favorable impact on low-income children than on higher-income children. Such programs paired with robust preschool programs offer the greatest promise for narrowing the achievement gap by income in school readiness.

Benefits of High-Quality Infant and Toddler Childcare

Evaluations of infant and toddler childcare demonstration projects and of Early Head Start show that among low-income children, high-quality infant and toddler childcare programs contributed to:

- Children's cognitive, language, and socio-emotional development;
- Higher reading and mathematics achievement in elementary and secondary school;
- Reduced grade retention and special education placement;
- Increased graduation rates and college attendance;
- Improved attention and approaches to learning; and
- Fewer behavioral problems.

Benefit-cost analyses comparing the cost of high-quality infant and toddler childcare programs to benefits find a favorable return on investment as well. The table below1 compares benefit-cost analyses for the Infant Health Development Program (IHDP) and the Abecedarian Programs that provided full-day childcare to infants and/or toddlers. The benefit/cost ratios estimated range from 1.8 to 7.3, meaning every dollar spent on a program generates $1.80 to $7.30 return in benefits that can include increased earnings, reduced government spending on remedial programs, and reduced criminal justice costs.

Summary of Benefit-Cost Ratios for IHDP and Abecedarian Programs

Program Evaluations	IHDP			Abecedarian		
	Program Costs	Lifetime Benefits	Benefit/Cost Ratio	Program Costs	Lifetime Benefits	Benefit/Cost Ratio
Kilburn and Karoly (2008)	$49,021	n/a	-	$42,871	$195,000	4.6
Bartik (2014)	$35,000	$63,000	1.8	$87,000	$209,000	2.4
Garcia, Heckman, Lead, and Brados (2016)	-	-	-	$92,570	$675,761	7.3

To understand the relative value of high-quality infant and childcare programs compared with preschool programs for 4-5 year olds, OLO examined the research literature on rates of return for the different early childhood education programs. Bearing in mind that it is not possible to make true apples to apples comparisons of rates of return on investment because these are calculated in different ways, the current body of evidence indicates that return on investment for high-quality infant and toddler childcare programs is on par with other early childhood education programs, including pre-k.

OLO Recommendations for Discussion

Based on this report's project findings regarding the favorable impact of high-quality infant and toddler childcare, OLO offers two recommended issues for Council discussion with agency representatives:

- ***What strategies can be undertaken to enhance the quality of current infant and toddler childcare slots in the County?***
- ***If the County or the State expands publicly funded pre-k, what strategies can be undertaken to maintain the quality and quantity of existing infant and toddler childcare slots?***

For a complete copy of OLO-Report 2018-3, go to:
http://www.montgomerycountymd.gov/OLO/Reports/CurrentOLOReports.html

Office of Legislative Oversight Report 2018-3

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Chapter 1. Authority, Scope, and Organization

A. Authority

Council Resolution 18-882, FY 2018 Work Program for the Office of Legislative Oversight, adopted July 25, 2017

B. Scope, Purpose, and Methodology

The County Council tasked the Office of Legislative Oversight to develop this report describing the impact of infant and toddler programs on child development and later outcomes as follow up to OLO Report 2016-7, ***Pre-K in Montgomery County and in Other Jurisdictions***. With the significant return on investment noted for high-quality pre-k programs among low-income students noted in that report, the Council tasked OLO to undertake this project to describe the related return on investment of high-quality childcare programs for infants and toddlers. A central question of interest is whether pre-k is too late to invest in early childhood education, particularly for low-income children.

This OLO report serves as primer on the potential impact of high-quality infant and toddler childcare on children, parents, and the public. Toward this end, this report synthesizes the research literature evaluating the impact of infant and toddler childcare. This project focuses on the impact of childcare programs for infants and toddlers rather than home-visiting programs that also serve infants and toddlers. Further, this project compares the estimated ROI of infant and toddler childcare programs to home-visiting programs for infants and toddlers and pre-k programs for three- and four-year-olds.

This report is organized as follows:

- **Chapter 2, How High-Quality Infant and Toddler Care Matters,** describes the research on early brain development, the anticipated impact of environment on child development, and the school readiness gap by income that is exacerbated by the high cost of childcare.

- **Chapter 3, Impact of High-Quality Infant and Toddler Education and Care**, describes the impact of infant and toddler care on children's development and other outcomes, and their estimated return on investment as compared to other early childhood programs.

- **Chapter 4, Project Findings and Recommended Discussion Issues,** summarizes this report's three major findings and offers two recommended discussion issues for the County Council to consider with Executive Branch representatives for follow-up.

Overall, OLO finds that the delivery of high-quality childcare for infants and toddlers offers an opportunity to improve school readiness, particularly for low-income children. High-quality infant and toddler programs coupled with high-quality pre-k programs can positively impact the school readiness gap, narrowing it by family income. These programs also generate long-term benefits for participants and society that exceed their initial program costs.

Analyses of available program evaluations also suggest that the return on investment for high-quality infant and toddler childcare for low-income infants and toddlers is on par with other early childhood education investments. This finding runs counter to perception that investments in infant and toddler programs yield higher returns than investments in pre-kindergarten programs. However, comparing cost-benefit analyses across programs can also be problematic because program evaluations across different programs and among different researchers rely on varying methodologies and assumptions that undermine apples to apples comparisons to determine the relative value of different programs.

As the County and the State consider options for expanding pre-k slots for four-year-olds, local agencies should consider and prepare for the impact of pre-k expansion on the current supply of infant and toddler slots. Enhancing the quality of current infant and toddler childcare providers is a related concern. OLO recommends that DHHS develop an action plan for maintaining the availability and quality of infant and toddler childcare slots in the County if public pre-k options for four-year-olds are expanded and update the Council on current efforts to enhance the quality of infant and toddler childcare slots and programs.

Chapter 2. How High-Quality Infant and Toddler Care Matters

This chapter describes how the environment impacts early brain development and how high-quality caregiving shapes the experiences of developing children. This section also describes how access to high-quality caregiving varies by family income and contributes to gaps by income, race, and ethnicity in school readiness. This section is presented in the following three subparts:

- Quality Caregiving and Early Brain Development;
- School Readiness Gaps by Income, Race, and Ethnicity; and
- High Cost of Infant and Toddler Care in Montgomery County.

Overall, this section shows that improved access to high-quality caregiving from families and providers among low-income families could help narrow the school readiness gap by income.

A. Quality Caregiving and Early Brain Development

As noted by the Children's Defense Fund[1] in their summary of the National Research Council's watershed Neurons to Neighborhoods report,[2] quality caregiving is extremely important to infants and toddlers because the first three years of life represent a significant stage in a child's brain development. During the first three years of life, children develop many of the basic learning patterns and abilities that they will build upon for the rest of their lives. More specifically:

- Research has shown that how children grow and develop depends on the interplay between nature (the child's genetic endowment) and nurture (including their nutrition, surroundings, care, and stimulation).

- Early learning experiences shaped by the quality of a young child's environment and social experience created "decisive, long-lasting impact on their well-being and ability to learn." These early experiences affect how children cope with stress and regulate their own emotions.

- Research shows that children's brain development is far more susceptible to adverse influences than had been realized. This means that children's environments play a significant role in influencing how they develop. Environmental influences not only affect a child's general development, but affect how the intricate circuitry of the brain is "wired."

The World Bank's synthesis of brain research[3] offers a similar description of how early brain development informs children's social and educational development. Children develop rapidly during their early years and positive or negative development in any of these areas has implications for their wellbeing, school readiness, and later success in life. During a child's early years, there are four critical areas of development: physical, cognitive, linguistic, and socio-emotional.

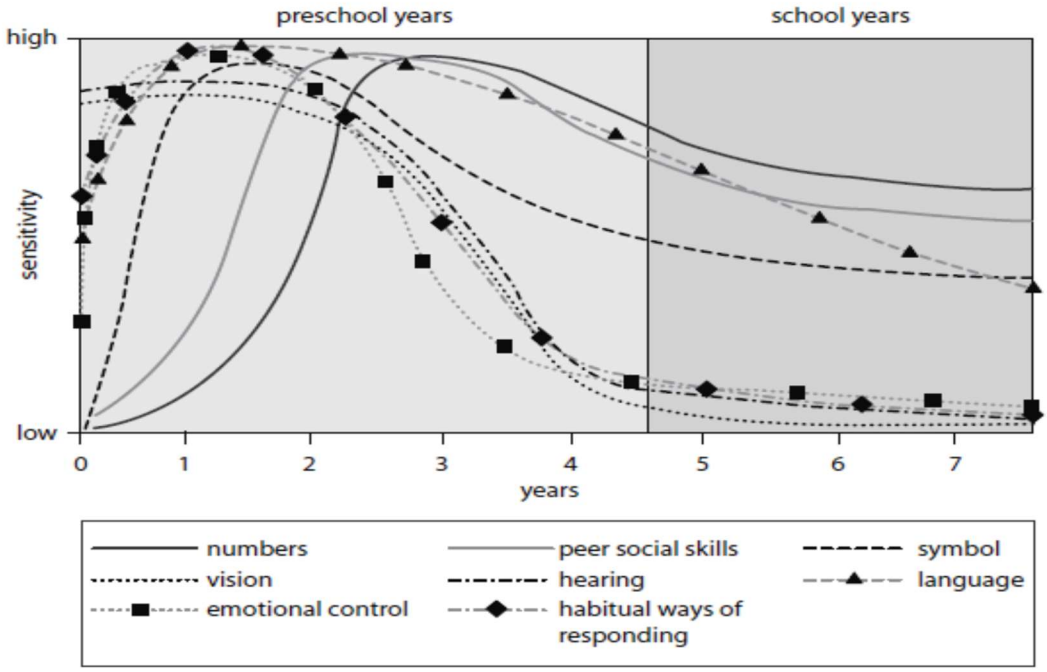
[1] Children's Defense Fund – 2003 Key Facts - Infants and Toddlers Are Particularly Vulnerable: Good Childcare and Early Education Can Play a Vital Role in Their Development

