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Examining the implementation and impact of full-day kindergarten in Oregon

Ashley Pierson and Becca Merrill **December 2021**

Many states and districts offer full-day kindergarten (FDK) to provide additional time for student learning in the hope that it will improve student outcomes. Prior research has shown an association between FDK and gains in student outcomes such as math and reading standardized assessment scores. In 2015/16, through a policy shift, Oregon changed its funding structure for kindergarten enrollment, which created incentives for districts to offer FDK. This study examines three aspects of FDK in Oregon. First, the study looked at the characteristics of Oregon districts that offered FDK in 2013/14 and 2014/15 (the two years before the policy shift) and how those FDK programs were structured. Next, the study estimated the impact of attending FDK in one large Oregon school district in 2013/14 and 2014/15 on academic and non-academic outcomes. Lastly, the study explored how FDK programs were implemented in 2017/18 (after the policy shift).

The study found that in 2013/14 and 2014/15, a majority of Oregon districts offered FDK in some capacity to all students and used district funding to support it. In one large Oregon school district, approximately 30 percent of kindergarten students in 2013/14 and 2014/15 were in FDK, and they tended to be more economically advantaged than their non-FDK peers. Compared to attending half-day kindergarten, attending FDK in this district had a small positive impact on attendance in grades 1 and 3 for the 2013/14 cohort and in grades K–3 for the 2014/15 cohort; a negative impact on English language proficiency in grade 3 in certain domains for English learners; and no impact on grade 3 test scores in math or reading, grade retention, or discipline. The results for attendance varied for different student groups, but there was no impact on test scores for different student groups.

Examining how FDK programs were implemented after the policy shift, only 22 percent of teachers responded to a survey, and those respondents reported a focus on teacher-directed activities and limited use of kindergarten entry assessment data in 2017/18. These findings cannot be generalized to all FDK teachers in Oregon and only apply to teachers who responded. In the same year, the 42 percent of principals who responded to the survey reported that a small number of FDK students only received a half day of instruction and that there was a lack of curricular and professional development alignment between preschool and kindergarten. Again, these findings cannot be generalized to all schools with FDK. The study's mixed findings indicate that FDK may slightly improve student attendance in early elementary grades for some student groups and in settings that are similar to the large district examined in this study. The study also reveals a need for more research on the barriers to offering, accessing, and implementing FDK, as well as the variation in the impact of FDK on student outcomes. Finally, the study points to a need for additional state guidance and support on how to implement high-quality FDK programs.

Why this study?

Many states and districts have increased the instructional hours students spend in kindergarten in the hope that it will boost later student outcomes. Full-day kindergarten (FDK) offers a similar number of instructional hours as other elementary grades, while half-day kindergarten (HDK) meets for approximately half of those hours. Nationally, the percentage of kindergarten students enrolled in FDK programs increased from 28 percent in 1977 to 77 percent in 2013 (Child Trends, 2015).

During the 2015/16 academic year, Oregon shifted its policy on kindergarten programs, which led to a dramatic increase in FDK enrollment. Oregon requires districts to offer HDK (Education Commission of the States, 2018a), although the state does not require kindergarten attendance (Or. Rev. Stat. 339.010, 2020).[1] Before 2015/16, the Oregon legislature allocated per-student funding for kindergarten students at half the rate for students in older grades, regardless of whether the student was attending a full- or half-day program. This funding structure disincentivized districts from offering FDK. In fall 2015, the state began paying the full student rate for kindergarten students in full-day programs (Or. Rev. Stat. 336.095, 2017), providing new incentives for districts to offer FDK. According to data provided by the Oregon Department of Education and calculated from annual surveys after this policy shift, nearly all districts chose to offer FDK. As a result, the percentage of kindergarten students enrolled in FDK jumped from an estimated 42.3 percent in 2014/15 to nearly 100 percent in 2015/16 (see figure C1 in appendix C).

Regional Educational Laboratory Northwest conducted this study in partnership with the Oregon Department of Education and one large Oregon school district. The study examined three aspects of FDK. First, the study described FDK implementation before the policy shift in 2015/16, identifying which districts implemented FDK and how programs were structured. Next, the study estimated the impact of attending FDK compared to HDK on student outcomes in kindergarten through grade 3 in one large Oregon school district before the policy shift in 2015/16. Finally, the study explored how FDK was implemented statewide after the 2015/16 policy shift. This study contributes to the literature on FDK outcomes through grade 3 with a rigorous quasi-experimental design and by examining a range of academic and non-academic outcomes associated with FDK.

The relationship between full-day kindergarten and student outcomes

Attending an FDK program is associated with positive student academic outcomes such as gains in reading and mathematics standardized assessments (Pelletier & Corter, 2019; Walston & West, 2004). The additional instructional time in FDK may be associated with increased literacy skills, including reading level, letter sound identification, and sequencing (Baskett et al., 2005). FDK may have a stronger positive relationship with academic achievement and attendance for specific student groups, such as urban students (Cooper et al., 2010), economically disadvantaged students (Zvoch et al., 2008), and English learner students (Cannon et al., 2011), compared to students not in these groups. (See appendix A for a review of FDK research.)

Attending FDK is also associated with a range of non-academic outcomes, including increases in self-regulation (Pelletier & Corter, 2019), self-confidence, the ability to work or play with others (Cooper et al., 2010), and other social and emotional learning skills (Baskett et al., 2005; Pelletier & Corter, 2019). These non-academic outcomes could translate into higher attendance (Gullo, 2000), higher test scores in math and reading (Cooper et al., 2010; Lee et al., 2006), and lower likelihood of grade retention (Gullo, 2000). Increased school attendance may also be associated with FDK due to family preferences, as FDK may be more amenable to the family schedules of households in which all adults work (Gullo, 1990).

There is conflicting evidence on several topics surrounding FDK, including FDK's impact on student discipline (Cooper et al., 2010), the longevity of the impact of FDK on student learning (Ansari & Gottfried, 2018; Cooper et al., 2010; Gullo, 2000), and a possible larger impact for English learner students than non-English learner students (Hall-Kenyon et al., 2009). One meta-analysis connected increased discipline problems in kindergarten with FDK compared to HDK (Cooper et al., 2010). Further, researchers disagree about the longevity of positive relationships between FDK and student outcomes, especially student achievement: Some research finds that effects fade out

[1] Most states require districts to offer at least HDK, although only 17 states require kindergarten attendance (Education Commission of the States, 2018a). As of 2018, only 14 states required districts to offer FDK (Education Commission of the States, 2018b), but many districts across the country choose to offer FDK regardless of state policy.

as early as grade 1 (DeCicca, 2007; Elder & Lubotsky, 2009), while other studies find effects through grade 3 (Cooper et al., 2010; Kay & Pennucci, 2014; Pelletier & Corter, 2019). Research on the effect of FDK for English learner students is also inconclusive. One study found no difference in English language proficiency between FDK and HDK students (Cannon et al., 2011), while another study found that English learner students had greater language development than native English speakers in FDK programs (Hall-Kenyon et al., 2009). The current study contributes to the knowledge base on FDK by analyzing the impact of FDK on student discipline and student learning through grade 3 as well as its impact for specific student groups, including English learner students, using more rigorous methods than many other studies. The study also contributes to the knowledge base by examining the impact of FDK in a new setting (Oregon).

Full-day kindergarten implementation compared to half-day kindergarten

Some FDK programs may use instructional time differently from HDK, while others may mirror HDK implementation. From 1998 to 2010, both FDK and HDK programs in the United States increased the amount of time spent on literacy and math content, teacher-directed instruction, and assessment, while both program types decreased time spent on art, music, science, and child-selected activities (Bassok et al., 2016). FDK programs tend to spend more time on academic content than HDK programs, with full-day teachers more likely to focus on advanced reading and math skills; they are also more likely to spend daily time on social studies and science (Walston & West, 2004).

The degree to which activities are developmentally appropriate is a concern for early elementary students. Developmentally appropriate activities, which support learning of academic content, include providing time for purposeful play and giving children meaningful choices in activities (that is, child-selected activities; National Association for the Education of Young Children, 2009). There is mixed evidence from other research that teachers in FDK programs may use their additional classroom time to incorporate more developmentally appropriate activities, including child-selected activities (Baskett et al., 2005; Elicker & Mathur, 1997). A nationally representative survey found no difference in the percentage of total class time spent on teacher-directed and child-selected activities between FDK and HDK (Walston & West, 2004). Thus, it is unclear whether FDK students spend more time in developmentally appropriate activities than HDK students.

Full-day kindergarten and the Oregon context

Oregon stakeholders wanted to understand how FDK was implemented before 2015/16, including the number of districts implementing FDK and the characteristics of districts that did and did not implement FDK, to determine how widespread FDK was before the policy shift and provide context for any influence of FDK on student outcomes. Stakeholders also wanted to understand how FDK influenced early grade student outcomes, such as attendance and grade 3 math and reading assessment scores, to determine potential impacts on later grade student outcomes and understand whether FDK may have reduced equity gaps between student groups. Based on stakeholder requests and prior literature on FDK, the study looked at implementation of FDK before the policy shift and examined attendance, standardized test scores in reading and math, discipline, and English language proficiency for English learners as outcome measures. This study focused on the 2013/14 and 2014/15 kindergarten cohorts, as these were the only two cohorts for which kindergarten entry assessment data and a comparison group of HDK students were available.

Stakeholders were also interested in FDK practices after the policy shift, including how FDK teachers used kindergarten entry assessment data. Kindergarten entry assessments provide baseline academic, developmental, and social and emotional learning data for incoming kindergarten students, who arrive with widely varying skill sets in all these domains (Bassok & Latham, 2017). This baseline assessment, which is used to inform curricular choices, is especially important because kindergarten is the only grade with no portfolio to

reference from prior years of schooling (Merrill et al., 2020). However, these data may be underused (Little et al., 2020).

Another area of interest for stakeholders was the level of alignment between curricula and professional development from prekindergarten through grade 3. Alignment is important because it creates a seamless transition of expectations from grade to grade, scaffolded appropriately for student success (Cohen-Vogel et al., 2020). Misalignments in terms of curricula and professional development have been documented in the transition from the largely private sector of preschool to the largely public sector of K–12 schooling, which have different sets of student learning standards and different governing boards (Cohen-Vogel et al., 2020). Thus, to address stakeholder needs, this study incorporated data on use of kindergarten entry assessment and the level of alignment of curricula and professional development from prekindergarten through grade 3, with a focus on the transition from prekindergarten to kindergarten and kindergarten to grades 1–3.

Box 1. Key terms

Full-day kindergarten (FDK) programs: Kindergarten programs that meet for approximately the same number of instructional hours as other elementary grades. Oregon Administrative Rule 581-022-2320 requires kindergarten programs to provide at least 900 hours of instructional time in a school year to qualify as FDK. This is the same number of hours of instructional time required for grades 1–8. This report examines only FDK programs at public schools.

Half-day kindergarten (HDK) programs: Kindergarten programs that meet for approximately half the number of instructional hours as other elementary grades. In Oregon, HDK programs are those that have fewer than 900 hours of instructional time in a school year. This report examines only HDK programs at public schools.

Outcome measures: Outcome measures used in this study are:

- Attendance in kindergarten through grade 3: Average annual attendance in each academic year.
- English proficiency in grades 1 to 3: A student's standardized score on the state English language proficiency exam (English Language Proficiency Assessment, or ELPA, in 2013/14 and the ELPA21 in 2014/15). In 2013/14, students received an overall proficiency score. In 2014/15, the assessment was updated (ELPA21) to give students proficiency scores in four domains (reading, listening, speaking, and writing) and an overall proficiency measure on a three-level scale. Scores have been standardized within each year by grade.
- Grade 3 math and reading assessment scores: A student's standardized score on grade 3 state assessments in math and reading. This is the first grade level at which students' state reading and math assessment scores are available. In 2013/14, the state used the Oregon Assessment of Knowledge and Skills, and in 2014/15 the state used the Smarter Balanced Assessment. Scores have been standardized within each year by grade.
- Retention by grade 3: A binary measure of whether a student was ever retained in kindergarten or grades 1 to 3.
- Discipline by grade 3: A binary measure of whether a student ever received in-school suspension, out-of-school suspension, or was expelled in kindergarten or grades 1 to 3.

The study may help Oregon stakeholders develop guidance for kindergarten implementation, such as incorporating developmentally appropriate practices like purposeful play, and understanding differences in outcomes among students in FDK programs compared to HDK programs in one large school district. States that have implemented FDK can gain information about how some districts and teachers in another state have chosen to implement FDK. This study may also be of interest to states seeking to provide guidance for such programs, to establish state policy on FDK, or to incentivize FDK among districts. In particular, states that are considering expanding FDK can use the findings on districts offering FDK prior to the 2015/16 policy shift to inform policy and funding mechanisms in their state. Finally, the study's rigorous quasi-experimental design and range of outcomes help address calls for more rigorous methods and a wider range of outcomes in the study of FDK (Cooper et al., 2010), while also contributing evidence to a mixed body of literature. The findings can provide states, districts, and schools with information on the potential benefits and limitations of FDK.

