



December 2019

Early Childhood Education for Low-Income Students: *A Review of the Evidence and Benefit-Cost Analysis UPDATE*

The Washington State Institute for Public Policy (WSIPP) Board of Directors and the Washington State Legislature directed WSIPP to update previous findings on early childhood education. To fulfill this assignment, WSIPP will release a series of three reports in which we will:

- 1) Conduct a comprehensive analysis of existing early childhood education (ECE) research.
- 2) Update WSIPP's 2014 outcome analysis of Washington's Early Childhood Education and Assistance Program (ECEAP).¹
- 3) Evaluate the impact of full- and part-day programming and, to the extent possible, staff characteristics on outcomes.²

Summary

WSIPP analyzed how three approaches to early childhood education (ECE) impact student outcomes and whether benefits exceed costs. These included the following:

- 1) State ECE programs: low-income,
- 2) State ECE programs: universal, and
- 3) Head Start.

To investigate the impact of these programs, we conducted a systematic review of all studies we could find on the effect of these programs after 1975. We reviewed outcomes in a wide range of outcome areas including the following:

- Academic outcomes,
- Behavioral outcomes,
- Other participant outcomes, and
- Parental outcomes.

We find that all three programs can improve outcomes. We expect that the benefits of any of these programs will exceed the cost of the program.

¹ The updated study of the effects of ECEAP is expected to be released in December 2021. [Engrossed Second Substitute House Bill 1391, Chapter 369, Laws of 2019](#).

² "To the extent that data is available, [the evaluation] must consider the education levels and demographics, including race, ethnicity, and socioeconomic status, of early childhood education and assistance program staff and the effects of full-day programming and half-day programming on outcomes." The dosage study is expected to be released in December 2021. [E2SHB 1391, Chapter 369, Laws of 2019](#).

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This is the first report of the series. In January 2014, we presented findings of the effectiveness and monetary benefits and cost for three approaches to early childhood education (ECE) for low-income children.³ The current report includes a new program, universally offered state early childhood education programs and updates and extends our previous findings.⁴

[Section I](#) describes the ECE landscape with a focus on programs comparable to ECEAP. [Section II](#) explains our research approach. [Section III](#) presents our new findings for three types of ECE programs:

- 1) Low-income ECE programs,
- 2) Universal ECE programs, and
- 3) Head Start.

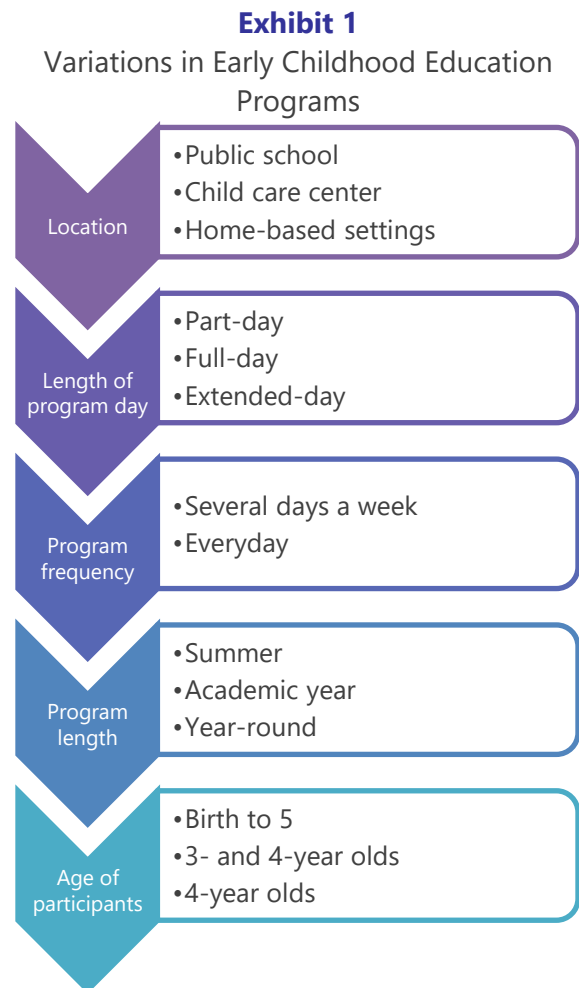
[Section IV](#) concludes the report.

³ Kay, N., & Pennucci, A. (2014). *Early childhood education for low-income students: A review of the evidence and benefit-cost analysis* (Doc. No. 14-01-2201). Olympia: Washington State Institute for Public Policy.

⁴ We will not be updating our finding for model programs. For a full discussion of why we chose to exclude this topic from the current analysis, please see [Appendix A](#).

I. Background

This section provides an overview of ECE programs in Washington and nationally. Early childhood education refers to education programs **designed to prepare children for the primary school system**. These programs can target children from birth to elementary school entry. The quality and intensity of these programs vary greatly over time and across locations. [Exhibit 1](#) outlines the variety of program characteristics.

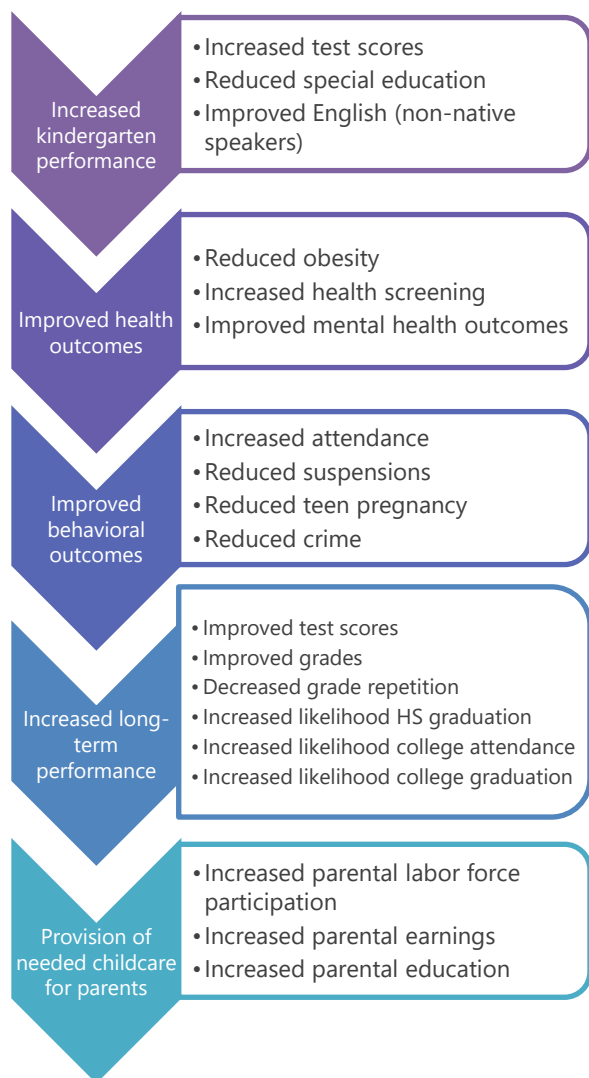


Although the primary goal of the program is to promote education, there are many additional potential benefits (outlined in [Exhibit 2](#)).⁵

⁵ Potential benefits come from a variety of resources reviewed through the literature review and background research done for this report. For more information on the potential benefits of early childhood education, please see Friedman-Krauss, A., Bernstein, S., & Barnett, S. (2019). *Early childhood education: Three pathways to better health*. National Institute for Early Education Research; Schweinhart, L. (1994). *Lasting benefits of preschool programs*. ERIC Clearinghouse on Elementary and Early Childhood Education; and Morrissey, T. (2017). Child care and parent labor force participation: A review of the research literature. *Review of Economics of the Household*, 15(1), 1-24.

Exhibit 2

Potential Benefits of Early Childhood Education



This report evaluates the effectiveness of ECE programs that resemble Washington's Early Childhood Education Assistance Program (ECEAP) or Head Start program.

Washington's ECE Program

The Early Childhood Education and Assistance Program (ECEAP) was established by the Washington State Legislature in 1985 to provide low-income and other at-risk 3- and 4-year-olds with quality early childhood education.⁶

Eligibility for ECEAP is largely determined by age and poverty level of children. Children must have a family income that is less than or equal to 110% of the federal poverty level, have special needs, or have other risk factors.⁷

ECEAP provides educational instruction in a small classroom setting, with a staff-child ratio of 1:10. Providers must offer a minimum of 320 classroom hours per year. The program provides part-, full-, and extended-day slots.⁸ Lead teachers are required to have at least an associate's degree and early childhood education training. The program also provides family support and health and nutrition services to enrolled children.⁹ Participation in ECEAP has increased from 1,000 children statewide at its inception to over 13,000 students in the 2018-19 academic year.

⁶ Eligible children must be at least three, but less than five, years old by August 31 of the school year that they enroll.

⁷ Other factors include homelessness, family violence, chemical dependency, foster care, or incarcerated parents DCYF. (2016). [ECEAP & Head Start](#).

⁸ Washington State Department of Children, Youth and Families defines part-day ECEAP classes as "2 ½ or more hours, several days a week, during the school year," full-day as, "5.5-6.5 hours per day, 4 or 5 days a week, during the school year" and extended day as "at least 10 hours a day, year round, combining child care and ECEAP." Parents must meet additional requirements to be eligible for extended day participation. DCYF. (2016). [ECEAP & Head Start](#).