[2] National Academy of Sciences – 2000 - From Neurons to Neighborhoods - http://nap.edu/9824

[3] The World Bank, January 2013 – What Matters Most for Early Childhood Development: A Framework Paper", Systems Approach for Better Education Systems 90183, Number 5

Experiences in early childhood shape the programming and wiring of the brain. Neurological studies show that synapses develop rapidly during a child's first few years, forming the basis of cognitive and emotional functioning for the rest of their life. As noted in Figure 1 below, there are several sensitive periods in children's development that peak well before a child begins school. Early experiences help determine whether a child's brain architecture develops in ways that promote future learning, behavior, and health. These influences impact the development of skills that determine outcomes later in life. [4]

Figure 1: Sensitive Periods in Early Brain Development



Source: Council for Early Child Development (2010).

The World Bank's research synthesis on early child development also notes that about half of the observed variance in cognitive abilities between children results from the quality of a child's environment, early stimulation, and learning opportunities, while genetic influences account for the other half. As such, interventions aimed at improving the quality of infant and toddler care can capitalize on these sensitive periods to improve children's long-term trajectories of cognitive learning and emotional development.

Theories on human capital in economics also help to explain how high-quality care for infants and toddlers can impact children's skill development and productivity. According to this conceptualization:[5]

- Child development is a process that happens over multiple time periods;
- The stock of skills generated in one period depends on the skills developed in previous periods;
- Both nature and nurture play roles in further skill development, and complement each other;

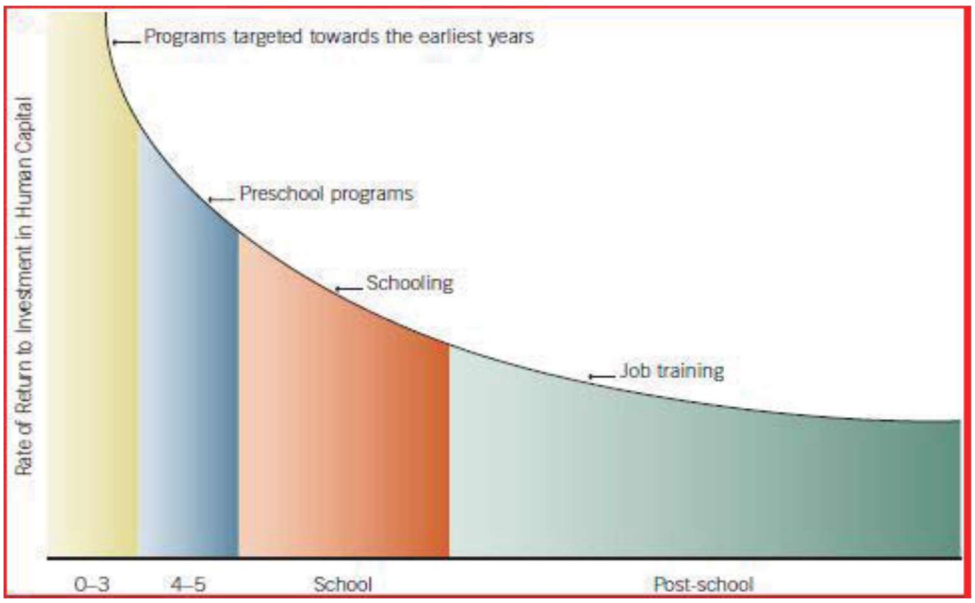
[4] Kilburn and Karoly, The Economics of Early Childhood Policy: What the Dismal Science Has to Say About Investing in Children, RAND Corporation, 2008

[5] Ibid

- Human capacities include a set of productive characteristics, including cognitive and non-cognitive skills, experience and health; and
- Investing in human capital formation early in the life cycle is likely to be more efficient than mitigating disadvantage at older ages.

Figure 2 below from Heckman[6] illustrates the last feature of the human capital model – that investments made early in the life cycle via infant and toddler and pre-school programs offer greater returns on investment than investments made later in childhood and into adulthood. This conceptualization aligns with the belief that efforts to prevent problems will yield greater successes than efforts that seek to remediate problems. Indeed, as one of the leading advocates in economics for expanding early childhood education programs, Heckman contends that beginning early education programs at pre-k, particularly for low-income children, is too late.[7]

Figure 2: Returns to a Unit Dollar Invested



Source: Heckman, 2008

[6] Heckman, Schools, skills and synapses. Economic Inquiry 46(3), 289–324, July 2008 https://artscimedia.case.edu/wp-content/uploads/sites/35/2014/02/14194019/Heckman-article-2010-child-development-strategies.pdf

[7] Heckman, December 7, 2012 cited on www.heckmanequation.org

B. School Readiness Gaps by Income, Race and Ethnicity

National datasets describing the early experiences of young children and their families reveal gaps in school readiness by family income, race, and ethnicity that may be exacerbated by differences in early childhood experiences that correlate with income, race, and ethnicity. For example, the Economic Policy Institute's analysis of the NCES Early Childhood Longitudinal Study, Kindergarten Class of 2010-11 (ECLS-K 2010-11)[8] finds a wide gap in school readiness by income. They find that among children's reading and math scores:

- Children in the highest socioeconomic group (the high SES fifth) had reading and math scores that were, on average, a full standard deviation higher than their peers in the lowest SES group.
- Children in the middle SES group had reading and math scores that, on average, were half a standard deviation higher than their peers in the lowest SES group.

Additionally, they found that black and Latino English language learners begin kindergarten with the greatest disadvantages in math and reading, due largely to links between minority status and social class/income. More specifically:

- There are significant gaps in reading and math skills among white and Asian children compared to black and Latino children. Yet, these gaps are much smaller than gaps based on social class.
- Race-based skills gaps shrink when children's social class is considered. This affirms prior research findings that black and Latino students' lower socioeconomic status largely explains gaps in school readiness by race and ethnicity.
- Adding controls for both social class and a set of parenting characteristics and practices that included enrichment opportunities and early literacy routines[9] makes the black/white gap in reading disappear almost entirely and the reading gap between non-English speaking Latino children and their white counterparts shrink by more than two-thirds.[10]

The ECLS-K 2010-11 also reveals gaps among measures of non-cognitive skills by income where:

- The lowest income children lagged substantially in non-cognitive skills as rated by both parents and teachers. For example, gaps in self-control and approaches to learning reported by teachers by student income were half as large as the gaps in math and reading skills by income.
- Both parents and teachers perceive income-based gaps in students' social skills, with high SES students evidencing even larger advantages when reported by teachers.
- Both parents and teachers also note gaps in persistence between low- and high-income students, with teachers perceiving larger gaps by income in persistence than parents.

[8] Garcia and Weiss**,** Early Education Gaps by Social Class and Race Start U.S. Children Out on Unequal Footing: Summary of the Major Findings in Inequalities at the Starting Gate – Economic Policy Institute and Broader, Bolder Approach to Education, 2015

[9] This variable indicated whether the child was engaged in enrichment activities with parents as a composite that captures early literacy practices, leisure activities, other rules, and routines.

[10] That such characteristics do little to mitigate the impact of social class, but substantially reduce the influence of race on gaps, suggests an association between these characteristics and socio-economic status. For example, black parents may read less to their children because they are less likely to have a second parent to help, rather than because of race.

The Economic Policy Institute (EPI) acknowledges that issues of race, ethnicity, and income often compound one another, with Latino and black children experiencing higher odds of living in poverty, living with one parent, and lacking access to preschool. Nevertheless, EPI finds that family income more so than race, ethnicity, parenting practices, or pre-k experience account for the cognitive and non-cognitive differences in school readiness among children in the ECLS-K 2010-11. Similarly, the National Institute for Child Health and Development Study (NICHD) finds that parental socio-economic status drives children's development more so than their early childcare experience.[11] EPI also finds that the association between income and school readiness in the ECLS-K remained virtually unchanged between 1998 and 2010.[12]

It is important to note, however, that differences in parenting resources and access to high-quality early childcare experiences by income exacerbate the school readiness gap. For example, Kahlil et al., find that affluent parents are more likely to display behaviors that support children's development by: [13]

- Displaying more authoritative (vs. authoritarian) parenting styles (Pinderhughes, Dodge, Bates, Pettit, & Zelli, 2000),
- Engaging in more sensitive and responsive mother-child interactions (NICHD Early Childcare Research Network, 2004),
- Using greater language stimulation (Hart & Risley, 1995; Phillips, 2011), and
- Using greater levels of parental management and advocacy (Lareau, 2003).