Research questions

This study addressed the following research questions:

1. What percentage of districts implemented FDK in the two years before the 2015/16 policy shift, and what were the characteristics of the districts that offered FDK in those years compared to districts that only offered HDK?
2. In one large Oregon school district, which students attended FDK in 2013/14 and 2014/15, and how did attending FDK (compared to attending HDK) in 2013/14 and 2014/15 affect the following student outcomes: attendance in grades K–3, English proficiency in grades 1–3, math and reading assessment scores in grade 3, retention by grade 3, or discipline by grade 3?
    a. Do impacts vary by particular student and school characteristics (race/ethnicity, English learner status, economic disadvantage status, student age, and percentage of economically disadvantaged students at the school)?
3. What classroom and school practices did staff members report in FDK programs in Oregon in the 2017/18 school year?

The data sources, sample, and analytic methods used for this study are in box 2. Additional information about the study data sources, sample, and methods is in appendix B.

Box 2. Data sources, sample, and methods

Data sources. This study used four main sources of data.

- Full-day kindergarten (FDK) district survey: An Oregon Department of Education survey of school districts on FDK implementation from the 2013/14 and 2014/15 school years (used to answer research questions 1 and 2). This survey included data on whether the district offered FDK or half-day kindergarten (HDK), how students were selected for FDK, and how the district funded FDK.
- Oregon Department of Education administrative data on preK–5 students enrolled in Oregon schools from 2013/14 to 2018/19, including student characteristics and outcomes such as grade 3 assessment scores (used to answer research questions 1 and 2).
- School district administrative data from one large Oregon school district detailing which students attended FDK or HDK in 2013/14 and 2014/15 (used to answer research question 2).
- FDK practices survey: An Oregon Department of Education survey of FDK kindergarten teachers, principals, and other relevant staff members (such as preK–3 coordinators) from the 2017/18 school year (used to answer research question 3). This survey collected information on FDK practices—such as the amount of time teachers spent on different subjects and activities in the classroom—and was only administered in 2017/18.

Sample. Of the approximately 190 districts in Oregon that had kindergarten students in schools in 2013/14 and 2014/15, 180 responded to the Oregon Department of Education FDK district survey in 2013/14 and 178 responded in 2014/15 (95 and 94 percent response rate, respectively). The responding districts served more than 97 percent of kindergarten students in the state in each year.

For the FDK practices survey in 2017/18, the sample included all Oregon kindergarten teachers, principals, and other relevant staff members (such as preK–3 coordinators) who responded to the survey from April to May 2018 (1,043 responses), most of whom were FDK teachers. Of Oregon's 199 districts with kindergarten programs in 2017/18, 174 districts had at least one staff member response. The response rate at the teacher level was approximately 22 percent of all kindergarten teachers (572 of approximately 2,560 total kindergarten teachers) and 42 percent of principals at schools with kindergarten students (326 of approximately 780 principals). At the other staff level, 145 staff members responded, and no data are available on the total number of other relevant staff members in Oregon to calculate a response rate.

For Oregon Department of Education administrative data used to answer research questions 1 and 2, the sample included all Oregon public school preK–5 students in 2013/14 and 2014/15 (535,497 students total). Twenty-five variables had missing data, ranging from 0.05 to 7.51 percent missing.

For the data used to answer research question 2, the sample included all students in one large school district in Oregon who attended kindergarten in 2013/14 or 2014/15, had information on FDK or HDK status, and remained in the district in the year each outcome was measured. This district was selected because it offered both HDK and FDK before the policy shift in 2015/16. In 2014/15, the district enrolled over 15,000 students—more than 50 percent of whom were economically disadvantaged—and included mostly urban or suburban schools. The study team chose the 2013/14 and 2014/15 cohorts for three reasons. First, the analysis design required a comparison group of students in HDK and thus had to focus on years before the 2015/16 statewide implementation of FDK. Second, the analysis used data from Oregon's kindergarten entry assessment as a measure of students' skills and abilities at kindergarten entry, which served as a baseline covariate. This assessment began in 2013/14. Third, these two years correspond to available survey data from the Oregon Department of Education describing district FDK implementation. Sample sizes vary by outcome and represent the number of students with available data who remain after matching FDK students to similar students who attended HDK for each outcome. In an effort to compare similar populations of students, the matching process excluded students in the HDK group (the comparison group) whose characteristics did not look similar to those in the FDK group. Using this matched sample allowed the study team to compare similar groups of students and obtain a more rigorous estimate of the relationship between FDK and outcomes. For the 2013/14 kindergarten cohort, sample sizes range from 2,535 for kindergarten attendance to 314 for grade 3 English language proficiency. For the 2014/15 kindergarten cohort, sample sizes range from 2,599 for kindergarten attendance to 265 for grade 3 English language proficiency reading and writing domains.

Within these matched samples, the study team analyzed results overall and for specific groups: Latinx (up to 677 students in 2013/14 and 532 in 2014/15); American Indian and Alaska Native, Black, multiracial, and Native Hawaiian and other Pacific Islander (289 students in 2013/14 and 198 in 2014/15); English learner students classified in kindergarten (634 in 2013/14 and 537 in 2014/15); and economically disadvantaged students (1,035 in 2013/14 and 729 in 2014/15). In addition, the study team explored whether FDK impact varied by student age and the percentage of economically disadvantaged students at the school. No data elements were missing for more than 7.5 percent of students with outcome data.

Methodology. To answer the first research question, the study team analyzed FDK district survey data that the Oregon Department of Education collected in 2013/14 and 2014/15 to understand the landscape of FDK across the state before the policy change. The survey analysis consisted of descriptive statistics. The study team compared FDK and HDK district characteristics using the FDK district survey data and the Oregon Department of Education administrative data.

To answer the second research question, the study team used a rigorous quasi-experimental design to estimate impacts. The study team first linked the Oregon Department of Education administrative data to school district data on FDK attendance. Then, the study team matched students who attended FDK with similar students who attended HDK within each of the two kindergarten cohort years (2013/14 and 2014/15) on a set of observable characteristics including similar kindergarten entry assessment scores (including measures of student academic and behavioral status; see appendix B for the list of variables). The study team then estimated the relationship between FDK and student outcomes. These regression analyses also included student demographic characteristics, kindergarten entry assessment scores, and school-level characteristics. As part of the second research question, the study team conducted analyses of student groups, looking at age at kindergarten entry; Latinx students; American Indian and Alaska Native, Black, multiracial, and Native Hawaiian and other Pacific Islander students; economically disadvantaged students; English learner students; and the percentage of economically disadvantaged students at the school. In addition to the quasi-experimental findings, the study team used the FDK district survey data in tandem with the Oregon Department of Education administrative data and school district data to describe which students attended FDK in 2013/14 and 2014/15.

To answer the third research question, the study team analyzed FDK practices survey data collected by the Oregon Department of Education and then calculated descriptive statistics for survey items, such as frequencies and means.

After reviewing the descriptive statistics, the study team considered percentage point differences of 5 or more as large, differences between 2 and 5 percentage points as moderate, and differences of less than 2 percentage points as small. Only moderate or large differences are highlighted in the report (with the exception of statistically significant results from the second research question), and all results are shown in the appendices.

Limitations. The FDK practices survey in 2017/18 is not representative of all teachers or principals in Oregon due to a low response rate, and data are not available to analyze differences between the characteristics of respondents and all educators in the state. The survey is used to help illustrate examples of FDK practices and classroom time allotments. Results from the impact study of kindergarten students in one large Oregon district from 2013/14 and 2014/15 are not generalizable to students who change districts because the sample is restricted to students who were in the district in the year the outcome was measured. Additionally, results are not generalizable to other districts, and details about FDK implementation during this time period were not available from the district. To compare FDK and HDK students, the analysis focuses on 2013/14 and 2014/15 data because the kindergarten entry assessment was available for those two years and because nearly all students began attending FDK by 2015/16, which makes it challenging to compare FDK and HDK students. Impact findings may reflect differences between FDK and HDK students that are not measured in available data, such as whether they have a stay-at-home parent or their parents' education levels. Lastly, the study team was unable to examine the likelihood of grade retention or discipline in each grade and was unable to examine group findings for the likelihood of grade retention or discipline or for English language proficiency due to small numbers of students.

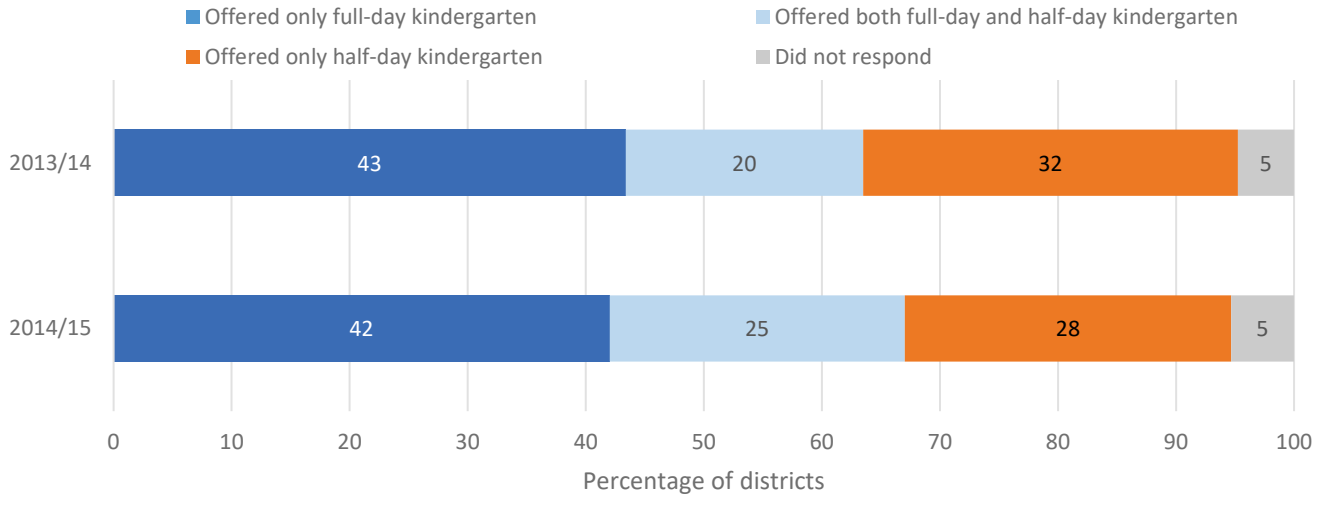
Findings

This study has five main findings, as well as several subfindings.

Before a policy shift in 2015/16 that resulted in nearly all kindergarten students enrolling in full-day kindergarten, approximately two-thirds of Oregon districts already offered full-day kindergarten, and many districts used district funding to support it in 2013/14 and 2014/15

Oregon requires that districts offer HDK and considers offering FDK a fulfillment of that requirement; thus, during the study period, all districts offered HDK only, FDK only, or both. In 2013/14, 63 percent of all Oregon districts with kindergarten students reported offering FDK: on the FDK district survey, 43 percent of districts reported offering only FDK, and 20 percent of districts reported offering both FDK and HDK. In 2014/15, 67 percent reported offering FDK: 42 percent only offered FDK, and 25 percent offered both FDK and HDK (figure 1). Thirty-two percent of responding districts only offered HDK in 2013/14; by 2014/15, the number of districts offering only HDK decreased to 28 percent (see figure 1). Nearly all districts offered FDK following the policy shift in 2015/16 and associated increase in funding for FDK, resulting in nearly 100 percent of Oregon students enrolled in FDK after the policy shift (see figure C1 in appendix C).

Figure 1. A majority of districts offered full-day kindergarten, 2013/14 and 2014/15



Note: Total number of districts is 189 in 2013/14 and 188 in 2014/15.
Source: Authors' analysis of Oregon Department of Education 2013/14 and 2014/15 full-day kindergarten district surveys.

Districts that offered FDK districtwide made it available to all students, although some required parent tuition for part of the day. Districts that did not offer FDK districtwide typically reported selecting students for participation in FDK based on district-defined risk factors; through lotteries;[2] or, less commonly, on a first-come, first-served basis. Districts that did not offer FDK districtwide offered HDK to students who were not selected for FDK.