⁹ Includes family support visits, health coordination services for families, and staff training to help families navigate service systems and other benefits.

Head Start

Head Start is the other major ECE program for low-income children in Washington. Head Start is a nationally-funded ECE program for low-income children started in 1965 as part of the Johnson administration's "War on Poverty" programs.¹⁰ Head Start is administered by local grantees who adhere to national program guidelines. The federal Head Start program now includes Head Start services for preschool children ages three to five, Early Head Start services for children birth to three and pregnant women, Tribal Head Start which provides services for American Indian and Alaskan Native children and pregnant women, and Migrant and Seasonal Head Start that offers services to children and pregnant women in migrant families. This analysis focuses on Head Start services for preschool children.

The program characteristics of Head Start are very similar to ECEAP. Head Start provides educational, social, nutritional, health, and dental services in an effort to promote child development and learning, with a minimum requirement of at least 448 hours per year (3.5 hours per day, 128 days per year). Services can be provided in center-based and/or home-based settings. Staff requirements differ depending on the staff member's role. Teachers in center-based programs must have at least an associate's or bachelor's degree in early childhood education or development.¹¹

¹⁰ War on Poverty programs refers to the set of programs passed during the Johnson administration beginning in 1964 that were aimed at reducing or eliminating poverty. In addition to Head Start, some other programs associated with the war on poverty include Medicare, Medicaid, and the Food Stamps program (now the Supplemental Nutrition Assistance Program).

¹¹ National Center on Early Childhood Development, Teaching, and Learning. (2018). [Education requirements for](#)

Children are eligible for Head Start if they come from families at or below 130% of the federal poverty line or are homeless, in foster care, or from families receiving Temporary Assistance for Needy Families. In Washington, Head Start providers serve about 9,000 children per year.¹²

State/District ECE Programs

The success of Head Start and other early research in ECE prompted many states to adopt their own state-funded ECE programs. According to the National Institute for Early Education Research (NIEER), 44 states, including Washington, had a state-funded preschool program in 2018.¹³

We categorize state programs into two broad categories:

- 1) Low-income ECE programs and
- 2) Universal ECE programs.

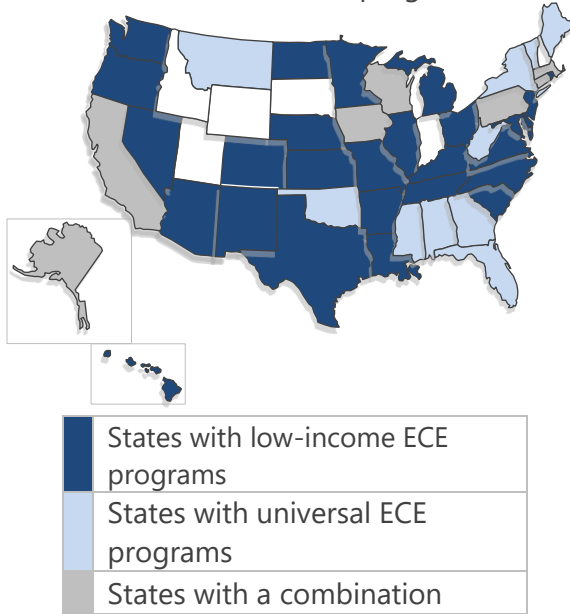
[center-based preschool teachers: Staff qualifications: Steps for programs to consider.](#)

¹² This number includes children receiving standard Head Start services and those receiving services from the American Indian/Alaska Native Head Start program. It does not include children receiving services through the Migrant/Seasonal Head Start program. Department of Children Youth and Families. (2018). [2018-2019 ECEAP caseload forecast report.](#)

¹³ DC also has a funded preschool program. Friedman-Krauss et al. (2019). [The state of preschool 2018 \(NIEER report 8/2019\).](#)

Exhibit 3

States with ECE programs



Note:

Map based on information reported in Friedman-Krauss et al. (2019). [The state of preschool 2018 \(NIEER report 8/2019\)](#).

Low-Income ECE Programs

Low-income ECE programs provide preschool access to low-income three- and four-year-olds. We consider programs that either require families to have income below a specific threshold to qualify or allow all children in low-income districts or regions to participate in the program. Currently, 34 states offer some sort of low-income ECE program.¹⁴

Universal ECE Programs

Universal programs provide preschool access to all children in a district or state. These programs are much less common than low-income targeted ECE programs, with 17 states offering a universal ECE program.

¹⁴Based on information reported in Friedman-Krauss et al. (2019). [The state of preschool 2018 \(NIEER report 8/2019\)](#).

II. Research Methods

WSIPP implements a rigorous, three-step research approach to assess the effectiveness and benefits and costs of programs and policies that could be implemented in Washington State. These studies are designed to provide policymakers with objective information about which programs or policy options (“programs” or “interventions”) work to achieve desired outcomes, and when possible, report on the likely long-term economic consequences of these options.

- 1) **Identify what works (and what does not).** For each program under consideration, we systematically review all rigorous research evidence and estimate the program’s effect on a desired outcome or set of outcomes. The evidence may indicate that a program worked (i.e., had a desirable effect on outcomes), caused harm (i.e., had an undesirable effect on outcomes), or had no detectable effect.
- 2) **Assess the return on investment.** Given the estimated effect of a program from Step 1, we estimate—in dollars and cents—how much the program would benefit people in Washington were it implemented and how much it would cost the taxpayers to achieve this result. We use WSIPP’s benefit-cost model to develop standardized, comparable results for all programs that illustrate the expected returns on investment. We present these results as net present values on a per-participant basis. We also consider how monetary benefits are distributed across program participants, taxpayers, and other people in society.

- 3) **Determine the risk of investment.**

We allow for uncertainty in our estimates by calculating the probability that a program will at least “break-even” if critical factors—like the actual cost to implement the program and the precise effect of the program—are lower or higher than our estimates.

We follow a set of standardized procedures (see [Exhibit 4](#)) for each of these steps. These standardized procedures support the rigor of our analysis and allow programs to be compared on an “apples-to-apples” basis.

For full detail on WSIPP’s methods, see WSIPP’s [Technical Documentation](#).¹⁵

¹⁵ Washington State Institute for Public Policy (December 2019). *Benefit-cost technical documentation*. Olympia, WA: Author.

Exhibit 4

WSIPP's Three-Step Approach

Step 1: Identify what works (and what does not)

We conduct a meta-analysis—a quantitative review of the research literature—to determine if the weight of the research evidence indicates whether desired outcomes are achieved, on average.

WSIPP follows several key protocols to ensure a rigorous analysis for each program examined:

- **Search for all studies on a topic**—We systematically review the national research literature and consider all available studies on a program, regardless of their findings. That is, we do not “cherry-pick” studies to include in our analysis.
- **Screen studies for quality**—We only include rigorous studies in our analysis. We require that a study reasonably attempts to demonstrate causality using appropriate statistical techniques. For example, the comparison group must be similar to the treatment group on at least academic, demographic, and socioeconomic characteristics. Studies that do not meet our minimum standards are excluded from the analysis.
- **Determine the average effect size**—We use a formal set of statistical procedures to calculate an average effect size for each outcome, which indicates the expected magnitude of change caused by the program (e.g., Head Start) for each outcome of interest (e.g., test scores).

Step 2: Assess the return on investment

WSIPP has developed, and continues to refine, an economic model to provide internally consistent monetary valuations of the benefits and costs of each program on a per-participant basis.

Benefits to individuals and society may stem from multiple sources. For example, a program that reduces the need for government services decreases taxpayer costs. If that program also improves participants' educational outcomes, it will increase their expected labor market earnings. Finally, if the program reduces crime, it will also reduce expected costs to crime victims.

We also estimate the cost required to implement an intervention. If the program is operating in Washington State, our preferred method is to obtain the service delivery and administrative costs from state or local agencies. When this approach is not possible, we estimate costs using the research literature, using estimates provided by program developers, or using a variety of sources to construct our cost estimate.

Step 3: Determine the risk of investment

Any tabulation of benefits and costs involves a degree of uncertainty about the inputs used in the analysis as well as the bottom-line estimates. An assessment of risk is expected in any investment analysis, whether in the private or public sector.

To assess the uncertainty in our bottom-line estimates, we look at thousands of different scenarios through a Monte Carlo simulation. In each scenario, we vary a number of key factors in our calculations (e.g., expected effect sizes, program costs), using estimates of error around each factor. The purpose of this analysis is to determine the probability that a particular program or policy will produce benefits that are equal to or greater than costs if the real-world conditions are different than our baseline assumptions.

Programs Reviewed

To focus on the effect of programs similar to Washington's current program, we restrict our analysis to examine the impact of the following programs:¹⁶

- State ECE programs targeting low-income children,
- Universal state ECE programs, and
- Head Start.

To be included in our analysis, studies must evaluate the effects of one of these programs on children participating after 1975. We further restrict state or district preschool programs¹⁷ to only include those that meet the following criteria:¹⁸

- The program has to be funded by the state;
- The program must be administered and/or supervised by the state;
- The program must largely serve children no younger than three or older than five;¹⁹
- Early education must be the primary focus of the program; and²⁰
- Program eligibility is based primarily on geography and/or socioeconomic status.²¹

Finally, studies must account for family characteristics including parental education, family structure, and parental income to be included.

