Washington State Institute for Public Policy

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Evaluation of the Early Childhood Education and Assistance Program: *Kindergarten Readiness for School-and Part-Day Enrollees*

The Early Childhood Education and Assistance Program (ECEAP) provides preschool education and wraparound services to low-income children and their families in Washington State.

In 2019, the Washington State Legislature directed the Washington State Institute for Public Policy (WSIPP) to explore long-term and short-term outcomes related to ECEAP enrollment. We were also directed to examine ECEAP dosage models, which is the focus of this report. Specifically, this report focuses on the relationship between School-Day enrollment and child outcomes, relative to Part-Day enrollment.

Depending on family needs and ECEAP slot availability, children can enroll in Part-Day classes or for longer periods in School-Day or Working-Day classes. Since 2017, the legislature has increased ECEAP funding annually with the goal to ensure that all eligible families who need services can enroll their children in ECEAP by 2026.

Section I provides an overview of WSIPP's early education research. Section II details background information about ECEAP. Section III outlines the methodological approach we use to answer the main research questions. Section IV describes the main findings. Section V summarizes findings and limitations.

Summary

The Early Childhood Education and Assistance Program (ECEAP) offers preschool education and wraparound services to low-income children and their families. Children can enroll in Part-Day classes or for longer periods of time in School-Day or Working-Day classes.

In 2019, the legislature directed WSIPP to examine ECEAP dosage models. In this report, we detail the relationship between School-Day enrollment and child outcomes, notably kindergarten readiness, which is measured by the Washington Kindergarten Inventory of Developing Skills (WaKIDS) assessment.

We find a positive relationship between School-Day enrollment and kindergarten readiness. On average, children in School Day are 15% more likely to demonstrate kindergarten readiness, compared to children in Part Day.

The relationship between School-Day enrollment and kindergarten readiness is driven by differences in demonstrated proficiency in several developmental learning areas including physical, cognitive, literacy, and mathematics domains. The positive relationship between School-Day enrollment and kindergarten readiness is observed for non-Hispanic children.

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I. WSIPP's Early Childhood Education Research Portfolio

High-quality early childhood education (ECE) programs have been shown to positively impact child developmental, academic, and behavioral outcomes as well as parental outcomes including maternal employment and earnings.[1] However, ECE programs vary, and results are often mixed depending on program models and populations served. Further research evidence indicates that effects might be limited to academic outcomes and that early effects often fade as children progress through school.[2]

As knowledge about the potential benefits of ECE programs has grown, so too has interest and investment in issues like affordable childcare, universal preschool,[3] supports for the ECE workforce, and rating systems that establish quality standards for childcare and educational providers.[4] Investments in ECE in Washington State have increased over time too, resulting in WSIPP's portfolio of ECE research projects.

The Washington State Legislature has directed WSIPP to evaluate ECE programs, including ECEAP, in several assignments over time. We summarize this work to place this report in the context of our overall ECE research.[5] Exhibit 1 provides an overview of each WSIPP report.

WSIPP has conducted meta-analytic and benefit-cost analyses of ECE programs. In 2014, we found evidence that ECE programs (on average) improve outcomes among low-income children. We estimated that the benefits of these programs outweighed the costs (report one in Exhibit 1).[6] In 2019, WSIPP updated this meta-and benefit-cost work to examine the effects of ECE programs among low-income populations, universal ECE programs, and Head Start. We found these three types of programs have positive effects on test scores (on average), but effects on other academic and behavioral outcomes were mixed or null (report three in Exhibit 1). Overall, we estimated that the benefits from these programs exceed the costs.[7]

[1] Hoagland, C., Fumia, D., & Reynolds, M. (2019). *Early childhood education for low-income students: a review of the evidence and benefit-cost analysis UPDATE* (Doc. No. 19-12-2201). Olympia: Washington State Institute for Public Policy.
[2] Bailey, D.H., & Duncan, G. (2015). Persistence and fadeout in the impacts of child and adolescent interventions. *Journal of Research on Educational Effectiveness, 10*(1), 7-39.
[3] Refers to programs that provide preschool access to all children in a district or state.
[4] Friedman-Krauss, A.H., Barnett, W.S., Garver, K.A., Hodges, K.S., Weisenfeld, G.G, & Gardiner, B.A. (2021). *The state of preschool 2020: state preschool yearbook.* The National Institute for Early Education Research.
[5] While not listed in this section, as of January 2022, WSIPP is completing a series of four evaluations of Early Achievers, Washington's quality rating system for early learning and childcare sites. The most recent report is Rashid, A., Goodvin, R., & Krnacik, K. (2021). *Early Achievers evaluation report three: Variation in links between quality and kindergarten readiness for children with childcare subsidy.* (Doc. No. 21-12-2201). Olympia: Washington State Institute for Public Policy.
[6] 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.
[7] Hoagland et al. (2019).

At the time of this publication, WSIPP has completed three evaluations of the ECEAP program. In 2014, WSIPP released a report examining the outcomes of children enrolled in ECEAP in the early 2000s.[8] We found a positive relationship between ECEAP enrollment and children's 3rd-, 4th-, and 5th-grade test scores (report two in Exhibit 1).

In 2019, the legislature directed WSIPP to update its former evaluation and examine the short-and long-term outcomes of children enrolled in ECEAP. Since children in cohorts studied previously have now graduated from high school, we examined ECEAP's impact on high school graduation rates and other outcomes like kindergarten readiness and criminal justice involvement.[9] This evaluation compared outcomes between children in ECEAP and similar children who were eligible for ECEAP but did not participate in the program (report four in Exhibit 1).[10] WSIPP researchers found that children in ECEAP were more likely to be kindergarten-ready and less likely to be placed in special education in early school years, compared to similar non-participants. However, there was no clear evidence that ECEAP participants had better or worse test scores, high school graduation rates, or criminal conviction rates in high school compared to non-participants.

In the same 2019 legislative assignment, WSIPP was directed to examine ECEAP's dosage models, called Part Day, School Day, and Working Day hereafter.[11] This report compares outcomes between children enrolled in School-Day and Part-Day classes. Report five is shaded in Exhibit 1 to reflect the focus of this report.

[8] Bania, N., Kay, N., Aos, S., & Pennucci, A. (2014). *Outcome evaluation of Washington State's Early Childhood Education and Assistance Program*. (Doc. No. 14-12-2201). Olympia: Washington State Institute for Public Policy.

[9] Engrossed Second Substitute House Bill 1391, Chapter 369, Laws of 2019.

[10] Hoagland, C., Ingraham, B., Fumia, D., Rashid, A. (2022). *Evaluation of the Early Childhood Education and Assistance Program: Short- and long-term outcomes for children* (Doc. No. 22-01-2202). Olympia: Washington State Institute for Public Policy.

[11] E2SHB 1391.

Exhibit 1

WSIPP's Evaluations of ECEAP

	Report one Meta-analysis of ECE programs	Report two Outcome evaluation of ECEAP	Report three Updated meta-analysis of ECE programs	Report four Outcome evaluation of ECEAP	Report five Outcome evaluation of ECEAP (dosage impacts)
Report overview	Systematic review of research on academic, social, and emotional development outcomes for children in ECE programs.	Retrospective evaluation of ECEAP.	Update of the 2014 systematic review focusing on research on academic, social, and emotional development outcomes for children in ECE programs.	Update to the 2014 outcome evaluation and focused on short-and long-term outcomes.	Evaluation of ECEAP dosage models (Part Day vs School Day).
Population evaluated	Children eligible to participate in ECE programs in the U.S. Treatment groups include children in ECE programs. Control groups include non-ECE participants (some studies assessed treatment as usual so control groups may have included children in other ECE programs).	Children born September 1999 – August 2004 who received Basic Food benefits when they were three-or four years old. Children in ECEAP were the treatment group. Children who were not in ECEAP were the comparison group.	Children eligible to participate in ECE programs in the U.S. Treatment groups include children in ECE programs. Control groups include non-ECE participants (some studies assessed treatment as usual so control groups may have included children in other ECE programs).	Children who received DSHS services when they were three or four years old. Historical cohort: children born between September 1996 – August 2004. Recent cohort: children born between September 2004 – August 2014. Children who received ECEAP were in the treatment group. Children who were similar but did not receive ECEAP were in the comparison group.	Children enrolled in ECEAP between academic years 2014-15 and 2018-19. The treatment group is comprised of children enrolled in School-Day classes. The comparison group is children enrolled in Part-Day classes.
Outcomes	Test scores, high school graduation, grade retention, special education placement, criminal justice involvement, teen births, and self-regulation.	Reading and math test scores measured in 3rd, 4th, and 5th grades.	Test scores, grade retention, special education placement, attendance, GPA, high school graduation, and college enrollment.	Kindergarten readiness, test scores, special education placement, high school graduation, criminal justice involvement, parental employment, Child Protective Services (CPS) involvement.	Kindergarten readiness, special education placement, monthly absences.
Published	January 2014	December 2014	December 2019	January 2022	January 2022

Given our legislative assignment (Exhibit 2), we answer the following research questions in this report:

- Does School-Day enrollment predict different child outcomes relative to Part-Day enrollment?
- Does the relationship between School-Day enrollment and child outcomes vary across child characteristics and regions?

We were also asked to examine results across child characteristics and—to the extent that data allows—ECEAP staff characteristics. We conduct subgroup analyses based on child characteristics and regions. However, due to data limitations, we were unable to examine how staffing characteristics like education and experience interact with results.[12]

Exhibit 2

Legislative Assignment

. . . the Washington state institute for public policy shall update the outcome evaluation of the early childhood education and assistance program required by chapter 16, Laws of 2013 and report to the governor and the legislature on the outcomes of program participants. The evaluation must include the demographics of program participants including race, ethnicity, and socioeconomic status. The evaluation must examine short and long-term impacts of program participants, including high school graduation rates for up to two cohorts. When conducting the evaluation, ***the institute must consider, to the extent that data is available, 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.***

Engrossed Second Substitute House Bill 1391, Chapter 369, Laws of 2019.

[12] We are not able to link ECEAP staff to ECEAP sites by school years and observe their employment over time. We provide additional information in Appendix VI describing data limitations.

II. Background

The Early Childhood Education and Assistance Program (ECEAP) was created in 1985 and is Washington's preschool program. Modeled after Head Start, ECEAP is designed to support children ages three and four who are eligible based on family income, developmental need, and/or designated risk factors.

Administered by the Department of Children, Youth, and Families (DCYF), ECEAP focuses on early education to support children's social-emotional and pre-academic development. Providers also offer wraparound health and nutrition services for children and family engagement.[13] For example, children are provided a traditional classroom preschool education and receive developmental screenings, periodic assessments, and individualized support to prepare them for kindergarten. Children also receive daily nutritious meals, medical and dental screenings, and mental health care referrals as needed.

In terms of family engagement, ECEAP staff connect with parents and guardians to provide resources and support financial and housing stability, employment, and educational attainment.

As of 2020, over 390 ECEAP providers were operating in various settings including public schools, childcare centers and homes, tribal organizations, community colleges, and non-profits. Statewide, these sites served children in approximately 14,000 slots.[14]

Eligibility and Enrollment

Most children are eligible for ECEAP services for the following reasons:[15]

- They are at least three years old (but less than five years old) by August 31st of the school year they enroll, and
- Their family income is less than or equal to 110% of the federal poverty level (FPL).[16]

Children are also eligible if they qualify for special education services. Additionally, a limited number of children who live in families with incomes greater than 110% FPL and have certain research-based prioritization factors[17] are also eligible.

While children may be eligible for ECEAP they are not guaranteed a classroom spot. During AY 2019,[18] there were a total of 13,491 ECEAP slots (also called classes) in the state and approximately 41,000 eligible children.[19] Since there are not enough classroom spaces available to serve all eligible children, children are prioritized for enrollment based on a point system using age, income, and risk factors.[20]

[13] Washington State Department of Children, Youth, & Families (DCYF) website. *Early Childhood Education and Assistance Program.*
[14] Ibid.
[15] (DCYF). *2020-21 ECEAP Performance Standards.*
[16] The equivalent of an annual income of $29,150 for a family of four in 2021. (DCYFC). *2021 ECEAP Income Eligibility Limits.*
[17] These factors include environmental circumstances such as family violence, chemical dependency, child protective service (CPS) involvement, incarcerated parents, foster care placement, and/or homelessness. (DCYF). *2020-21 ECEAP Performance Standards.*
[18] We define academic year (AY) based on the last year in a school year (e.g., AY 2019 refers to 2018-2019 academic year). Regarding ECEAP, a school year refers to enrollment between September and August.
[19] (DCYF). *2018-19 Outcomes Report* and (DCYF). *2019-20 Caseload Forecast Report.*
[20] For example, children who are four years old live in low-income households, and/or are in the child welfare system

ECEAP Dosage Models

From the time ECEAP was implemented in 1985 through 2013, providers offered families Part-Day services only.[21] Beginning in 2014, providers started offering School-Day and/or Working-Day classes. Today, children can be enrolled in the following models:

Part Day: Class sessions are available for a minimum of three hours per day, several days per week. ECEAP providers must offer at least 360 hours of class over at least 30 calendar weeks.[22]

School Day: Class sessions are available for a minimum of 5.5 hours per day, four or five days a week. ECEAP providers must offer a minimum of 1,000 class hours for at least 30 calendar weeks.[23]

Working Day: Class sessions are available for a minimum of ten hours per day, five days per week. Providers must offer a minimum of 2,370 hours of class year-round, combining ECEAP educational and child care services.[24]

Parents or guardians who want to enroll children in Working-Day models must meet additional eligibility requirements. For example, single parents must be employed in a training program, school, and/or completing WorkFirst activities for at least 25 hours per week. Two-parent households must meet these requirements for at least 55 hours per week.[25]

Regardless of the dosage model, children receive the same comprehensive educational, health, and family support services.

Parents and guardians make decisions about what models to enroll children in based on their work and school schedules as well as a child's developmental needs. Enrollment is partially first-come-first-served, but one's ability to get their first choice also depends on the availability of Part-, School-, and Working-Day slots, which is based on funding from the Washington State Legislature and community need.[26]

ECEAP Expansion and Funding

In 2015, the legislature passed the Early Start Act, which implemented widespread policies and resources to increase access to high-quality early learning and childcare programs in Washington.[27] The Early Start Act established a phased-in expansion of ECEAP slots so that all eligible children are entitled to be enrolled in the program. Changes, based on the 2021 Fair Start Act, mandate that the legislature increase funding each year until ECEAP is fully implemented statewide in 2026.[28]

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are prioritized for enrollment. (DCYF). *2020-21 ECEAP Performance Standards.*

[21] Between 1985-2006, part day services included 240 hours of educational services over 30 weeks and each class session lasted at least 2.5 hours. Beginning in 2007, total educational hours increased from 240 to 320 hours over 30 weeks.

[22] (DCYF). *2020-21 ECEAP Performance Standards.*

[23] Ibid.

[24] Ibid.

[25] Ibid.

[26] Since Part-Day slots outnumber School-and Working-Day slots, parents/guardians who want to enroll a child in Part Day are more likely to get their first pick compared to parents who want to enroll children in School- or Working-Day slots, though ECEAP providers try to fulfill parent preferences if possible. Sara Schwartz Jewell, DCYF (personal communication, December 2020).

[27] Second Engrossed Second Substitute House Bill 1491, Chapter 7, Laws of 2015.