Most districts that offered FDK before the policy shift—including those that offered only FDK and those that offered both FDK and HDK—used district funds to do so, and many districts combined multiple funding sources. About 80 percent of districts that reported offering FDK in both 2013/14 and 2014/15 funded the program at least partially using district funding. Slightly less than one-third of districts used Title I funds (see table C1 in appendix C). A few districts reported funding FDK through parent tuition (10 to 13 percent), charter funding (2 to 3 percent), or other funding sources (5 percent). In those districts that funded FDK partially through parent tuition, parents who wanted their child to access FDK were required to pay tuition for the additional half day that their child spent in the public school program.

A typical full-day kindergarten schedule in Oregon was a full school day of 6.6 hours for four or five days per week

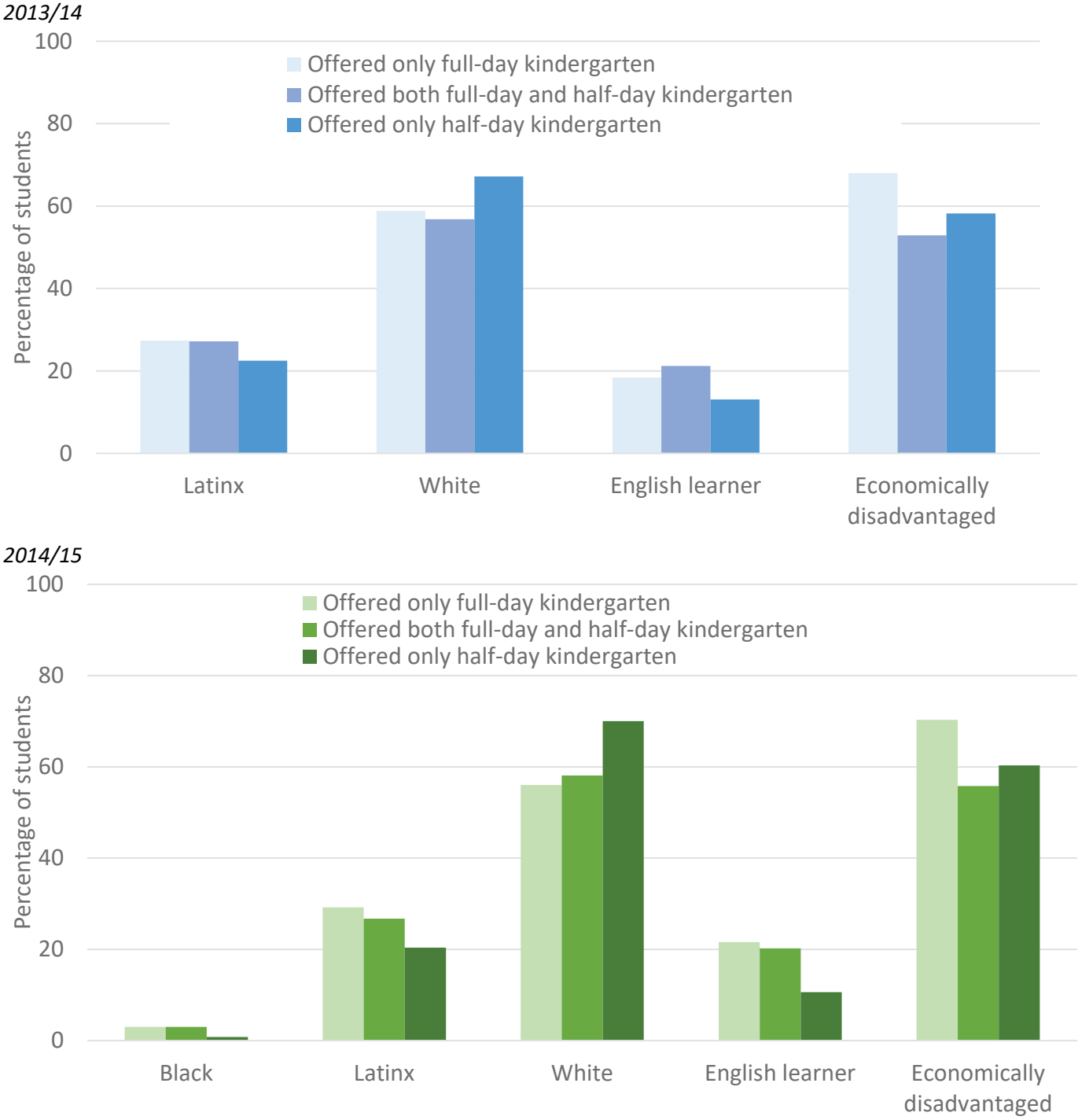
Among districts offering FDK in 2014/15,[3] the average number of hours in the FDK schedule per day was 6.6 (see table C2 in appendix C). Nearly all districts (91 percent) offered 6 to 7.5 hours of FDK each day. On average, districts offered FDK for 4.6 days per week, with 98 percent of districts reporting four or five days per week of FDK (see table C2 in appendix C).[4] Overall, the typical FDK schedule varied little across the state.

Districts that offered full-day kindergarten in 2013/14 and 2014/15 served a more diverse and economically disadvantaged population, and districts that offered both full- and half-day kindergarten had fewer rural schools than districts that offered a single option (only full-day kindergarten or only half-day kindergarten)

In 2013/14 and 2014/15, districts that offered only FDK served a more diverse and more economically disadvantaged student population than districts that only offered HDK. Districts that offered only FDK and districts that offered both FDK and HDK had higher percentages of Latinx, and English learner students in both years, higher percentages of Black students in 2014/15, and lower percentages of White students than districts that only offered HDK in both years. Districts that offered only FDK had higher percentages of ecnonomically disadvantaged students in both years than districts that only offered HDK (figure 2; see table C3 in appendix C).

[2] On the FDK district survey, districts could mark whether students were selected by risk factors, a lottery, not applicable, or other. Risk factors were not defined on the survey (see appendix B, FDK district survey protocol, question 8).
[3] The Oregon Department of Education did not include the question on which this information is based in the 2013/14 survey. Thus, the study can only report results from the 2014/15 survey for this question.
[4] In Oregon, as of 2013, 64 districts used a four-day schedule for all grades (Heyward, 2018).

Figure 2. Full-day kindergarten districts had higher percentages of Latinx, Black, economically disadvantaged, and English learner students than districts that only offered half-day kindergarten, 2013/14 and 2014/15



Note: See table C3 in appendix C for full results. Differences between groups for Black students in 2013/14 were below 2 percentage points, so they are not displayed here.
Source: Authors' analysis of Oregon Department of Education 2014/15 full-day kindergarten district surveys.

Overall, districts that offered either only FDK or only HDK had higher proportions of rural schools than districts that offered both FDK and HDK, indicating that nonrural districts were more likely to offer both options. In 2013/14, 69 percent of schools in FDK-only districts were rural, while 39 percent of schools in HDK-only districts were rural (see table C3 in appendix C). In the same academic year, 11 percent of schools in districts that offered both FDK and HDK were rural. More rural districts began offering both FDK and HDK in 2014/15: the percentage

of rural schools in these districts increased to 20 percent, while the percentage of rural schools was 57 percent in FDK-only districts and 34 percent in HDK-only districts.

In one large Oregon school district, about 30 percent of kindergarten students attended full-day kindergarten in 2013/14 and 2014/15, and these students tended to be more economically advantaged than their half-day kindergarten peers

To compare FDK and HDK students, the analysis focused on the two years before the statewide policy shift in 2015/16 (2013/14 and 2014/15). After the policy shift, nearly 100 percent of students in the state began attending FDK, making it challenging to compare FDK and HDK students. In this section, results are drawn from the FDK district survey and Oregon Department of Education administrative data for one large Oregon school district.

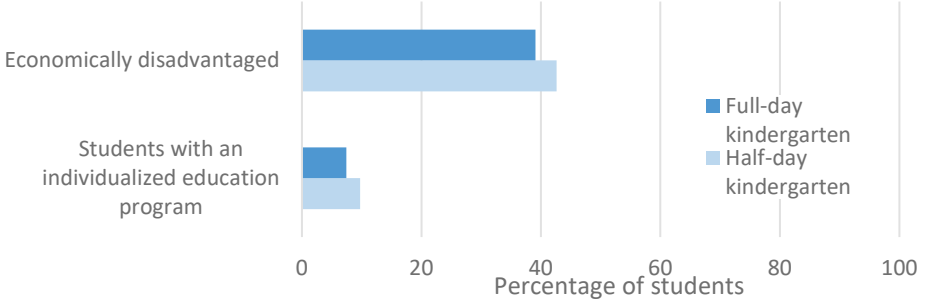
The district offered district-funded and tuition-based full-day kindergarten in a majority of schools and served about 30 percent of kindergarten students, who were selected based on a lottery or risk factors

In one large Oregon school district, district-funded and partially tuition-funded FDK was offered in a majority of schools for 6.5 hours per day for five days a week (see table C2 in appendix C). About 30 percent of kindergarten students were enrolled in FDK in 2013/14 and 2014/15, with the other 70 percent of students attending HDK. In 2013/14 and 2014/15, approximately 70 percent of schools serving kindergarten students offered FDK in at least one classroom. The remaining 30 percent of schools did not offer or implement FDK; these schools offered only HDK. The district's FDK program was funded through a combination of district funds and tuition in both years. Schools used either a lottery or student risk factors to enroll students into FDK. In the Oregon Department of Education FDK district survey, the district reported using a lottery to select students for FDK participation in both 2013/14 and 2014/15. In 2014/15, the district also reported using student risk factors. However, no further information about the lottery or specific risk factors was available from the district.

District full-day kindergarten programs in 2013/14 and 2014/15 enrolled fewer economically disadvantaged students and students with an individualized education program than half-day kindergarten programs

FDK programs in this district enrolled lower percentages of economically disadvantaged students and students with an individualized education program (IEP) compared to HDK programs before the policy shift (figure 3; see table C4 in appendix C). For students with an IEP, there was a moderate difference of 2 percentage points in both study years (FDK: 7 percent in 2013/14 and 8 percent in 2014/15; HDK: 9 percent in 2013/14 and 10 percent in 2014/15). In 2013/14, HDK programs served larger percentages of economically disadvantaged students than FDK programs (44 percent compared to 38 percent). In 2014/15, the district reported in the FDK district survey that it began using risk factors when enrolling children into FDK.

Figure 3. A smaller percentage of full-day kindergarten students were economically disadvantaged or had an individualized education program compared to half-day kindergarten students in 2013/14 and 2014/15 in one large Oregon school district



Note: Only differences of 2 percentage points or more are shown; percentages represent the average annual percentage across 2013/14 and 2014/15.
Source: Authors' analysis of data from the Oregon Department of Education and one large Oregon school district.

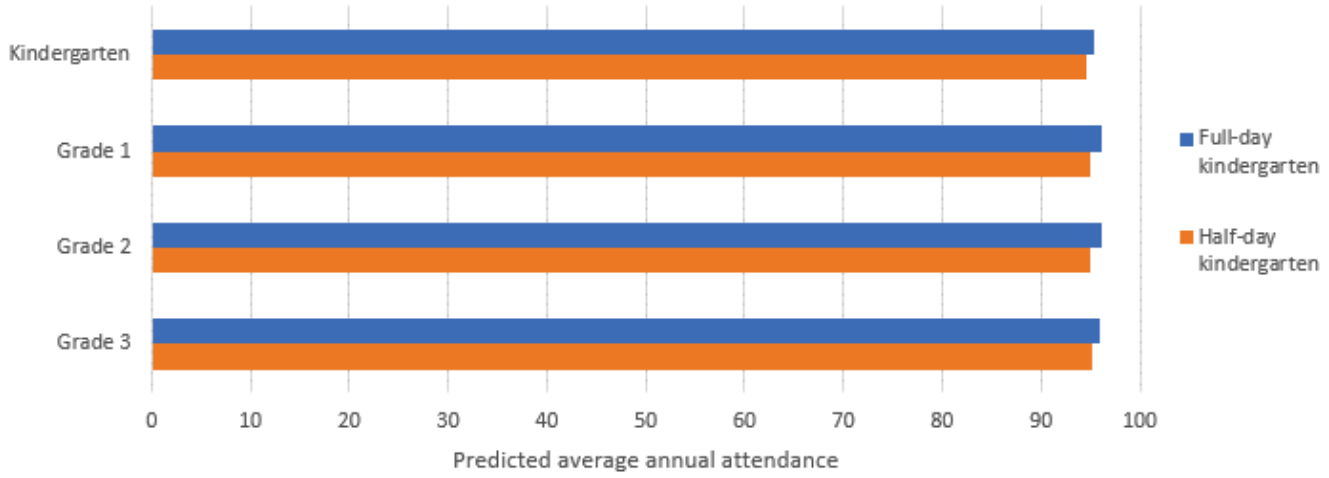
Attending full-day kindergarten in one large Oregon school district had a small positive impact on attendance and a negative impact on English language proficiency for English learner students. Attending full-day kindergarten had no impact on grade 3 test scores in math or reading, grade retention, or discipline for the 2013/14 and 2014/15 cohorts.