¹⁶ We chose to not update our results for model programs such as Perry Preschool and the Abecedarian project for two main reasons. First, as noted in our 2014 report, these were small scale, intensive programs that are likely unrepresentative of modern ECE programs. Second, these programs do not meet our current inclusion criteria for ECE programs. For example, children participated in Perry Preschool and the Abecedarian project prior to 1975, a time when many children did not participate in ECE. Therefore the control conditions are not comparable. For benefit-cost analyses focusing on specific model programs, see Heckman, J.J., Moon, S.H., Pinto, R., Savelyev, P.A., & Yavitz, A. (2010). The rate of return to the High Scope Perry Preschool Program. *Journal of Public Economics*, 94(1), 114-128 and Barnett, W.S., & Masse, L.N. (2007). Comparative benefit-cost analysis of the Abecedarian program and its policy implications. *Economics of Education Review*, 26(1), 113-125.

¹⁷ Since a majority of the programs analyzed in this report are state programs, rather than district programs, we will refer to all state and district programs as state programs for the remainder of the report.

¹⁸ Our criteria closely follow the criteria for a program to be classified as a state preschool program used by NIEER. Friedman-Krauss et al. (2019). [The state of preschool 2018 \(NIEER report 8/2019\)](#).

¹⁹ Programs designed to serve pregnant women or children from infancy are excluded.

²⁰ The program cannot offer extensive parental education, health services, or other support that would make the program more intensive than the "typical" state ECE program. The program cannot be a subsidy program or other program with a primary goal of general child care provision.

²¹ The program cannot be designed to serve primarily children with disabilities (although disability can be a risk factor included in priority of participation). The program cannot be tied to parental work status.

These restrictions lead to us to exclude some studies that were included in other meta-analyses of ECE programs, including those in our previous report. For example, restricting our analysis to studies of children participating after 1975 eliminated some studies that examined long-term outcomes because there was a relatively smaller window to examine study participants.

The restrictions in our study inclusion criteria also result in many ECE studies using administrative data being excluded. Administrative data is widely available but typically does not contain enough student and family information that we believe would be necessary to control for potential differences in the types of parents who choose to enroll or not enroll their children in ECE programs. A full discussion of our methodological changes and their implications are included in [Appendix I](#).

Using these criteria, we identified 18 studies evaluating Head Start that met our criteria for inclusion. We also identified nine studies evaluating state programs targeting low-income children and nine studies evaluating universal state programs that met our criteria for inclusion.²²

Outcomes Reviewed

We present meta-analytic findings, when possible, for the following outcome areas:

- Academic outcomes,
- Behavioral outcomes,
- Other participant outcomes, and
- Parental outcomes.

²² Some included studies evaluate both universal programs and programs targeting low-income children in the same study. We include these studies in both counts.

For most outcomes, we base our analysis on the longest follow-up reported in each relevant study. For example, if the study measured grade retention (being held back a grade) through the end of kindergarten and through the end of first grade, the effect size²³ reported will be grade retention through the first grade. For test scores, we include the first measure following the program, as long as it takes place between the end of preschool through the end of kindergarten to obtain an estimate of the impact of ECE immediately following program participation.

We were unable to measure the same outcomes for all three programs. [Exhibits 5-8](#) summarize which outcomes we were able to measure by program and outcome area.

The exact timing of measurement for each outcome varies by ECE program. This may impact the observed effect of the program, since many studies have found that the impact of ECE programs fades over time. For this reason, it may be important to not directly compare effect sizes across programs without also observing when these outcomes were measured; the average age at which effects were measured can be found in [Exhibit A2 of Appendix II](#). This should not impact the benefit-cost results of the programs, since we control for the time of outcome observation when determining program benefits.

²³ Effect size is a standard metric that summarizes the degree to which a program or policy (e.g., Head Start) affects a measured outcome of interest (e.g., test scores). Positive effect sizes indicate that, averaged across all included studies, the intervention increased the level or likelihood of the outcome for treatment groups. Negative effect sizes indicate that, on average, participation in the intervention reduced the level or likelihood of the outcome.

Exhibit 5

Description of Academic Outcomes

Outcomes	Description	Programs measuring this outcome		
		State ECE: Low-income	State ECE: Universal	Head Start
Test scores	Measures the impact that ECE programs have on test scores at the end of preschool through the end of kindergarten. When reports measured the impact of tests at multiple periods, we used the first measure.	X	X	X
Grade retention	Measures the change in the likelihood that a student was ever held back.	X	X	X
Special education	Measures the change in the likelihood that a student ever participated in a special education program.	X	X	X
School attendance	Measures the number of days that a student did not have a recorded absence.	X	X	X
Grades or GPA	Measures the impact that ECE programs have on middle school GPA.		X	X
High school graduation	Measures whether individuals receive a high school diploma.			X
Enroll in any college	Measures whether students ever attended a college.			X
Graduate with any degree	Measures whether program participants obtained a technical, associate's or bachelor's degree.			X

Exhibit 6

Description of Behavioral Outcomes

Outcomes	Description	Programs measuring this outcome		
		State ECE: Low-income	State ECE: Universal	Head Start
Office discipline referrals (ODRs)	Measures disciplinary actions occurring by the time children are in the second or third grade.	X	X	
Suspension/expulsion	Measures in-school and out-of-school suspensions and school expulsions occurring during middle school.		X	X
Crime	Measures data on arrests, charges, and convictions.			X
Alcohol use by middle school	Measures whether male students had ever tried alcohol, tobacco, and/or illicit drugs by the time they were 12 or 13.			X
Illicit drug use by middle school	Measures whether male students had ever tried alcohol, tobacco, and/or illicit drugs by the time they were 12 or 13.			X
Tobacco use by middle school	Measured whether male students had ever tried alcohol, tobacco, and/or illicit drugs by the time they were 12 or 13.			X
Youth binge drinking	Measured whether students reported being drunk by age 16 or 17.			X

Exhibit 7

Description of Other Participant Outcomes

Outcomes	Description	Programs measuring this outcome		
		State ECE: Low-income	State ECE: Universal	Head Start
Social and emotional development	Includes measures of a broad range of skills relative to social skills and emotions. This includes, but is not limited to, measures of self-awareness, self-control, self-management, social awareness, relationship skills, persistence, and social management. It does not include child mental health outcomes such as internalizing behavior, externalizing behavior, disruptive behavior disorder, attention deficit hyperactivity disorder (ADHD), depression, or anxiety.			X
Executive function	Includes measures of students' cognitive mental processes but not the behaviors themselves. For example, executive function may capture working memory, attention shifting, and attention. It does not capture intelligence. It also does not capture measures of self-regulation, self-control, self-management, behavior regulation, emotion regulation, or responsible decision making, which are better captured under social-emotional development.		X	
Internalizing	Measures negative behaviors which are focused inwards. These behaviors do not necessarily indicate that a child has a mental health problem but may be correlated with later depression or anxiety.			X
Externalizing	Measures negative behaviors which are focused outwards. This can include impulsive, hyperactive, aggressive, and/or antisocial behavior. These behaviors do not necessarily indicate that a child has a mental health problem but may be correlated with later delinquency, hyperactivity, conduct disorders, and other externalizing disorders.			X
Depression	Measures the difference in depression symptoms as measured by the Center for Epidemiologic Studies Depression Scale (CES-D).			X
Child obesity-BMI	Measures whether students were considered obese.			X
Teen births < 18	Measures whether individuals of either gender had a child by the time they were 18 or 19 years old. This measure does not include individuals who were married at the time of the birth.			X
Employment	Measures whether students have ever worked by the time they were 20-21.			X

Exhibit 8

Description of Parental Outcomes

Outcomes	Description	Programs measuring this outcome		
		State ECE: Low-income	State ECE: Universal	Head Start
GED	Measures whether parents earned a GED. [#]			X
Graduate with any degree	Measures whether parents obtained a technical, associate's, or bachelor's degree.			X
Employment	Measures the percentage of parents who move from being not employed to employed.			X

Note:

[#]The study measured high school degree/GED receipt. We assume the average parent received a GED rather than a high school diploma because the average age of parents in the study is 29 years old.

III. Research Findings

Exhibits 10-13 summarize the effect sizes for all outcomes observed. All outcomes are labeled with a direction of the desired effect. The exhibits also include error bars which indicate the 95% confidence intervals for each outcome. When the 95% confidence interval crosses the horizontal axis, where the effect size equals zero, the effect size is not “statistically significant” by conventional standards.

However, even if a program does not have a statistically significant impact, the strength of evidence may still suggest that the program is likely effective; we define this result as marginal evidence of an effect. In addition to discussing the statistical significance, we also indicate when findings indicate marginal evidence of an effect. This section concludes with an analysis of the overall impact of each of the three programs analyzed. Exhibit 9 provides information on how to interpret our meta-analytic findings.

Exhibit 9

How to Interpret Meta-Analytic Results

Effect size: A standard metric that summarizes the degree to which a program or policy (e.g., Head Start) affects a measured outcome of interest (e.g., test scores). Positive effect sizes indicate that, averaged across all included studies, the intervention increased the level or likelihood of the outcome for treatment groups. Negative effect sizes indicate that, on average, participation in the intervention reduced the level or likelihood of the outcome.

Error bars: Bars that indicate the 95% confidence interval for each effect. This is a commonly used metric of statistical significance. When the confidence interval does not cross the horizontal axis (the confidence interval does not contain negative and positive values), it is very unlikely that the outcome results occurred by chance.