[28] RCW 43.216.556.

The legislature provides ECEAP funding on a per-slot basis.[29] For example, the legislature allocated 750 new slots statewide for AY 2023, 600 of which are designated School-Day slots and 150 are designated Working-Day slots.[30] After receiving funding from the legislature, DCYF awards funding for specific slot types to providers (or organizations that want to become new providers) that have completed a request for application (RFA).[31] Ultimately, decisions to fund Part-, School-, and Working-Day slots are based on RFA scores and community need (i.e., communities with large populations of unserved eligible children). Providers in communities with the highest need receive priority funding.[32]

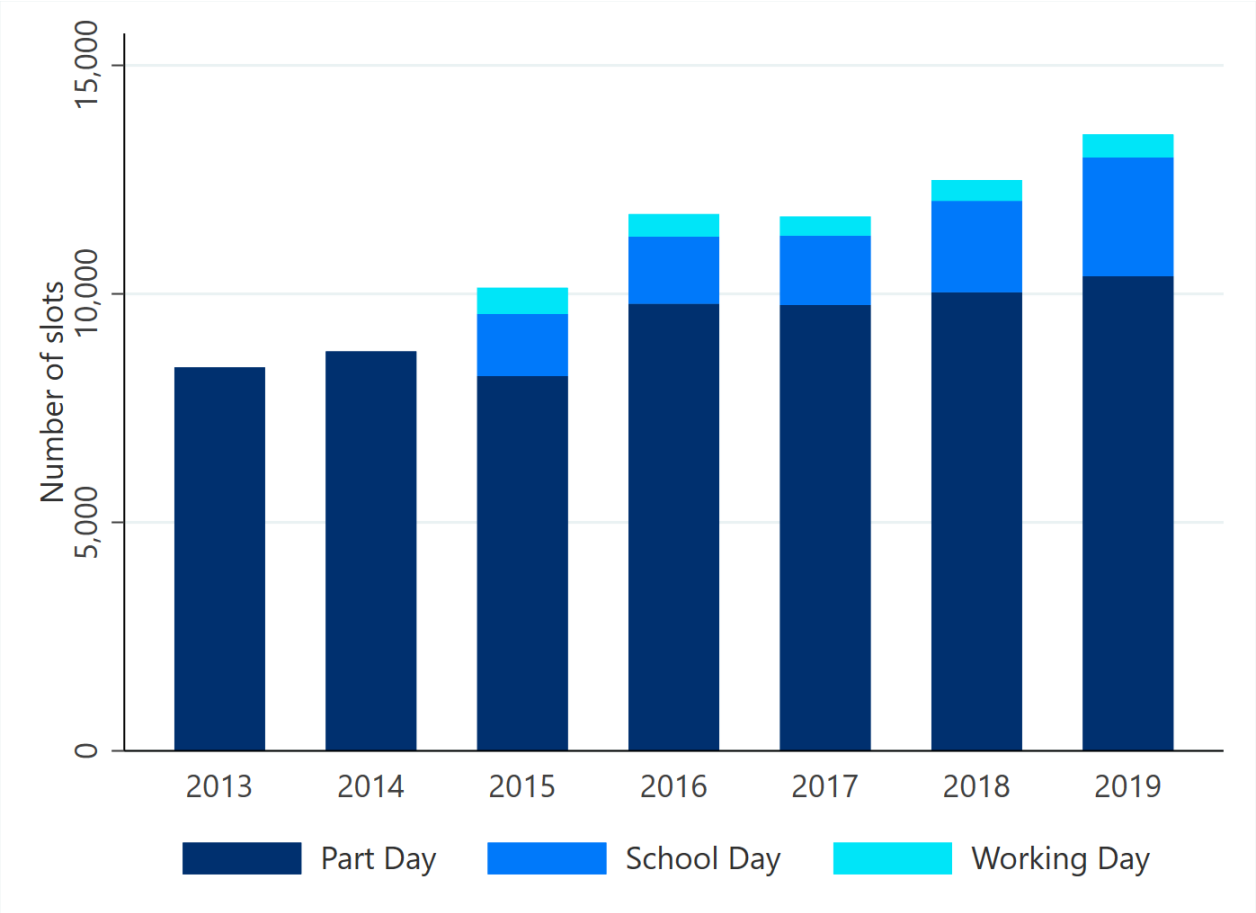
While the legislature provides ECEAP funding at a flat rate based on model type, DCYF contracts with successful RFA applicants at a regional rate. There are seven rate regions in the state and Part-, School-, and Working-Day slot rates reflect these regional variations.[33] In AY 2022, the average rate of one Part-Day slot is approximately $9,200, one School-Day slot is $12,400, and one Working-Day slot is $18,900.[34]

Exhibit 3 shows the total number of slots available between AY 2013 and AY 2019 and the proportion of slots that are Part, School, and Working Day. Even after School-Day and Working-Day slots were introduced in AY 2015, most slots remain Part Day. On average, between AY 2015 and AY 2019, 80% of total slots in the state were Part Day, 15% were School Day, and 5% were Working Day.

[29] Funding mostly comes from the state general fund, the Education Legacy Trust Account, and Opportunity Pathways Account. DCYF presentation. *General ECEAP Slides.*
[30] DCYF. (2021). *Request for Application Guide.*
[31] Ibid.
[32] Karin Ganz, DCYF (personal communication, December 2020).
[33] Ibid.
[34] DCYF. (2021). *2022-23 ECEAP Expansion: Addendum #1 request for application (RFA) questions and answers.*

Exhibit 3

Number of Part-, School-, and Working-Day Slots, AY 2013-2019



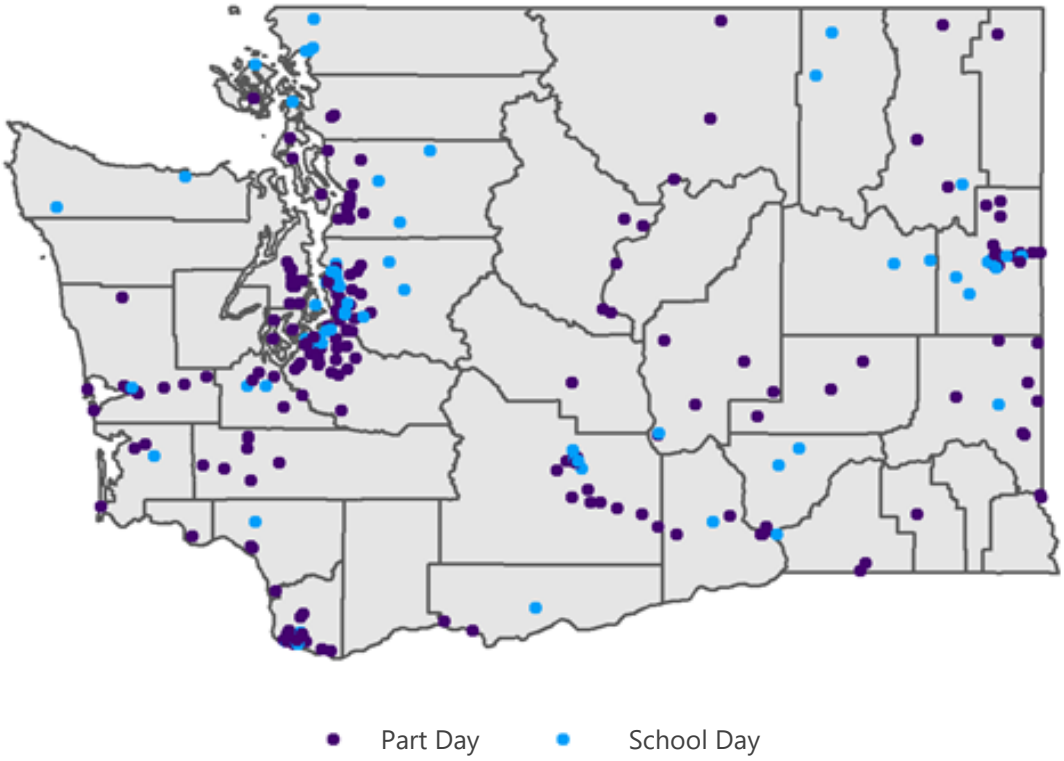
Since the beginning of expansion in 2017, the total number of ECEAP slots in Washington State has increased 20%.[35]

A single ECEAP provider can offer a combination of Part-, School-, and Working-Day slots.[36] In Exhibit 4, the purple points depict ECEAP providers that offer only Part-Day slots in AY 2019 (60% of all ECEAP sites). The light blue points represent ECEAP providers that offer at least one School-Day slot in AY 2019 (34% of ECEAP sites).

In AY 2019, the majority of ECEAP slots were concentrated in urban counties (70%), compared to rural counties (30%).[37] We observe this same trend when looking at specific Part-Day and School-Day slot types. Approximately 70% of Part-Day and School-Day slots are in urban counties and 30% are in rural counties.

Exhibit 4

ECEAP Sites with Part-Day and School-Day slots (AY 2019), Washington County Map



[35] From 11,700 in 2017 to 14,000 in 2020. Based on slot counts provided by (DCYF). *2019-20 Caseload Forecast Report*.

[36] In AY 2019, an individual ECEAP provider offered (on average) about 35 slots.

[37] Office of Financial Management website: *Population density and land area criteria used for rural area assistance and other programs*.

Research on the Effects of Full-day ECE Programs

Existing research generally suggests a positive relationship between attending full-day early education programs and academic and behavioral outcomes. Much of this research focuses on kindergarten programs. For example, researchers have found that children attending full-day kindergarten have higher math and reading achievement[38] and improvements to attendance and pro-social behaviors,[39] compared to children in half-day programs. However, effects tend to fade over time.[40]

The amount and quality of research that has been completed in the context of preschool is more limited and results are mixed. Some evidence suggests that full-day preschool has positive impacts on children's verbal skills, attendance, and kindergarten-readiness measures.[41] Studies focusing on the effect of full-day Head Start, a federal preschool program, report mixed results. For example, one study[42] found no differences in academic and social outcomes between children in full-day and part-day Head Start. Alternatively, another study[43] found greater cognitive skills among children who attended Head Start centers providing full-day services.

Our evaluation adds to this research by examining the relationship between dosage models in ECEAP and outcomes among a low-income and diverse population of children in Washington State.

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[38] Gibbs, C.R. (2014). *Experimental evidence on early intervention: The impact of full-day kindergarten.* University of VA; Cannon, J.C., Jacknowitz, A., & Painter, G. (2006). Is full better than half? Examining the longitudinal effects of full-day kindergarten attendance. *Journal of Policy Analysis and Management, 25*(2); and DeCicca, P. (2007). Does full-day kindergarten matter? Evidence from the first two years of schooling. *Economics of Education Review, 26*(1), 67-82.

[39] Cooper, H., Batts Allen, A., Patall, E.A., & Dent, A.L. (2010). Effects of full-day kindergarten on academic achievement and social development. *Review of Education Research, 80*(1).

[40] This may be due to multiple factors including (but not limited to) limited curriculum alignment between preschool, kindergarten, and primary grades. It may also be driven by the occurrence of children who did not receive high-quality preschool programming generally catching up to their peers because of assistance they receive in primary grades.

[41] Atteberry, A., Bassok, D., & Wong, V.C. (2019). The effects of full-day prekindergarten: Experimental evidence of impacts on children's school readiness. *Educational Evaluation and Policy Analysis, 41*(4), 537-562; Reynolds, A.J., Richardson, B.A., Hayakawa, M., Lease, E.M., Warner-Richter, M., Englund, M.M., . . . Sullivan, M. (2014). Association of a full-day vs part-day preschool intervention with school readiness, attendance, and parent involvement. *JAMA, 312*(20), 2126-2134; and Robin, K.B., Frede, E.C., & Barnett, S. (2006). Is more better? The effects of full-day vs half-day preschool on early school achievement. *National Institute for Early Education Research.*

[42] Leow, C., & Wen, X. (2017). Is full day better than half day? A propensity score analysis of the association between Head Start program intensity and children's school performance in kindergarten. *Early Education and Development, 28*(2), 1-16.

[43] Walters, C.R. (2015). Inputs in the production of early childhood human capital: Evidence from Head Start. *American Economic Journal: Applied Economics, 7*(4), 76-102.

III. Methodology

Through E2SHB 1391, WSIPP was directed to compare "the effects of full-day [ECEAP] programming and half-day programming on outcomes".[44] We o perationalize assignment language by examining the relationship between School-Day enrollment and child outcomes compared to Part-Day enrollment. As mentioned earlier, our main research questions are:

- Does School-Day enrollment predict different child outcomes relative to Part-Day enrollment?
- Does the relationship between School-Day enrollment and child outcomes vary across child characteristics and regions?

Data

In this evaluation, we use state administrative data provided by the Education Research and Data Center (ERDC), the Department of Children, Youth, and Family Services (DCYF), and the Research and Data Analysis (RDA) division within the Department of Social and Health Services (DSHS). The following is an overview of these data.[45]

ECEAP Child-and-Site-Level Data

For each child, we have ECEAP eligibility information like age, sex, race and ethnicity, and family income, as well as enrollment information including the ECEAP model a child received and the length of time they were enrolled.

For each ECEAP site, we have information about ECEAP providers, the number of slots offered per year, location information, whether sites were licensed or not, and where sites operated (e.g., public school, not-for-profit institution).

K-12 Public School Child-and-School-Level Data

For each child, we have school enrollment and attendance, program participation (e.g., special education), and assessment results including a measure of kindergarten readiness. For each school, we have aggregate information on enrollment, race and ethnicity, and teacher experience.

Sample

With support from ERDC, RDA, and DCYF, data were linked to create a longitudinal dataset, which we used to construct our analytic sample (Appendix II details this process).

In our analytic sample, we include children enrolled in ECEAP during their pre-kindergarten year (we refer to this as the pre-k year) and subsequently enroll in kindergarten the following year. That is, we observe children enrolled in ECEAP at age four who then enroll in kindergarten the next year.[46] We observe five cohorts of children enrolled in ECEAP between AY 2015-2019 (and enrolled in kindergarten between AY 2016-2020).

[44] E2SHB 1391.

[45] All child, parent, and ECEAP staff data WSIPP received was unidentifiable. Additional information about data elements and sources is reported in Appendix I.