REL Northwest used data from the 2013/14 and 2014/15 kindergarten cohorts in one large Oregon school district to conduct a quasi-experimental analysis that contrasted FDK students' outcomes with those of similar HDK students. Although the approach sought to minimize observable differences between FDK students and the HDK students, study findings could still reflect differences between FDK and HDK students that could not be measured with available data (e.g., having a stay-at-home parent).

Attending full-day kindergarten had a small positive impact on attendance in grades 1 and 3 among the 2013/14 kindergarten cohort and on attendance in all K–3 grades among the 2014/15 kindergarten cohort in one large Oregon school district

Among a group of students in one large Oregon school district who were similar across demographic characteristics and kindergarten entry assessment scores, attending FDK had a positive impact on attendance in grades 1 and 3 for the 2013/14 cohort (see table C5 in appendix C). However, for the same cohort, attending FDK had a negative impact on kindergarten attendance and no impact on grade 2 attendance compared to attending HDK, indicating mostly positive but mixed results for this cohort. For the 2014/15 cohort, the impact of attending FDK was positive for attendance in all four grades tested (K–3), although the size of the impact was small (an increase of less than 1 percentage point higher attendance for FDK students compared to HDK students; figure 4; see table C5 in appendix C).

Figure 4. Attending full-day kindergarten in 2014/15 had small positive impacts on attendance in kindergarten and grades 1–3 compared to attending half-day kindergarten in one large Oregon school district



Note: Data represent the predicted outcomes from the analysis shown in table C5 in appendix C. In each of the grades shown here, full-day kindergarten is statistically significantly related to higher attendance.
Source: Authors' analysis of data from the Oregon Department of Education and one large Oregon school district.

Attending full-day kindergarten in one large Oregon school district had a negative impact on grade 3 English language proficiency scores in listening for English learner students in the 2013/14 cohort and speaking for these students in the 2014/15 cohort

Attending FDK had a negative impact on the English language proficiency domains of listening in grade 3 for the 2013/14 cohort and a negative impact on the speaking domain in grade 3 for English learner students in the 2014/15 cohort (see table C6 in appendix C).[5] Attending FDK did not have an impact on other domains of reading and writing.

Attending full-day kindergarten in 2013/14 and 2014/15 had no impact on grade 3 test scores in math or reading in one large Oregon school district

For both cohorts examined in this study, attending FDK in comparison to HDK did not have a statistically significant relationship with grade 3 math or reading test scores (see table C7 in appendix C). Test scores in math or reading were not available from earlier grades.

Attending full-day kindergarten did not result in a discernable difference in students' likelihood of grade retention by grade 3 or of being disciplined by grade 3 compared to half-day kindergarten students in one large Oregon school district

Students attending FDK were no more or less likely to be retained (held back a grade) or disciplined before or during grade 3 than their peers in HDK (see table C8 in appendix C). The study team did not examine likelihood of grade retention or discipline in each grade due to small numbers of students retained or disciplined in each year.

In one large Oregon school district, attending full-day kindergarten in 2013/14 and 2014/15 had mixed impacts on attendance and no impact on test scores for different student and school characteristics

To determine whether attending FDK had an impact among key student groups, the study team examined the impact of FDK on K–3 attendance and grade 3 test scores by race/ethnicity, economic disadvantage, and English learner status in one large Oregon school district. In addition, the study team examined whether FDK had a different impact on students in the district who enrolled in kindergarten at an older age and on students in schools with a higher percentage of students who were economically disadvantaged.[6] The study team did not examine group findings for other outcomes that were only available for small numbers of students.

For historically disadvantaged student groups, attending full-day kindergarten generally had a negative impact on attendance in kindergarten for the 2013/14 cohort and positive impacts on attendance in certain grades for the 2014/15 cohort in one large Oregon school district

The impact of attending FDK on early grade attendance for specific student groups showed a pattern of negative results in kindergarten for the 2013/14 cohort and positive results in certain grades for the 2014/15 cohort (see table 1 and table C9 in appendix C). For Latinx students, attending FDK had a negative impact on kindergarten attendance for the 2013/14 cohort and a positive impact on grade 1 and grade 2 attendance for the 2014/15 cohort compared to attending HDK (see table 1 and table C9 in appendix C, panel A). For students who identified

[5] The English language proficiency assessment changed format across the two years in this analysis; an overall score was available in 2013/14, and four domain scores and a three-level proficiency measure were available in 2014/15. The study team standardized scores within year by grade.

[6] The age analysis is motivated by research that examines the impact of age at kindergarten entry on early grade outcomes, given that older children have had more time to progress developmentally (Bassok & Reardon, 2013; Cascio & Schanzenbach, 2016; Cryan et al., 1992; Datar, 2006; Elder & Lubotsky, 2009; Huang & Invernizzi, 2012; Lincove & Painter, 2006; Stipek & Byler, 2001).

as American Indian or Alaska Native, Black, multiracial, or Native Hawaiian or other Pacific Islander, attending FDK had no impact on attendance in any grade for either cohort (see table 1 and table C9 in appendix C, panel B). For economically disadvantaged students, attending FDK had a negative impact on kindergarten attendance for the 2013/14 cohort and a positive impact on kindergarten, grade 1, and grade 2 attendance for the 2014/15 cohort (see table 1 and table C9 in appendix C, panel C). Among English learner students, attending FDK had a negative impact on kindergarten attendance for the 2013/14 cohort and a positive impact on grade 1 attendance for the 2014/15 cohort (see table 1 and table C9 in appendix C, panel D).

Table 1. Impacts of attending full-day kindergarten on attendance in kindergarten through grade 3 for specific student groups in one large Oregon school district, 2013/14 and 2014/15

	2013/14 cohort				2014/15 cohort			
	Kinder-garten	Grade 1	Grade 2	Grade 3	Kinder-garten	Grade 1	Grade 2	Grade 3
Latinx	-					+	+	
American Indian or Alaska Native, Black, multiracial, or Native Hawaiian or other Pacific Islander								
Economically disadvantaged	-				+	+	+	
English learner	-					+		

Note: Statistically significant estimates are designated with a plus sign for positive impacts or minus sign for negative impacts.
Source: Authors' analysis of data from the Oregon Department of Education and one large Oregon school district. See table C9 in appendix C for full results.

Student age was positively related to the impact of FDK on kindergarten attendance, indicating older students in FDK experienced more of a positive impact on kindergarten attendance than younger students (see table C9 in appendix C, panel E). The percentage of economically disadvantaged students at a school was not associated with an impact of FDK on attendance for either cohort in any tested grade (see table C9 in appendix C, panel F).

Attending full-day kindergarten had no impact on grade 3 test scores in math or reading for students of color, English learner students, or students who were economically disadvantaged in one large Oregon school district

For student demographic groups (race/ethnicity, English learner students, and students who were economically disadvantaged), attending FDK had no impact on grade 3 math or reading test scores for either cohort (see table C10 in appendix C, panels A, B, C, and D). Additionally, student age and the percentage of economically disadvantaged students at a school were not related to the impacts of attending FDK on early grade attendance, except for a small, positive effect on kindergarten attendance for the 2014/2015 cohort (see table C9 in appendix C, panels E and F).

In 2017/18, the 22 percent of full-day kindergarten teachers who responded to the survey reported a focus on teacher-directed activities and limited use of kindergarten entry assessment data. The 42 percent of principals who responded to the survey reported a small number of full-day kindergarten students only received a half day of instruction and a lack of curricular and professional development alignment between preschool and kindergarten. These responses are not representative of all full-day kindergarten teachers and principals in Oregon with full-day kindergarten programs.

On the 2017/18 Oregon Department of Education FDK practices survey, the teachers and principals who responded reported full-day kindergarten practices used in schools after the policy shift. The survey was not representative of all teachers and principals in Oregon; it only represents those who responded (see page B-4 in appendix B). Therefore, the data only provide examples of FDK practices and classroom time allotments.

Responding teachers reported that their full-day kindergarten classrooms in Oregon were focused on reading and math, and most teachers in the sample spent less than one hour in a typical day on child-selected activities

FDK teachers responding to the survey most commonly focused on reading, English language arts, and math, with most of them reporting spending time on reading for five days per week (see appendix D for more detailed information from the FDK practices survey). Teachers reported integrating social studies, science, and music into the curriculum only two days per week and art and physical education only one day per week. More than 95 percent of teachers also reported having physical classroom spaces dedicated to reading and math (see figure D1 in appendix D), and the two most common classroom activities were literacy blocks and math blocks (see figure D2 in appendix D). Most teachers (76 percent) reported spending two hours or more on teacher-directed whole-class activities, 50 percent reported spending two hours or more on teacher-directed small-group activities, and 90 percent reported spending less than one hour on child-selected activities (see figure D3 in appendix D).

Many of the teacher survey respondents reported they did not use kindergarten entry assessment data

About 429 teachers (about 17 percent of all teachers in the state and 75 percent of teachers who responded to this survey) responded to this item, and the majority of respondents (56 percent) said they did not use kindergarten entry assessment data. Of those who reported not using the data, 29 percent reported that they do not receive the results, 17 percent reported using another assessment instead, and 9 percent reported that the results arrive too late to be useful. More than 100 teachers who said they do not use the results reported that they would like Oregon Kindergarten Assessment results returned to them more quickly and in a more user-friendly format, such as whole-class snapshots, individual student results, and comparisons to district and state averages. Of the 187 teachers (44 percent) who reported using the results of the Oregon Kindergarten Assessment in their classroom, 49 percent said that they use results for baseline data on students' skills, 37 percent reported using results for placement in classrooms and learning groups, and 17 percent reported using the results to guide instruction and lesson planning. Given that these findings are based on a small share of Oregon's kindergarten teachers, readers should use caution in interpreting the results.

Responding principals reported that professional development and curricula were typically aligned between kindergarten and grades 1 to 3, but were not commonly aligned between preschool and kindergarten

More than three-quarters of responding principals reported that both professional development and curriculum were aligned between kindergarten and grades 1 through 3. However, among responding principals at schools that offered preschool, less than a third reported alignment of professional development and curricula between preschool and kindergarten. Nearly all responding principals (95 percent) reported joint professional development for teachers of kindergarten and grades 1 through 3. Only about one-third of responding principals (36 percent) whose schools offered preschool reported that the school has joint professional development for kindergarten and preschool teachers. Over three-quarters of responding principals reported that the reading and math curricula in kindergarten aligned completely with the grade 1 through 3 curricula, while about one-quarter (24 percent) of principals whose schools offer preschool said that the preschool curriculum was completely aligned with the kindergarten curriculum.

Principal survey respondents reported that a small number of children were still on half-day schedules

According to responding principals, some children were on half-day schedules while attending FDK programs in 2017/18, although the Oregon Department of Education discouraged this practice because it potentially exacerbates inequities by not providing all children with access to FDK. Twenty-two percent of the 326 responding principals and 145 respondents who were in other roles (including superintendents, reading specialists, and assistant principals) reported that some children were in an FDK program but only attended half of the day.

The most common reasons survey respondents reported for students' continued participation in HDK were behavioral issues, the child not being developmentally ready for a full day, and the child having an IEP. Most of the respondents who reported that some children were on a half-day schedule in FDK said there were plans to reintroduce those children to a full-day schedule during the kindergarten year. Regardless of number, the potential exclusion of students with IEPs is of concern if this student group is not being afforded the same educational opportunities as their peers.

Implications and Limitations

This study has four implications for research and practice and some limitations.

Further research can help explain variation in the impact of full-day kindergarten attendance

The mixed results in this study suggest a need to better understand why FDK may have a different impact in some settings, though this study's findings on student outcomes are based on results from one large Oregon school district and may not generalize to other settings. In addition, results may reflect other differences across students who did and did not attend FDK that are not observed in the data (such as having a stay-at-home parent).

Future research on FDK should focus on implementation differences in FDK across classrooms, schools, and districts, specifically the level of differentiation for higher-performing students and time spent on developmentally appropriate practices and academic instruction. The research literature suggests that kindergarten teachers may focus their attention on struggling students until students hit academic benchmarks and have "caught up" (Davies & Cress, 2010). This focus means that teachers may not challenge students who perform above academic benchmarks. Lack of differentiation for higher-performing students may explain the fade-out of FDK effects on academic outcomes by or before grade 3, which may be one factor underlying this study's finding that FDK had no impact on grade 3 achievement scores compared to HDK. Another potential reason lies in the types of instruction in FDK compared to HDK, including time spent in developmentally appropriate activities and academic instruction. Differences between FDK and HDK in practice may be smaller than expected (Davies & Cress, 2010), implying that implementation matters and can vary between FDK programs.