Direction of desired effects: Next to each outcome label we include an arrow indicating the desired direction of the effect.

- ↑ indicates that it would be desirable for the ECE programs to increase (the likelihood of) this outcome.
- ↓ indicates that it would be desirable for the ECE programs to decrease (the likelihood of) this outcome.

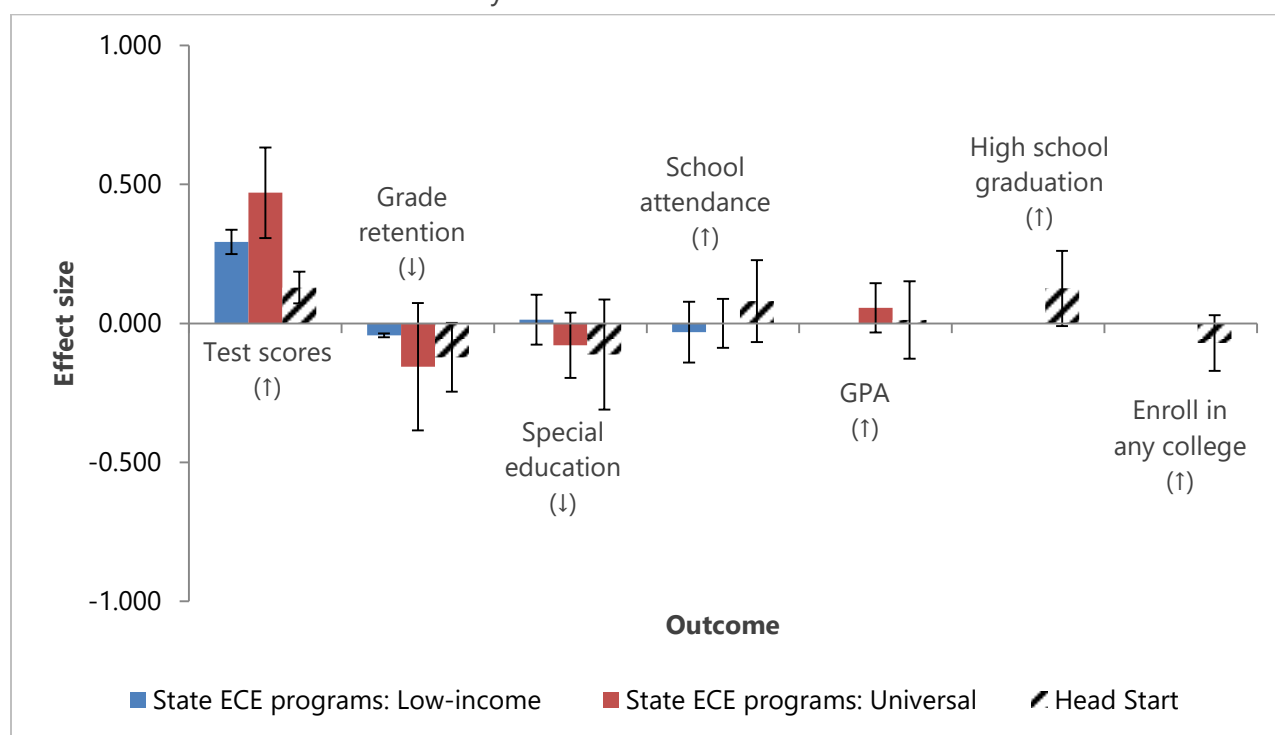
Academic Outcomes

Since early childhood education programs are, by definition, required to have a main focus of preparing children for school, it is not surprising that we have the most coverage across all three types of ECE programs on our academic outcomes. Our results are also consistent with other literature which generally finds that ECE programs have a large impact on initial outcomes and that the impacts of the programs decrease over time.

As shown in [Exhibit 10](#), all three ECE programs have statistically significant effects on test scores, which are measured immediately after ECE program participation. Other measured effects varied across program approaches. For example, while state ECE programs for low-income students showed a significant reduction in grade retention, Head Start participants also showed marginal improvements in both grade retention and high school graduation.

Exhibit 10

Meta-Analytic Results: Academic Outcomes



Notes:

95% confidence intervals are shown for each effect size.

An up arrow (↑) indicates that it is desirable for the program to increase the level or likelihood of this outcome.

A down arrow (↓) indicates that it is desirable for the program to decrease the level or likelihood of this outcome.

Behavioral Outcomes

Behavioral outcome results can be broken into three categories:

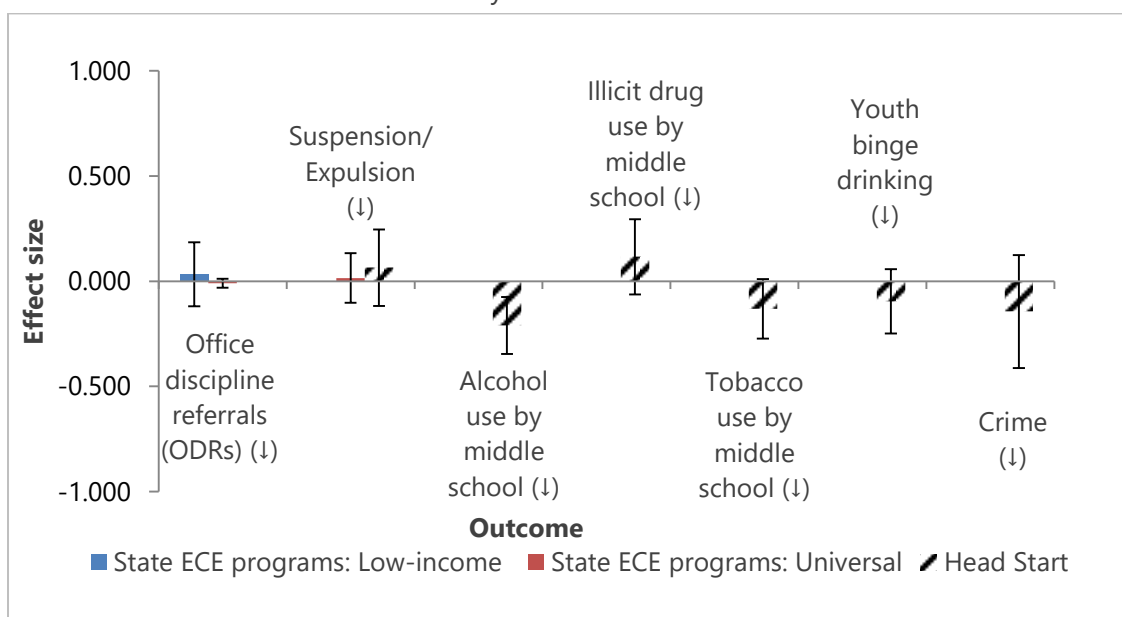
- 1) disciplinary action taken against a student in an academic setting,
- 2) substance use, and
- 3) crime.

We are able to measure at least one outcome related to early disciplinary action taken against the student for all three types of ECE programs. We are only able to measure the impact of ECE program participation on subsequent substance use and criminal activity for Head Start.

We did not find even marginal evidence of an effect of low-income or universal state ECE programs on office discipline referrals. We found marginal evidence that Head Start impacts some substance use but did not find evidence that the program had an effect on disciplinary action taken against a student in an academic setting or on criminal activity.²⁴

Exhibit 11

Meta-Analytic Results: Behavioral Outcomes



Notes:

95% confidence intervals are shown for each effect size.

An up arrow (↑) indicates that it is desirable for the program to increase the level or likelihood of this outcome.

A down arrow (↓) indicates that it is desirable for the program to decrease the level or likelihood of this outcome.

²⁴ We find Head Start had an impact on some substance use and depression symptoms, but these findings come from a single study that examined the impact of the program for male participants.