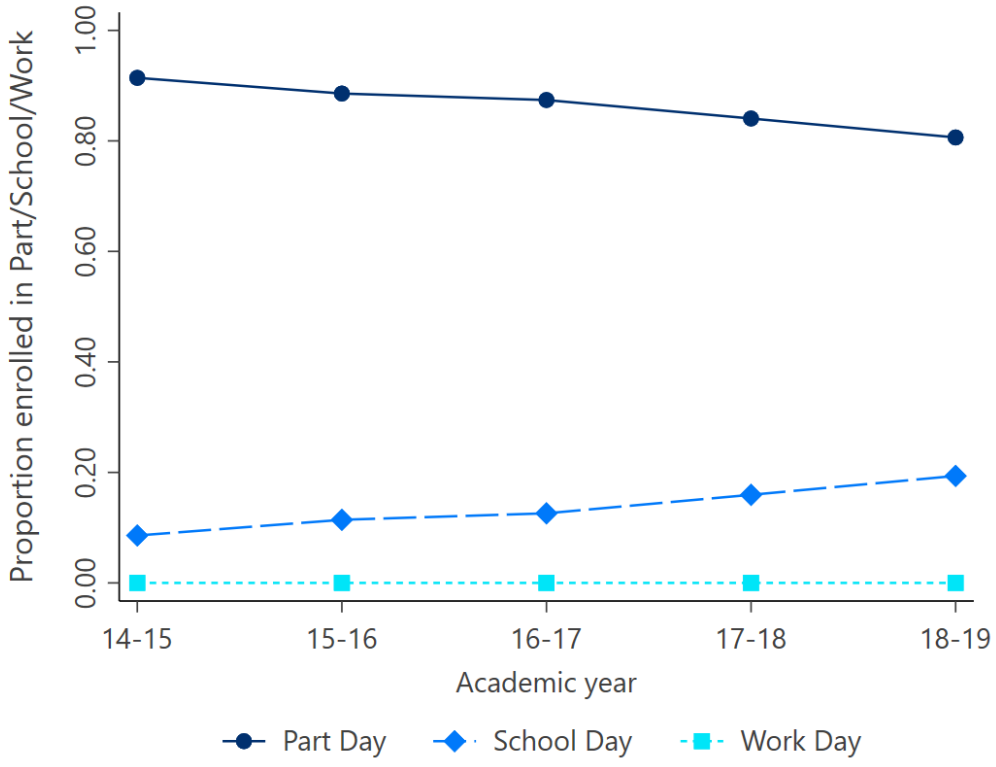
[46] Children can be in ECEAP for two years if they enroll at age three and remain through age four. For children who attend for two years, we restrict enrollment information at age four and drop records associated when they were three.

In our sample, children in School Day are more likely to attend ECEAP for two years, compared to Part-Day enrollees (55% versus 31%, respectively). Part-Day classrooms have a higher enrollment rate of children identified as White or Hispanic, and School-Day classrooms have a higher enrollment rate of children identified as non-Hispanic Black, Indigenous, and people of color (BIPOC).[47] Regardless of the model, the average child enrolled in ECEAP in our sample is four-and-a-half years old.[48]

There are 21,099 children in ECEAP in our sample. Exhibit 5 shows the proportion of these children in Part-, School-, and Working-Day classes between AY 2015 and AY 2019. On average, 13% of children in our sample are enrolled in School-Day classes, 84% of children are in Part-Day classes, and 3% of children are enrolled in Working-Day classes during our period of analysis. Since enrollment in Working Day is low and sample sizes are limited, we were unable to examine the relationship between Working-Day enrollment and outcomes.

Exhibit 5

Proportion of Children in Part-, School-, & Working-Day Models, AY 2015-2019

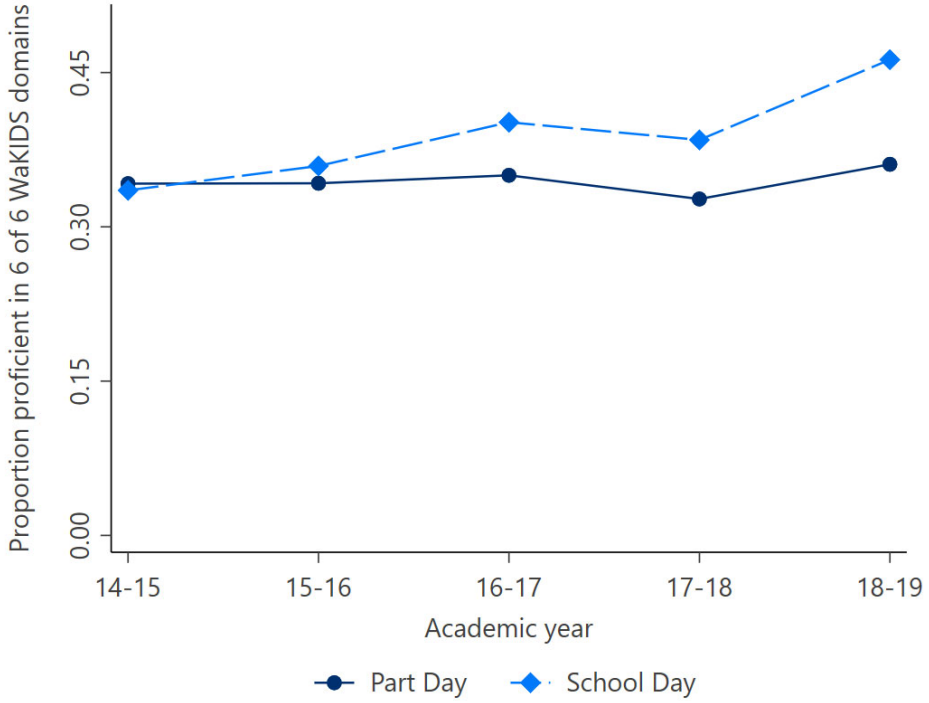


[47] Hispanic" includes children identified as Hispanic of any race(s). "Non-Hispanic BIPOC" includes children identified as Black, American Indian/Alaska Native, Native Hawaiian/other Pacific Islander, Asian, multiracial, or other.

[48] See Appendix V for more information about the sample of children and sites included in our analysis.

Exhibit 6

Proportion of Children Meeting 6 of 6 WaKIDS Domains, by Part-and School-Day Enrollment



Outcomes

One of DCYF's ECEAP expansion goals is to "ensure that 90% of children are ready for kindergarten, with race and income no longer predictors of readiness".[49] With this in mind, our primary outcome is kindergarten readiness, measured during the fall of a child's kindergarten school year using the Washington Kindergarten Inventory of Developing Skills (WaKIDS) assessment.[50]

A child is deemed "kindergarten ready" if they meet or exceed benchmark scores indicating age-appropriate skills in all six WaKIDS domains, including social-emotional, physical, cognitive, language, literacy, and mathematics.[51] Exhibit 6 shows the proportion of children enrolled in ECEAP (in their pre-k year) meeting expectations on all six WaKIDS domains over time, by School-Day and Part-Day enrollment.

[49] Washington State DCYF website: *Early Childhood Education and Assistance Program.*

[50] WaKIDS data comes from the Washington Office of Superintendent of Public Instruction's (OSPI) Comprehensive Education Data and Research System (CEDARS). OSPI website: *WaKIDS frequently asked questions.*

[51] ERDC website: *Early learning feedback report.*

Exhibit 7 shows the proportion of children in our sample meeting benchmark scores within each developmental domain. In our sample, children are most likely to demonstrate proficiency in the physical domain (81%), and children are least likely to demonstrate proficiency in the mathematics domain (55%).

Exhibit 7

Proportion of Children Meeting Benchmark Scores, by WaKIDS Domain (2016-2020)

WaKIDS domain	Mean (SD)
Social-emotional	0.74 (0.44)
Physical	0.81 (0.39)
Language	0.65 (0.48)
Cognitive	0.67 (0.47)
Literacy	0.71 (0.45)
Mathematics	0.55 (0.50)
Observations	21,099

Appendix III details how we constructed these outcomes for analysis.[52]

Research Design

In this section, we summarize the research design we use to examine differences in outcomes for children who enroll in School Day, compared to children in Part Day.

The "gold standard" approach for estimating statistically valid treatment effects is using random assignment. This approach enables an unbiased comparison of outcomes between a treatment group (children in School Day in our case) and a comparison group (children in Part Day). Under random assignment, we can assume there are no differences in characteristics between the treatment and comparison groups, on average, at the beginning of an experiment. Therefore, any difference in outcomes between the groups after random assignment can be attributed to a program's effect, rather than other observed or unobserved factors. Since we are taking a retrospective approach, we cannot randomly assign Part-Day and School-Day slots to ECEAP providers, and we cannot randomly assign children to these experimental conditions.

A major concern for evaluating the relationship between School-Day enrollment and child outcomes is that children/families who are enrolled in School Day may be systematically different from children/families enrolled in Part Day in ways that predict academic achievements. For example, children in a household with two working parents may be more likely to enroll in School-Day classes, and these children may also be more/less likely to be kindergarten-ready regardless of pre-k classroom enrollment.

[52] In Appendix V, we report secondary outcomes focused on special education placement and absences in kindergarten.

This type of child-level selection bias can lead us to overestimate or underestimate the importance of School-Day enrollment in influencing kindergarten readiness (and other relevant outcomes). To address this concern, our model accounts for relevant child and family characteristics such as household structure, race and ethnicity, and disability status.[53]

Further, classroom enrollment depends not only on family choice but also on the availability of School-Day and Part-Day slots. As previously mentioned, slot type availability is based on funding from the state legislature, and funding is distributed based on ECEAP providers' application scores and community need. Therefore, slot types are not randomly distributed across ECEAP providers in the state. Consequently, it is possible that ECEAP providers with more School-Day slots are systematically different (than providers with Part-Day slots) in ways that predict children's kindergarten readiness.

To address site-level selection, our model accounts for site-level fixed effects, which control for all differences between sites that predict child outcomes and do not change over time (e.g., region of location or a site's culture or leadership).[54] In addition, we account for relevant provider-level census tract characteristics[55] (e.g., neighborhood factors) such as median household income and population demographics.[56] Finally, we include year fixed effects to account for year-to-year differences that predict outcomes and are shared by all ECEAP providers in the state (e.g., an economic recession).

See Appendix IV for full details regarding our research design.[57]

Our study design works to alleviate selection bias, but we cannot rule out the possibility that parent/guardian and ECEAP program decisions drive our results. That is, we cannot definitively say that School-Day enrollment has a cause-and-effect relationship with outcomes like kindergarten readiness.

As previously mentioned, we compare outcomes for children enrolled in School Day versus children enrolled in Part Day. Our primary analysis omits children enrolled in Working Day. Working Day enrollment is too low to conduct a reliable analysis.

[53] The full set of child covariates include age at pre-k, sex, race/ethnicity, years of ECEAP enrollment, household structure, diagnosed disability, ECEAP income-eligible, and primary language. In alternate analyses, we find that our results are robust when controlling for months of ECEAP enrollment.

[54] Fixed effects do not account for site characteristics that vary annually, therefore our models control for average annual site enrollment.

[55] Manson, S., Schroeder, J., Van Riper, D., Kugler, T., & Ruggles, S. *IPUMS National Historical Geographic Information System: Version 16.0 [dataset].* Minneapolis, MN: IPUMS. 2021

[56] The full set of census tract covariates include population under five years of age, racial demographics, higher education attainment, proportion of households renting, proportion households with English as a second language, median household income, and unemployment rate.

[57] Results in the next section are estimated from linear fixed effects models that allow for clustering at the site-level.

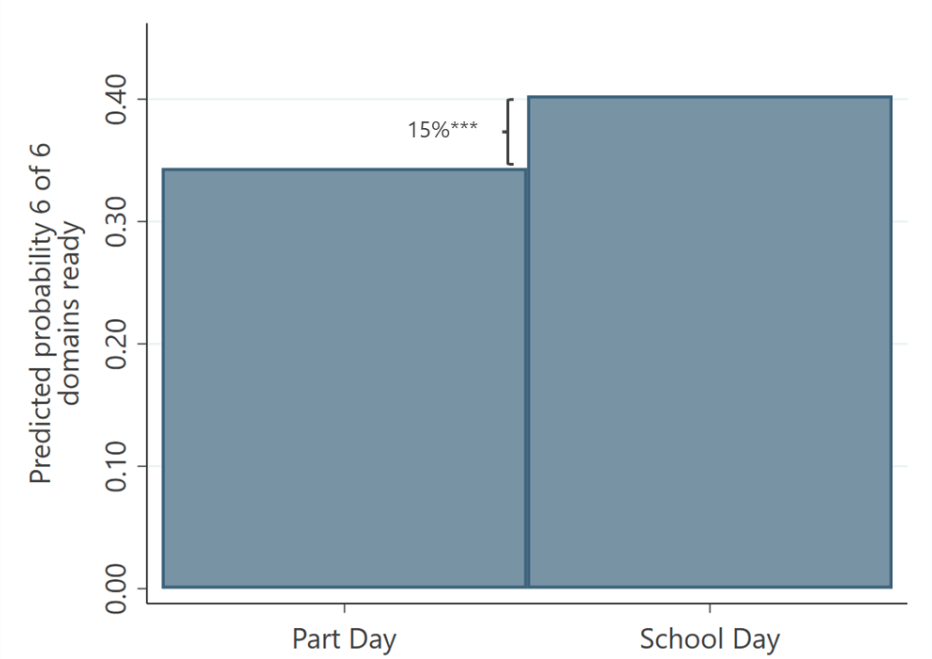
IV. Results

In this section, we examine the average difference in kindergarten readiness between School-Day participants and Part-Day participants. Recall that kindergarten readiness is defined as meeting/exceeding expectations in all six WaKIDS domains.[58]

Exhibit 8 depicts the probability of kindergarten readiness for children in Part-Day and School-Day classes, as *predicted* by our model. The bar on the right indicates that our model predicts that the average School-Day enrollee has a 40% likelihood of demonstrating proficiency in all six WaKIDS domains. The bar on the left indicates that our model predicts that the average Part-Day enrollee has a 34% likelihood of demonstrating proficiency in all six WaKIDS domains. That is, *children in School Day have a 15% (i.e., six-percentage point) higher likelihood of proficiency in all six domains*.[59]

Exhibit 8

Predicted Probability of Kindergarten Readiness, by School-and Part-Day Participation



Notes:
Predicted probabilities are estimated from a single linear regression model. This model accounts for the full set of control variables, the first year of WaKIDS implementation, and adjusts standard errors for clustering at the ECEAP site level (in the pre-k year).

[58] ERDC website: *Early learning feedback report.*

[59] The difference in the probability of kindergarten readiness across the two groups is 40 - 34 = 6 percentage points. The percent difference is 15% = (40%-34%) ÷ 40%.

Next, we examine how School-Day enrollment predicts readiness separately for each of the six WaKIDS domains, relative to Part-Day enrollment. Exhibit 9 illustrates the estimated percentage difference in the likelihood of individual domain readiness between children enrolled in School-Day programming and Part-Day programming.

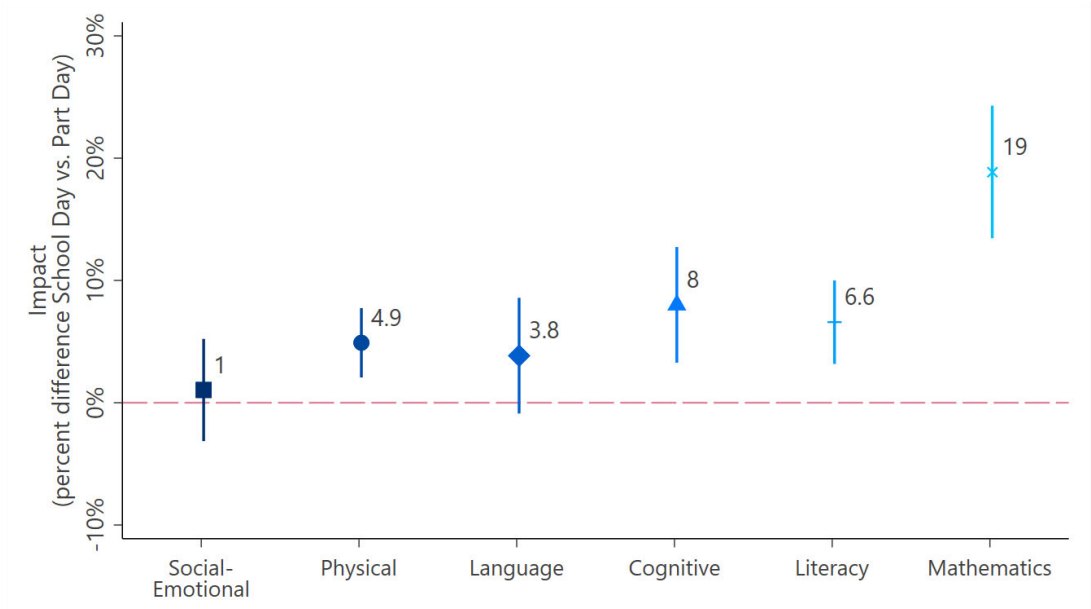
Starting from the left of Exhibit 9, our estimates indicate that enrollment in School-Day classes (relative to Part-Day classes) does not predict a significant difference in the probability of readiness in the social-emotional domain. Enrollment in School Day does predict a 5-8% higher likelihood of proficiency in the physical, cognitive, and literacy domains. The final estimate indicates that *children enrolled in School-Day classes are 19% more likely to demonstrate proficiency in the mathematics domain, relative to children in Part-Day classes.*

Subgroup Analyses

We conducted subgroup analyses to examine how the positive relationship between School-Day enrollment and kindergarten readiness differs across child characteristics and region.