Additional research in a variety of state and district contexts and among student groups is needed to explore the variation in impact of FDK on outcomes in this study, as well as reasons for the fade-out effect found in prior research. Researchers should estimate FDK's impact on a variety of early elementary outcomes and conduct group analyses to determine for which groups of students FDK is beneficial or detrimental, as well as explore differences in school quality and FDK implementation across groups. For example, examining the impact of FDK on grade 1 and grade 2 math and reading tests is key to understanding whether FDK is related to initial gains that fade over time. Finally, more research is needed to understand this study's findings on the possible negative effects of FDK on English learner students' speaking and listening skills compared to HDK students.

Examining why some students enrolled in full-day kindergarten are on half-day schedules could identify barriers to full-day participation

There is a need to understand which kindergarten students access FDK compared to those who access HDK or are put on a half-day schedule. In Oregon, state data flagging these different settings would help researchers better understand which students are accessing FDK. On the 2017/18 Oregon Department of Education FDK practices survey, 22 percent of the responding principals and other district staff respondents reported that children in FDK programs are still placed on a half-day schedule. These survey responses pointed to the possibility that children placed on half-day schedules are more likely to have an IEP. Although this affects a small number of students,

more research is needed to understand which student groups are more likely to be on this shortened schedule, why they are placed on a shortened schedule, whether they successfully transition to FDK during the school year, and what supports might be needed to facilitate a successful transition to FDK.

Districts and schools may benefit from state guidance on developmentally appropriate and evidence-based kindergarten practices, which might contribute to higher-quality full-day kindergarten

To support student learning outcomes, the Oregon Department of Education could consider developing materials and supports for districts on FDK implementation and evidence-based practices in kindergarten, as well as alignment between preschool and kindergarten. This study found FDK had no impact compared to HDK on student achievement overall. This finding is inconsistent with other research on FDK. Several previous studies of FDK have shown a positive association with student achievement scores (Cooper et al., 2010; DeCicca, 2007; Gibbs, 2014; Gullo, 2000; Lee et al., 2006; Peletier & Corter, 2019).

Changes to FDK implementation may improve student outcomes. Information gathered from some teachers and principals on the 2017/18 Oregon Department of Education FDK practices survey showed that some FDK classrooms focus on teacher-directed academic content and engage less frequently in child-selected activities, though results should be interpreted with caution due to low survey response rates. Some research suggests that early childhood and kindergarten classrooms with high proportions of child-selected activities are associated with greater student receptive vocabulary and cognitive flexibility (Ansari & Purtell, 2017; Lippard et al., 2019). This highlights a possible need for the state education agency to provide guidance and professional development that helps teachers provide developmentally appropriate and academically rigorous kindergarten activities, including incorporating purposeful play and child-selected activities into the kindergarten day. This type of guidance and support to help districts and schools implement more developmentally appropriate and evidence-based practices in kindergarten could lead to improved student learning outcomes. For those districts that offer preschool, providing guidance and support on best practices in aligning preschool and kindergarten curricula and teacher professional development could also be useful. Survey responses indicated low alignment in these areas in many responding schools.

All districts could benefit from increased support from the state on how to use kindergarten entry assessment data to guide instruction, another evidence-based practice. For example, data reports could be made available to teachers early in the school year and could facilitate use of these data to differentiate instruction. Using kindergarten entry assessment data to differentiate instruction is a best practice that may be underemployed in Oregon; many teachers who responded to the 2017/18 FDK practices survey said that they did not use these data.

States seeking to expand FDK could consider funding incentives and more research to identify other ways to facilitate FDK expansion

States that are considering expanding FDK may want to provide funding incentives for districts to offer FDK and to collect data from school districts on why they have or have not chosen to offer FDK. This study found that about 30 percent of Oregon districts did not offer FDK before the 2015/16 policy shift, yet the available data did not include information about districts' decisionmaking. Districts used a variety of sources to fund FDK before Oregon's 2015/16 policy shift that fully funded FDK, including direct funding from the district. This study found that about 80 percent of districts funded FDK at least partially with district funding in 2013/14 and 2014/15. When Oregon transitioned to fully funding FDK in 2015/16, Oregon's statewide kindergarten enrollment increased by 57.4 percent (see figure C1 in appendix C), indicating that funding may have been a key barrier to offering FDK for many districts. This implies that states wanting to encourage FDK for all students should provide adequate district funding. Additionally, gathering information from districts that do not offer FDK could help identify other facilitators to expanding FDK, such as schedule alignment and transportation cost reductions, and additional

barriers, such as lack of space, at the district level. States looking to expand FDK could use this information to help craft an appropriate FDK policy and offer supports and incentives to overcome barriers for districts in addition to providing statewide funding for FDK.

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Examining the implementation and impact of full-day kindergarten in Oregon

See https://ies.ed.gov/ncee/edlabs/projects/project.asp?projectID=4634 for the full report.

Appendix A. About the study

This appendix includes a review of the research literature on full-day kindergarten (FDK) program practices and the influence of attending FDK on student outcomes. The research base on the effects of FDK is still limited, as described below, but suggests the value of this study, which contributes to the knowledge base and can inform public policy in Oregon and other states. Only well-designed quasi-experimental studies and randomized controlled trials are cited in the section discussing the effect of FDK on student outcomes.

Practices in full-day kindergarten programs

Teachers in FDK programs have more instructional time than teachers in half-day kindergarten (HDK) programs to devote to academic content areas. For example, Walston and West (2004) found that full-day programs were significantly more likely than half-day programs to spend more than an hour per day on reading instruction. They also found that full-day programs were more likely than half-day programs to spend daily instructional time on math, social studies, and science.

Teachers in full-day programs may also use their additional classroom time to incorporate more developmentally appropriate activities and transition practices. For example, the International Reading Association and National Association for the Education of Young Children (1998) argued that extensive whole-group instruction is inappropriate for kindergarten students, who "need to be engaged in experiences that make academic content meaningful and build on prior learning" (p. 197). Elicker and Mathur (1997) offer evidence from a study of about 250 students in one U.S. community that students in full-day classrooms spend more time in child-initiated activities such as learning centers (both as a fraction of the school day and in minutes spent), more time in teacher-directed individual work, and relatively less time in teacher-directed large groups than students in half-day classrooms. In contrast, Walston and West (2004) found that the percentage of total class time spent in child-selected activities and teacher-directed whole-class, small-group, and individual activities was similar for full- and half-day programs in the nationally representative Early Childhood Longitudinal Study (ECLS)-Kindergarten class of 1998/99.[1]

Specific classroom characteristics may allow FDK to be particularly beneficial for certain student groups. For example, although having an instructional aide in the classroom was not associated with literacy gains for White

[1] These data were also collected for a more recent cohort, the ECLS kindergarten class of 2010/11, but similar analyses comparing practices across full- and half-day classrooms have not been published.

students, Black students in full-day programs made more progress in reading when there was an instructional aide in the classroom (Walston & West, 2004). Similarly, FDK may be more effective for economically disadvantaged students when class sizes are small (Zvoch et al., 2008).

Effect of full-day kindergarten on student outcomes

Compared to half-day programs, FDK programs are associated with increased student progress on academic outcomes of about one-quarter standard deviation during the kindergarten year (Bingham & Hall-Kenyon, 2013; Cooper et al., 2010; Elicker & Mathur, 1997; Kay & Pennucci, 2014; Pelletier & Corter, 2019), although one recent study dissents from these conclusions, finding no benefit for students in FDK (Youmans et al., 2018). Some evidence shows that the relationship between FDK and higher gains in reading and mathematics achievement on standardized tests holds even after adjusting for prior achievement, race/ethnicity, poverty, gender, class size, relative time spent on subject area instruction, maternal education, student age, and the presence of an instructional aide in the classroom (Pelletier & Corter, 2019; Walston & West, 2004). A 2019 study found that FDK programs, compared to half-day programs, also had positive effects on the complexity of student drawings and early writing skills (Pelletier & Corter, 2019). Research has also demonstrated some positive associations between FDK and non-academic outcomes. For example, a meta-analysis by Cooper and colleagues (2010) found significant positive relationships between FDK and students' self-confidence and ability to work or play with others. Further, a recent longitudinal study found positive effects for student self-regulation—including inhibitory control, working memory, and cognitive flexibility—for students attending Ontario's play-based FDK compared to those in HDK (Pelletier & Corter, 2019).

Beyond the general academic and non-academic outcomes outlined above, FDK may also have different impacts for specific student groups, although the research evidence is mixed. Cannon, Jacknowitz, and Painter (2006) did not find any additional benefit of FDK for students from low-income households over students from higher-income households through grade 3, but Cooper and colleagues (2010) found a significantly stronger association between FDK and academic achievement at the end of kindergarten for urban students than for rural students. Other studies demonstrate how FDK can help close achievement gaps. Bingham and Hall-Kenyon (2013) provide evidence that attending FDK may help close gaps between kindergarten mathematics scores of English learner students and students who only speak English. Similarly, Schroeder (2007) found that gains from attending FDK can almost offset achievement gaps in kindergarten in English language arts and mathematics between students from low-income and higher-income households. In addition, Cannon, Jacknowitz, and Painter (2011) found lower grade retention by grade 2 for English learner students who attended FDK compared to English learner students who attended HDK, although they did not find evidence that FDK helped close achievement gaps by grade 2 for English learner students.

The current evidence base is inconclusive about how long potential gains from FDK persist beyond the kindergarten year. Cryan and colleagues (1992) found a positive relationship between FDK and student behavior and academic outcomes at least through grade 1. In contrast, Zvoch (2009) observed FDK literacy gains disappearing by the beginning of grade 1. Other research has shown that the impact of FDK fades by grade 3 (see, for example, Cannon et al., 2006; Cooper et al., 2010; Kay & Pennucci, 2014). One recent study, exploiting a natural experiment, found that although math and writing gains from FDK faded by grade 3, reading gains persisted compared to HDK students (Pelletier & Corter, 2019).

This study adds to the literature by examining the impact of FDK using a rigorous method and including a wide range of outcomes (see Cooper et al., 2010 for a discussion of the need in the literature). To the study team's knowledge, only three recent studies of FDK have employed matching methods, a method that is rigorous enough to allow for estimates of impact. Of those that did employ matching methods, Brownell and colleagues (2015) estimated population-based outcomes, rather than overall impacts, as in the current study. In a study that used

the ECLS-Kindergarten Class of 2010/11, Gottfried and Le (2016) employed matching methods to investigate outcomes for a narrower population, children with disabilities, than the sample in this study, which included all students in the district that had data on FDK attendance. The third study, Gottfried and Le (2017) used the same dataset and method as Gottfried and Le (2016) to investigate differences in physical activity among FDK and HDK students, finding a higher degree of physical activity among students who attended FDK. The study employed matching methods on a nationally representative sample but for a narrow set of outcomes compared to this study.

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Appendix B. Methods

This appendix details study data sources, sample, and analytic methods in more detail than provided in the body of the report.

Study data

This study uses Oregon Department of Education (ODE) administrative data, full-day kindergarten (FDK) data from one large Oregon school district, and survey data collected by ODE. Each of these data sources is described in more detail below.

Oregon Department of Education administrative data

This data source provided information on Oregon K–8 students, schools, and districts from 2013/14 to 2018/19, focusing on students who attended kindergarten in 2013/14 and 2014/15. The study team used these data to answer research questions 1 and 2. The data source includes information on:

- Student demographics (race/ethnicity, economic disadvantage, English learner status, individualized education program [IEP] status, age) and enrollment.
- Performance on the Oregon kindergarten entry assessment (measuring the social, self-regulatory, and academic skills of incoming kindergarten students).
- Performance on grade 3 math and reading assessments (from 2013/14 through 2014/15, the Oregon Assessment of Knowledge and Skill and, from 2015/16 on, Smarter Balanced).
- English language proficiency for English learner students only (measured by the English Language Proficiency Assessment for the 21st Century).[1]
- Attendance.
- Discipline (in-school suspension, out-of-school suspension, and expulsions).
- Grade retention.

School- and district-level variables include school demographics, number of students, and number of schools. ODE administrative data did not identify whether students were enrolled in FDK or whether FDK was offered at the school; the study team used additional data sources to identify which students enrolled in FDK and which schools offered the program.