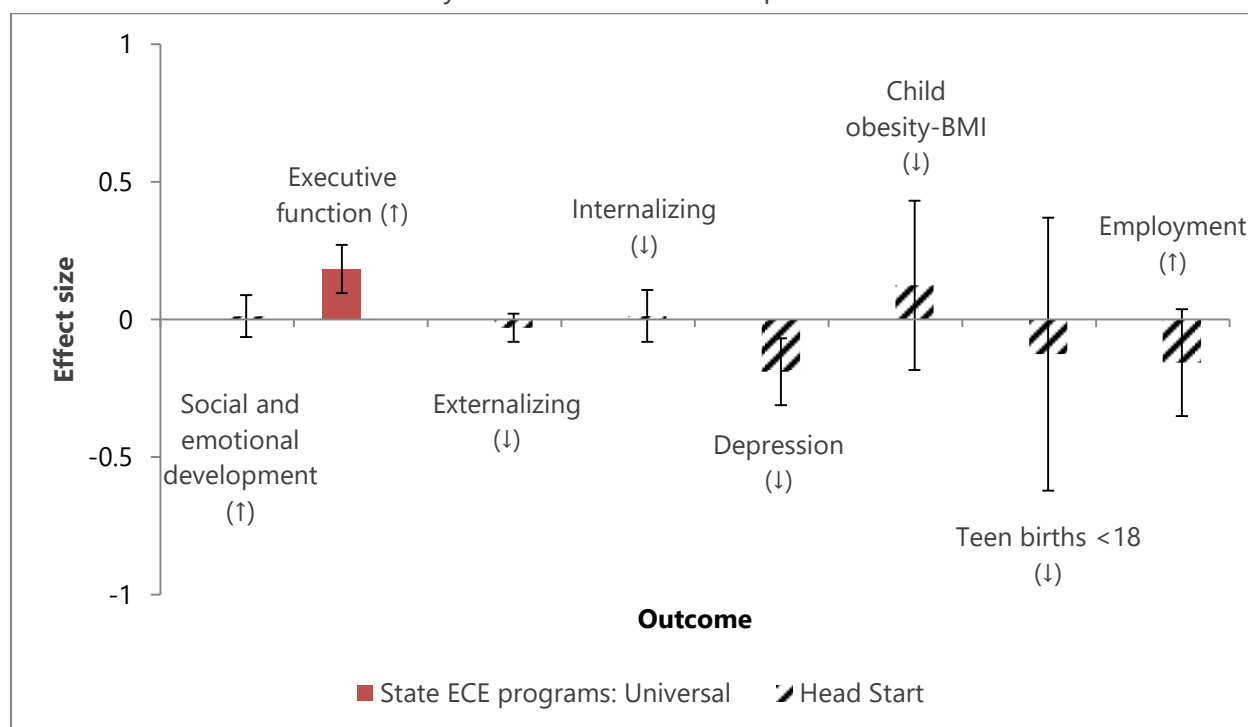
Other Outcomes

Other outcomes include a broad range of student outcomes not captured in the previous two areas. We are not able to compare results across programs since each outcome was measured in only a single ECE program type, with a majority of outcomes only being reported for Head Start.

We do not have any outcomes in this category for state ECE programs targeting low-income students. We find that universal state ECE programs impact executive functioning. We also find that Head Start has a statistically significant impact on depression. We do not find evidence of an effect on the other outcomes measured.

Exhibit 12

Meta-Analytic Results: Other Participant Outcomes



Notes:

95% confidence intervals are shown for each effect size.

An up arrow (↑) indicates that it is desirable for the program to increase the level or likelihood of this outcome.

A down arrow (↓) indicates that it is desirable for the program to decrease the level or likelihood of this outcome.

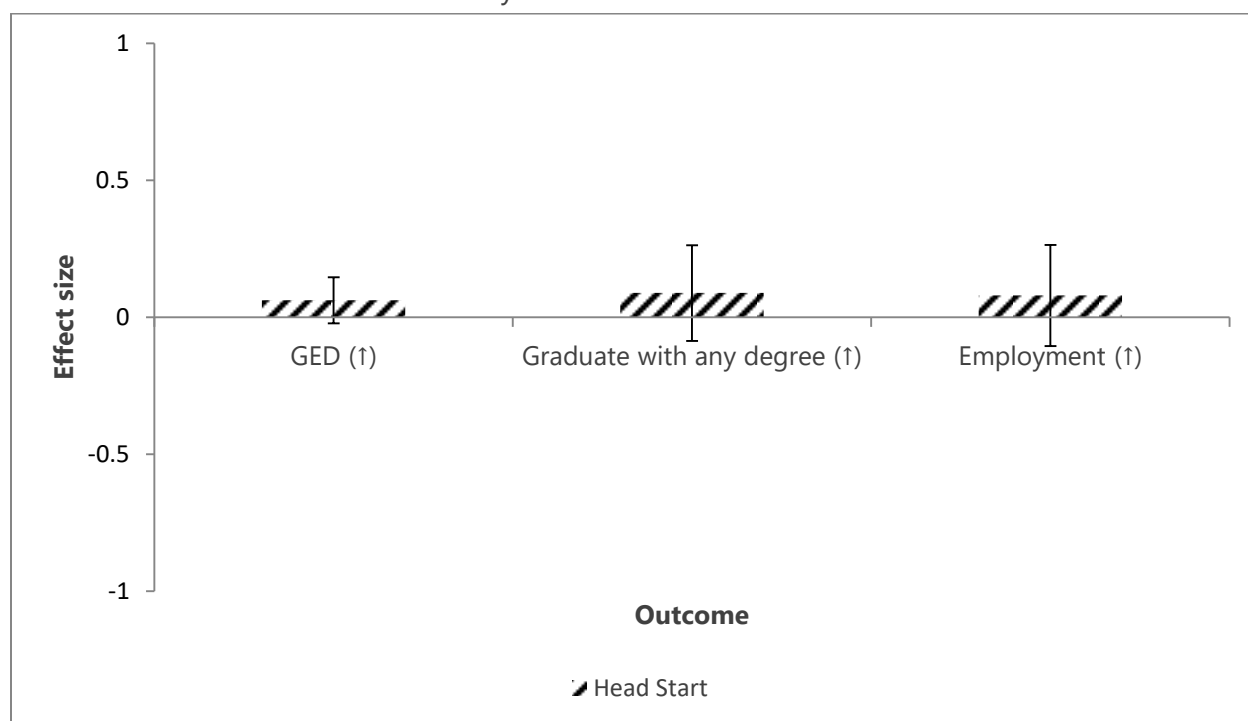
Parental Outcomes

Parental outcomes capture the impact of ECE program participation for the parents of ECE program participants. Programs could have a positive impact on the parents of program participants because they provide parents with access to childcare. We were

only able to find Head Start evaluations that reported parental outcomes and met our inclusion standards. We do not find evidence that Head Start affected any of the parental outcomes observed. We cannot speak to the impact that low-income or universal state programs have on parental outcomes.

Exhibit 13

Meta-Analytic Results: Parental Outcomes



Notes:

95% confidence intervals are shown for each effect size.

An up arrow (↑) indicates that it is desirable for the program to increase the level or likelihood of this outcome.

A down arrow (↓) indicates that it is desirable for the program to decrease the level or likelihood of this outcome.

Key Takeaways

We observed estimates of the impact of ECE program participation on numerous outcomes across a wide range of topic areas, primarily due to the abundance of research on Head Start. The evidence from research on Head Start programs suggests

that most of the effect of ECE programs is localized to an academic setting. [Exhibit 14](#) summarizes the key results by outcome area and program type.

Future research could expand these findings by evaluating the effects of other types of ECE programs on behavioral, parent, and other participant outcomes.

Exhibit 14

Summary of Meta-Analytic Results

Outcome areas	Programs		
	State ECE program: Low-income	State ECE program: Universal	Head Start
Academic outcomes	We find statistically significant evidence that low-income ECE programs increase test scores and reduce grade retention. However, evidence suggests that low-income ECE programs do not impact special education participation or school attendance.	We find statistically significant evidence that universal ECE programs increase test scores. However, evidence suggests that universal ECE programs do not impact grade retention, special education, school attendance, or grades.	Head Start is the only program with rigorous research meeting our inclusion criteria to measure student outcomes from immediately after program participation through college graduation. We find statistically significant evidence that Head Start increases test scores immediately following program participation. We also find marginal evidence that Head Start reduces grade retention and increases high school graduation. Evidence suggests that Head Start does not impact other outcomes.
Behavioral outcomes	Evidence suggests that state ECE programs do not have an effect on the number of office discipline referrals received by children in elementary school.	Evidence suggests that state ECE programs do not have an effect on the number of office discipline referrals received by children in elementary school or school suspensions.	We find statistically significant evidence that Head Start reduces alcohol use by middle school. We also find marginal evidence that Head Start reduces student tobacco use by middle school. Evidence suggests that Head Start does not affect suspensions/expulsions, illicit drug use by middle school, youth binge drinking, or crime.
Other participant outcomes	No outcomes measured.	We find statistically significant evidence that universal ECE programs increase executive function in students. We were unable to find research on any other outcomes listed in this category.	We find statistically significant evidence that Head Start decreases depression symptoms in male students. Evidence suggests that Head Start does not affect social-emotional development, externalizing behavior, internalizing behavior, child obesity, teen births, or employment.
Parental outcomes	No outcomes measured.	No outcomes measured.	Evidence suggests that Head Start does not affect any of the parental outcomes observed.

Benefit-Cost Results

We conducted a benefit-cost analysis of state ECE programs targeting low-income children, universal state ECE programs and Head Start. These results are based on 11 outcomes we can reliably monetize through our benefit-cost model. [Exhibit 15](#) outlines the key information we include in our benefit-cost analysis. It includes not only information on the expected benefits and costs of the program, but also how likely it is the benefits of the program will exceed its costs. [Exhibit 16](#) summarizes our results.

Benefits

We find that all three programs have a positive potential benefit. The majority of the benefits of these programs come from a potential increase in the lifetime labor market earnings for program participants.

We also observe that some of the difference in the expected benefit of Head Start and the state ECE programs comes from differences in the breadth of monetized outcomes for Head Start. Recall, from [Exhibits 5-8](#) that evaluations of Head Start measure many more outcomes than evaluations of either of the state ECE programs. As a result, we can monetize the impact of Head Start through many more channels than the other programs. For example, part of the benefit of Head Start comes from changes in expected parental earnings, which is not measured by the state programs. We then implicitly assume that the state programs have no impact on parental earnings. If the state programs have a similar impact on parental earnings, then we will be underestimating the potential benefits from state ECE programs compared to Head Start. A full analysis of the source of the benefits across programs is included in [Appendix III](#).