A famous example of differential parenting practices by family income is the study by Betty Hart and Todd Risley (1995) that found that in professional families, children heard an average of 2,153 words per hour compared to children in working-class families hearing an average of 1,251 words per hour and children in welfare-recipient families hearing an average of 616 words per hour. They note that by age 4, a child from a welfare-recipient family could have heard 32 million fewer words than a classmate from a professional family.

Visiting nurse programs for infants, toddlers, and to a lesser extent preschools are early childhood education programs designed to encourage low-income families to adopt middle-income parenting styles that promote children's cognitive and behavioral skills. Infant and toddler childcare programs, particularly those that promote parent engagement and education, can also include interventions aimed at changing parenting behavior.

[11] The NICHD Study of Early Childcare and Youth Development – Findings for Children up to Age 4 ½ Years. NIH Pub No 05-4318, January 2006

[12] Garcia and Weiss, Education Inequalities at the Starting Gate, Economic Policy Institute, 2017

[13] Original citations in Kalil, Ziol-Guest, Ryan, and Markowitz, Changes in Income-Based Gaps in Parent Activities with Young Children from 1988 to 2012, AERA Open, July – September 2016

C. High Cost of Infant and Toddler Care in Montgomery County

As more mothers of young children enter and return to the workforce, the demand for affordable infant and toddler childcare programs increases. Yet, as the NICHD study shows, the high cost of infant and toddler childcare also exacerbates the gap in early childcare experiences by family income because generally only high-income families can afford high-quality infant and toddler childcare.[14] As such, subsidizing and/or reducing the costs of high-quality infant and toddler care among low income families could help to narrow the school readiness gap by race, ethnicity, and income.

Given the high cost of infant and toddler care, it is not surprising that higher-income children are more likely to receive non-parental childcare from higher quality childcare centers than from family based homes or relatives.[15] The Maryland Family Network reports that the average weekly cost of infant and toddler care in Montgomery County for October 2017 was $368 for center-based care and $253 for family-based care.[16] Of note, these costs of $18,000 per year for center-based care and $13,000 per year for family-based care reflect the average costs of childcare and do not necessarily reflect the cost of high-quality programs. Yet, they are still beyond the reach of many families with infants and toddlers.

The expense of infant and toddler care in part reflects the level of staffing necessary to support high-quality programs. The typical infant to provider ratio is 3 to 1, so staffing costs are higher for infant and toddler programs compared to preschoolers and elementary students, whose average center costs range between $231 and $274 per week for center-based care in Montgomery County and from $196 to $216 per week for family-based care.

In short, higher income children enjoy the benefit of having parents who are more likely to display behaviors that encourage development as well as placements in high-quality infant and toddler childcare that also encourage their development.

[14] The NICHD Study of Early Childcare and Youth Development, 2006
[15] Ibid
[16] Maryland Family Network, October 10, 2017

Chapter 3. Impact of High-Quality Infant and Toddler Care and Early Education

Program evaluations of high-quality early childhood education programs have generally revealed a positive impact of such programs on child and parent outcomes. Table 1 below describes the child outcomes and monetary benefits associated with early childhood programs from prior research.[17]

Table 1: Child Outcomes and Benefits or Costs to Government from Early Childhood Programs

Child Outcome Affected	Monetary Benefits (or Costs) to Government
Reduced child maltreatment	Lower costs to child welfare system
Reduced child accidents and injuries	Lower costs for hospital visits and other health care costs
Reduced incidence of teen childbearing	Lower costs for public health care system and social welfare
Reduced grade repetition	Fewer years spent in K-12 education
Reduced use of special education	Lower costs of special education
Increased high school graduation rate	(More years spent in K-12 education)
Increased college attendance rate	(More years spent in postsecondary education)
Increased labor force participation and earnings in adulthood	Increased tax revenue
Reduced use of welfare and other means-tested programs	Reduced administrative costs for social welfare programs and reduced welfare program transfer benefits
Reduced crime and contact with the criminal justice system	Lower costs for criminal justice system
Reduced incidence of smoking and substance abuse	Lower costs for public health care system and from premature death
Improved pregnancy outcomes	Lower medical costs due to fewer low birth weight babies

Evaluations of visiting nurse and pre-k programs consistently demonstrate improved child and parent outcomes. Rigorous program evaluations have shown that nearly two-dozen early childhood programs improved children's outcomes in the short run and about a third of them showed improved outcomes in the longer run, as late in adulthood as the age of 40.[18] Researchers also acknowledge that while available research tends to demonstrate a favorable impact of high-quality infant and toddler care for low-income children, the infant and toddler care research base remains at the early stages compared to pre-k and visiting nurse programs.[19]

This section summarizes the research base describing the effectiveness of high-quality childcare programs for infant and toddlers. It is presented in three parts:

A. Early Education and Care Demonstrations and Their Impact describes the evaluations of two comprehensive early childhood education demonstration programs that included infant and toddler childcare: The Abecedarian Project and the Infant Health and Development Program;

[17] From Kilburn and Karoly, The Economics of Early Childhood Policy, RAND, 2008

[18] Ibid

[19] See for example Lynn Karoly, Investing in the Early Years: The Costs and Benefits of Investing in Early Childhood Education in New Hampshire, RAND, 2017

B. Large Scale Early Education and Care Programs and Their Impact describes the evaluation of the Early Head Start Program and the associations between childcare quality and early childhood outcomes evident from the National Institute of Child Health and Human Development's (NICHD) Study of Early Childcare and Youth Development (SECCYD);

C. Returns on Investment from Early Education and Care Programs describes estimates on the return on investment for the Abecedarian Project and IHDP as compared to home-visiting and pre-k programs while acknowledging the limitations of using cost-benefit analyses across different programs to inform local decision-making.

An analysis of the research reviewed in this section demonstrates the potential of high-quality infant and toddler childcare programs to yield long-term benefits that exceed the initial costs of these programs when they are targeted to low-income children. This finding is significant because high-quality infant and toddler childcare is expensive (approaching $20,000 per year for two or more years). Moreover, the combined lifetime benefits to low-income participants, their parents, and the public ranges from $63,000 - $676,000 for infant and toddler childcare demonstration programs and could approach half of this range if implemented on a larger scale.[20]

Results from the Abecedarian Program and Early Head Start evaluation also suggest that high-quality infant and toddler care combined with high-quality preschool experiences yield greater improvements in cognitive and non-cognitive skills than pre-k programs alone. However, the limited body of existing evidence suggests that the return from infant and toddler programs is on par with the return for pre-k programs for three- and four-year-old children. This contradicts James Heckman's assertion that pre-k is "too late" to invest in early education interventions from an economic perspective.

A. Early Education and Care Demonstrations and Their Impact

Compared to the research describing the impact of pre-k for four-year-olds and home-visiting programs for first-time mothers, the research base describing the impact of high-quality comprehensive child development programs for infants and toddlers is limited. There are, however, two demonstration projects whose evaluations describe the potential impact of high-quality infant and toddler childcare on children, their parents, and society: The Abecedarian Program and the Infant Health and Development Project and. These two programs and their evaluation impacts are described below.

The Abecedarian Program was a federally funded demonstration project that provided early education and childcare services for children from infancy to the age of five. The Abecedarian Program largely served economically disadvantaged children; the parents were primarily first-time mothers, black, and single. The Abecedarian Program also provided full-time childcare for 0-3-year-olds and full-time preschool services for participants for 4-5-year-olds.[21] The demonstration project was housed at the University of North Carolina at Chapel Hill and ran from 1972 to 1977.

[20] Range based on data compiled in Table 2 on page 16 of this report; large scale implementations generating half the benefits of demonstration programs based on Karoly's review of pre-k evaluations noted on page 21.

[21] Group size to staff ratios changed from 6 infants to 2 teachers for the first year, to 8 toddlers to 2 teachers for the second year, to 10 preschoolers to 2 teachers for the third year, and to 14 preschoolers to 2 teachers for the fourth and fifth years. Teachers were high school graduates for children from birth to age 2. Teachers were college graduates for children from ages three to five. Salaries were competitive with public school salaries.

The Abecedarian Program incorporated an experimental design, with families randomly assigned to treatment and control groups. The children have been followed to age 21.[22] Of the 111 children, half were randomly assigned to receive the center-based program and the other half to a control group that received no program. In addition to full-time childcare and pre-k, the program also included home visits every other week.[23]

Program Impact: Evaluations of the Abecedarian Program reported very large effects on children's cognitive development (effect sizes of 1.0 standard deviation) at the time the program ended and when children entered school.[24] Evaluations reported that treatment children were less likely to be retained in their grade or require special education and were more likely to graduate from high school and attend college. The treatment group had higher IQ, math, and reading scores from age 8 to 21.