Demographic variables used in the analyses are race/ethnicity, economic disadvantage, English learner status, IEP status, and age at first kindergarten entry. Race/ethnicity is reported by the parent to the school. Economic disadvantage is an indicator for whether the child was eligible for free or reduced-price lunch or, for schools with community eligibility, an indicator for economic disadvantage as measured by the school. English learner status indicates the student received English learner services during that school year. IEP status indicates the student had an IEP during that school year. Age of the student at first kindergarten entry is measured in years (for example, 5.3 years) and calculated by taking the number of days old as of September 1 in the student's first year of kindergarten and dividing those days by 365.25.

[1] The available data for English language proficiency changed across the two years of this data source. In 2013/14, the available data measure an overall English language proficiency score. In 2014/15, the available data measure reading, writing, listening, and speaking domains and include an overall three-level proficiency measure.

Enrollment data were used to create a variable denoting whether the student was present in the single large Oregon school district for kindergarten through grade 3, kindergarten through grade 2, kindergarten through grade 1, or kindergarten only. This variable was included as a set of indicators in the analyses.

The Oregon kindergarten entry assessment includes four domain scores: early literacy letter name recognition, early literacy letter sound recognition, early math, and approaches to learning. Early literacy and early math domains are assessed within the first three weeks of kindergarten, while approaches to learning is assessed in weeks 4 to 6 of kindergarten. Letter naming is the count of the letters a child is able to name when prompted, and letter sounds are the number of letters a child correctly identifies by the sound. Early math includes geometry, measurement, and counting. The letter naming, letter sounds, and early math sections are an assessment administered by the kindergarten teacher. The fourth domain, approaches to learning, is an observational assessment completed by the teacher that uses 15 items of the Child Behavior Rating Scale (Bronson et al., 1990). It covers self-regulation (for example, whether a child attempts new challenges, responds to instructions, and returns to unfinished tasks after an interruption) and interpersonal skills (for example, willingness to share, cooperation with classmates, and compliance with adult directives).

District full-day kindergarten data from one large school district in Oregon

This data source indicated whether the student attended FDK in this school district between 2004/05 to 2014/15. These data were merged with the ODE administrative data to provide the indicator for FDK enrollment used in the analysis for research question 2. FDK students were enrolled in the program by their parents through either a lottery system or through district prioritization of student risk factors; further data were not available on the mechanism through which students were selected for FDK.

Oregon Department of Education survey data and documents

The study team used data from two surveys. In the ODE FDK district survey used for research question 1, ODE collected survey data in 2013/14 and 2014/15 from district administrators about whether they offered FDK in each of those years (see end of appendix B for the protocol). The survey also asked districts about how students were enrolled in FDK and how FDK was funded. These were the only statewide data available on FDK implementation before the 2015/16 policy shift.

ODE administered the FDK practices survey used for research question 3 to kindergarten teachers, principals, and other district staff members (such as preK–3 coordinators) in April 2018, two years after the policy shift, to gather data on how FDK was implemented in Oregon schools. Teachers responded to questions about their classroom schedule, classroom activity centers, and kindergarten transition practices and supports. Principals and other staff members provided information on preschool provision at their school, use of half-day kindergarten (HDK), alignment of professional development across grades, and alignment of curriculum across grades.

Outcome measures

The study team determined outcome measures for research question 2 based on a logic model of FDK and what the program might be expected to influence in the short, medium, and long term (figure B1). The logic model defined the potential outcomes to examine in the study. With the input of FDK, which means more instructional time for the child, the expected outputs are:

- The family takes school more seriously because the full-day schedule makes it seem more like “real school.”
- More time in the classroom results in more content instruction, including math, reading, and English language instruction (Gibbs, 2014; Pelletier & Corter, 2019).
- The child spends more time in school.

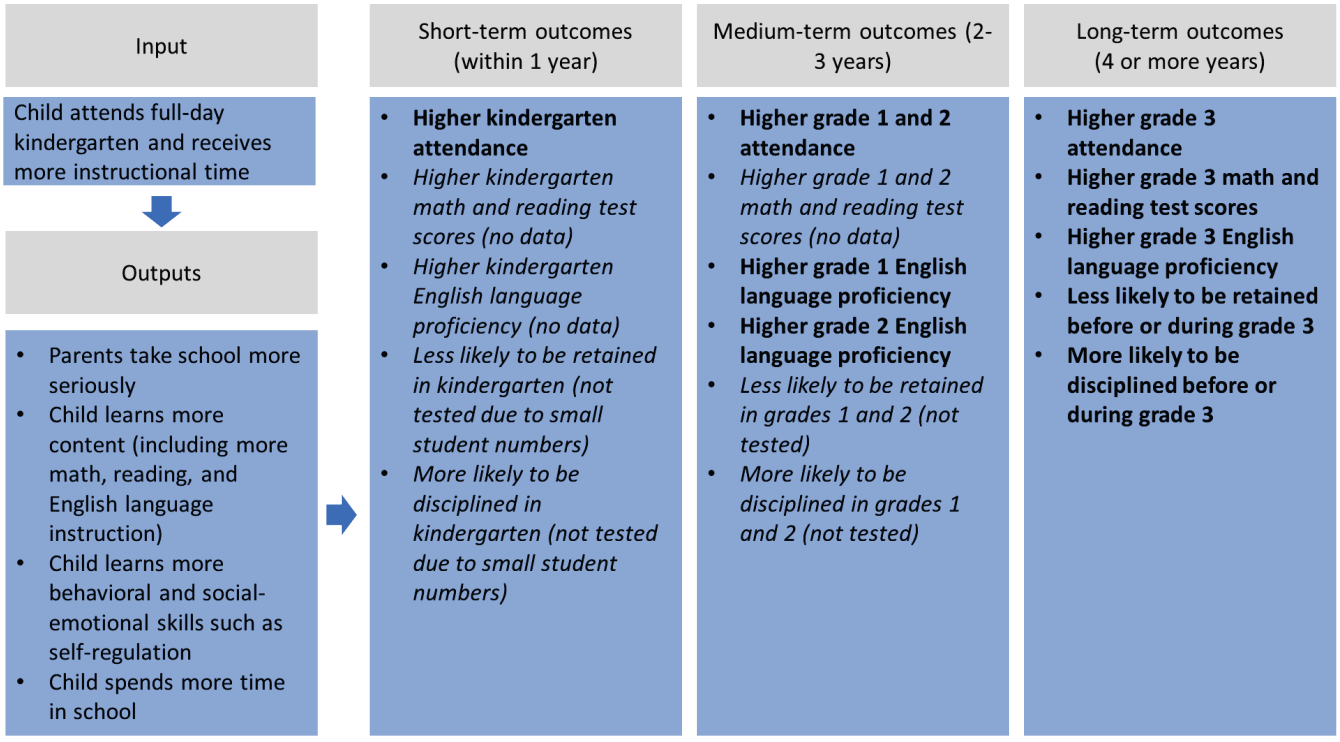
- More time in school results in improved behavioral and social and emotional learning skills for students (Carnes & Albrecht, 2007), such as self-regulation.

In the short term—by the end of the kindergarten year—the expected outcomes include higher kindergarten attendance (tested in the current study; Gullo, 2000), higher kindergarten reading and math test scores, and higher English language proficiency (Hall-Kenyon et al., 2009). Early work by Gullo (1990) suggests that FDK may be more amenable to family work schedules in two-parent households in which both parents work, and to single, working parents, which might be a reason for increased attendance rates in FDK.

In interviews with teachers during a mixed-methods study, Hall-Kenyon and colleagues (2009) reported that teachers in HDK found it challenging to adapt instruction for English learner students during the shorter school day, whereas FDK teachers reported that the longer school day gave students more time to hear and learn English. Given that FDK students are expected to learn more content and make more progress in social and emotional learning skills than HDK students, FDK students are also less likely to be retained in kindergarten (not tested in this study, as the number of children retained in kindergarten was too small).

Although FDK students are expected to learn more social and emotional learning skills than HDK students (Carnes & Albrecht, 2007), FDK students are expected to experience greater discipline in kindergarten (not tested in the current study, as the number of children disciplined in kindergarten was too small). Given that students are more likely to be disciplined at the end of the school day compared to other times of the school day (Smolkowski et al., 2016), the likelihood of increased discipline for FDK students is theorized to be higher because they are in school until the end of the day, whereas HDK students are not. This logic follows for medium- and long-term outcomes, where students might be expected to have higher discipline outcomes due to having higher discipline outcomes in kindergarten (see figure B1). However, increases in social and emotional learning skills in kindergarten may mitigate this potential negative relationship with discipline in later grades.

Figure B1. Logic model of study outcomes



Source: Authors' compilation.

Sample

For research question 1, the study team used FDK district survey data collected by ODE for nearly all districts in the state in 2013/14 and 2014/15. Of the approximately 190 districts in Oregon that offered kindergarten, 180 districts responded in 2013/14 and 178 responded in 2014/15. The sample for those data is all responding districts.

For research question 2, the study team analyzed ODE K–8 data paired with district administrative data for two cohorts of students in one large district in Oregon: those who were in their first year of kindergarten in 2013/14 and 2014/15 and those who remained in the district in the grade corresponding to the outcome analyzed. Restricting the sample to those who remained in the district at the time of measurement for the given outcome ensured that students in the analysis had not been exposed to other district policies or programs during the study timeframe. The restriction is a limitation, however, in that the results are not generalizable to students who change districts. Sample sizes vary by outcome. For the 2013/14 kindergarten cohort, sample sizes range from 2,535 for kindergarten attendance to 314 for grade 3 English language proficiency. For the 2014/15 kindergarten cohort, sample sizes range from 2,599 for kindergarten attendance to 265 for grade 3 English language proficiency.

For research question 3, which used ODE FDK practices survey data, the sample is all respondents to the survey. In April 2018, ODE asked all superintendents and principals in Oregon to disseminate the FDK survey in April and May to kindergarten teachers and other relevant staff members (such as preK–3 coordinators). Of the three types of respondents (kindergarten teachers, principals, and other relevant staff members), only principals received the survey directly from ODE. Sampling of kindergarten teachers and other relevant staff members, such as preK–3 coordinators, was based on superintendents and principals forwarding the survey because ODE did not have contact lists for those roles.

ODE fielded the survey to understand examples of classroom practices occurring across the state in kindergarten and to gather documents from districts about how they were implementing FDK to inform an implementation guide. ODE's goal was to receive responses from all districts, and 174 of 199 districts that offered kindergarten responded—an 87 percent response rate at the district level. The survey cannot be considered representative at the district level, however, given that the items were directed toward teachers and principals. ODE received 1,043 responses: 572 teachers, 326 principals, and 145 other relevant staff members. Other relevant staff roles included superintendents, reading specialists, assistant principals, and K–8 teachers. The survey provides valuable information about examples of FDK implementation across the state, but it cannot be considered representative of kindergarten teachers, principals, or other relevant staff members statewide. Findings from this survey should be viewed cautiously because it is unclear whether respondents accurately represent educators statewide.[2]

Methodology

To answer the first and third research questions, the study team analyzed the full-district kindergarten district survey and FDK practices survey data collected by ODE. Analysis methods included calculating descriptive statistics for each survey item (such as frequencies, means, minimums, and maximums), as well as cross-tabulating survey response data with other survey responses to understand how responses vary by teacher, principal, and school.

For the first research question, the study team calculated descriptive characteristics at the state and district levels for each year of data and by districts that offered FDK in the sample year and those that did not, including the number of classes offering FDK; number of kindergarten students; number of districts responding to the survey; percentage of schools that are rural; percentage of students who are English language proficient; percentage identified for special education services; percentage of students by race; percentage female; percentage eligible

[2] The study team was not able to statistically adjust for nonresponse because the available teacher background characteristics collected on the survey were not correlated strongly with outcomes.

for free or reduced-price lunch; percentage retained; percentage of students experiencing a disciplinary event; mean test scores in reading and mathematics; and mean attendance rates.

To answer the second research question, the study team conducted both descriptive and statistical analyses. The team used administrative data from ODE as well as data from one large school district in Oregon on FDK from the 2013/14 and 2014/15 school years. The team then calculated district- and school-level descriptive statistics from the district data for each year of data (2013/14 and 2014/15) and for schools that offered FDK in the sample years and those that did not. These descriptive statistics include number of kindergarten students; percentage of English learner students in kindergarten; percentage identified for special education services in kindergarten; percentage of kindergarten students by race; percentage of female kindergarten students; percentage eligible for free or reduced-price lunch in kindergarten; percentage retained in kindergarten; percentage of students who experienced a disciplinary event in kindergarten; mean test scores in reading and mathematics in grade 3; mean attendance rates in kindergarten; and mean English Language Proficiency Assessment scores in kindergarten.