Costs

Costs for these three programs are the estimated per-participant cost to implement the program in Washington, relative to the cost of treatment as usual. In other words, it represents the difference in the cost of the program and the cost of other services the state would provide if it did not offer the program. We used per-student funding levels for ECEAP to estimate the cost of state ECE programs. We use per-student funding levels for Head Start to estimate the cost of Head Start. When determining the cost of the comparison groups, we estimate the cost of all state- or federally-funded programs in which children might participate including state subsidies for childcare. We incorporate the state subsidy programs because we believe that the provision of ECE programs may also reduce the need for child care.

It is important to note the reason that the net costs for low-income ECE programs are so much lower than the net costs for universal ECE programs is that many of the participating children in a universal program would not receive state-funded childcare in the absence of the program. This means that the expected “treatment as usual” cost for children who would not have otherwise participated in a state program is zero.²⁵ Since the costs to the state for children who are not enrolled in a universal program are lower for the state, the cost of the universal ECE relative to the cost of treatment as usual will be higher than that for low-income ECE programs.

Similarly, the cost of low-income ECE programs is lower than the cost of Head Start because Head Start is more expensive than state ECE programs. We assume that families treat Head Start and low-income ECE programs as substitutes (will enroll in one if the other is unavailable). The higher cost of Head Start means that not only is the cost of the treatment higher, for Head Start, but the average “treatment as usual” cost is lower, since these children are enrolled in the relatively less expensive state program. Please see [Appendix III](#) for more information on our cost methodology.

Chance benefits exceeds costs

We also find that the level of uncertainty for the investment is relatively low. We find that there is at least a 70% chance that the investment in any of the ECE programs will at least break even.

²⁵ We do not incorporate the cost of child care or early childhood education provision for the parents.

Exhibit 15

How to Interpret WSIPP's Benefit-Cost Results

The numbered columns on the benefit-cost exhibits are described below.

- 1) [Program name](#) describes the name of the intervention analyzed. Some programs are general categories of a type of intervention, while others are specific name-brand programs. Descriptions of each program can be found preceding each exhibit as well as on our website.[#]
- 2) [Total benefits](#) are the average benefits of the intervention, per-participant. This is the sum of the taxpayer and non-taxpayer benefits.
- 3) [Taxpayer benefits](#) are benefits that accrue to the taxpayers of the state of Washington through avoided publicly funded health care system costs and/or taxes participants would pay on their increased labor market earnings.
- 4) [Non-taxpayer benefits](#) include benefits that accrue directly to program participants; benefits to others, such as reduced costs to private health insurance providers; and indirect benefits, such as the value of a statistical life and the deadweight costs of taxation.
- 5) [Costs](#) are the estimated per-participant cost to implement the program in Washington, relative to the cost of treatment as usual. If the cost is positive, the intervention is estimated to be cheaper than the treatment as usual.
- 6) [Benefits minus costs \(net present value\)](#) are the net benefits, or the difference between the total benefits and the cost to implement the program, per participant. If this number is positive, the expected benefits of the program exceed the estimated cost. If this number is negative, the program is estimated to cost more than the sum of the expected benefits.
- 7) [Benefit to cost ratio](#) represents the estimated value to Washington State for each dollar invested in the program. It is the total benefits, divided by the cost of the program. If a program cost is positive, the benefit-to-cost ratio is designated as "n/a"—not applicable.
- 8) [Chance benefits will exceed costs](#) describes the risk of the investment. In our benefit-cost analysis, we account for uncertainty in our estimates by allowing key inputs to vary across thousands of scenarios. We run our benefit-cost model 10,000 times; this statistic shows the percentage of cases in which the total benefits were greater than the costs.

Note:

[#] The benefit-cost section of WSIPP's website presents our current findings for a variety of public policy topics. Items on these tables are updated periodically as new information becomes available. Interested readers can find more information by clicking each entry in the tables.

Exhibit 16

Benefit-Cost Results

Program name (1)	Total benefits (2)	Taxpayer benefits (3)	Non- taxpayer benefits (4)	Costs (5)	Benefits minus costs (net present value) (6)	Benefit to cost ratio (7)	Chance benefits will exceed costs (8)
Low-income ECE programs	\$12,751	\$2,938	\$9,813	(\$2,946)	\$9,805	\$4.33	91%
Universal ECE programs	\$22,012	\$6,499	\$15,513	(\$6,990)	\$15,022	\$3.15	78%
Head Start	\$21,281	\$7,588	\$13,694	(\$8,800)	\$12,481	\$2.42	70%

IV. Summary of Findings

This report updates our 2014 meta-analysis of the impact of early-childhood education programs in Washington. Our findings are consistent with our previous findings on the benefits of early childhood education programs. We find that early childhood education programs for three- and four-year-olds have positive impacts on short- and long-term academic outcomes.

We find evidence that ECE programs have an impact on kindergarten readiness as measured by kindergarten and pre-kindergarten test scores.

We were unable to find recent research on the impact of universal and low-income early childhood education programs on high school graduation. However, the literature on Head Start programs suggests that there may be a positive impact of early childhood education on high school graduation.

Next Steps

WSIPP is currently working on two reports examining the impact of ECEAP participation. These reports may fill in some of the current gaps in the literature on the impact of more recent early childhood education programs on short- and long-term student outcomes.

The first will update WSIPP's 2014 outcome analysis of Washington's Early Childhood Education and Assistance Program (ECEAP). It will use the original cohort of students to examine the impact of ECEAP on long-term outcomes, like high school graduation.

The second report will evaluate the impact of part- and full-day programming and staff characteristics on program outcomes and include more recent cohorts of ECEAP participants.²⁶ Both reports are expected to be released in December 2021.

²⁶ "To the extent that data is available, [the evaluation must consider] the education levels and demographics, including race, ethnicity, and socioeconomic status, of early childhood education and assistance program staff and the effects of full-day programming and half-day programming on outcomes." [E2SHB 1391](#).



Appendices

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I. Comparison of the 2014 and 2019 Reports

This report updates the 2014 meta-analysis of early childhood education programs in Washington by updating the review of relevant research. Through the update process, we made changes to the programs included, the outcomes analyzed, and the inclusion criteria used between the 2014 report and 2019 reports. This appendix describes these changes and the implications for the analysis.

Programs Included

In the initial report, we focused specifically on low-income early child education programs. We analyzed the following programs:

- 1) State and district pre-kindergarten programs,
- 2) Head Start, and
- 3) Model programs.²⁷

In the 2019 update, we divided “state and district pre-kindergarten programs” into:

- 1) Low-income ECE programs and
- 2) Universal ECE programs.

The division allows for an examination of whether offering an ECE program to a wider group of children changes the expected returns of the program.

New research also allows us to expand outcomes included in our Head Start analysis to include outcomes related to parents of Head Start participants instead of only analyzing the impact of the program on participants.

We excluded model programs from our current analysis. Many of the studies included in our prior analysis were from two seminal, and well-cited, model programs: Perry Preschool and the Abecedarian Project. The reason for the exclusion of these programs was twofold. First, these programs were implemented prior to 1975. As discussed in other sections of the report, we have do not know how relevant results from these older cohorts would be for determining the benefit of current ECE programs. Second, these programs were much more intensive than current ECE programs, including ECEAP. Perry Preschool provided weekly home visits to parents to help them reinforce the preschool curriculum at home. In the Abecedarian

²⁷ Model programs in the research literature are generally small programs implemented in the 1960s and 1970s with highly trained teachers, a consistent curriculum, and oversight by the program developer.

Project, children were provided with high-quality child care from birth to age five. The program also provided children with on-site health care. The intensity of the program again suggests that they would not be very informative in helping us to understand the likely benefit of ECE programs similar to those occurring in Washington State. Readers interested in the effects of model ECE programs during the time they were implemented can refer to the 2014 report.

Outcomes Included

Exhibit A1 shows the difference in outcomes examined in the 2014 and 2019 reports.

Exhibit A1
Changes to Previously Reviewed Programs

Outcome	Change between 2018 and 2019 reports
State and district pre-kindergarten	Name change: State early childhood education programs: low-income
Grade retention	No change
Special education	No change
Test scores	No change
Crime	No longer measured because of the above changes
Emotional development	No longer measured because of the above changes
High school graduation	No longer measured because of the above changes
Self-regulation	No longer measured because of the above changes
Attendance	New outcome
Office discipline and referrals	New outcome
Head Start	
Crime	No change
Grade retention	No change
High school graduation	No change
Test scores	No change
Teen birth < 18	No change
Emotional development	Name change: Now "social and emotional development"
Self-regulation	No longer measured because of the above changes
Alcohol use by middle school	New outcome
Attendance	New outcome
Childhood obesity-BMI	New outcome
Depression	New outcome
Employment	New outcome
Enroll in any college	New outcome
Externalizing	New outcome
GPA	New outcome
Graduate with any degree	New outcome
Illicit drug use by middle school	New outcome
Internalizing	New outcome
Special education	New outcome
Suspension/expulsion	New outcome
Tobacco use by middle school	New outcome
Youth binge drinking	New outcome

Inclusion/Exclusion Criteria

We made two fundamental changes to our exclusion criteria in the 2019 report:

- 1) We exclude studies of children who were enrolled in a Head Start or ECE program before 1975.
- 2) We increased the number of characteristics that needed to be controlled for either directly, or indirectly, in order for a quasi-experimental research study to be included in our analysis.

Why Did We Exclude Older Studies?