Of note, the Chapel Hill environment of this experiment probably resulted in good follow up services for the Abecedarian students and their families.[25] Their public school system was highly ranked and enrolled a relatively small percentage of low-income children. The school system also offered extensive support services for struggling learners. In addition, among both the treatment and the control groups, half of the children were randomly assigned to additional school-age interventions. In these school-age interventions, home/school resource teachers helped provide supplemental materials for parents to work on with their children.

As such, the estimated effects of the Abecedarian Program likely represent both the effects of early childhood intervention and participation in a variety of follow-up services during the elementary school years. If early childhood services have positive synergistic effects with school-age services, this may increase the effects of the Abecedarian program.[26]

The Infant Health and Development Project was a federally funded demonstration program launches in the 1980's that provided intervention services for low-birth weight children under the age of three.[27] IHDP provided services to both low-income and non-poor families; its evaluation describes the impact of this program on both groups. Modeled after the Abecedarian Program, this program is of relevance to both low and normal birth-weight children because researchers have parceled out the impact of IHDP on "heavier" low-weight children whose developmental trajectories were like typical normal birth-weight children.[28]

IHDP served 985 children in eight sites across the country. The main intervention was full-time, full-year childcare to one- and two-year-old children in childcare centers.[29] The secondary intervention was home-visiting during the participants' first year of life. IHDP was also run as a random assignment experiment, so differences between the treatment and control groups are most likely due to the IHDP program and not to unobserved differences between these two groups.

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[22] SECPTAN, School Readiness Briefing Paper 7 - www.finebynine.org

[23] Bartik, Investing in Kids: Early Childhood Programs and Local Economic Development, 2011

[24] Love, Chazan-Cohen, Raikes, and Brooks-Gun – What Makes a Difference: Early Head Start Evaluation Findings in a Developmental Context. The Society for Research in Child Development, 2013

[25] Bartik, 2011

[26] Ibid

[27] https://investinginkids.net/2013/03/25/recent-research-on-how-educational-benefits-of-high-quality-child-care-vary-by-income/

[28] Ibid

[29] IHDP also provided some home visiting services for children from birth to age 3.

Program Impact: So, what did the evaluation of IHDP find? There were favorable effects of IHDP at the end of the program on children's cognitive development, language development, and social and emotional development.[30] Additionally, positive effects of IHDP among heavier low birth weight infants extended into elementary and secondary school: higher reading and math achievement at age 8 and higher achievement scores at age 18 and a dosage effect with large effect sizes on cognitive development at age 8 among children who experienced more than 350 days of center-based care in the IHDP study over two years.

Impact by Income: Parsing out the impact of IHDP by income shows that the program had a larger impact on improving the IQ and test scores for low-income families (with incomes below 180% of the poverty line[31]) than for higher-income families.[32] Moreover, program evaluation results suggest that an IHDP-style program provided to the general U.S. population would have substantial effects in reducing the educational achievement gaps between low and high-income groups. Duncan and Sojourner estimate that for the "heavier" sample of children, IHDP had large effects in both the short- and long-run on improving IQ and test scores for low-income children, but did not have statistically significant long-run effects on higher-income children.

The differential impact of high-quality childcare on children by income aligns with research on universal childcare from other countries indicating that lower-income children benefit, but higher-income children do not. For example, evaluations of universal and subsidized childcare in Norway and Quebec show that lower-income children benefited from these opportunities, while higher-income children did not.[33] Researchers find that this is likely due to the larger improvements in the quality of the early environment for low-income children resulting from subsidized childcare compared to higher-income children. As noted by Elango, Garcia, Heckman, and Hojman:[34]

> *When children attend programs with higher-quality care than they would have received at home or in an alternative setting, the effects of the programs are generally positive. Given that disadvantaged children have less access to the alternatives, they benefit the most from universal programs. Programs that crowd out high-quality alternatives for advantaged families (e.g. home care by educated parents who elect to when provided universal childcare) as in Quebec, produce weak or even negative results.*

As such, findings from the IHDP suggest that high-quality infant and toddler care programs could narrow the school readiness gap among children by income.

[30] Love, Chazan-Cohen, Raikes, and Brooks-Gun, What Makes a Difference: Early Head Start Evaluation Findings in a Developmental Context, The Society for Research in Child Development, 2013
[31] This income level is analogous to eligibility for free and reduced priced meals at 185% of the federal poverty line.
[32] http://sites.uci.edu/gduncan/files/2013/06/Duncan-Sojourner-Gaps-paper-IZA.pdf
[33] Elango, Garcia, Heckman, and Hojman, Early Childhood Education, NBER Working Paper 21766, 2015
[34] Ibid

B. Large-Scale Early Education and Care Programs and Their Impact

There are few evaluations of large-scale publicly-funded high-quality childcare programs for infants and toddlers in part because these are such a rarity. The Early Head Start Program targeting services to low-income infants and toddlers and their families is the only federal program of its kind and reaches about five percent of income-eligible families.[35] As a large-scale program operating in many sites, this section describes the evaluation of EHS and provides a summary of the NICHD Study of Early Childcare and Youth Development that describes the association between early childcare quality and child outcomes.

Early Head Start is a federal program that offers child and family development services, including center- or home-based early learning experiences, health and developmental screenings, parenting resources, and access to social services for children under the age of 3 and pregnant women in poverty.[36] EHS has provided services through a variety of providers that include community-based groups, and family- and center-based childcare providers. Of note, EHS supports parents in their role as primary caregivers and teachers of their children and assists families in meeting their own personal goals, that may include achieving housing stability, continued education, and financial security.

When EHS began in 1995, a randomized trial was launched to evaluate the efficacy of 17 Early Head Start sites with programs.[37] In all, 3,001 low-income families with a pregnant woman or child under the age of 12 months were randomly assigned to a treatment or a control group. Data were collected with the children were 1, 2, and 3 years of age, and again at age 5 – two years after leaving EHS. The treatment and control groups were racially and ethnically diverse (37% were white, 35% were black, and 24% were Latino).

Program Impact: Overall, EHS benefited children and families. As noted by Love et.al, at ages two and three, EHS impacts were evident across both child and maternal outcome domains with significant effect sizes ranging from 0.1 to 0.2 standard deviations. [38] Moreover, at age 5, participating children had better attention and approaches to learning and fewer behavior problems and both black children and Latino children who spoke Spanish experienced cognitive gains that were sustained for two years after EHS.

On the downside, the EHS evaluation revealed that participating children evidenced more aggressive behaviors and problem behaviors at age five. However, the negative socio-emotional consequences of EHS participation were "not substantial in terms of differences in behavior and d(id) not raise children's behavior problems to levels indicating a need for clinical intervention."[39]

The greatest impact of EHS was found among five-year-olds who participated in formal pre-school programs following EHS. This aligns with the Abecedarian evaluation results describing the favorable outcomes associated with pairing high-quality infant and toddler childcare with pre-school programs. The EHS evaluation also found that at age 5, participating children and families experienced benefits in language, behavior, parenting, and attendance that yielded benefits in early school achievement.

[35] Early Head Start: A Critical Support for Infants, Toddlers, and Families, Zero to Three and CLASP, 2017
[36] Early Head Start serves pregnant low-income women and provides services in a home-based model, center-based model, or a combined approach after the child is born.
[37] Love, Chazan-Cohen, Raikes, and Brooks-Gun, What Makes a Difference: Early Head Start Evaluation Findings in a Developmental Context, The Society for Research in Child Development, 2013
[38] Ibid
[39] Ibid

Overall, Karoly summarizes the EHS evaluation as not demonstrating "particularly strong or lasting effects on children's development based on follow up through grade 5" except among children who participated in formal preschool programs such as Head Start immediately following EHS.[40]

Study of Early Childcare and Youth Development. The National Institute for Child Health and Development began the Study of Early Childcare and Youth Development (SECCYD) in 1991. Rather than evaluate a specific program, the purpose of this study was to describe the different non-maternal childcare arrangements used by families, and the variations in children's performance associated with different placements. In addition to providing a comprehensive study of the environments that serve young children, the study also offers information about non-maternal childcare and its links to children's development. Overall, NICHD researchers examined childcare quality and various outcomes while accounting for children's family features and specific childcare features.

Short-Term Findings. Quality, quantity, and type of non-maternal care were modestly, but not strongly, linked to children's development regardless of family features.[41] More specifically:

- Children in *higher-quality* non-maternal childcare had somewhat *better language and cognitive development* during the first 4 ½ years of life. The most important feature of quality for predicting cognitive and language development up to age 3 was the language used by the caregiver. More stimulation from the caregiver – asking questions, responding to vocalizations, and other forms of talking – was linked to better cognitive and language development. Children receiving quality care were also more cooperative than those who had lower-quality care.

- Children with *higher quantity* (total combined number of hours) or experience in non-maternal childcare showed somewhat *more behavior problems* in childcare and in kindergarten classrooms than those who experienced fewer hours.

- Children who attend *childcare centers* had somewhat *better cognitive and language development*, but also *more behavior problems* in childcare and in kindergarten classrooms than children who experienced other non-maternal childcare arrangements (e.g. family-based day care).