Exhibit 9

Predicted Probability of Kindergarten Readiness on Individual WaKIDS Domain, by School-and Part-Day Participation



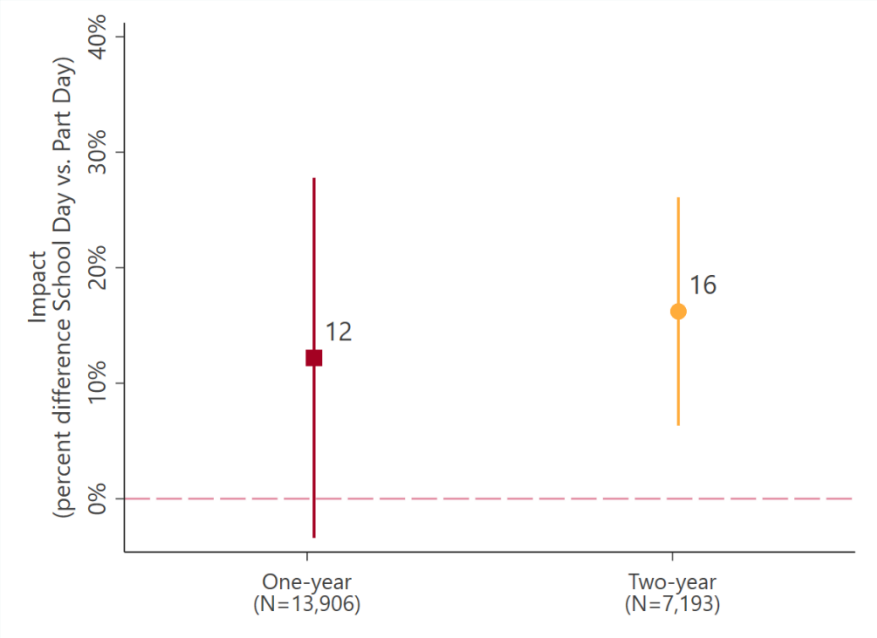
Notes:
Each point represents the predicted domain readiness estimated from separate regression models. Models account for the full set of control variables, the first year of WaKIDS implementation, and adjust standard errors for clustering at the ECEAP site level.
Impact: Represented by the shapes, is the *estimated* relationship between treatment and outcomes. For example, in Exhibit 9, the estimated impact of School Day (versus Part Day) on social-emotional domain readiness is 1%.
Confidence intervals: The vertical lines extending from each shape represent 95% confidence intervals, a range that likely includes the true treatment effect. Intervals that cross the red dashed line indicate the estimate is not statistically significantly different from zero. For example, in Exhibit 9, intervals around the estimated impact on social-emotional domain readiness suggest that the true (population) impact lies between -4% and +4% and is not statistically significant.

Children in ECEAP for two years are more than twice as likely to enroll in School Day (in their pre-k year) than children in ECEAP for one year.[60]

Depicted in Exhibit 10, among children in ECEAP for two years, those in School Day are 16% more likely to be kindergarten ready than Part-Day enrollees. For children in ECEAP for one year, those in School Day are 12% more likely to be kindergarten-ready.[61] There is no significant difference in the relationship between School-Day enrollment and kindergarten readiness for children in ECEAP for one versus two years.

Exhibit 10

Predicted Probability of Kindergarten Readiness Among One-Versus Two-Year Enrollees, by School-and Part-Day Participation



Notes:
Each point represents the predicted domain readiness estimated from separate regression models. Models account for the full set of control variables, the first year of WaKIDS implementation, and adjust standard errors for clustering at the ECEAP site level.
Impact: Represented by the shapes, is the *estimated* relationship between treatment and outcomes.
Confidence intervals: The vertical lines extending from each shape represent 95% confidence intervals, a range that likely includes the true treatment effect.

[60] 21% versus 9%, respectively.

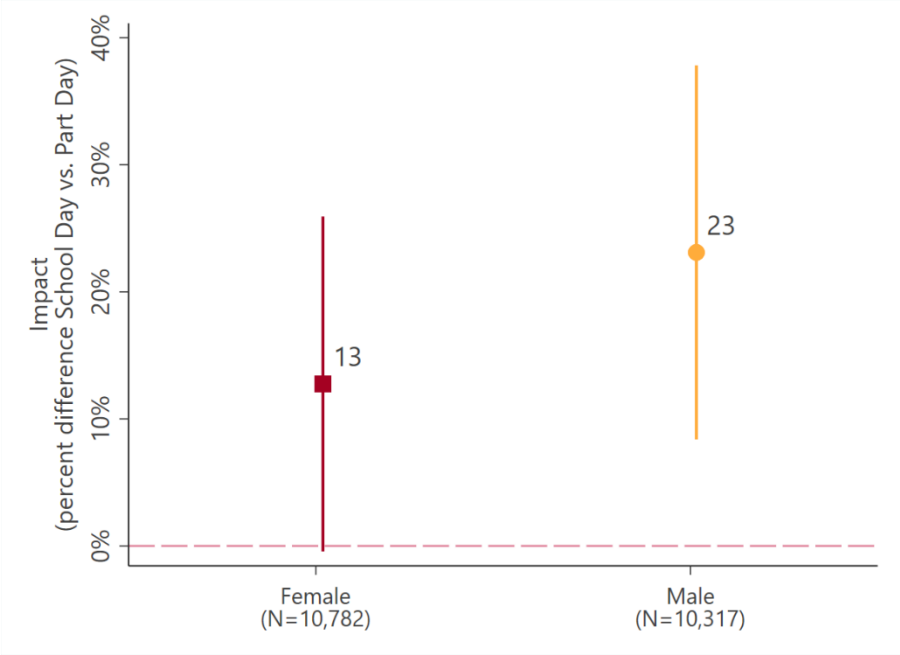
[61] This result is imprecisely estimated due to the relatively small sample of children who are enrolled in one year of ECEAP and School-Day classes (e.g., 9%, 1,319 children).

In our sample, roughly 14% of female and male children are enrolled in School-Day slots in their pre-k year. The relative impacts depicted in Exhibit 11 indicate that there is no significant difference in the relationship between School-Day enrollment and kindergarten readiness across male and female children in the pre-k year.

We also examine how results differ across racial and ethnic subgroups, including Hispanic, non-Hispanic BIPOC, and non-Hispanic White children.[62] The probability of School-Day enrollment across the three groups, respectively, is 19%, 13%, and 11%.

Exhibit 11

Predicted Probability of Readiness Among Female and Male Enrollees, by School-and Part-Day Participation



Notes:
Each point represents the predicted domain readiness estimated from separate regression models. Models account for the full set of control variables, the first year of WaKIDS implementation, and adjust standard errors for clustering at the ECEAP site level.
Impact: Represented by the shapes, is the *estimated* relationship between treatment and outcomes.
Confidence intervals: The vertical lines extending from each shape represent 95% confidence intervals, a range that likely includes the true treatment effect.

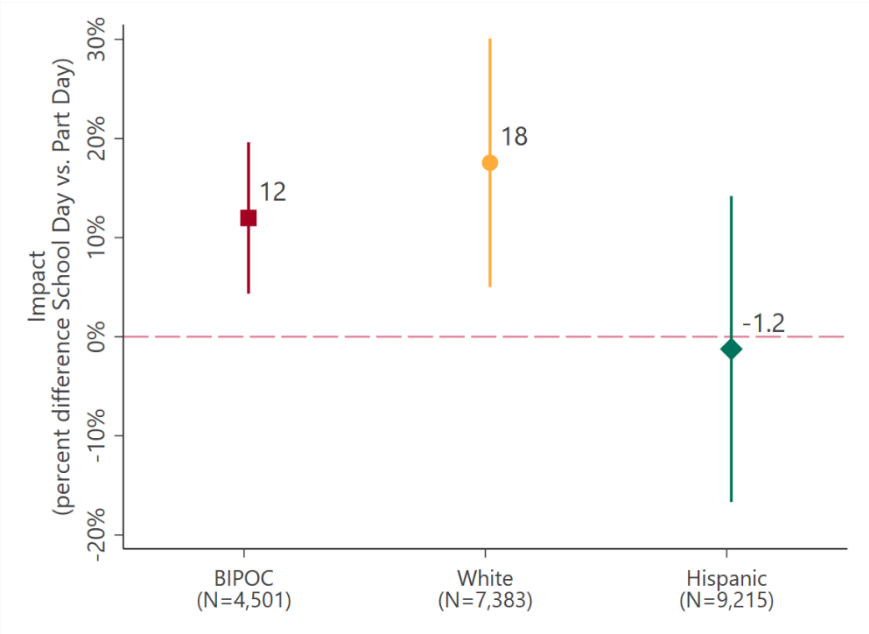
[62] "Hispanic" includes children identified as Hispanic and any race(s). "Non-Hispanic BIPOC" includes children identified as Black, American Indian/Alaska Native, Native Hawaiian/other Pacific Islander, Asian, multiracial, or other. We could not further disaggregate racial categories for subgroup analyses due to small sample size restrictions.

The results from our analysis are represented in Exhibit 12. We find that among Hispanic-identified children, School-Day participation does not have a practically or statistically significant relationship with kindergarten readiness. We do observe a significant and positive relationship between School-Day enrollment and demonstrated proficiency in all 6 WaKIDS domains among (non-Hispanic) BIPOC and White children.

Last, we compare outcomes for children enrolled in School-Day classrooms in rural versus urban counties.[63] Roughly 70% of the children in our sample are enrolled in a site located in an urban county. The remaining 30% of children are enrolled in a site in a rural county. The probability of enrollment in School Day is equivalent between rural and urban regions.

Exhibit 12

Predicted Probability of Kindergarten Readiness Among BIPOC, Hispanic, and White Enrollees, by School-and Part-Day Participation



Notes:
Each point represents the predicted domain readiness estimated from separate regression models. Models account for the full set of control variables, the first year of WaKIDS implementation, and adjust standard errors for clustering at the ECEAP site level.
Impact: Represented by the shapes, is the *estimated* relationship between treatment and outcomes.
Confidence intervals: The vertical lines extending from each shape represent 95% confidence intervals, a range that likely includes the true treatment effect.

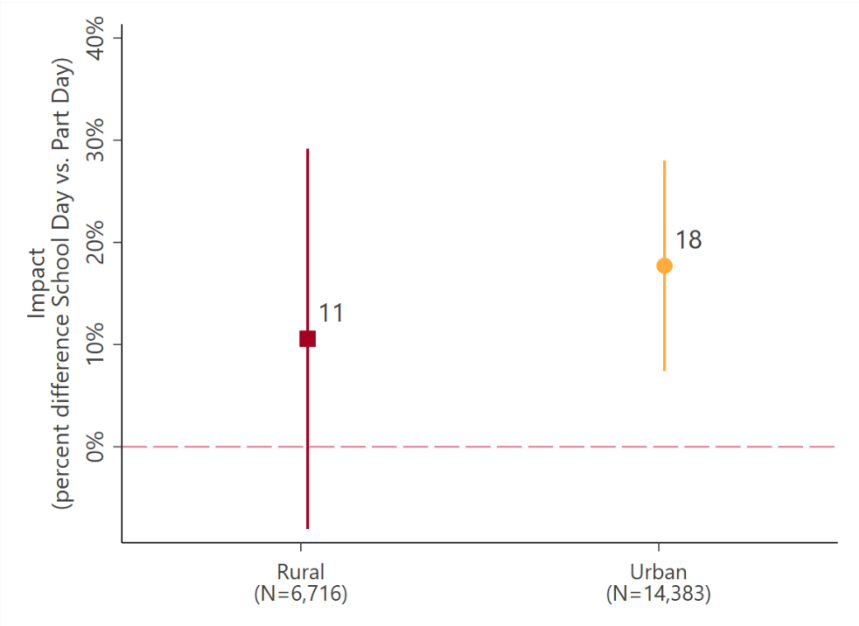
[63] Office of Financial Management website: *Population density and land area criteria used for rural area assistance and other programs*.

The results summarized in Exhibit 13 indicate there is no significant difference in the positive relationship between School-Day enrollment and kindergarten readiness for children enrolled in ECEAP sites in rural or urban counties.[64]

Comprehensive results from our analysis on the full set of outcomes[65] and subgroup analyses are reported in Appendix V.

Exhibit 13

Predicted Probability of Kindergarten Readiness Among Children Attending Sites in Urban and Rural Counties, by School-and Part-Day Participation



Notes:
Each point represents the predicted domain readiness estimated from separate regression models. Models account for the full set of control variables, the first year of WaKIDS implementation, and adjust standard errors for clustering at the ECEAP site level.
Impact: Represented by the shapes, is the *estimated* relationship between treatment and outcomes.
Confidence intervals: The vertical lines extending from each shape represent 95% confidence intervals, a range that likely includes the true treatment effect.

[64] In Appendix V, we further examine how this relationship differs between specific regions of the state. Due to small samples of School-Day enrollment in select regions, our results are inconclusive.

[65] We do not find a relationship between School-Day enrollment and placement in special education or the average monthly absences in kindergarten. These results are reported in Appendix V.

VI. Conclusion

Limitations

There are several key limitations to consider when interpreting results.[66] The major limitation is our inability to randomly assign sites and children to School-Day and Part-Day programs. A random assignment would increase our confidence that the group differences we estimate are due to School-Day participation, not other unobserved child characteristics or policies that impact similar outcomes and went into effect at the same time as School-Day programming.

Our methodological strategy takes strides to alleviate these concerns, and our sensitivity analyses further support our main results. However, we observe limited family and site information, and we cannot rule out the possibility that decisions or circumstances surrounding School-Day participation drive the outcomes we observe, rather than the program itself.

The interpretability and generalizability of our results are further limited by the fact that the group of children enrolled in School-Day classes is relatively small. School-Day and Working-Day models only began operation in AY 2015, and therefore our results speak to the *preliminary* efficacy of School-Day classroom models.

Further, we were unable to examine components of the assignment due to data limitations. Primarily, we could not explore how ECEAP staff characteristics like education level, experience, and demographics influence our results. This is because information about staff characteristics was incomplete, and we could not accurately track ECEAP staff employment over time.