We chose to exclude studies of children enrolled in early childhood education before 1975 because of fundamental changes in the field of early childhood education and the experiences of children enrolled in these programs. In the 2014 report, our analysis included studies of children enrolled in ECE programs as far back as the 1960s. Many more children in the comparison groups in those studies (i.e., those not receiving ECE) were not receiving alternative ECE services than compared to children today. According to Gibbs, Ludwig and Miller, only about 10% of 3- and 4-year-olds were enrolled in school in 1964.²⁸ In 2017, 68% of 4-year-olds and 40% of 3-year-olds were enrolled in a kindergarten or preschool program.²⁹ The implementation and expansion of Head Start and state ECE programs during this time meant that many more children in the comparison group of recent studies may have had access to some other form of ECE program or preschool in the absence of program participation than in the earlier cohorts.

In addition, the quality of programs has improved and become more standardized over time. Head Start, for example, did not publish the Head Start Program Performance Standards until 1975.³⁰ Knowledge about ECE has grown considerably since the 1960s when many of these theories were first being tested through the model programs. We believe that research on more recent cohorts of children will better predict the type of program children will now experience.

²⁸ Gibbs, C., Ludwig, J., & Miller, D. (2013). Head Start origins and impacts. In M. Bailey & S. Danziger (Eds.), *Legacies of the War on Poverty*, (pp. 39–65). New York: Russel Sage Foundation and Haskins, R. (2004). Competing visions. *Education Next*, 4(1), 26–33.

²⁹ U.S. Department of Education, National Center for Education Statistics. (2019). *The Condition of Education 2019* (NCES 2019-144), [Preschool and Kindergarten Enrollment](#).

³⁰ Early Childhood Learning & Knowledge Center. (2019). [Head Start Timeline](#).

Why Did We Change Our Exclusion Criteria?

Our 2014 report states that “we only include quasi-experimental studies if sufficient information is provided to demonstrate comparability between the treatment and comparison groups on important pre-existing conditions such as age, gender, and pre-treatment characteristics such as test scores.”³¹ However, we believe that several studies previously included matched children on too few characteristics to comfortably believe that matched children had the same likelihood of success in the absence of participation in the ECE program.³² Most programs were not able to match children on prior ability and/or performance, since many children who did not participate in an ECE program did not have assessments of their ability until entering the K-12 system. This meant that many of these studies were matching children on demographic characteristics, such as race and gender, and FRL status.³³ We believe that matching on demographic characteristics is insufficient because within categories, such as race, we expect that unobserved differences between parents will drive ECE program participation and later performance. Therefore, to be included in the analysis, we require studies to account for specific child and family characteristics, including parental education and family structure. We also require includes studies to account for a granular measure of parental or neighborhood income.

³¹ See page 10, [Kay & Pennucci \(2014\)](#).

³² Please see Deschacht, N., & Goeman, K. (2015). *Selection bias in educational issues and the use of Heckman's sample selection model*. Contemporary economic perspectives in education. Leuven University Press. pp. 35-51; Crosnoe, R., Purtell, K.M., Davis-Kean, P., Ansari, A., & Benner, A.D. (2016). The selection of children from low-income families into preschool. *Developmental psychology*, 52(4), 599–612; and D'Elio, M.A., O'Brien, R.W., Grayton, C.M., Keane, M.J., Connell, D.C., Hailey, L., & Foster, M.E. (2001). *Reaching out to families: Head Start recruitment and enrollment practices*. Prepared for the Administration on Children, Youth, and Families, U.S. Department of Health and Human Services (DHHS) under contract HHS-282-98-0006.

³³ Matching students on characteristics like FRL status is also problematic because students are matched on characteristics that occurred after program participation.

II. Full Meta-Analytic Results

Descriptions of how to read the meta-analytic results exhibits are provided in [Exhibit A2](#).

Exhibit A2

How to Interpret WSIPP's Meta-Analytic Results

The columns of the meta-analytic exhibits are described below.

- 1) [Intervention](#) describes the name of the intervention or policy analyzed. Some programs and policies are general categories of a type of intervention, while others are specific name-brand programs. Descriptions of each program can be found preceding each exhibit as well as on our website.
- 2) [Outcome](#) identifies the specific outcome of interest measured in the studies included in the meta-analysis.
- 3) [# of effect sizes](#) represents the number of effects we included in our meta-analysis. Generally, this number reflects the number of studies included in the meta-analysis.
- 4) [Effect size](#) is a standard metric that summarizes the degree to which a program or policy (e.g., dual enrollment) affects a measured outcome of interest (e.g., college enrollment). Positive effect sizes indicate that, averaged across all included studies, the intervention increased the likelihood of the outcome for treatment groups. Negative effect sizes indicate that, on average, participation in the intervention reduced the likelihood of the outcome. We report adjusted effect sizes, which account for the rigor of study research designs.
- 5) [Standard error](#) identifies the variation or uncertainty in our estimated adjusted effect size. Our effect sizes are estimates and can vary depending on numerous factors. The smaller the standard error, the more certain we are about the estimated effect size.
- 6) [p-value](#) is another measure of certainty in our estimated effect size. The p-value can range from 0 to 1 and represents the chance that we would observe the reported effect if the intervention truly had no effect at all. We report the p-value associated with the unadjusted effect size.
- 7) [# in treatment](#) represents the total number of treated individuals across all studies included in the meta-analysis.
- 8) [Age at ES1](#) reports the average age at which the effect size was measured. Studies may measure outcomes at different ages after participation. We take a weighted average of the ages at which the effect was measured across the included studies to arrive at age at ES1.

Exhibit A3

Meta-Analytic Results: Financial Interventions

Intervention	Outcome	# of effect sizes	Effect size	Standard error	P-value	# in treatment	Age at ES1
State early childhood education programs: Low-income	Attendance	1	-0.032	0.056	0.572	1,852	8
	Grade retention	3	-0.043	0.004	0.000	274,592	8
	Special education	3	0.013	0.046	0.778	274,606	8
	Test scores	6	0.293	0.022	0.000	4,616	5
	Office discipline referrals (ODRs)	1	0.033	0.078	0.672	1,852	8
State early childhood education programs: Universal	Grade retention	3	-0.156	0.117	0.181	513,943	9
	Special education	1	-0.079	0.060	0.186	991	12
	Test scores	4	0.470	0.083	0.000	4,055	5
	Attendance	1	0.000	0.045	1.000	991	12
	Executive function	1	0.183	0.045	0.000	1,009	4
	Grades or GPA	1	0.056	0.045	0.212	991	12
	Office discipline referrals (ODRs)	1	-0.010	0.011	0.348	29,709	7
	Suspension/expulsion	1	0.015	0.060	0.801	991	12
Head Start	Child obesity-BMI	2	0.124	0.157	0.430	1,419	6
	Crime	3	-0.144	0.137	0.295	988	19
	Depression	1	-0.190	0.062	0.002	527	15
	Externalizing	7	-0.030	0.026	0.258	6,203	8
	Grade retention	6	-0.122	0.063	0.051	2,848	13
	High school graduation	4	0.126	0.069	0.069	1,485	18
	Internalizing	2	0.013	0.048	0.784	1,905	8
	Special education	4	-0.112	0.101	0.268	1,735	14
	Teen births <18	2	-0.126	0.253	0.619	824	17
	Test scores	7	0.129	0.029	0.000	6,047	5
	Alcohol use by middle school*	1	-0.211	0.069	0.002	634	12
	Attendance	1	0.080	0.075	0.288	214	13
	Employment*	1	-0.157	0.099	0.114	461	20
	Enroll in any college	4	-0.071	0.051	0.163	1,658	25
	Grades or GPA	1	0.012	0.071	0.868	255	13
	Graduate with any degree	1	-0.033	0.068	0.626	497	32
	Illicit drug use by middle school*	1	0.116	0.091	0.201	634	12
	Social and emotional development	4	0.012	0.039	0.749	4,158	7
	Suspension/Expulsion	1	0.064	0.093	0.490	263	13
	Tobacco use by middle school*	1	-0.131	0.072	0.070	634	12
	Youth binge drinking*	1	-0.096	0.078	0.218	584	16
Head Start (Parent outcomes)	Employment	2	0.079	0.094	0.401	1,775	31
	GED	2	0.062	0.043	0.148	1,775	31
	Graduate with any degree	2	0.088	0.089	0.321	1,775	31

Notes:

Bolded outcomes are monetized in our benefit-cost approach.

* These outcomes are monetizable in general but were not used to monetize Head Start. This includes employment (participants only), alcohol use by middle school, illicit drug use by middle school, tobacco use in middle school, and youth binge drinking.

III. Understanding the Benefit-Cost Results

Eleven of the 26 outcomes analyzed across all three programs are monetized, which means that we used them to estimate the expected monetary benefit of the program. However, some of these outcomes are likely alternative ways of measuring the same underlying benefit (construct).³⁴ In addition, some outcomes can be linked to multiple constructs.³⁵

When topics have multiple outcomes measuring the same construct, we typically determine the expected present value of the benefit for each alternative outcome and report the benefit from the outcome(s) with the largest effect,³⁶ dropping the others and/or monetizing the most directly observed path to the construct.³⁷ If a program has positive and negative benefits (where a negative benefit is an outcome going in the opposite of the desired direction), we will include the largest benefit and the largest negative benefit. We also include costs directly attributable to the outcome change in our negative benefits estimate. For example, if a program increased college enrollment, we would include the cost of tuition that would not have otherwise been paid as a negative benefit. For a more detailed explanation, please see the [Technical Document](#).³⁸

[Exhibits A4-A6](#) outline the composition of the benefits for the three ECE programs. We are only able to monetize academic outcomes for state early childhood education programs. For Head Start, we have at least one monetized outcome in each outcome area. To make the program benefits more comparable, we divide the benefits out by the outcome area discussed in the body of the report. These include the following:

- Academic outcomes,
- Behavioral outcomes,
- Other participant outcomes, and
- Parental outcomes.