Despite these associations between childcare quality, quantity, and child outcomes, it is important to note that these associations pale in comparison to the link between family characteristics and child outcomes. As noted in the 2006 report from the National Institutes for Research:[42]

[40] Lynn Karoly, Investing in the Early Years: The Costs and Benefits of Investing in Early Childhood Education in New Hampshire, RAND, 2017

[41] The NICHD Study of Early Childcare and Youth Development – Findings for Children up to Age 4 ½ Years. NIH Pub No 05-4318, January 2006

[42] Ibid

> *"(P)arent and family characteristics were more strongly linked to child development than were childcare features. And, parent and family characteristics predicted some developmental outcomes that were not predicted by childcare. For instance, children showed more cognitive, language, and social competence among more harmonious relationships with parents when parents were more educated, had higher incomes, and provided home environments that were emotionally supportive and cognitively enriched, and when mothers experienced little psychological distress."*

Long-Term Findings. NICHD researchers have tracked the SECCYD participants into high school and find that both the quality and quantity of childcare experienced in early childhood also link to adolescent functioning.[43] Vandel et al. found that both quality and quantity of childcare were linked with adolescent functioning and that the effects were similar in size as those observed at younger ages.

More specifically, they found that:

- High-quality care predicted higher cognitive-academic achievement at age 15, with escalating positive effects at higher levels of quality. The association between quality and achievement was mediated in part by earlier childcare effects on achievement. Higher-quality early childcare also predicted youth reports of externalizing behavior.

- More hours of non-relative care predicted greater risk-taking and impulsivity at age 15.

In short, higher-quality care was associated with improved achievement and socio-emotional outcomes at age 15, while greater quantities of non-maternal care were associated with diminished socio-emotional outcomes (i.e. risk taking and impulsivity) at age 15.

C. Returns on Investment from Early Education and Care Programs

Another way to describe the benefits of infant and toddler childcare is to compare the per child costs of such programs to the benefits they generate. Cost-benefit analyses convert program effects into monetary benefits, adjusts them for inflation, and discount them to express them in present value dollars. Monetized benefits can include reduced governmental costs for education, child welfare, and criminal justice services and increased earnings for participants and their parents.

Researchers have conducted benefit-cost analyses on a range of early childhood education programs, including the two infant and toddler demonstration programs already described, visiting nurse programs, and preschool programs. Each researcher, however, has used different assumptions in their analysis and, in some cases, have generated a range of return on investment estimates for the same programs. Additionally, meta-analyses suggest that larger-scale program implementations yielded lower rates of return than the smaller demonstration programs on which they were based.

This section is presented in two parts to describe the estimated return on investment for the IHDP and Abecedarian Program and how the return on investment for these two programs compares to the returns for other early childhood programs.

[43] Vandell, Burchinal, Vandergrift, Belsky, and Steinberg, Do the Effects of Early Childcare Extend to Age 15 Years? Results from the NICHD Study of Early Childcare and Youth Development, 2010

1) **Return on Investment on IHDP and Abecedarian Program** describes the estimated return on investment (ROI) for these two demonstration programs;

2) **Comparing the ROI for Infant and Toddler Programs v. Pre-K Programs** compares the ROI for the IHDP and Abecedarian Programs to other early childhood programs to consider whether the empirical evidence demonstrates a stronger return for infant and toddler childcare v. pre-k.

A review of the available benefit-cost analysis data shows a favorable return on investment for early childhood programs inclusive of infant and toddler childcare that are on par with estimated returns for other early childhood programs, including pre-k. It is important to note, however, that benefit-cost comparisons across early childhood interventions often do not offer apple-to-apple comparisons.

1) Return on Investment on IHDP and Abecedarian Program

Given the experimental design and extensive follow up data collected on program participants and non-participants, several researchers have conducted benefit-cost analyses of the IHDP and Abecedarian Programs. This section describes cost-benefit analyses compiled or performed by Lynn Karoly of the RAND Corporation, Timothy Bartik of the Upjohn Institute, and James Heckman of the University of Chicago to offer an estimate of the anticipated return on investment of infant and toddler programs.

Table 2 provides a summary of the estimated ROI of the IHDP and Abecedarian Programs across three program evaluations. The estimates for the ROI for Abecedarian range from 2.4 to 7.3 and include changes in participant and parent earnings and costs for crime and taxpayer costs. Conversely, only one ROI estimate is offered for IHDP that reflect changes in participants' and parents' earnings at 1.8.

Table 2: Summary of Benefit-Cost Ratios for IHDP and Abecedarian Programs

Program Evaluations	IHDP			Abecedarian		
	Program Costs	Lifetime Benefits	Benefit/Cost Ratio	Program Costs	Lifetime Benefits	Benefit/Cost Ratio
Kilburn and Karoly (2008)	$49,021	n/a	-	$42,871	$195,000	4.6
Bartik (2014)	$35,000	$63,000	1.8	$87,000	$209,000	2.4
Garcia, Heckman, Lead, and Brados (2016)	-	-	-	$92,570	$675,761	7.3

Sources: NBER Working Paper 22993; Kilburn and Karoly, The Economics of Early Childhood Policy; and Bartik, From Preschool to Prosperity – The Economic Payoff of Early Childhood Education.

Of note, while both IHDP and Abecedarian served low-income children between the ages of 0-3 in full-time childcare programs, neither program exclusively served this group: IHDP also served non-poor children; and Abecedarian served both infants and toddlers between the ages of 0-3 and preschoolers between the ages of 3-5. Both programs also included home visiting components. As such, the return on investments for these programs reflects broader conceptualizations of high-quality early education and care beyond full-time childcare for low-income infants and toddlers: they reflect childcare and home visiting for children ages 0-3 plus and in the case of Abecedarian – full-time preschool as well.[44]

[44] Bartik also notes that ROI of Abecedarian also reflects the impact of high-quality elementary and secondary school services provided by Chapel Hill school system were Abecedarian participants enrolled for K-12.

IHDP Program. Karoly and Bartik have each analyzed data to describe the return on investment of the Infant Health and Development Program. Relying on a meta-analysis of early childhood education programs compiled by Aos et al., Karoly finds that the benefit-cost ratio of IHDP cannot be calculated because the IHDP evaluation did not collect data on monetized benefits.[45] The IHDP evaluation describes the impact of IHDP on test scores; Karoly notes a lack of consensus among researchers on how to convert test scores into monetarized benefits to inform a cost-benefit analysis.

Conversely, Bartik relies on a methodology for predicting long-term earnings effects from short-term test score effects to calculate at return on investment for IHDP. Replicating methodological approaches undertaken by other researchers (Krueger, Chetty et al, and Currie and Thomas), Bartik calculates the return on investment of IHDP on both participants' and parents' earnings. In 2012 dollars, Bartik estimates that program costs of $35,000 for two years of full-time childcare and one year of home visiting leads to $33,000 increase in participants' lifetime earnings and a $30,000 increase in their parents' lifetime earnings. This generates a ratio of earnings benefits to costs of 1.8.

The true return on investment for IHDP could be much higher when considering additional potential benefits of the program in reduced government costs for remediation, grade retention, and special education and reduced societal costs for criminal justice involvement. Yet, two uncertainties could also lower the estimated benefit-cost ratio: a higher actual cost for IHDP than the cost articulated by Bartik; and limiting the calculation of program benefits to government cost savings rather than including earning benefits for participants and parents in benefit-cost calculations. For example, in Kilburn and Karoly's review of Aos et al.'s meta-analysis that includes IHDP, they cite program costs of $49,000 per child in 2003 dollars.[46] They also find that prior program evaluations did not describe government savings from IHDP.

Abecedarian Program. Karoly, Bartik, and Heckman have each calculated ROI estimates for the Abecedarian Program. Both Karoly and Bartik have calculated benefit-cost ratios ranging from 2.4 to 2.5 based on analyses conducted by other researchers or their own.[47] For example, Bartik estimates in 2012 dollars that five years of full-time childcare with the Abecedarian Program would cost $87,000 per child and generate a $209,000 increase in earnings for participants and their parents.

Heckman's most recent analysis of the Abecedarian data,[48] however, finds a seven-fold return on investment for an Abecedarian type of program costing $92,570 per child in 2016. According to Heckman, the biggest driver of Abecedarian's ROI is the savings in crime costs to society associated with boys' participation in the program. Whereas the return on investment for girls of the Abecedarian Program is estimated at 2.6, the return on investment for boys is estimated at 10.1, with the reduction in crime costs representing two-thirds of the lifetime benefit of the program.