Students who attended FDK and those who attended HDK may be different across characteristics that are related to their later school outcomes, regardless of their kindergarten status. To address this selection bias, the study team implemented a quasi-experimental design that incorporated a matching process and allowed for estimation of impact, following What Works Clearinghouse standards (U.S. Department of Education, 2017). The matching process ensures that treatment and comparison groups are comparable on the observed covariates. Additionally, covariate adjustment in the statistical analysis may reduce the remaining differences on observed covariates between FDK students and half-day students, which improves the precision of the impact estimation. The study team used a matching process to balance each analytic sample on observed variables that meet What Works Clearinghouse criteria for each outcome under study and each cohort of students (2014 and 2015 cohorts) by excluding HDK students who were not similar to FDK students on observable matching characteristics. If the effect size (Hedge's *g* or Cox's index) for a matching characteristic was above the absolute threshold of 0.25, we trimmed from the minimum or maximum values in the distribution (depending on the direction of the effect size) of the matching characteristic until the effect size fell below 0.25. The resulting samples were balanced within What Works Clearinghouse thresholds for baseline equivalence (see tables B1 and B2 for matching characteristics and balancing results). Then, the team conducted regression analyses for each outcome and cohort separately.

Because all variables used in the matching process must be exogenous to the intervention, and this intervention is in kindergarten, information from later in the students' kindergarten year or later in their schooling may not be used. The kindergarten entry assessment is conducted within the first few weeks of kindergarten, and per What Works Clearinghouse standards, using a measure that occurs shortly after the beginning of the intervention may be considered exogenous (U.S. Department of Education, 2017). However, Oregon only began conducting kindergarten entry assessments in 2013/14. For this reason, the sample was restricted to students in two cohorts of kindergarten classes: 2013/14 and 2014/15 (the two years before the policy shift by the state, which paid for FDK statewide).

The study team implemented matching techniques when absolute differences in Hedges' *g* and Cox's index estimates were 0.25 standard deviations or above the pre-matched treatment and comparison groups for both continuous and binary variables, respectively. Both cohorts were matched exactly on school year. The study team matched on the following student-level variables: age at kindergarten entry; gender; race/ethnicity; early literacy letter naming, early literacy letter sound recognition, and approaches to learning average score (from the kindergarten entry assessment); English learner status; and special education status. Giving priority to keeping FDK observations, the study team removed observations in the HDK group for which there was no corresponding observation in the FDK group, based on Hedge's *g* and Cox's index estimates. If the sample was not balanced after removing HDK observations, FDK observations were removed for which there was no corresponding observation in the HDK group. In practice, very few (0 to 2) FDK students and between 0 and 148 HDK students were removed

from each analytic sample. After this process, all Hedges' *g* and Cox's index estimates were less than 0.25. For English language proficiency outcomes, a larger number of HDK students was trimmed to achieve balance than for other outcomes. The number of HDK students trimmed for English language proficiency outcomes ranged from 16 to 148. Comparatively, the number of HDK students trimmed for all other outcomes ranged from 0 to 21. The larger number of students trimmed for English language proficiency outcomes may indicate that the HDK and FDK populations were less similar for these outcomes before trimming than HDK and FDK populations were for other outcomes before trimming. However, after balancing on baseline characteristics, analytic samples for English language proficiency outcomes were within What Works Clearinghouse thresholds for baseline equivalence. The study team statistically adjusted for remaining differences in Hedges' *g* and Cox's index estimates by including each student-level variable matched on in the regression models. This method resulted in a matched and balanced analytic sample for each outcome, precluding the need for weighting the sample and ensuring baseline equivalence between the matched FDK and HDK analytic samples (see tables B1 and B2). This process was conducted for each analytic sample, that is, for the sample used to estimate results for each outcome in the analysis. For some outcomes (kindergarten, grade 1, grade 2, and grade 3 attendance; standardized grade 3 assessment scores in math and reading; retained by grade 3; and disciplined by grade 3 for 2014/15), no trimming was needed, and thus the unmatched and matched samples have the same statistics. For group analyses, the same analytic samples were used for each outcome as the main analyses.

Table B1. Full-day kindergarten and half-day kindergarten students' unmatched means, matched means, and matched Hedge's g estimates, 2013/14 kindergarten cohort

Panel A: Kindergarten attendance outcome

	Unmatched			Matched		
Variables	FDK mean	HDK mean	Hedge's g/Cox's index	FDK mean	HDK mean	Hedge's g/Cox's index
Standardized early literacy: English letter naming score	0.556	0.275	-0.247	0.556	0.277	-0.246
Early literacy: Test score for English letter sounds recognition	0.533	0.242	-0.236	0.534	0.246	-0.233
Early math: Raw score (number of correct responses items)	9.183	8.429	-0.221	9.191	8.462	-0.214
Approaches to learning: Combined average score for the two subdomains	3.813	3.828	0.019	3.816	3.846	0.038
Age on September 1 of first kindergarten year, in years	5.528	5.515	-0.043	5.528	5.515	-0.044
Free or reduced-price lunch in this year	0.360	0.430	-0.178	0.360	0.429	-0.175
Female	0.497	0.496	0.002	0.497	0.497	0.000
Asian (using post-2010 codes, mode since 2011)	0.160	0.130	0.147	0.161	0.131	0.144
Black (using post-2010 codes, mode since 2011)	0.022	0.021	0.040	0.022	0.020	0.054
Latinx (using post-2010 codes, mode since 2011)	0.261	0.269	-0.025	0.261	0.270	-0.027
White (using post-2010 codes, mode since 2011)	0.467	0.486	-0.046	0.467	0.484	-0.040
Multiracial (using post-2010 codes, mode since 2011)	0.083	0.084	-0.002	0.082	0.084	-0.016
Student received limited English proficiency services in given year	0.235	0.263	-0.091	0.235	0.264	-0.094
Special education in this year	0.061	0.087	-0.229	0.060	0.081	-0.194
Number of FDK students	767			766		
Number of HDK students	1781			1769		

Panel B: Grade 1 attendance outcome

Variables	Unmatched			Matched		
	FDK mean	HDK mean	Hedge's g/Cox's index	FDK mean	HDK mean	Hedge's g/Cox's index
Standardized early literacy: English letter naming score	0.566	0.281	-0.251	0.566	0.300	-0.235
Early literacy: Test score for English letter sounds recognition	0.550	0.245	-0.246	0.550	0.258	-0.236
Early math: Raw score (number of correct responses items)	9.203	8.495	-0.207	9.203	8.556	-0.190
Approaches to learning: Combined average score for the two subdomains	3.811	3.844	0.041	3.811	3.856	0.057
Age on September 1 of first kindergarten year, in years	5.527	5.521	-0.019	5.527	5.521	-0.018
Free or reduced-price lunch in this year	0.352	0.420	-0.176	0.352	0.415	-0.163
Female	0.501	0.498	0.007	0.501	0.501	0.000
Asian (using post-2010 codes, mode since 2011)	0.155	0.133	0.110	0.155	0.135	0.101
Black (using post-2010 codes, mode since 2011)	0.018	0.018	0.016	0.018	0.017	0.030
Latinx (using post-2010 codes, mode since 2011)	0.266	0.278	-0.038	0.266	0.271	-0.016
White (using post-2010 codes, mode since 2011)	0.465	0.473	-0.021	0.465	0.478	-0.032
Multiracial (using post-2010 codes, mode since 2011)	0.089	0.087	0.016	0.089	0.088	0.007
Student received limited English proficiency services in given year	0.232	0.272	-0.129	0.232	0.266	-0.110
Special education in this year	0.054	0.086	-0.309	0.054	0.074	-0.206
Number of FDK students	708			708		
Number of HDK students	1565			1544		

Panel C: Grade 2 attendance outcome

Variables	Unmatched			Matched		
	FDK mean	HDK mean	Hedge's g/Cox's index	FDK mean	HDK mean	Hedge's g/Cox's index
Standardized early literacy: English letter naming score	0.575	0.289	-0.251	0.575	0.294	-0.247
Early literacy: Test score for English letter sounds recognition	0.563	0.251	-0.251	0.563	0.254	-0.248
Early math: Raw score (number of correct responses items)	9.260	8.533	-0.213	9.260	8.552	-0.208
Approaches to learning: Combined average score for the two subdomains	3.815	3.858	0.054	3.815	3.860	0.056
Age on September 1 of first kindergarten year, in years	5.529	5.523	-0.018	5.529	5.523	-0.018
Free or reduced-price lunch in this year	0.342	0.419	-0.199	0.342	0.419	-0.197
Female	0.501	0.495	0.013	0.501	0.496	0.012
Asian (using post-2010 codes, mode since 2011)	0.155	0.133	0.110	0.155	0.133	0.108
Black (using post-2010 codes, mode since 2011)	0.018	0.018	0.012	0.018	0.018	0.010
Latinx (using post-2010 codes, mode since 2011)	0.262	0.280	-0.057	0.262	0.280	-0.055
White (using post-2010 codes, mode since 2011)	0.469	0.468	0.003	0.469	0.468	0.004
Multiracial (using post-2010 codes, mode since 2011)	0.090	0.089	0.002	0.090	0.090	0.000
Student received limited English proficiency services in given year	0.229	0.279	-0.162	0.229	0.279	-0.161
Special education in this year	0.057	0.084	-0.253	0.057	0.081	-0.233
Number of FDK students	669			669		

Variables	Unmatched			Matched		
	FDK mean	HDK mean	Hedge's g/Cox's index	FDK mean	HDK mean	Hedge's g/Cox's index
Number of HDK students	1421			1416		

Panel D: Grade 3 attendance outcome

Variables	Unmatched			Matched		
	FDK mean	HDK mean	Hedge's g/Cox's index	FDK mean	HDK mean	Hedge's g/Cox's index
Standardized early literacy: English letter naming score	0.581	0.293	-0.254	0.581	0.313	-0.236
Early literacy: Test score for English letter sounds recognition	0.579	0.261	-0.255	0.579	0.275	-0.243
Early math: Raw score (number of correct responses items)	9.292	8.542	-0.220	9.292	8.597	-0.205
Approaches to learning: Combined average score for the two subdomains	3.820	3.869	0.062	3.820	3.879	0.076
Age on September 1 of first kindergarten year, in years	5.527	5.524	-0.012	5.527	5.523	-0.014
Free or reduced-price lunch in this year	0.327	0.417	-0.233	0.327	0.409	-0.214
Female	0.498	0.500	-0.003	0.498	0.503	-0.011
Asian (using post-2010 codes, mode since 2011)	0.151	0.136	0.075	0.151	0.138	0.064
Black (using post-2010 codes, mode since 2011)	0.018	0.018	-0.022	0.018	0.018	-0.005
Latinx (using post-2010 codes, mode since 2011)	0.264	0.285	-0.062	0.264	0.277	-0.040
White (using post-2010 codes, mode since 2011)	0.474	0.461	0.033	0.474	0.465	0.022
Multiracial (using post-2010 codes, mode since 2011)	0.090	0.088	0.010	0.090	0.090	0.001
Student received limited English proficiency services in given year	0.226	0.287	-0.195	0.226	0.280	-0.173
Special education in this year	0.056	0.082	-0.249	0.056	0.074	-0.181
Number of FDK students	624			624		
Number of HDK students	1313			1294		

Panel E: Grade 3 math standardized assessment outcome

Variables	Unmatched			Matched		
	FDK mean	HDK mean	Hedge's g/Cox's index	FDK mean	HDK mean	Hedge's g/Cox's index
Standardized early literacy: English letter naming score	0.586	0.304	-0.246	0.586	0.315	-0.237
Early literacy: Test score for English letter sounds recognition	0.576	0.275	-0.241	0.576	0.285	-0.232
Early math: Raw score (number of correct responses items)	9.293	8.614	-0.200	9.293	8.653	-0.189
Approaches to learning: Combined average score for the two subdomains	3.832	3.887	0.072	3.832	3.894	0.081
Age on September 1 of first kindergarten year, in years	5.527	5.526	-0.002	5.527	5.525	-0.007
Free or reduced-price lunch in this year	0.332	0.420	-0.229	0.332	0.414	-0.213
Female	0.502	0.502	0.000	0.502	0.503	-0.004
Asian (using post-2010 codes, mode since 2011)	0.157	0.137	0.097	0.157	0.138	0.089
Black (using post-2010 codes, mode since 2011)	0.017	0.017	0.003	0.017	0.017	-0.004
Latinx (using post-2010 codes, mode since 2011)	0.272	0.291	-0.057	0.272	0.286	-0.043
White (using post-2010 codes, mode since 2011)	0.460	0.456	0.010	0.460	0.458	0.004

Variables	Unmatched			Matched		
	FDK mean	HDK mean	Hedge's g/Cox's index	FDK mean	HDK mean	Hedge's g/Cox's index
Multiracial (using post-2010 codes, mode since 2011)	0.092	0.088	0.024	0.092	0.089	0.016
Student received limited English proficiency services in given year	0.232	0.291	-0.186	0.232	0.287	-0.174
Special education in this year	0.052	0.073	-0.227	0.052	0.070	-0.198
Number of FDK students	600			600		
Number of HDK students	1266			1252		