We find that when we focus on the benefits from academic outcomes that there are many similarities in the expected benefit across all three programs. Although Head Start measures labor market earnings through the outcome “high school graduation” and the labor market effect of low-income targeted ECE programs are measured through the outcome “test scores,” the expected total benefit of this construct is within \$100 for these two programs. The expected benefits for Head Start and low-income targeted ECE programs differ because Head Start studies also found that Head Start reduced criminal justice system involvement and increase parental employment, which we estimate to have large monetary benefits.

³⁴ For example, test scores and high school graduation both have estimated benefits through predicted changes in labor market earnings.

³⁵ For example, obesity contributes to benefits associated with the statistical value of decreased mortality as well as changes in labor market earnings due to health problems.

³⁶ If a program has positive and negative benefits (where a negative benefit is an outcome going in the opposite of the desired direction), we will include the largest benefit and the largest negative benefit.

³⁷ For example, we would prefer to use high school graduation to measure that likelihood of high school graduation than to measure the impact of test scores on high school graduation to measure that likelihood of high school graduation if we have estimates on the programs impact on both test scores and high school graduation.

³⁸ Washington State Institute for Public Policy. (December 2019). [Benefit-cost technical documentation](#). Olympia, WA: Author.

Exhibit A4

Predicted Benefits: State Early Childhood Education Programs: Low-Income

Outcome area	Benefits from outcomes	By perspective							Total
		Participants	Taxpayer perspective				Other [#]	Indirect [^]	
			Taxpayers total	Federal	State	Local			
Academic	Test scores: Labor market effects	\$7,468	\$3,179	\$2,039	\$644	\$496	\$3,939	\$0	\$14,586
	Grade retention: K-12 system costs	\$0	\$51	\$3	\$37	\$10	\$0	\$26	\$77
	Special education: K-12 system costs	\$0	(\$293)	\$0	(\$163)	(\$130)	\$0	(\$146)	(\$439)
Adjustment for deadweight cost of the program	NA	\$0	\$0	\$0	\$0	\$0	\$0	(\$1,473)	(\$1,473)

Notes:

[#]"Others" includes benefits to people other than taxpayers and participants. Depending on the program, it could include reductions in crime victimization, the economic benefits from a more educated workforce, and the benefits from employer-paid health insurance.

[^]"Indirect benefits" includes estimates of the net changes in the value of a statistical life and net changes in the deadweight costs of taxation.

Exhibit A5

Predicted Benefits: State Early Childhood Education Programs: Universal

Outcome area	Benefits from outcomes	By perspective							Total
		Participants	Taxpayer perspective				Other [#]	Indirect [^]	
			Taxpayers total	Federal	State	Local			
Academic	Test scores: Labor market effects	\$11,986	\$5,103	\$3,272	\$1,034	\$796	\$6,323	\$0	\$23,412
	Grade retention: K-12 System Costs	\$0	\$152	\$10	\$111	\$31	\$0	\$76	\$228
	Special education: K-12 system costs	\$0	\$1,244	\$12	\$726	\$506	\$0	\$622	\$1,866
Adjustment for deadweight cost of the program	NA	\$0	\$0	\$0	\$0	\$0	\$0	(\$3,495)	(\$3,495)

Notes:

[#]"Others" includes benefits to people other than taxpayers and participants. Depending on the program, it could include reductions in crime victimization, the economic benefits from a more educated workforce, and the benefits from employer-paid health insurance.

[^]"Indirect benefits" includes estimates of the net changes in the value of a statistical life and net changes in the deadweight costs of taxation.

Exhibit A6
Predicted Benefits: Head Start

Outcome area	Benefits from outcomes	By perspective							Total
		Participants	Taxpayer perspective				Other [#]	Indirect [^]	
			Taxpayers total	Federal	State	Local			
Academic	High school grad: Labor market effects	\$7,353	\$3,131	\$2,008	\$635	\$488	\$4,011	\$0	\$14,495
	Grade retention: K-12 system costs	\$0	\$138	\$9	\$101	\$28	\$0	\$69	\$208
	Special education: K-12 system costs	\$0	\$2,385	(\$1)	\$1,330	\$1,057	\$0	\$1,193	\$3,578
	High school Grad: Costs of higher education	(\$557)	(\$656)	(\$144)	(\$511)	(\$1)	(\$183)	(\$328)	(\$1,723)
Behavioral	Crime: Recidivism effects	\$0	\$1,218	\$0	\$810	\$408	\$2,731	\$609	\$4,558
Other	Externalizing: Health care costs	\$16	\$57	\$49	\$8	\$0	\$59	\$29	\$161
	Internalizing: Health care costs	(\$2)	(\$7)	(\$6)	(\$1)	\$0	(\$7)	(\$4)	(\$20)
	Depression: Mortality	\$0	\$0	\$0	\$0	\$0	\$0	\$1	\$1
	Obesity: Labor market effects	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	\$0	\$0	(\$0)
	Obesity: Mortality	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	\$0	(\$0)	(\$0)
Parents	Employment: labor market Effects (parents)	\$3,103	\$1,321	\$847	\$268	\$206	\$0	\$0	\$4,424
Adjustment for deadweight cost of the program	NA	\$0	\$0	\$0	\$0	\$0	\$0	(\$4,400)	(\$4,400)

Notes:

[#]"Others" includes benefits to people other than taxpayers and participants. Depending on the program, it could include reductions in crime victimization, the economic benefits from a more educated workforce, and the benefits from employer-paid health insurance.

[^]"Indirect benefits" includes estimates of the net changes in the value of a statistical life and net changes in the deadweight costs of taxation.

Understanding the Costs of the Programs

For all three programs, the treatment and control costs are based on a combination of the estimated cost of 1) Head Start, 2) state ECE programs, 3) state subsidy programs, and 4) no state-funded care.

We estimated the cost of Head Start participation by dividing the total federal funding by the total enrollment in Washington in 2019.³⁹ The cost of state universal and low-income ECE program participation is estimated from Washington's Early Childhood Education Assistance Program (ECEAP).⁴⁰ The cost of receiving state-funded childcare subsidies is based on Washington's childcare subsidy reimbursement rates as of February 2019.⁴¹ We assume that the cost of receiving no state-funded care is zero.

We then estimate the number of children who were 1) eligible for ECEAP/Head Start, 2) enrolled in an ECEAP slot, 2) enrolled in a Head Start slot, 3) participating in other state-provided care, 4) eligible but not receiving any state-provided care,⁴² or 5) ineligible to participate in ECEAP/Head Start. [Exhibit A7](#) summarizes our slot and cost estimates.

Exhibit A7

Expected program enrollment

Eligibility	Program Participation	Expected enrollment	Expected cost
Eligible for ECEAP/Head Start	Enrolled in ECEAP	13,491	\$9,330
	Enrolled in Head Start	9,038	\$13,550
	Enrolled in other subsidized care	13,961	\$3,868
	Not enrolled in state subsidized care	4,654	\$0
Ineligible for ECEAP/Head Start	Not enrolled in state subsidized care	47,828	\$0

Comparison group costs are a weighted average of the costs for all children not participating in the program. When possible, we try to match the costs experienced by children not participating in the program in the research used to calculate the effect size of the program. For state ECE programs, this would include children who participated in a combination of Head Start, state-subsidized care and no state-funded care. For Head Start, this included a combination of studies in which the children who did not participate in Head Start had access to a state ECE program⁴³ and did not have access to a state ECE program.⁴⁴

[Exhibit A8](#) lists the calculated treatment and comparison costs for all three ECE programs analyzed.

³⁹ The costs of Head Start participation were provided by T. Saenz-Thompson (personal communication, Office of Head Start Region 10, October 24, 2019).

⁴⁰ Washington State Department of Children, Youth & Families (2019) [2019-20 ECEAP Contractor Slots, Models, Overcome Allotments, and Funding](#).

⁴¹ Washington State Department of Children, Youth & Families (2019) [Child Care Subsidy Rate Increase for Licensed Centers](#).

⁴² We assume that 25% of eligible children who are not enrolled in ECEAP or Head Start do not receive any subsidized care.

⁴³ The comparison group costs are a weighted average of the costs of ECEAP, state-subsidized childcare, and no state-funded care. Approximately 66% of Head Start studies fell into this category.

⁴⁴ The comparison group costs are a weighted average of the costs of state-subsidized childcare, and no state-funded care. Approximately 33% of Head Start studies fell into this category.

Exhibit A8

Expected program enrollment

Program	Program costs	Comparison costs
State ECE program: low income	\$9,330	\$6,384
State ECE program: universal	\$9,330	\$2,340
Head Start	\$13,550	\$4,750

The comparison costs for low-income state programs are lower than the comparison costs for universal state programs because we expect that a greater percentage of children in the control would not qualify for Head Start or subsidized care and would have no expected cost to the state in absence of the program.

For further information, contact:

Chasya Hoagland at 360.664.9084, chasya.hoagland@wsipp.wa.gov

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