[45] Kilburn and Karoly, 2005
[46] Ibid
[47] Karoly citing Mass & Barnett (2002); Barnett & Masse (2007) in Toward Standardization of Benefit-Cost Analyses of Early Childhood Interventions, RAND, December 2010; Bartik, 2014
[48] With Garcia, Lead, and Brados in NBER Working Paper 22993, 2016

2) Comparing the ROI for Infant and Toddler Programs v. Pre-K Programs

Heckman recommends that investments in early childhood education begin as early as possible. The Heckman Curve illustrated on Figure 1 on page four demonstrates his theory that the earliest childhood investments yield the greatest return. The following 2012 quote from Heckman captures this belief:

> "The highest rate of return in early childhood development comes from investing as early as possible, from birth through age five, in disadvantaged families. ***Starting at age three or four is too little, too late, as it fails to recognize that skills beget skills in a complementary and dynamic way (emphasis added).*** Effort should focus on the first years for the greatest efficiency and effectiveness. The best investment is in quality early childhood education from birth to five for disadvantaged children and their families."[49]

But does an analysis of program evaluations of early childhood education programs bear out that statement that waiting to age three or four is too late? The short answer is no, at least not consistently. While Heckman's analysis of the Abecedarian and Perry Preschool programs finds a higher return on investment for the former, it's only marginally higher (7.3 v. 7.1).[50] Moreover, return on investment analyses from other researchers has not found a trend of programs serving the youngest children yielding higher returns than pre-k programs.

For example, Kilburn and Karoly's comparison of benefit-cost analyses of several early childhood programs in 2008 shows a range of ROI across home-visiting, childcare, and preschool programs that do not vary by the ages of children served.[51] Table 3 on the next page list the cost-benefit results for the following programs:

- *Nurse-Family Partnership (NFP)*: Home visits to low-income, first-time mothers from prenatal to the child's age of two or three.
- *Home-Visiting Programs for At Risk Participants* (meta-analysis): Average effect for 13 programs.
- *Infant Health and Development Program (IHDP):* Home visiting and center-based child development program for low birth weight babies from birth to age 3.
- *Abecedarian Program:* Center-based program for at-risk children from 0-5.
- *Chicago Child Parent Center (CPC):* One- to two-year, part-day preschool with parent program.
- *Perry Preschool Project*: One- or two-year, part-day preschool with home visiting.
- *Early Childhood Education* (meta-analysis): Average effect for 48 programs serving 3-4-year-olds.

Based on their analysis at the time in 2008, Kilburn and Karoly found that the returns on investment for home visiting and comprehensive child development programs serving infants and toddlers ranged between 2.2 and 5.7 for low-income families compared to a range of 2.4 to 17.1 for preschool programs. Moreover, if Heckman's most recent calculations of the returns of investment for the Abecedarian and Perry Preschool Programs were included above, the ranges for these programs would be similar – from 2.2 to 7.3 for 0-3 and 0-5 programs v. 2.4 to 7.1 for 4-5-year-old programs.

[49] Heckman, December 7, 2012 cited on www.heckmanequation.org
[50] 2016 report for Abecedarian – NBER Working Paper 22993; 2009 report for Perry Preschool Project – NBER Working Paper 15471
[51] From Kilburn and Karoly, The Economics of Early Childhood Policy, RAND, 2008

Table 3: 2003 Cost-Benefit Results of Selected Early Childhood Education Programs

			Distribution of Benefits to					
Program	**Age at Last FU**	**Program Costs**	**Participants**	**Government Savings**	**Rest of Society**	**Total Benefits**	**Net Benefits**	**Benefit-Cost Ratio**
Home Visiting (HV) Programs, 0-3								
NFP – full sample	15	$9,118	$2,674	$9,548	$14,075	$26,298	$17,180	2.88
NFP – high risk	15	$7,271	$1,277	$32,447	$7,695	$41,419	$34,148	5.70
NFP – low risk	15	$7,271	$2,051	$5,095	$2,005	$9,151	$1,880	1.26
13 HV Progs	Varies	$4,892	$6,194	$1,815	$2,960	$10,969	$6,077	2.24
Comprehensive Child Development Programs, 0-3 and 0-5								
IHDP	8	$49,021	$0	$0	$0	$0	$49,021	-
Abecedarian	21	$42,871	n/a	n/a	n/a	$138,635	$95,764	3.23
Preschool Programs, 3-5								
Chicago CPC	21	$6,913	$22,715	$19,985	$6,637	$49,337	$42,424	7.14
Perry Preschool	40	$14,830	$61,866	$191,288		$253,154	$238,324	17.07
48 ECE Programs	Varies	$6,681	$6,036	$4,329	$5,377	$15,742	$9,061	2.36

Note: All dollar values are 2003 dollars per child using a 3 percent annual real discount rate to calculate present values over time. NA- not available. Meta-analysis is from Aos et al. (2004)

An important caveat in interpreting this data is the inability to compare childcare programs exclusively serving infants and toddlers to pre-k programs for older children. Both the IHDP and Abecedarian Programs include home visiting components for infants; and Abecedarian also includes pre-k for three- and four-year-olds. The ROI for these comprehensive child development programs, however, offer the best available data on the costs and benefits of high-quality infant and toddler childcare programs.

Additionally, Kilburn and Karoly note that some of the variation in benefit-cost ratios evident from prior research results from differences in the length of follow-up for the program evaluations and the range of outcomes measures in the evaluations. For example, the highest benefit-cost ratio at the time of the 2008 review was for the Perry Preschool Project, which had followed participants to age 40. Most program evaluations do not follow participants long enough to measure some of the benefits of early childhood experiences on teens' criminal activity or adult earnings.

In 2010, Karoly revisited the review of early childhood programs and generated an updated report on the benefit-cost ratios for early childhood interventions.[52] Her 2010 comparison of benefit-cost ratios is listed in Table 4 on the next page and for reference also includes Heckman, et al.'s estimated ROI for Abecedarian based on his colleagues 2016 NBER report and Bartik's estimate of the ROI for IHDP based on his 2014 report.[53] Again, an analysis of program evaluation data across programs does not support the claim that early interventions for infants and toddlers yield higher returns that preschool programs.

[52] Karoly, Toward Standardization of Benefit-Cost Analyses of Early Childhood Interventions, RAND, 2010
[53] NBER 2016 Working Paper; Bartik, 2014

Table 4: Reported Benefit-Cost Ratios for Early Childhood Interventions

Program/Program Type	Source	Benefit-Cost Ratio
Home Visiting Programs for 0-3-Year-Olds		
NFP – Full sample	Aos et al. (2004)	2.88[b]
NFP – Higher-risk sample	Karoly et al. (1998)	5.06[a]
NFP – Lower-risk sample	Karoly et al. (1998)	1.10[a]
Comprehensive Child Development including Childcare for 0-3- and 0-5-Year-Olds		
IHDP	Aos et al. (2004); Bartik (2010)	0.00 – 1.8
Abecedarian	Mass & Barnett (2002); Barnett & Masse (2007); Heckman (2016)	2.49[c] -7.3
Preschool Programs for 4-5 Year Olds		
Chicago CPC	Reynolds et al. (2002)	7.14
Perry Preschool – Age 19 FU	Berrueta-Clement et al. (1984)	3.56
Perry Preschool – Age 27 FU	Karoly et al. (1998)	4.11[a]
Perry Preschool – Age 27 FU	Barnett (1993, 1996), Schweinhart, Barnes, & Weikart (1993)	8.74[b]
Perry Preschool – Age 40 FU	Barnett et al. (2005), Nores et al. (2005), Belfied et al. (2006)	16.14[b]
Perry Preschool – Age 40 FU	Heckman et al. (2010)	7.1-12.2 [b, d]
Estimates for Meta-Analysis of Intervention Types		
Home visiting for at-risk mothers and children	Aos et al. (2004)	2.27[b]
Early childhood education for low-income 4-5-year-olds	Aos et al. (2004)	2.36[b]

Notes: a) discount rate 4 percent; b) included value of reduced intangible crime victim costs; c) from revised estimate in Barnett and Masse (2007); and d) range of estimates under alternative assumptions on the economic cost of crime.

Limitations of Current Research: While program evaluations completed to date do not support the premise that interventions aimed at infants and toddlers offer a more effective use of public funding than pre-k programs for older children, it is important to note that benefit-cost comparisons across early childhood interventions often do not offer apple-to-apple comparisons.

For example, as noted by Karoly and others,[54] the calculated ROI from early childhood programs can vary considerably from one study to another due to variations in methodology around determining:

- Program costs and benefits (including the discount rate used to account for inflation).
- What social impacts will be examined (some studies consider reduced crime rates, future earnings, taxes paid, and reduced government costs, while other studies may consider only the economic benefits of higher graduation rates and additional years of education).
- The face value of benefits derived in the future.

Another issue noted by Karoly is that the evaluations do not always employ the same baseline or alternative to compare with the program of interest. For example, the Perry Preschool program was evaluated in the 1960's when the alternative or status quo for most children was no formal early education. In contrast, recent national evaluations of Head Start have included control children who attended some other type of early education program, including those who attended a different Head Start than the one they had been selected to participate in as part of the randomization trial.

Other challenges noted by Karoly that limit the value of comparing benefit-cost analyses among different researchers and programs is that costs are not always measured in the same way as benefits. For example, costs may be based on budgeted values rather than actual program expenditures that may in turn underestimate the actual costs of administering the program. In short, the absence of a standardized approach to conducting benefit-cost analyses undermines efforts to compare the return on investment of different early childhood education interventions.