While these limitations challenge our ability to estimate unbiased treatment effects and address all components of the legislative assignment, we conducted numerous sensitivity analyses (Appendix VI) and generally find that the positive relationship between School-Day enrollment and kindergarten readiness is consistent and robust to various specifications.

Summary of Findings

In 2019, the legislature directed WSIPP to examine long-term and short-term outcomes for children enrolled in ECEAP and "the effects of full-day [ECEAP] programming and half-day programming."[67] In this report, we operationalize this legislative directive by examining the relationship between School-Day enrollment and child outcomes, primarily kindergarten readiness, compared to Part-Day enrollment.

[66] A description of limitations is in Appendix VI.

[67] E2SHB 1391.

We observe that children enrolled in School-Day classes are more likely to be kindergarten-ready compared to children in Part-Day classes. Specifically, *we estimate that children in School Day are 15% more likely (on average) to achieve proficiency in all six WaKIDS domains, relative to children in Part Day.*

When examining proficiency within each WaKIDS domain, we find that children in School-Day classes were more likely to meet expectations in physical, cognitive, literacy, and mathematics domains. Further, we estimate the highest impact in the mathematics domain. Children in School Day are 19% more likely to demonstrate proficiency in the mathematics domain, relative to children in Part Day.

In addition to our main analysis, findings from subgroup analyses suggest that the estimated size of the relationship between School-Day enrollment and kindergarten readiness is largest for non-Hispanic BIPOC and White children.

In a separate report, WSIPP additionally evaluated the long-and short-term effects of ECEAP.[68] Specifically, WSIPP researchers compared outcomes between children enrolled in ECEAP and similar children who did not enroll, examining their kindergarten readiness, academic achievement, high school graduation rates, and other outcomes like criminal justice involvement. Like the findings in this report, the long-and short-term evaluation found a positive and significant (though smaller) relationship between children enrolled in ECEAP and kindergarten readiness, relative to children who did not enroll in ECEAP.

Ultimately, the results from this report and WSIPP's long-and short-term evaluation suggest that children who enroll in ECEAP are more likely to be kindergarten-ready (than similar children who do not enroll in ECEAP) and among ECEAP enrollees, those in longer class periods (School Day) are more likely to be kindergarten-ready than peers in Part Day.

Overall, these conclusions are consistent with broader literature findings, which indicate that children exposed to high-quality early education programs—and for longer periods of time—have improved development and academic skills.

WSIPP's evaluations provide evidence of a positive relationship between ECEAP programming in general and dosage impacts on kindergarten readiness among a low-income and diverse population of children in Washington State.

[68] Hoagland et al. (2022).

Acknowledgments

The authors would like to thank the staff at DCYF, ERDC, and RDA/DSHS for helping us obtain the data we needed to conduct this evaluation. We are particularly grateful to Tom Aldrich & Tim Norris (ERDC), Warren Wessling & Kevin Cummings (DCYF), and Deleena Patton & Barbara Lucenko (RDA/DSHS) for their support in providing the administrative data we relied on to conduct our analyses.

In addition to the data support we received, we also want to thank Vickie Ybarra, Sara Schwartz Jewell, Karin Ganz, Sarah Veele, and Angela Abrams for answering countless questions about ECEAP and dosage programming. Your expertise was vital to our understanding of ECEAP and the families and children it serves in Washington State.

We also thank our WSIPP colleagues including Chasya Hoagland, Danielle Fumia, Rebecca Goodvin, and Bailey Ingraham for providing helpful feedback on our research design and report drafts.

Appendices

Evaluation of the Early Childhood Education and Assistance Program:
Kindergarten Readiness for School-and Part-Day Enrollees

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I. Data Sources

We received data from multiple agencies including the Education Research and Data Center (ERDC), the Research and Data Analysis (RDA) division within the Department of Social and Health Services (DSHS), and the Department of Children, Youth, and Families (DCYF). Exhibit A1 summarizes the data used in this analysis.

Using its P20W longitudinal data system, ERDC matched ECEAP child-and site-level data (from the Early Learning Management System (ELMS) database) to K-12 data (from OSPI's Comprehensive Education Data and Research System (CEDARS) database). This allowed us to track children's enrollment between ECEAP and kindergarten. ERDC then sent us personally unidentifiable datasets that we linked together using anonymous IDs.

Exhibit A1

Data Used in Evaluation

Data system	Description	Source[^]	Years included
ECEAP site-level data			
ELMS	ECEAP site characteristics (e.g., contractor information, slot counts, locale information, licensed facility or not, years in operation, enrollment)	DCYF (ERDC)	AY 2015-2019
ECEAP site neighborhood-level data			
American Community Survey	Census tract (neighborhood) characteristics include population under five years old, race and ethnicity compositions, population with less than a bachelor's degree, rate of households with less than 80% FPL, unemployment rate, median household income	U.S. Census Bureau	2015-2019
Child-level data			
ELMS	ECEAP child eligibility and enrollment information (e.g., age, sex, race/ethnicity, language, enrollment duration)	DCYF (ERDC)	AY 2015-2019
CEDARS	K-12 public school information (e.g., school enrollment, program participation, absence and retention information, and assessment results)	OSPI (ERDC)	AY 2016-2020
SSPS	Childcare subsidy for Working Connections Child Care, Seasonal Child Care, or child welfare programs	DCYF (ERDC)	AY 2015-2019
Parent/household-level data			
ACES[#]	Family characteristics (e.g., single vs two-parent households, parent education, age, marital status)	ESA (RDA)	AY 2014-2019
School-level data			
Washington School Report Card	K-12 school data (e.g., enrollment, racial and ethnic composition, teachers' average years of experience, and percent of teachers with at least a master's degree)	OSPI	AY 2016-2020

Notes:

[^] Agencies in parentheses are not data owners but linked and/or provided data directly to WSIPP.

[#] This data was used for supplemental analysis to examine additional household controls but was not included in the main analyses.

ELMS: Early Learning Management System
ERDC: Education Research and Data Center
AY: Academic year
SSPS: Social Service Payment System
ESA: Economic Services Administration
DCYF: Department of Children, Youth, and Families
CEDARS: Comprehensive Education Data and Research System
OSPI: Office of the Superintendent of Public Instruction
ACES: Automated Client Eligibility System
RDA: Research and Data Analysis

II. Construction of Analytic Sample

After receiving raw data files from ERDC, RDA, and DCYF, we processed datasets separately and merged files to create one large longitudinal child-by-site-by-year dataset. We made restrictions to this panel data to create our main analytic sample where each observation is a single child in the first site they attended in the academic year before enrolling in kindergarten. These steps are outlined below:

Data Processing

1) ECEAP Site Information
   We received site-level data from ERDC for AY 2013-2019 (from the ELMS data system). This included data on ECEAP contractors/subcontractors including the academic year they operated, the number of funded slots and type offered (Part, School, and Working Day), regional location, and where the site operated (e.g., in a public school, childcare center, non-profit). We excluded ECEAP sites from our sample if they did not have any slots in a given year. This site-by-year dataset includes a total of 2,976 observations (579 unique ECEAP sites).

2) ECEAP Child-Level Information
   We received child-level eligibility and enrollment information from ERDC for AY 2013-2019 (from the ELMS data system). Eligibility data included age, sex, race/ethnicity, language, and disability status and household information like family income, and whether children lived in single or two-parent households or were homeless. Enrollment information included the academic year in which a child was enrolled in ECEAP, the classroom type they were enrolled in (Part, School, and Working Day), and the length of time they were enrolled in a given year. We also received data from ERDC to identify children who received services from the Early Support for Infants and Toddlers (ESIT) program.[69] Further, we received data to identify children who received subsidized childcare. This is a child-by-site-by-year constructed dataset that includes a total of 90,101 observations (70,188 unique children. Prior to restrictions (described below), children can be in multiple sites and slot types in a single year).

3) K-12 Child-Level Information
   We received K-12 child-level data from ERDC for AY 2010-2020 (from the CEDARS data system). Data files had enrollment information including the schools' children enrolled in over time, length of enrollment, and grade levels. We also had information about programs that children participated in (i.e., special education) and the number of absences children received. We also had WaKIDS scores for children enrolled in kindergarten. If a student switched schools within a single school year, we kept the first school they enrolled in and dropped all other school records to limit the dataset to a unique child per school per year. This dataset includes 4.9 million observations (more than 762,000 unique children).

4) Merging ECEAP Site, ECEAP Child, and K-12 School Information
   We merged the data files above together using anonymous child IDs, site IDs, and school years to create a longitudinal dataset that spans the AY 2013-2019.

[69] ESIT is a program for children ages birth to 3 with developmental delays or disabilities. Department of Children, Youth & Families website: *Early support for infants & toddlers.*

Analytic Sample Construction

After merging site, child, and K-12 data files, we restricted[70] the sample to include children observed in both kindergarten enrollment (between the 2016-2020 AYs) *and* ECEAP sites in the previous year (between 2015-2019 AYs). [71] Additional sample restrictions are listed below:

- We omitted children missing information for outcome variables or child-level control variables.[72]
- Children can enroll in multiple sites in the pre-k year. To ensure we only have one observation per child, our sample keeps information from the first site a child attends in the pre-k year.
- To isolate the relationship between School Day and outcomes (relative to Part-Day enrollment), we omitted children who switched models within the academic year (e.g., moved from Part Day to School Day).[73] To ensure we are not capturing the impacts of additional childcare, we also omitted children who simultaneously received part-or full-day subsidized childcare.[74]
- We omitted children who enrolled in Working-Day models.[75] Due to prohibitively small enrollment in Working-Day models we were unable to compare outcomes between children in Working-Day and Part-Day classrooms.
- For consistency with the broader literature and to improve statistical precision, we omitted children enrolled in ECEAP for one month or less,[76] and we omitted children who received ESIT services[77] prior to enrolling in ECEAP.[78]
- We omit ECEAP sites that operated for fewer than two years because we wanted to capture sites with multiple years of experience serving families.[79] We also excluded sites that were operated by tribal organizations[80] since these sites may operate differently than non-tribal ECEAP providers. [81]

[70] This restriction omits approximately 26,000 children from the original sample.
[71] Our sample begins with ECEAP pre-k enrollments in the AY 2015, because the AY 2016 is the first year we can reliably draw inferences from the WaKIDS assessment data.
[72] Approximately 1,700 children.
[73] Approximately 230 children.
[74] Approximately 4,500 children.
[75] Approximately 700 children.
[76] Approximately 800 children.
[77] Approximately 3,000 children.
[78] The magnitude of our main results is not sensitive to these sample restrictions.
[79] This restriction drops approximately 3,000 children.
[80] This restriction drops approximately 300 children.
[81] The magnitude of our main results is not sensitive to these sample restrictions.

Our final analytic sample includes 21,099 children in ECEAP between AY 2015-2019. Exhibit A2 illustrates the approach for processing raw site, child, and school-level data, merging, and constructing this sample.

Exhibit A2
Analytic Sample Construction

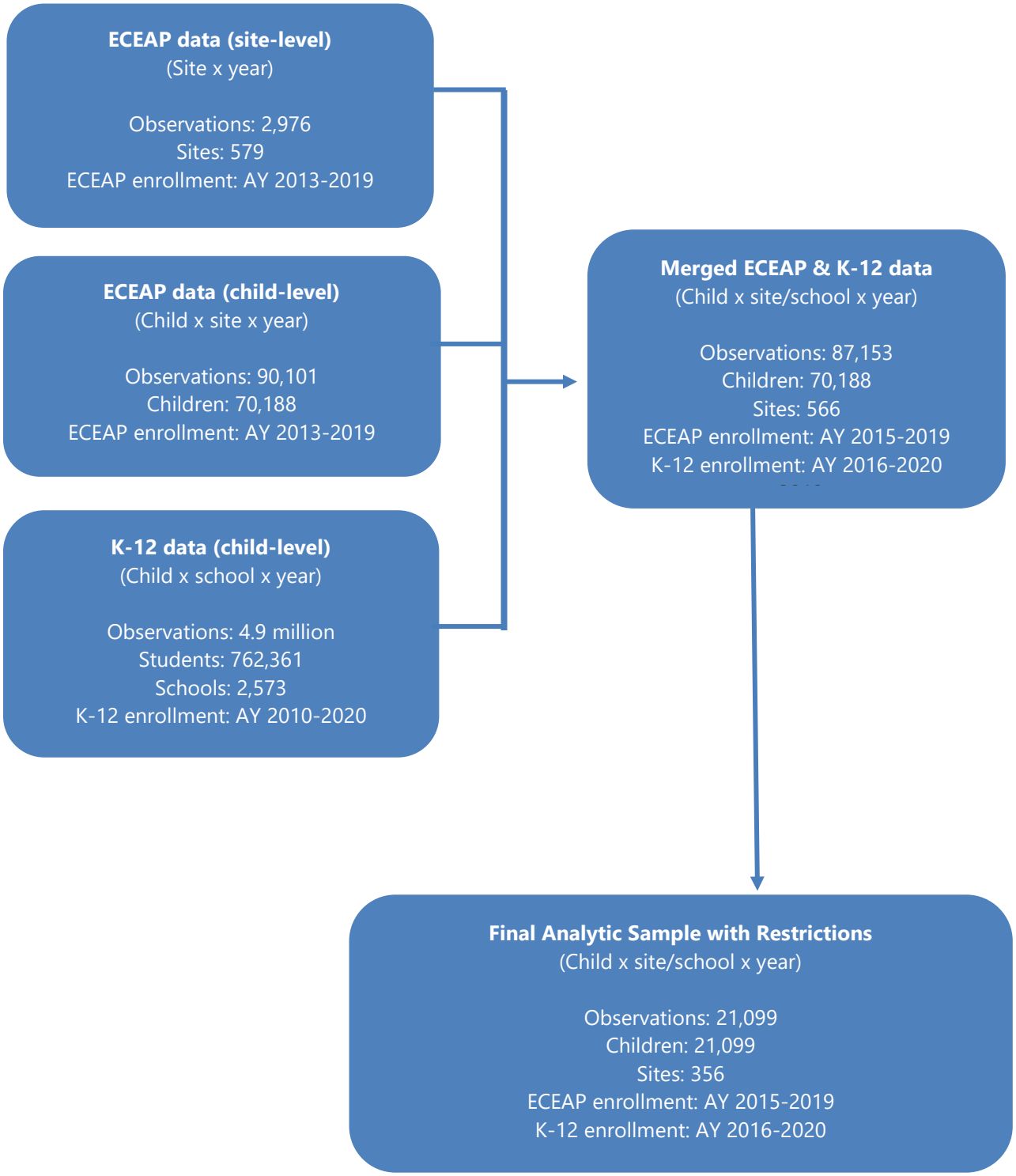


Exhibit A3 below depicts child characteristics in our analytic sample compared to the broader ECEAP population of children (i.e., children who attend ECEAP in their pre-k year and enroll in kindergarten the following year). The magnitude of the mean values is generally similar across the two groups.

Exhibit A3

Child Characteristics (In ECEAP population vs Main Analytic Sample)

	ECEAP population	Analytic sample
Proportion enrolled in part day	0.81 (0.39)	0.84 (0.37)
Proportion enrolled in school day	0.16 (0.36)	0.13 (0.34)
Proportion enrolled in working day	0.04 (0.20)	0.03 (0.17)
Attends one year of ECEAP	0.64 (0.48)	0.64 (0.48)
Age at enrollment	4.59 (0.31)	4.58 (0.31)
Female	0.49 (0.50)	0.51 (0.50)
Primary language, English	0.64 (0.48)	0.61 (0.49)
Primary language, Spanish	0.27 (0.45)	0.29 (0.46)
Primary language, other	0.08 (0.28)	0.09 (0.29)
Not income-eligible	0.13 (0.34)	0.13 (0.33)
One parent	0.42 (0.49)	0.37 (0.48)
Two parents	0.51 (0.50)	0.58 (0.49)
Other	0.07 (0.25)	0.05 (0.22)
Disability	0.11 (0.31)	0.08 (0.27)
Multiracial	0.12 (0.32)	0.11 (0.31)
American Indian/Alaska Native	0.01 (0.08)	0.00 (0.06)
Asian	0.01 (0.11)	0.01 (0.12)
Black	0.09 (0.28)	0.08 (0.27)
Native Hawaiian/Pacific Islander	0.01 (0.08)	0.01 (0.08)
White	0.35 (0.48)	0.35 (0.48)
Hispanic	0.42 (0.49)	0.43 (0.50)
Observations	39,273	21,099

Note:
Standard errors in parentheses.

Exhibit A4 below depicts site characteristics in our analytic sample compared to the broader ECEAP population of children who attend ECEAP in their pre-k year and enroll in kindergarten the following year. The magnitude of the mean values is generally similar across the two groups.

Exhibit A4

Site & Neighborhood Characteristics

(In ECEAP population vs Main Analytic Sample)

	ECEAP population	Analytic sample
ECEAP site characteristics		
Annual enrollment	70.7 (67.58)	70.48 (66.39)
Years in operation	4.50 (1.85)	4.93 (1.42)
Region, Central	0.15 (0.35)	0.15 (0.35)
Region, Eastern	0.21 (0.41)	0.19 (0.39)
Region, King & Pierce	0.31 (0.46)	0.32 (0.47)
Region, Northwest	0.15 (0.35)	0.14 (0.35)
Region, Olympic Peninsula	0.08 (0.27)	0.08 (0.27)
Region, Southwest	0.11 (0.31)	0.12 (0.32)
Neighborhood characteristics		
Population under 5 years old	411.88 (258.67)	411.32 (258.95)
Rate of households renting	0.41 (0.20)	0.41 (0.20)
Population rate, BIPOC	0.38 (0.23)	0.37 (0.23)
Rate of households as ESL	0.06 (0.08)	0.05 (0.06)
Unemployment rate	7.09 (3.43)	7.11 (3.42)
Log median household income	10.91 (0.35)	10.91 (0.34)
Population rate, less than BA	0.75 (0.12)	0.75 (0.11)
Observations	39,273	21,099

Note:
Standard errors in parentheses.

III. Outcomes

This section describes the outcomes we compared between children who participated in School-Day models and those in Part-Day models. We examined A) kindergarten readiness; B) special education participation; and C) absences. We also include additional information about how we constructed the kindergarten readiness measure to ensure comparability over time.

A. Kindergarten Readiness

Our primary outcome of interest is kindergarten readiness measured during a child's kindergarten year, immediately after their enrollment in ECEAP. In kindergarten, readiness is measured using the Washington Kindergarten Inventory of Developing Skills (WaKIDS) assessment.[82] This is an observational assessment that kindergarten teachers administer to children in the fall of their kindergarten school year. WaKIDS provides a snapshot of a child's development in six domain areas including social-emotional, physical, cognitive, language, literacy, and mathematics. Within each of these domain areas, there are specific objectives (and underlying dimensions) that children are observed on. Teachers assign scores to measure a child's knowledge and skills on a developmental continuum. In each of the six domains, scores are compared against benchmarks. Children with scores that meet or exceed benchmarks in all six domains are deemed "kindergarten ready."[83]

We focus specifically on the probability of meeting all six developmental domains since this is the measure used to determine kindergarten readiness. We also report the probability of a child meeting/exceeding expectations within each of the six developmental domains (e.g., social-emotional, cognitive, literacy).

The WaKIDS assessment was first piloted in a small number of elementary schools in AY 2011 and AY 2012. Beginning in AY 2013, WaKIDS was required to be administered to all children enrolled in state-funded, full-day kindergarten.[84] Both full-day kindergarten and WaKIDS were initially rolled out in schools with the highest rates of children qualifying for free-or reduced-priced lunch. As a result, the population of children assessed with WaKIDS in earlier years of our analysis is not representative of the full population of Washington kindergarteners. The number of schools implementing WaKIDS steadily increased over time and the assessment was fully implemented in all public elementary schools in AY 2018. We include the first year that WaKIDS is implemented in a school as a control variable in our model.

A Note on Readiness Measured in ECEAP

Kindergarten readiness is also measured in the fall and spring of a child's ECEAP year, using the Teaching Strategies GOLD™ development assessment (TS GOLD). WaKIDS is a custom version of the TS GOLD assessment and uses a subset of objectives from the full TS GOLD assessment to measure proficiency in each of the six developmental domains. Due to assessment changes (which we describe in detail below) and challenges in making TS GOLD scores reliably comparable over time, we focus on WaKIDS as our primary measure of kindergarten readiness in this report. In other words, we focus on readiness as measured when a child starts kindergarten, not during their ECEAP enrollment.

[82] OSPI website: *Washington kindergarten inventory of developing skills (WaKIDS).*
[83] ERDC website: *Early learning feedback report.*
[84] RCW 28A.655.080.

Reconstructing WaKIDS to be Comparable Over Time

Since we observe cohorts of children enrolled in ECEAP and then kindergarten, any changes to kindergarten readiness assessments during our study period have implications for analysis. Though the conceptual definition of kindergarten readiness has remained consistent over time, small changes in the measurement risk masking or misattributing our estimated relationship between School Day and kindergarten-readiness outcomes.

Several changes to WaKIDS and TS GOLD occurred over our period of analysis. In AY 2016, the set of objectives/dimensions included on the WaKIDS was revised.[85] Additionally, starting in the 2018 AY, Teaching Strategies introduced a new version of the TS GOLD assessment, which as noted earlier, is the foundational assessment that WaKIDS is based on. This new version of TS GOLD was designed to cover developmental progression from birth through 3rd grade (B-3), whereas the previous version covered birth through kindergarten (B-K).[86] The new TS GOLD (B-3) version included the addition of new objectives on literacy and math domains, the revision of scores to cover more advanced developmental knowledge, and the adjustment of benchmark scores for kindergarten readiness. These changes impact the consistency of the WaKIDS measure over time.

To mitigate the impact of these changes, we used raw WaKIDS objective-level data to reconstruct scores within each of the six developmental domains. We replicated the Teaching Strategies' method when dealing with missing data. Teaching Strategies' approach in the TS GOLD (B-K) version is to impute the mean domain score for each child based on their completed items when at least 80% of items are completed. When fewer than 80% of items in a domain are complete, mean imputation was not used and the child's domain score was considered missing.[87] Next, we applied WaKIDS benchmark cutoff scores as documented by Teaching Strategies.[88] No new items were added to the WaKIDS assessment when the B-3 version was introduced, and only the WaKIDS literacy score cutoff changed starting in AY 2018. We determined that the best approach to maintaining consistency over time in the kindergarten readiness classification was to apply the B-K version cutoffs through AY 2017, and the B-3 version cutoffs from AY 2018 forward. Exhibit A5 illustrates our preferred construction of the WaKIDS measure. Exhibit A6 illustrates the approach if we applied the B-K version cutoffs for all years. While the probability of meeting expectations for social-emotional, physical, cognitive, language, and math domains is the same in either approach, our preferred method (Exhibit A5) shows a slightly lower probability of meeting expectations in the literacy domain over time than Exhibit A6. In other words, if we continued to use B-K cutoff scores for all years, we would identify kids as meeting expectations in the literacy domain when in fact they were not.

[85] The WaKIDS objectives and dimensions have been the same from AY 2016 through AY 2020.

[86] Lambert, R. (2017). *Technical Manual for the Teaching Strategies GOLD™ Assessment System: Birth through third grade edition.* The Center for Educational Measurement and Evaluation.

[87] Lambert et al. (2014). *Technical Manual (3rd edition) for the Teaching Strategies GOLD Assessment System.* The Center for Educational Measurement and Evaluation.

[88] K. Houser, Teaching Strategies (personal communication, November 16, 2020).

Exhibit A5

B-K Version Cutoffs 2015-2017, B-3 Version Cutoffs 2018-2020

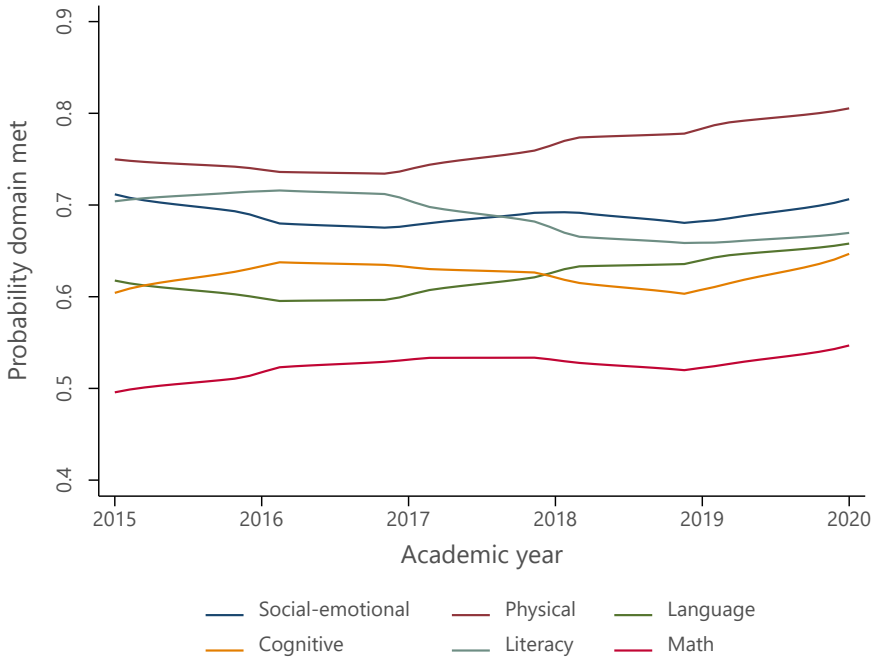
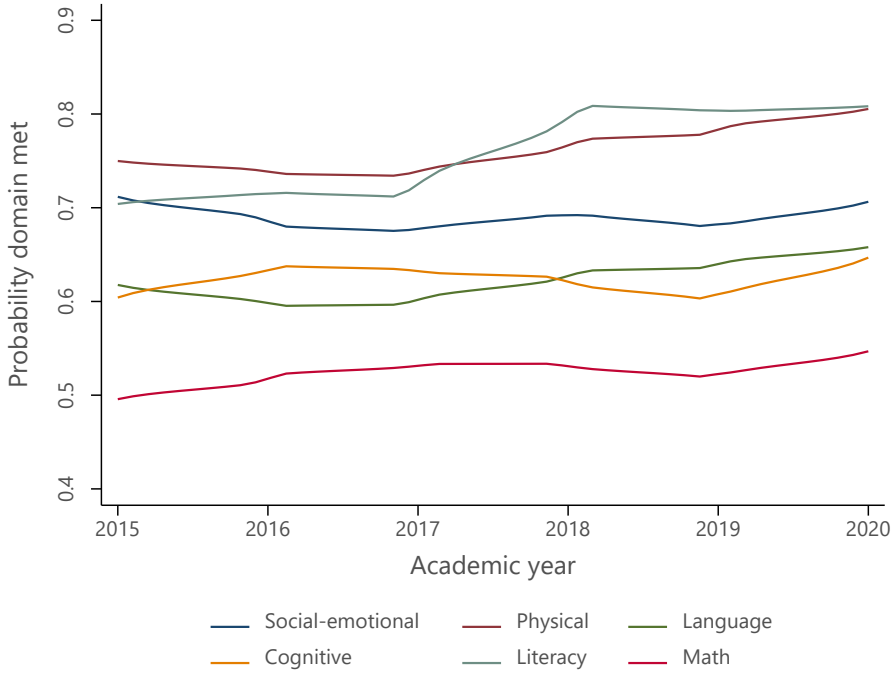


Exhibit A6

B-K Version Cutoffs 2015-2020



B. Special Education Placement in Kindergarten

We also measure the probability of a child's enrollment into special education in kindergarten. Enrollment is defined as observing the presence of at least one enrollment in the CEDARS special education program data file. We measure special education enrollment for children in kindergarten for AY 2016-2019.[89]

We want to highlight that the mechanism between School-Day ECEAP and special education enrollment in kindergarten is challenging to predict. There is limited evidence regarding the effect of full-day early education programs and placement into special education. One study suggests that full-day kindergarten may better support self-regulation and academic skills among children who are at risk for special education needs, more so than half-day kindergarten.[90] Other research suggests that participation in high-quality early education programs, in general, reduces the likelihood that children need special education services once they enter primary grades.[91]

The relationship between School Day and placement into special education in kindergarten may be positive or negative. For example, one may theorize that the longer a child is able to practice skills like self-regulation in School-Day classrooms and receive ECEAP wrap-around services, the less likely they will need special education services once they enter kindergarten. Alternatively, one may hypothesize that the longer a child is enrolled in ECEAP, the more likely staff will assess a child's developmental needs and accurately refer them for special education services. We highlight the challenge in identifying a mechanism between School Day and special education enrollment in kindergarten to emphasize caution when interpreting special education placement results.

C. Average Number of Monthly Absences in Kindergarten

Using the absence file from the K-12 CEDARS data system, we estimate a child's average number of monthly absences, which include both excused and unexcused absences. Research suggests that children in full-day preschool programs have lower rates of absences, compared to peers who attend Part-Day preschool.[92] We measure absences for children enrolled in kindergarten for AY 2016-2019.[93]

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[89] We did not have data on special education enrollment for kindergarteners in AY 2020.

[90] Pelletier, J., & Fesseha, E. (2019). The impact of full-day kindergarten on learning outcomes and self-regulation among kindergarten children at risk for placement in special education. *Linking Quality Early Child Education and Special Education Needs, 29*(3).

[91] Melhuish, E., Barnes, J. Gardiner, J., Siraj, I. Sammons, P., Sylva, K. & Taggart, B. (2019). A study of the long-term influence of early childhood education and care on the risk for developing special educational needs. *Exceptionality Education international, 29*(3), 22-41 and Philpott, D., Young, G., Maich, K., Penney, S., & Butler, E. (2019). *The preemptive nature of quality early childhood education on special educational needs in children*. Memorial University of Newfoundland.

[92] Reynolds et al. (2014).

[93] We did not have data on absences for kindergarteners in AY 2020.

IV. Empirical Approach

Ideally, we would randomly assign School-Day and Part-Day slots to ECEAP providers in the state and then randomly assign children to each model. This would ensure that ECEAP site characteristics and child characteristics are balanced—on average—between sites and slot types.[94] With random assignment, we could confidently attribute any difference in outcomes between children in School-Day and Part-Day as an unbiased effect of School-Day programming.

We cannot set up a randomized control trial because we are evaluating the ECEAP program retrospectively. As a result, children enrolled in School-Day models may differ systematically from children enrolled in Part-Day models. For example, children in School-Day classrooms may have backgrounds (family income, parents working full time with less flexible work schedules) that require a greater need for longer educational and childcare services, than children in Part-Day models. These differences may independently impact children's kindergarten readiness and other outcomes.