Lessons from Pre-K Cost-Benefit Research: Finally, Karoly's 2017 review of pre-k programs offers several lessons regarding the potential impact of scaled up infant and toddler childcare programs.[55]

First, regarding the costs and benefits of scaled-up pre-k programs, Karoly notes that:

> *"(T)he estimated returns (of small demonstration programs) represent more of a proof of the principle that high-quality (early childhood programs) can provide positive economic benefits, rather than definitive evidence of the economic returns that would be expected from scaled-up programs."*

Similarly, the estimated return on investment of demonstration infant and toddler childcare programs represent proof of the principle that high-quality infant and toddler childcare programs can generate favorable returns on investment rather than definitive evidence that scaled up programs will generate favorable returns.

Second, Karoly finds lower returns on investment among meta-analyses of recent pre-k program participants than earlier cohorts. Similarly, one would expect to find lower returns on investment on scaled up infant and toddler childcare programs today because both the home and nonparental care environments of low-income infants and toddlers have improved overtime.[56]

[54] See for example West Virginia Early Childhood Planning Task Force: Early Childhood Development: A Proven Strategy to Boost State Economic Growth, March 2014
[55] Karoly, The Costs and Benefits of Scaled-Up Pre-Kindergarten Programs, 2017
[56] Ibid

Finally, Karoly offers several implications for investing in pre-k programs that likely have import for expanding infant and toddler childcare programming:[57]

- ***Economic returns can be expected to vary across states and districts implementing scaled up pre-k programs***. Since economic considerations vary by jurisdiction, including parents' and children's long-term earnings projections, the impact of expanded infant and toddler childcare will vary among jurisdictions as well.

- ***Positive economic returns are unlikely for low-quality pre-k programs***. Similarly, low-quality infant and toddler programs are unlikely to yield favorable returns on their investment.

- ***Per-child economic returns are likely to be higher for economically disadvantaged children.*** This aligns with the research to date demonstrating a more favorable return for high-quality infant and toddler programs for low-income children compared to higher income children.

- ***Unless impacts on school outcomes (e.g. special education placement) are exceptionally large, the intermediate-term savings to the education system are not likely to be large enough to cover the cost of high-quality pre-k programs.*** Similarly, infant and toddler childcare programs are unlikely to yield savings to government costs that exceed their program costs. Particularly in the short-term. Instead, increased earnings and diminished societal costs for reduced crime serve as the largest drivers of long-term benefits.

- ***The economic returns of high-quality pre-k programs accrue to multiple stakeholders in the public and private sector***. For infant and toddler childcare, the benefits accrue to the parent and participants in their increased earnings potential and to the public in reduced costs of criminal activity that arise from increasing the employability of parents and their children.

[57] Ibid

Chapter 4. Project Findings and Recommended Discussion Issues

The County Council tasked OLO to develop this report describing the impact of infant and toddler programs as follow up to OLO Report 2016-7 that includes a description of the impact of pre-k programs. This memorandum report synthesizes the research literature regarding the impact of high-quality infant and toddler childcare on program participants, their parents, and the public at large.

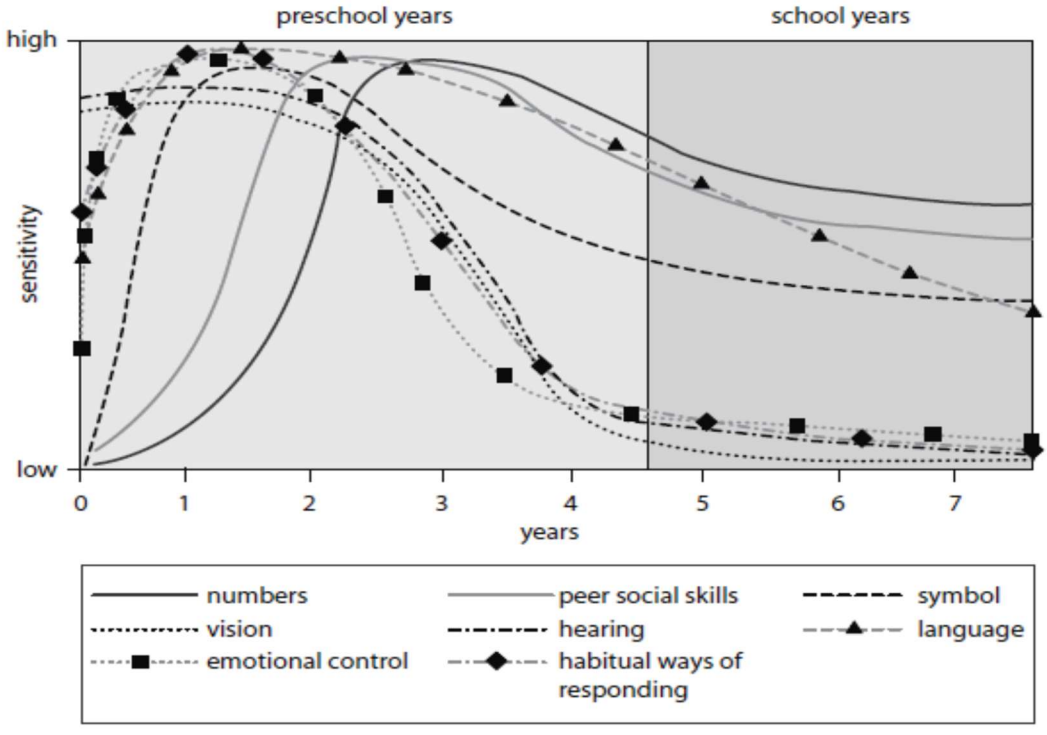
This section summarizes three major findings that emerged from OLO's review of the research literature examining the impact of high-quality infant and toddler childcare programs. Based on these findings, this section also offers two recommended issues for discussion for the Council to consider with Executive Branch representatives as follow up.

Summary of Project Findings

Finding #1: Early brain research suggests that high-quality infant and toddler childcare can help narrow the achievement gap, particularly when paired with high-quality pre-K.

The early brain research[58] finds that children's early experiences with caregivers help determine whether their brain's architecture will develop in ways that promote future learning, behavior and health. As such, infants and toddlers are especially amenable to educational interventions because, as illustrated in the figure below, their brains are especially sensitive during the first three years of life.

Figure 1: Sensitive Periods in Early Brain Development



Source: Council for Early Child Development (2010).

[58] See National Research Council's 2000 report, Neurons to Neighborhoods.

How infants and toddlers grow and develop depends on the interplay between nature and nurture during their early learning experiences. These early experiences affect how children cope with stress and regulate their own emotions. Research also shows that children's brain development is far more susceptible to adverse influences than had been realized. Environmental influences not only affect a child's general development, but affect how the intricate circuitry of the brain is "wired."

Early brain research can help inform policymakers about the potential benefits of investing in high-quality childcare programs for infants and toddlers to reduce the school readiness gap by income. Differences in infant and toddler caregiving correlate with income may help to explain the variance in school readiness by student income.

For example, affluent parents are more likely to demonstrate educationally enriching parental practices[59] and to enroll their children in higher-quality childcare that are out of reach for most low-income families. Further, children in high-quality non-maternal care, including those enrolled in childcare centers as compared to family day care, on average demonstrate better language and cognitive development in both elementary and secondary school.[60]

Finally, evaluations of the Infant Health Development Project, Early Head Start, and universal childcare programs in other countries demonstrate a more favorable impact of high-quality childcare on low-income children v. affluent ones. This finding suggests that the high-quality infant and toddler programs can be particularly effective at narrowing the school readiness gap by income. Evaluation data also shows that the impact of high-quality infant and toddler childcare can be especially robust when children enroll in preschool programs (e.g. Head Start) immediately following 0-3 childcare programs. [61]

Finding #2: The benefits of high-quality infant and toddler childcare can exceed their initial program costs in the long-term, despite their high costs.

Evaluations of high-quality early childhood education initiatives, including infant and toddler childcare, generally reveal positive impacts on child and parent outcomes and societal programs when these investments target low-income children. The table on the next page describes the child outcomes and monetary benefits associated with early childhood programs from prior research.[62]

[59] Kalil, Ziol-Guest, Ryan, and Markowitz, "Changes in Income-Based Gaps in Parent Activities with Young Children from 1988 to 2012", AERA Open, July – September 2016

[60] Vandell, Burchinal, Vandergrift, Belsky, and Steinberg – Do the Effects of Early Childcare Extend to Age 15 Years? Results from the NICHD Study of Early Childcare and Youth Development, 2010

[61] Karoly, Investing in the Early Years: The Costs and Benefits of Investing in Early Childhood Education in New Hampshire, RAND, 2017

[62] Kilburn and Karoly, The Economics of Early Childhood Policy, RAND, 2008

Table 1: Child Outcomes and Benefits or Costs to Government from Early Childhood Programs

Child Outcome Affected	Monetary Benefits (or Costs) to Government
Reduced child maltreatment	Lower costs to child welfare system
Reduced child accidents and injuries	Lower costs for hospital visits and other health care costs
Reduced incidence of teen childbearing	Lower costs for public health care system and social welfare
Reduced grade repetition	Fewer years spent in K-12 education
Reduced use of special education	Lower costs of special education
Increased high school graduation rate	(More years spent in K-12 education)
Increased college attendance rate	(More years spent in postsecondary education)
Increased labor force participation and earnings in adulthood	Increased tax revenue
Reduced use of welfare and other means-tested programs	Reduced administrative costs for social welfare programs and reduced welfare program transfer benefits
Reduced crime and contact with the criminal justice system	Lower costs for criminal justice system
Reduced incidence of smoking and substance abuse	Lower costs for public health care system and from premature death
Improved pregnancy outcomes	Lower medical costs due to fewer low birth weight babies

Benefit-cost analyses comparing the cost of infant and toddler childcare programs to long-term outcomes find a favorable return on investment for high-quality programs. The table below compares benefit-cost analyses compiled by three different sets of researchers for the Infant Health Development Program and the Abecedarian Project.