Additionally, ECEAP slot types are not randomly distributed to providers in the state. The Washington State Legislature allots funding each year, which is distributed to ECEAP providers based on application scores as well as a community need. Furthermore, providers in communities with a larger population of eligible unserved children are more likely to receive funding than providers in communities with less need. These factors, at both the family and ECEAP program levels, determine the population of children enrolled in Part-, School-, and Working-Day models, making it difficult to estimate an unbiased treatment effect.

To mitigate bias at the site level, we estimate a site fixed effects regression model. Site fixed effects allow us to account for relevant unobserved time-invariant differences across sites that may predict outcomes. We also include year fixed effects to control for differences over time that predict outcomes and are shared across all ECEAP sites (e.g., an economic recession). The inclusion of site and year fixed effects does not control for differences across sites or years that change over time or time-varying child and family characteristics. We account for several child/family characteristics and time-varying sites and site neighborhood (census tract) characteristics. Finally, we control for kindergarten school characteristics that predict kindergarten readiness.

[94] "Any small and idiosyncratic differences that exist among the groups prior to treatment will fall within the noise that is accounted for naturally by statistical methods used to analyze the resulting outcome data." Murnane, R.J., & Willett, J.B. (2011). *Methods Matter: Improving causal Inference in Educational and Social Science Research*. Oxford University Press.

Our preferred model is estimated using the Ordinary Least Squares regression below:

Equation 1: $$Y_{is(y+1)} = \beta_0 + \beta_1(School\ Day_{isy}) + \beta_2 X_i + \beta_3 Z_{sy} + \alpha_s + \tau_y + \varepsilon_{isy}$$

Model term	Description
Y_{isy}	Kindergarten outcome for individual *i* in ECEAP site *s* in their kindergarten year (*y+1*)
β_1	Parameter of interest. Identifies the relationship between participation in School-Day ECEAP and child outcomes, relative to participation in Part-Day ECEAP
$School\ Day_{isy}$	Equals one if child *i* attends a School-Day model in site *s* in pre-k year *y*, and equals zero if the child attends a Part-Day model
X_i	Vector of child-and school-level controls. Child controls: Child attends ECEAP for one year, age at enrollment, race/ethnicity, sex, primary language, two-parent household, ECEAP eligible (because the family has income greater than 110% FPL), ECEAP eligible because of diagnosed disability. School controls: Total enrollment; racial and ethnic composition, average instructor years of experience, percentage of teachers with a master's degree or higher, years from WaKIDS assessment adoption.
Z_s	Vector of time varying ECEAP site and neighborhood controls. ECEAP site controls: Total enrollment Neighborhood (census tract) controls: Total population under five years old, racial composition, unemployment rate, median household income, proportion of households with income 80% or below tract median, proportion of population less than a bachelor's degree, proportion households renting, proportion households with English as a second language.
α_s	ECEAP site fixed effects
τ_y	Year fixed effects
ε_{isy}	Random error term^

Note:
^Standard errors are estimated to account for clustering at the ECEAP site level.

Exhibit A7 depicts characteristics between children enrolled in Part-Day and School-Day classes in our analytic sample. Children in School-Day enrollment are more likely to have attended two years of ECEAP and more likely to identify as black. Children in Part-Day enrollment are more likely to live in a two-parent household. We control for these characteristics in our main regression model.

Exhibit A7

Child characteristics by Part- & School-Day Models, AY 2015-2019

	Part Day	School Day	Difference
Attends one year of ECEAP	0.691 (0.011)	0.457 (0.028)	0.234***
Age at enrollment	4.592 (0.003)	4.566 (0.008)	0.025
Multiracial	0.108 (0.006)	0.126 (0.015)	-0.019
American Indian/Alaska Native	0.004 (0.001)	0.002 (0.001)	0.002
Asian	0.016 (0.003)	0.009 (0.002)	0.007
Black	0.064 (0.009)	0.165 (0.035)	-0.101**
Native Hawaiian/Pacific Islander	0.008 (0.001)	0.002 (0.001)	0.006**
White	0.352 (0.018)	0.335 (0.035)	0.017
Hispanic	0.449 (0.019)	0.361 (0.045)	0.088
Female	0.511 (0.004)	0.514 (0.008)	-0.003
Primary language, English	0.606 (0.019)	0.617 (0.037)	-0.011
Primary language, Spanish	0.305 (0.016)	0.248 (0.042)	0.057
Primary language, Other	0.089 (0.011)	0.135 (0.025)	-0.046
Not income-eligible	0.126 (0.006)	0.129 (0.010)	-0.003***
One parent	0.357 (0.007)	0.389 (0.014)	-0.032
Two parents	0.594 (0.008)	0.547 (0.017)	0.048**
Other	0.049 (0.003)	0.064 (0.007)	-0.016**
Disability	0.083 (0.004)	0.069 (0.007)	0.014
Observations	18,212	2,887	

Notes:
Standard errors in parentheses. Standard errors are estimated to adjust for clustering at the site-level
The value displayed for t-tests represents the differences in means between Part-and School-Day groups.
*** significant at the 0.001-level, ** significant at the 0.05-level, * significant at the 0.10-level.

Exhibit A8 depicts site and neighborhood characteristics between children enrolled in Part-Day and School-Day classes in our analytic sample. Children in Part-Day classes are more likely to attend a site located in a neighborhood (census tract) with a higher unemployment rate and lower median household income. We control for these site and neighborhood characteristics in our main regression model.

Exhibit A8

ECEAP Site and Neighborhood Characteristics by Part- & School-Day Models, AY 2015-2019

	Part Day	School Day	Difference
ECEAP site characteristics			
Annual enrollment	72.626 (8.071)	54.770 (9.142)	17.856
Years in operation	4.982 (0.116)	4.535 (0.178)	0.447
Region, Central	0.157 (0.028)	0.084 (0.053)	0.073
Region, Eastern	0.184 (0.029)	0.222 (0.053)	-0.039
Region, King & Pierce	0.313 (0.039)	0.358 (0.063)	-0.046
Region, Northwest	0.148 (0.030)	0.123 (0.040)	0.025
Region, Olympic Peninsula	0.089 (0.017)	0.055 (0.032)	0.034
Region, Southwest	0.110 (0.020)	0.158 (0.051)	-0.048
Neighborhood characteristics			
Population under 5 years old	415.523 (19.110)	393.168 (54.884)	22.355
Population rate, BIPOC	0.371 (0.017)	0.358 (0.037)	0.013
Rate of households renting	0.412 (0.016)	0.399 (0.026)	0.013
Population rate, less than BA	0.761 (0.007)	0.718 (0.017)	0.043
Rate of households as ESL	0.051 (0.004)	0.065 (0.012)	-0.015
Unemployment rate	7.194 (0.204)	6.526 (0.302)	0.668***
Log median household income	10.907 (0.026)	10.948 (0.041)	-0.041***
Observations	18,212	2,887	

Notes:
Standard errors in parentheses. Standard errors are estimated to adjust for clustering at the site-level
The value displayed for t-tests represents the differences in means between Part-and School-Day groups.
*** significant at the 0.001-level, ** significant at the 0.05-level, * significant at the 0.10-level.

V. Results & Subgroup Analyses

Kindergarten Readiness

The results of our primary analyses are depicted in Exhibit A9. Column 1 estimates the difference in the likelihood of kindergarten readiness for children in School Day versus Part Day from a model accounting for site and year fixed effects. Column 2 estimates the same relationship from a model which additionally accounts for child-level covariates; Column 3 adds school-level covariates; and Column 4 includes site-level covariates. Column 4 represents estimates from Equation 1 above, including the full set of control variables and is the specification estimated for subsequent analyses.[95]

Exhibit A9

School-Day Participation and Proficiency in 6 of 6 WaKIDS Domains
(Relative to Part Day)

	(1)	(2)	(3)	(4)
School Day	0.071***	0.063***	0.061***	0.059***
	(0.021)	(0.020)	(0.020)	(0.020)
Outcome mean	0.353	0.353	0.353	0.353
Outcome standard deviation	0.478	0.478	0.478	0.478
Impact (%)	20.165	17.702	17.356	16.784
Effect size	0.149	0.131	0.128	0.124
Observations	21,099	21,099	21,099	21,099
Site and year fixed effects	Yes	Yes	Yes	Yes
Child controls	No	Yes	Yes	Yes
School controls	No	No	Yes	Yes
Time-varying site/neighborhood controls	No	No	No	Yes

Notes:
Results in each column are estimated from a separate regression (Equation 1).
Standard errors in parentheses. Standard errors are estimated to adjust for clustering at the site-level
*** significant at the 0.001-level, ** significant at the 0.05-level, * significant at the 0.10-level.
Impact (%) is calculated by dividing the parameter estimate by the outcome mean value
Effect Size is calculated by dividing the parameter estimate by the outcome standard deviation.

Exhibit A10 shows the full set of covariate coefficient estimates from the model estimated in Column 4 of Exhibit A9 above.

[95] The estimated School-Day effect decreases as we account for additional child, school, site, and neighborhood covariates. Estimates remain similar and statistically significant across specifications.

Exhibit A10

School-Day Participation and Proficiency in 6 of 6 WaKIDS Domains (Relative to Part Day), Full Set of Covariates

	Coefficient	SE
School Day	0.059***	(0.020)
Child controls		
Attends one year of ECEAP	-0.052***	(0.008)
Age at current site enrollment	0.211***	(0.011)
Female	0.070***	(0.006)
Primary language, Spanish	-0.108***	(0.011)
Primary language, Other	-0.084***	(0.013)
Not income eligible	0.032***	(0.010)
Two parents	0.035***	(0.007)
Diagnosed disabled	-0.200***	(0.012)
White	-0.005	(0.011)
Hispanic	-0.043***	(0.013)
ECEAP site & neighborhood controls		
Annual enrollment	0.000	(0.000)
Population under 5 years old	0.000	(0.000)
Rate of households renting	0.12	(0.181)
Population rate, less than BA	0.077	(0.207)
Rate of households as ESL	-0.137	(0.123)
Unemployment rate	-0.003	(0.002)
Log median household income	0.172**	(0.078)
Rate of households with income < %80 tract mean	-0.13	(0.116)
Population rate, BIPOC	-0.247	(0.171)
School controls		
Annual enrollment	0.000	(0.000)
Percent Hispanic	-0.001	(0.001)
Percent White	0.001	(0.001)
Average years of educator experience	0.000	(0.002)
Percent teachers with at least a master's degree	0.000	(0.000)
One year from WaKIDS implementation	-0.03	(0.038)
Two years from WaKIDS implementation	-0.013	(0.038)
Three years from WaKIDS implementation	-0.004	(0.034)
Four years from WaKIDS implementation	0.019	(0.032)
Five years from WaKIDS implementation	0.01	(0.030)
Six years from WaKIDS implementation	-0.014	(0.030)
Seven years from WaKIDS implementation	-0.018	(0.026)
Eight years from WaKIDS implementation	-0.032	(0.027)
Observations	21,099	
Outcome mean	0.353	
Outcome standard deviation	0.478	

Notes:
Results are estimate from Equation 1.
Standard errors in parentheses. Standard errors are estimated to adjust for clustering at the site-level
*** significant at the 0.001-level, ** significant at the 0.05-level, * significant at the 0.10-level.
Impact (%) is calculated by dividing the parameter estimate by the outcome mean value
Effect Size is calculated by dividing the parameter estimate by the outcome standard deviation.

Each column of Exhibit A11 depicts the estimated relationship between School-Day enrollment and demonstrated proficiency in each of the six WaKIDS domains (separately). Children in School Day are more likely to meet benchmark scores in physical, cognitive, literacy, and mathematics domains, compared to children in Part Day. The relationship between School-Day participation and proficiency is largest for the mathematics domain. Children in School Day are 10 percentage points more likely to meet benchmark scores in the mathematics domain than children in Part Day. This is equivalent to a 19% overall impact.

Exhibit A11

School-Day Participation and Proficiency in Each Individual WaKIDS Domain
(Relative to Part Day)

	Social-emotional	Physical	Cognitive	Language	Literacy	Mathematics
School Day	0.008	0.040***	0.053***	0.025	0.053***	0.103***
	(0.019)	(0.014)	(0.019)	(0.019)	(0.017)	(0.018)
Outcome mean	0.743	0.811	0.667	0.645	0.801	0.547
Outcome standard deviation	0.437	0.392	0.471	0.478	0.399	0.498
Impact (%)	1.042	4.898	7.992	3.835	6.578	18.788
Effect size	0.018	0.101	0.113	0.052	0.132	0.206
Observations	21,099	21,099	21,099	21,099	21,099	21,099

Notes:
Results in each column are estimated from a separate regression (Equation 1).
Standard errors in parentheses. Standard errors are estimated to adjust for clustering at the site-level
*** significant at the 0.001-level, ** significant at the 0.05-level, * significant at the 0.10-level.
Impact (%) is calculated by dividing the parameter estimate by the outcome mean value
Effect Size is calculated by dividing the parameter estimate by the outcome standard deviation.

Special Education Placement and Absences in Kindergarten

Exhibit A12 depicts regression results from our preferred model estimating secondary outcomes, which include placement in special education and the average total number of monthly absences in kindergarten. We do not observe a relationship between School-day enrollment and placement in special education in kindergarten or the number of absences a child has in kindergarten.

Exhibit A12

School-Day Participation and Other Kindergarten Outcomes (Relative to Part Day)

	Special education	Absences
School Day	0.012	-0.081
	(0.012)	(0.073)
Outcome mean	0.12	1.493
Outcome standard deviation	0.325	1.287
Impact(%)	9.894	-5.456
Effect size	0.037	0.063
Observations	17,036	17,036

Notes:
Results in each column are estimated from a separate regression (Equation 1). Standard errors in parentheses. Standard errors are estimated to adjust for clustering at the site-level
*** significant at the 0.001-level, ** significant at the 0.05-level, * significant at the 0.10-level.
Impact (%) is calculated by dividing the parameter estimate by the outcome mean value
Effect Size is calculated by dividing the parameter estimate by the outcome standard deviation.

Subgroup Analyses

ECEAP Enrollment (One Versus Two Years)

We examine the relationship between School-Day enrollment (versus Part Day) and kindergarten readiness separately for the subsample of children who are enrolled in ECEAP for one year (in their pre-k year) and children enrolled in ECEAP for two years. In our sample, about 9% of children enrolled in ECEAP for one year are in School-Day classes, and 22% of children enrolled in ECEAP for two years are in School-Day classes. Results from this analysis are depicted in Exhibit A13. For children in ECEAP for one year, those in School-Day classes are 12% more likely to be kindergarten-ready (relative to children in Part Day). For children enrolled in ECEAP for two years, those in School-Day slots are 16% more likely to be kindergarten ready (relative to children in Part-Day slots). This estimated impact is not significantly different across enrollment duration.

Exhibit A13

School-Day Participation and Proficiency in 6 of 6 WaKIDS Domains (Relative to Part Day), by ECEAP Enrollment Duration

	1-year ECEAP (1)	2-years ECEAP (2)
School Day	0.041	0.061***
	(0.032)	(0.023)
Outcome mean	0.334	0.379
Outcome standard deviation	0.472	0.485
Impact(%)	12.193	16.197
Effect size	0.086	0.126
Observations	13,906	7,193

Notes:
Results in each column are estimated from a separate regression (Equation 1).
Standard errors in parentheses. Standard errors are estimated to adjust for clustering at the site-level
*** significant at the 0.001-level, ** significant at the 0.05-level, * significant at the 0.10-level.
Impact (%) is calculated by dividing the parameter estimate by the outcome mean value
Effect size is calculated by dividing the parameter estimate by the outcome standard deviation.

Sex

The same proportion of male and female children are enrolled in School-Day classes in their pre-k year (e.g., 14% of male children and female children are in School Day). Depicted in Exhibit A14, both male and female children in School-Day models are more likely to meet all six WaKIDS domains compared to children in Part Day, although the latter is imprecisely estimated. There is no significant difference in the relationship between School-Day enrollment and kindergarten readiness across male and female children.

Exhibit A14

School-Day Participation and Proficiency in 6 of 6 WaKIDS Domains (Relative to Part Day), by Sex

	Female	Male
	(1)	(2)
School Day	0.050	0.072***
	(0.031)	(0.028)
Outcome mean	0.393	0.312
Outcome standard deviation	0.489	0.463
Impact (%)	12.689	22.976
Effect size	0.102	0.155
Observations	10,782	10,317

Notes:
Results in each column are estimated from a separate regression (Equation 1).
Standard errors in parentheses. Standard errors are estimated to adjust for clustering at the site-level
*** significant at the 0.001-level, ** significant at the 0.05-level, * significant at the 0.10-level.
Impact (%) is calculated by dividing the parameter estimate by the outcome mean value
Effect size is calculated by dividing the parameter estimate by the outcome standard deviation.
Results are based on our preferred model, which includes site and year fixed effects and a full set of child, school, ECEAP site, and neighborhood controls.

Race and Ethnicity

We examine how results differ across racial and ethnic subgroups, including Hispanic, non-Hispanic BIPOC, and non-Hispanic White children.[96] In our sample, the probability of School-Day enrollment across the three groups (respectively) is 19%, 13%, and 11%. We find that School-Day participation does not have a practically or statistically significant relationship with kindergarten readiness for Hispanic-identified children (Column 3 in Exhibit A15). We observe a significant and positive relationship between School-Day enrollment and proficiency of meeting all 6 WaKIDS domains among non-Hispanic BIPOC and White children (Columns 1 and 2, respectively).

[96] "Hispanic" includes children identified as Hispanic of any race(s). "Non-Hispanic BIPOC" includes children identified as Black, American Indian/Alaska Native, Native Hawaiian/other Pacific Islander, Asian, multiracial, or other. We could not further disaggregate racial categories for subgroup analyses due to small sample size restrictions.

Exhibit A15

School-Day Participation and Proficiency in 6 of 6 WaKIDS Domains (Relative to Part Day), by Race/Ethnicity

	Non-Hispanic BIPOC (1)	Non-Hispanic White children (2)	Hispanic children (3)
School Day	0.120**	0.069**	-0.004
	(0.046)	(0.030)	(0.027)
Outcome mean	0.408	0.394	0.294
Outcome standard deviation	0.491	0.489	0.456
Impact (%)	11.978	17.493	-1.234
Effect size	0.244	0.141	0.008
Observations	4,501	7,383	9,215

Notes:
Results in each column are estimated from a separate regression (Equation 1).
Standard errors in parentheses. Standard errors are estimated to adjust for clustering at the site-level
*** significant at the 0.001-level, ** significant at the 0.05-level, * significant at the 0.10-level.
Impact (%) is calculated by dividing the parameter estimate by the outcome mean value
Effect size is calculated by dividing the parameter estimate by the outcome standard deviation.

Geographic Regions

We examine how the relationship between School-Day enrollment and kindergarten readiness differs across rural and urban counties (Exhibit A16). The magnitude of the impact is larger for children enrolled in ECEAP sites in urban counties (Column 2), compared to ECEAP sites in rural counties (Column 1).

Exhibit A16

School-Day Participation and Proficiency in 6 of 6 WaKIDS Domains (Relative to Part Day), by Rural-Urban Counties

	Rural (1)	Urban (2)
School Day	0.034	0.064***
	-0.037	-0.023
Outcome mean	0.327	0.365
Outcome Standard deviation	0.469	0.482
Impact (%)	10.542	17.592
Effect size	0.074	0.134
Observations	6,716	14,383

Notes:
Results in each column are estimated from a separate regression (Equation 1).
Standard errors in parentheses. Standard errors are estimated to adjust for clustering at the site-level
*** significant at the 0.001-level, ** significant at the 0.05-level, * significant at the 0.10-level.
Impact (%) is calculated by dividing the parameter estimate by the outcome mean value
Effect size is calculated by dividing the parameter estimate by the outcome standard deviation.

We further examined the relationship between School Day and kindergarten readiness across Child Care Aware of Washington's six designated regions (Exhibit A17).[97]

Exhibit A17

School-Day Model Participation and Proficiency in 6 of 6 WaKIDS Domains (Relative to Part Day), by Child Care Aware Region

	Central (1)	Eastern (2)	King & Pierce (3)	Northwest (4)	Olympic Peninsula (5)	Southwest (6)
School day	-0.043	0.078**	0.049	0.096*	-0.114	0.069
	(0.032)	(0.027)	(0.049)	(0.048)	(0.102)	(0.048)
Outcome mean	0.309	0.310	0.399	0.331	0.394	0.350
Outcome standard deviation	0.462	0.463	0.490	0.471	0.489	0.477
Impact (%)	-13.810	25.133	12.185	28.871	-29.033	19.860
Effect size	0.092	0.169	0.099	0.203	0.234	0.146
Observations	3,097	3,987	6,727	3,044	1,786	2,458

Notes:
Results in each column are estimated from a separate regression (Equation 1).
Standard errors in parentheses. Standard errors are estimated to adjust for clustering at the site-level
*** significant at the 0.001-level, ** significant at the 0.05-level, * significant at the 0.10-level.
Impact (%) is calculated by dividing the parameter estimate by the outcome mean value
Effect size is calculated by dividing the parameter estimate by the outcome standard deviation.

[97] Child Care Aware website *regional partners*.

VI. Sensitivity Analyses & Limitations

In this section, we examine the sensitivity of our results to alternative specifications and examination. All the analyses in the section use the main kindergarten readiness measure of proficiency in all six WaKIDS domains (i.e., kindergarten readiness).

Entropy Balanced Sample

We examine the robustness of our primary findings with entropy weighting. Entropy weighting is a data processing method that is used to balance covariates between treatment and controls groups in observational studies.[98] This method directly estimates weights for the comparison group such that the reweighted comparison group and treatment group balance on covariates incorporating information about known sample moments (e.g., mean, variance, skewness) and minimizing entropy distance (i.e., "uncertainty").[99] In other words, entropy weights allow us to exactly adjust for inequalities in observable predictors across the two groups (with regards to not only the mean but also higher moments of the predictor variable distribution).

In this analysis, we estimate entropy weights to balance the set of child-level covariates summarized in Exhibit A18.[100]

[98] Hainmueller, J. (2012). Entropy balancing for casual effects: a multivariate reweighting method to produce balanced samples in observational studies. *Political Analysis. 20,* 25-46.
[99] Ibid.
[100] We estimate entropy weights such that we impose balance on both the mean and variance of covariates across the treatment and control group.

Exhibit A18

Distribution of Child Covariates Before and After Weighting

	Unmatched (full sample)		Matched (entropy weighted sample)	
	Part day	School day	Part day	School day
Attends one year of ECEAP	0.691	0.457	0.457	0.457
	(0.011)	(0.028)	(0.013)	(0.028)
Age at enrollment	4.592	4.566	4.566	4.566
	(0.003)	(0.008)	(0.004)	(0.008)
Multiracial	0.108	0.126	0.126	0.126
	(0.006)	(0.015)	(0.007)	(0.015)
American Indian/Alaska Native	0.004	0.002	0.002	0.002
	(0.001)	(0.001)	(0.000)	(0.001)
Asian	0.016	0.009	0.009	0.009
	(0.003)	(0.002)	(0.001)	(0.002)
Black	0.064	0.165	0.165	0.165
	(0.009)	(0.035)	(0.022)	(0.035)
Native Hawaiian/Pacific Islander	0.008	0.002	0.002	0.002
	(0.001)	(0.001)	(0.000)	(0.001)
White	0.352	0.335	0.335	0.335
	(0.018)	(0.035)	(0.020)	(0.035)
Hispanic	0.449	0.361	0.361	0.361
	(0.019)	(0.045)	(0.019)	(0.045)
Female	0.511	0.514	0.514	0.514
	(0.004)	(0.008)	(0.005)	(0.008)
Primary language, English	0.606	0.617	0.617	0.617
	(0.019)	(0.037)	(0.021)	(0.037)
Primary language, Spanish	0.305	0.248	0.248	0.248
	(0.016)	(0.042)	(0.015)	(0.042)
Primary language, Other	0.089	0.135	0.135	0.135
	(0.011)	(0.025)	(0.019)	(0.025)
Not income-eligible	0.126	0.129	0.129	0.129
	(0.006)	(0.010)	(0.006)	(0.010)
One parent	0.357	0.389	0.389	0.389
	(0.007)	(0.014)	(0.009)	(0.014)
Two parents	0.594	0.547	0.547	0.547
	(0.008)	(0.017)	(0.009)	(0.017)
Other	0.049	0.064	0.064	0.064
	(0.003)	(0.007)	(0.004)	(0.007)
Disability	0.083	0.069	0.069	0.069
	(0.004)	(0.007)	(0.004)	(0.007)
Observations	18,212	2,887	18,212	2,887

Notes:
Standard errors in parentheses. Standard errors are estimated to adjust for clustering at the site-level.

Column 1 in Exhibit A19 summarizes the results estimated from Equation 1 using the unbalanced sample (shown in Column 4 of Exhibit A9). Column 2 summarizes the results estimated from Equation 1 using the entropy weighted sample. Results are quantitatively equivalent across the two samples. When matching child covariates between School-Day and Part-Day groups, we find an equivalent significant positive relationship between School-Day enrollment and kindergarten readiness

Exhibit A19

School-Day Participation and Proficiency in 6 of 6 WaKIDS Domains (Relative to Part Day), Entropy Weighting

	Full sample	Entropy-weighted sample
	(1)	(2)
School Day	0.059***	0.055***
	(0.020)	(0.020)
Outcome mean	0.353	0.353
Outcome standard deviation	0.478	0.478
Impact (%)	16.784	15.835
Effect size	0.124	0.117
Observations	21,099	21,099

Notes:
Results in each column are estimated from a separate regression (Equation 1).
Standard errors in parentheses. Standard errors are estimated to adjust for clustering at the site-level
*** significant at the 0.001-level, ** significant at the 0.05-level, * significant at the 0.10-level.
Impact (%) is calculated by dividing the parameter estimate by the outcome mean value
Effect size is calculated by dividing the parameter estimate by the outcome standard deviation.

Minimum Duration of ECEAP Attendance

We examine the robustness of our results to alternative restrictions to ECEAP enrollment duration (in the pre-k year). Column 1 of Exhibit A20 summarizes our baseline results using the entire sample, and Columns 2 and 3 show results when we restrict the sample to children enrolled in ECEAP (in the pre-k year) for at least three months and at least six months, respectively. Results are quantitatively equivalent across all three samples.

Exhibit A20

School-Day Model Participation and Proficiency in 6 of 6 WaKIDS Domains (Relative to Part Day), by Months of Pre-K ECEAP Attendance

	Full sample (1)	3+ months (2)	6+ months (3)
School Day	0.059***	0.053**	0.056**
	(0.020)	(0.021)	(0.024)
Outcome mean	0.353	0.356	0.364
Outcome standard deviation	0.478	0.479	0.481
Impact (%)	16.784	14.932	15.341
Effect size	0.124	0.111	0.116
Observations	21,099	20,160	18,381

Notes:
Results in each column are estimated from a separate regression (Equation 1).
Standard errors in parentheses. Standard errors are estimated to adjust for clustering at the site-level
*** significant at the 0.001-level, ** significant at the 0.05-level, * significant at the 0.10-level.
Impact (%) is calculated by dividing the parameter estimate by the outcome mean value
Effect size is calculated by dividing the parameter estimate by the outcome standard deviation.

Changes in Covariate Distributions

We examine whether child-and site-level covariate distributions change when School-Day programming is introduced. Our concern is that the observed relationship between School-Day enrollment and kindergarten readiness is driven by changes in the population of children enrolled in ECEAP, or related policies or circumstances. If the composition of children in sites (or the composition of sites) changes over time this may explain our kindergarten readiness results, not the School-Day program itself.

To test for distribution changes in child and site covariates we use our same regression model and treat the covariate of interest as the outcome. Essentially, we are estimating whether School Day predicts changes in site-level child characteristics or site characteristics. Our results suggest that site-level enrollment and neighborhood characteristics do not systematically change with the introduction of School-Day models. A notable exception is that two-year enrollment increases systematically with School-Day availability, however, the magnitude of the difference is small.

Limitations

There are several limitations to consider when interpreting results from this evaluation.

Omitted Variables Bias

We attempt to mitigate child/family and site selection by estimating models which control for site and year fixed effects and time-varying child, site, and neighborhood controls. We also ran a separate analysis using a subset of our analytic sample with additional parent and household information provided by RDA—about 30% of our sample of ECEAP children. We estimate our main model using the RDA subset accounting for additional relevant household information (e.g., parent's education, marital status, mother's age, number of siblings in household). The results from this analysis are qualitatively comparable to our primary results (though imprecisely estimated). In addition, our results are robust to the aforementioned child-level statistical matching method. However, we ultimately cannot rule out the potential that family-level selection bias influences our results.

Further, we cannot account for potential confounding policies; for example, ECEAP expansion and the state's quality rating system (i.e., Early Achievers) were rolled out over the same period that School-Day classes were increasing. These statewide policies led to increasing numbers of ECEAP slots and quality improvements for ECEAP providers. These policies may have influenced the composition of ECEAP providers providing Part-Day and School-Day classes, the composition of staff at these sites, and the composition of families enrolled in these sites. Data limitations inhibit our ability to comprehensively account for confounding policies and circumstances. In addition, our inability to examine child outcomes in the years prior to the rollout out of School-Day programming[101] inhibits our ability to assess the possibility that our results are driven by systematic differences in child performance in sites that adopt School-Day slots versus those that do not.

ECEAP Staff Characteristics

We were directed to "consider, to the extent that data is available, the education levels and demographics, including race, ethnicity, and socioeconomic status of early childhood education and assistance program staff." We were unable to fulfill this component of the assignment due to data constraints. We received data on ECEAP staff from DCYF's Managed Education and Registry Information Tool (MERIT), which included demographic information like age, sex, and race and ethnicity as well as educational attainment and training information, and job positions. To complete this assignment, we would need to observe employees (e.g., lead teachers) working in specific classrooms in a site in a year. That is, we would need to track staff employment over time to know who staffs School-Day classrooms and who staffs Part-Day classrooms. Unfortunately, data are collected in a way that does not allow us to accurately link staff to sites over time.

[101] In AY 2016, WaKIDS objective dimensions were revised based on WaKIDS data from earlier years. WaKIDS objectives from AY 2016-2020 are consistent, but scores prior to AY 2016 are not comparable. As a result, we had to use WaKIDS data for years AY 2016-2020.

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