Table 2: Summary of Benefit-Cost Ratios for IHDP and Abecedarian Programs

Program Evaluations	IHDP			Abecedarian		
	Program Costs	Lifetime Benefits	Benefit/Cost Ratio	Program Costs	Lifetime Benefits	Benefit/Cost Ratio
Kilburn and Karoly (2008)	$49,021	n/a	-	$42,871	$195,000	4.6
Bartik (2014)	$35,000	$63,000	1.8	$87,000	$209,000	2.4
Garcia, Heckman, Lead, and Brados (2016)	-	-	-	$92,570	$675,761	7.3

Sources: NBER Working Paper 22993; Kilburn and Karoly, The Economics of Early Childhood Policy, RAND Corporation; and Bartik, From Preschool to Prosperity – The Economic Payoff of Early Childhood Education, W.E. Upjohn Institute

Of note, Bartik finds that a $35,000 investment in two years of full-time childcare for one- and two-year-olds with home visiting during infancy results in a $63,000 increase in lifetime earnings for parents and participants. This generates a ratio of earnings benefit of 1.8, meaning every dollar spent on the program generates a $1.80 return in increased earnings. When considering other potential benefits of early childhood investments noted in Table 3.3, the ROI for IHDP could be higher.

Researchers also find a favorable ROI for the Abecedarian Program, ranging from 2.4 to 7.3. Garcia, et al. in particular find that the ROI for Abecedarian averaged 2.6 for girls but 10.1 for boys due to the reduction in crime costs associated with program participation. Karoly advises, however, that the favorable ROI for early childhood education programs should be interpreted as proof that such programs can generate favorable outcomes rather than as clear evidence that they will.

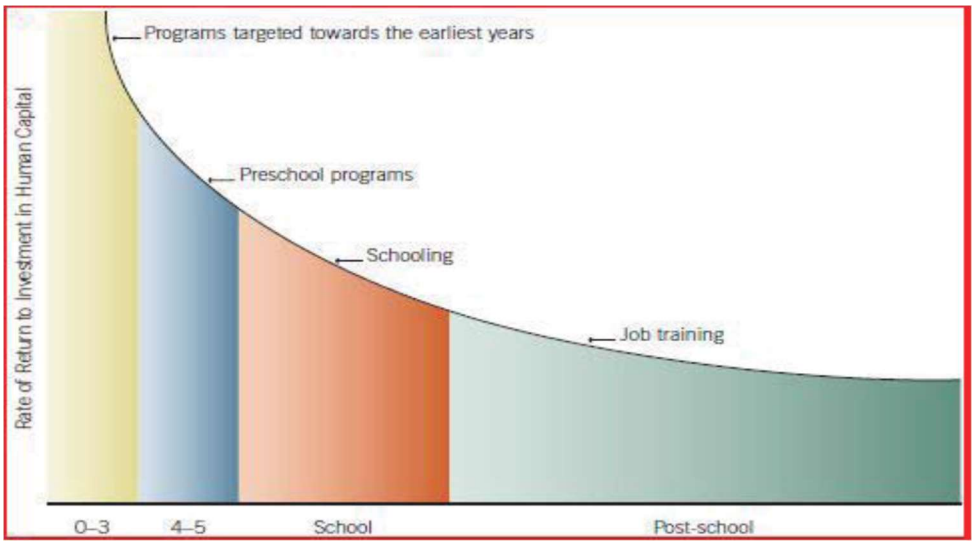
Finding #3: Available analyses suggest that the return on investment (ROI) for high-quality infant and toddler childcare for low-income children is on par with other investments in early childhood education such as pre-K.

As noted by the Heckman Curve illustrated in the figure below, the leading economist advocating for expansion of high-quality infant and toddler childcare programs for low-income children contends that early childhood investments in programs targeting 0- to 3-year-olds will generate higher returns on investment than preschool programs for 4- to 5-year-olds. Yet, a review of benefit-cost analyses across early childhood investments does not bear out this theory.

As noted in the table on the next page, preschool programs for 4-5-year-olds, home visiting programs for 0-3-year-olds, and comprehensive child development programs with full-time childcare components for 0-3-year-olds and 0-5-year-olds yield similar returns of investments averaging between 2.0 and 3.0. Moreover, the range of returns for high-quality preschool programs is generally larger than the range for comprehensive programs with full-time childcare.

Yet, while existing program evaluations do not consistently support the Heckman Curve, it is important to note the limitations of comparing benefit-cost analyses across program evaluations that use different methodologies to estimate program costs and benefits. The differences in methodologies used to calculate benefit-cost analyses, including the follow-up time periods for calculating benefits, undermines much of the usefulness in comparing estimated ROI across programs as attempted in Table 2. Yet, it is also important to place claims that *"starting at age three or four is too little, too late"* in the appropriate context: it may be too late, but the available research does not support this belief.

Figure 2: Returns to a Unit Dollar Invested



Source: Heckman, 2008

Table 4: Reported Benefit-Cost Ratios for Early Childhood Interventions

Program/Program Type	Source	Benefit-Cost Ratio
Home Visiting Programs for 0-3-Year-Olds		
NFP – Full sample	Aos et al. (2004)	2.88[b]
NFP – Higher-risk sample	Karoly et al. (1998)	5.06[a]
NFP – Lower-risk sample	Karoly et al. (1998)	1.10[a]
Comprehensive Child Development including Childcare for 0-3- and 0-5-Year-Olds		
IHDP	Aos et al. (2004); Bartik (2010)	0.00 – 1.8
Abecedarian	Mass & Barnett (2002); Barnett & Masse (2007); Heckman (2016)	2.49[c] -7.3
Preschool Programs for 4-5 Year Olds		
Chicago CPC	Reynolds et al. (2002)	7.14
Perry Preschool – Age 19 FU	Berrueta-Clement et al. (1984)	3.56
Perry Preschool – Age 27 FU	Karoly et al. (1998)	4.11[a]
Perry Preschool – Age 27 FU	Barnett (1993, 1996), Schweinhart, Barnes, & Weikart (1993)	8.74[b]
Perry Preschool – Age 40 FU	Barnett et al. (2005), Nores et al. (2005), Belfied et al. (2006)	16.14[b]
Perry Preschool – Age 40 FU	Heckman et al. (2010)	7.1-12.2 [b, d]
Estimates for Meta-Analysis of Intervention Types		
Home visiting for at-risk mothers and children	Aos et al. (2004)	2.27[b]
Early childhood education for low-income 4-5-year-olds	Aos et al. (2004)	2.36[b]

Notes: a) discount rate 4 percent; b) included value of reduced intangible crime victim costs; c) from revised estimate in Barnett and Masse (2007); and d) range of estimates under alternative assumptions on the economic cost of crime.

Recommended Discussion Issues

This OLO report helps to demonstrate the value of high-quality infant and toddler childcare: these programs can improve life opportunities for low-income children whose families are least able to afford such care. Moreover, high-quality infant and toddler childcare programs targeted to low-income families can yield long-term benefits for participants, their parents, and the public at-large. Like other early childhood education programs, infant and toddler childcare can be a useful investment in taxpayer funding to support the public good.

Recommended Discussion Issue #1

Given the value of high-quality infant and toddler care, particularly for low-income children, the County has an important role to play in ensuring the quality, availability, and affordability of local infant and toddler care slots. ***OLO recommends that the County Council discuss with the Executive Branch its efforts to ensure the availability and quality of infant and toddler childcare slots in the County, particularly for low-income children.*** Specific strategies aimed at encouraging more providers to participate in the State's quality rating improvement system (EXCELS) should be shared.

Recommended Discussion Issue #2

Additionally, as both the County and the State consider efforts to create universal pre-k for four-year-olds, ***OLO recommends that the County Council discuss with the Executive Branch its efforts to maintain the quantity and quality of existing infant and toddler childcare slots in the County with the expansion of publicly funded pre-k***. Since private providers often rely on the delivery of childcare for older children to offset the higher cost of providing infant and toddler care, the supply of infant and toddler slots in the County is likely to shrink as a significant share of four-year-olds shifts to public pre-k programs. OLO recommends that DHHS update the County Council on its efforts to prepare for the consequences of this anticipated shift.