Panel F: Grade 3 reading standardized assessment outcome

Variables	Unmatched			Matched		
	FDK mean	HDK mean	Hedge's g/Cox's index	FDK mean	HDK mean	Hedge's g/Cox's index
Standardized early literacy: English letter naming score	0.591	0.302	-0.253	0.591	0.322	-0.236
Early literacy: Test score for English letter sounds recognition	0.585	0.268	-0.253	0.585	0.282	-0.242
Early math: Raw score (number of correct responses items)	9.300	8.609	-0.204	9.300	8.661	-0.189
Approaches to learning: Combined average score for the two subdomains	3.830	3.885	0.071	3.830	3.894	0.083
Age on September 1 of first kindergarten year, in years	5.525	5.525	0.000	5.525	5.526	0.002
Free or reduced-price lunch in this year	0.328	0.421	-0.242	0.328	0.413	-0.221
Female	0.503	0.501	0.006	0.503	0.503	0.000
Asian (using post-2010 codes, mode since 2011)	0.156	0.136	0.094	0.156	0.138	0.084
Black (using post-2010 codes, mode since 2011)	0.017	0.016	0.004	0.017	0.017	-0.005
Latinx (using post-2010 codes, mode since 2011)	0.268	0.291	-0.068	0.268	0.282	-0.042
White (using post-2010 codes, mode since 2011)	0.465	0.455	0.024	0.465	0.460	0.012
Multiracial (using post-2010 codes, mode since 2011)	0.091	0.089	0.013	0.091	0.091	0.003
Student received limited English proficiency services in given year	0.228	0.290	-0.195	0.228	0.281	-0.169
Special education in this year	0.050	0.073	-0.247	0.050	0.065	-0.175
Number of FDK students	604			604		
Number of HDK students	1276			1258		

Panel G: English language proficiency assessment, grade 1

Variables	Unmatched			Matched		
	FDK mean	HDK mean	Hedge's g/Cox's index	FDK mean	HDK mean	Hedge's g/Cox's index
Standardized early literacy: English letter naming score	-0.664	-0.527	0.183	-0.664	-0.488	0.230
Early literacy: Test score for English letter sounds recognition	-0.526	-0.477	0.096	-0.526	-0.457	0.130
Early math: Raw score (number of correct responses items)	6.748	6.397	-0.129	6.748	6.461	-0.104
Approaches to learning: Combined average score for the two subdomains	3.681	3.666	-0.018	3.681	3.703	0.027
Age on September 1 of first kindergarten year, in years	5.427	5.488	0.204	5.427	5.489	0.206
Free or reduced-price lunch in this year	0.861	0.791	0.296	0.861	0.812	0.217

Variables	Unmatched			Matched		
	FDK mean	HDK mean	Hedge's g/Cox's index	FDK mean	HDK mean	Hedge's g/Cox's index
Female	0.530	0.480	0.121	0.530	0.478	0.126
Asian (using post-2010 codes, mode since 2011)	0.099	0.153	-0.300	0.099	0.116	-0.105
Black (using post-2010 codes, mode since 2011)	0.020	0.020	-0.007	0.020	0.019	0.017
Latinx (using post-2010 codes, mode since 2011)	0.801	0.701	0.328	0.801	0.760	0.147
White (using post-2010 codes, mode since 2011)	0.060	0.101	-0.343	0.060	0.083	-0.215
Multiracial (using post-2010 codes, mode since 2011)	0.013	0.013	0.032	0.013	0.014	-0.026
Special education in this year	0.106	0.106	0.003	0.106	0.105	0.006
Number of FDK students	151			151		
Number of HDK students	398			362		

Panel H: English language proficiency assessment reading, writing, listening, and speaking outcomes, grade 2

Variables	Unmatched			Matched		
	FDK mean	HDK mean	Hedge's g/Cox's index	FDK mean	HDK mean	Hedge's g/Cox's index
Standardized early literacy: English letter naming score	-0.774	-0.652	0.194	-0.774	-0.677	0.158
Early literacy: Test score for English letter sounds recognition	-0.554	-0.549	0.012	-0.554	-0.549	0.012
Early math: Raw score (number of correct responses items)	6.531	6.122	-0.159	6.531	6.023	-0.198
Approaches to learning: Combined average score for the two subdomains	3.662	3.615	-0.056	3.662	3.649	-0.015
Age on September 1 of first kindergarten year, in years	5.444	5.492	0.160	5.444	5.498	0.178
Free or reduced-price lunch in this year	0.930	0.850	0.515	0.930	0.944	-0.142
Female	0.523	0.470	0.129	0.523	0.470	0.130
Asian (using post-2010 codes, mode since 2011)	0.023	0.094	-0.886	0.023	0.019	0.136
Black (using post-2010 codes, mode since 2011)	0.016	0.016	-0.002	0.016	0.011	0.200
Latinx (using post-2010 codes, mode since 2011)	0.883	0.762	0.519	0.883	0.872	0.060
White (using post-2010 codes, mode since 2011)	0.063	0.097	-0.290	0.063	0.068	-0.051
Multiracial (using post-2010 codes, mode since 2011)	0.008	0.016	-0.426	0.008	0.011	-0.224
Special education in this year	0.125	0.110	0.089	0.125	0.113	0.071
Number of FDK students	128			128		
Number of HDK students	319			266		

Panel I: English language proficiency assessment reading and writing outcomes, grade 3

Variables	Unmatched			Matched		
	FDK mean	HDK mean	Hedge's g/Cox's index	FDK mean	HDK mean	Hedge's g/Cox's index
Standardized early literacy: English letter naming score	-0.794	-0.763	0.057	-0.794	-0.756	0.068
Early literacy: Test score for English letter sounds recognition	-0.570	-0.586	-0.043	-0.570	-0.585	-0.039
Early math: Raw score (number of correct responses items)	6.118	5.645	-0.196	6.118	5.698	-0.173
Approaches to learning: Combined average score for the two subdomains	3.680	3.569	-0.135	3.680	3.591	-0.109
Age on September 1 of first kindergarten year, in years	5.442	5.481	0.127	5.442	5.484	0.137

Variables	Unmatched			Matched		
	FDK mean	HDK mean	Hedge's g/Cox's index	FDK mean	HDK mean	Hedge's g/Cox's index
Free or reduced-price lunch in this year	0.941	0.890	0.410	0.941	0.920	0.201
Female	0.529	0.500	0.071	0.529	0.505	0.060
Asian (using post-2010 codes, mode since 2011)	0.020	0.061	-0.717	0.020	0.014	0.201
Black (using post-2010 codes, mode since 2011)	0.020	0.018	0.069	0.020	0.019	0.024
Latinx (using post-2010 codes, mode since 2011)	0.882	0.811	0.336	0.882	0.854	0.151
White (using post-2010 codes, mode since 2011)	0.059	0.083	-0.227	0.059	0.085	-0.239
Multiracial (using post-2010 codes, mode since 2011)	0.010	0.013	-0.180	0.010	0.014	-0.225
Special education in this year	0.147	0.145	0.011	0.147	0.146	0.004
Number of FDK students	102			102		
Number of HDK students	228			212		

Panel J: English language proficiency assessment speaking outcome, grade 3

Variables	Unmatched			Matched		
	FDK mean	HDK mean	Hedge's g/Cox's index	FDK mean	HDK mean	Hedge's g/Cox's index
Standardized early literacy: English letter naming score	-0.794	-0.762	0.058	-0.794	-0.758	0.065
Early literacy: Test score for English letter sounds recognition	-0.570	-0.586	-0.043	-0.570	-0.585	-0.040
Early math: Raw score (number of correct responses items)	6.118	5.617	-0.206	6.118	5.695	-0.174
Approaches to learning: Combined average score for the two subdomains	3.680	3.561	-0.145	3.680	3.583	-0.117
Age on September 1 of first kindergarten year, in years	5.442	5.482	0.132	5.442	5.483	0.136
Free or reduced-price lunch in this year	0.941	0.887	0.431	0.941	0.920	0.198
Female	0.529	0.504	0.061	0.529	0.507	0.054
Asian (using post-2010 codes, mode since 2011)	0.020	0.065	-0.756	0.020	0.014	0.203
Black (using post-2010 codes, mode since 2011)	0.020	0.017	0.074	0.020	0.019	0.027
Latinx (using post-2010 codes, mode since 2011)	0.882	0.809	0.347	0.882	0.854	0.148
White (using post-2010 codes, mode since 2011)	0.059	0.083	-0.221	0.059	0.085	-0.236
Multiracial (using post-2010 codes, mode since 2011)	0.010	0.013	-0.175	0.010	0.014	-0.222
Special education in this year	0.147	0.152	-0.024	0.147	0.150	-0.015
Number of FDK students	102			102		
Number of HDK students	230			213		

Panel K: English language proficiency assessment listening outcome, grade 3

Variables	Unmatched			Matched		
	FDK mean	HDK mean	Hedge's g/Cox's index	FDK mean	HDK mean	Hedge's g/Cox's index
Standardized early literacy: English letter naming score	-0.794	-0.760	0.061	-0.794	-0.756	0.068
Early literacy: Test score for English letter sounds recognition	-0.570	-0.585	-0.042	-0.570	-0.585	-0.039
Early math: Raw score (number of correct responses items)	6.118	5.620	-0.205	6.118	5.698	-0.173
Approaches to learning: Combined average score for the two subdomains	3.680	3.567	-0.137	3.680	3.591	-0.109

Variables	Unmatched			Matched		
	FDK mean	HDK mean	Hedge's g/Cox's index	FDK mean	HDK mean	Hedge's g/Cox's index
Age on September 1 of first kindergarten year, in years	5.442	5.483	0.133	5.442	5.484	0.137
Free or reduced-price lunch in this year	0.941	0.886	0.434	0.941	0.920	0.201
Female	0.529	0.502	0.066	0.529	0.505	0.060
Asian (using post-2010 codes, mode since 2011)	0.020	0.066	-0.758	0.020	0.014	0.201
Black (using post-2010 codes, mode since 2011)	0.020	0.017	0.071	0.020	0.019	0.024
Latinx (using post-2010 codes, mode since 2011)	0.882	0.808	0.350	0.882	0.854	0.151
White (using post-2010 codes, mode since 2011)	0.059	0.083	-0.224	0.059	0.085	-0.239
Multiracial (using post-2010 codes, mode since 2011)	0.010	0.013	-0.177	0.010	0.014	-0.225
Special education in this year	0.147	0.148	-0.007	0.147	0.146	0.004
Number of FDK students	102			102		
Number of HDK students	229			212		

Panel L: Retained by grade 3 and disciplined by grade 3 outcomes

Variables	Unmatched			Matched		
	FDK mean	HDK mean	Hedge's g/Cox's index	FDK mean	HDK mean	Hedge's g/Cox's index
Standardized early literacy: English letter naming score	0.576	0.283	-0.258	0.576	0.302	-0.241
Early literacy: Test score for English letter sounds recognition	0.575	0.252	-0.258	0.575	0.266	-0.247
Early math: Raw score (number of correct responses items)	9.278	8.510	-0.225	9.278	8.557	-0.212
Approaches to learning: Combined average score for the two subdomains	3.820	3.857	0.047	3.820	3.869	0.063
Age on September 1 of first kindergarten year, in years	5.526	5.522	-0.014	5.526	5.522	-0.013
Free or reduced-price lunch in this year	0.327	0.419	-0.237	0.327	0.411	-0.217
Female	0.498	0.498	0.002	0.498	0.502	-0.008
Asian (using post-2010 codes, mode since 2011)	0.152	0.134	0.087	0.152	0.136	0.077
Black (using post-2010 codes, mode since 2011)	0.018	0.019	-0.043	0.018	0.018	-0.027
Latinx (using post-2010 codes, mode since 2011)	0.265	0.286	-0.063	0.265	0.278	-0.040
White (using post-2010 codes, mode since 2011)	0.473	0.461	0.029	0.473	0.466	0.018
Multiracial (using post-2010 codes, mode since 2011)	0.089	0.088	0.009	0.089	0.089	0.000
Student received limited English proficiency services in given year	0.228	0.288	-0.189	0.228	0.280	-0.165
Special education in this year	0.058	0.084	-0.250	0.058	0.078	-0.198
Number of FDK students	626			626		
Number of HDK students	1326			1308		

FDK is full-day kindergarten. HDK is half-day kindergarten.
Source: Authors' analysis of data from the Oregon Department of Education and one large Oregon school district.

Table B2. Full-day kindergarten and half-day kindergarten students' unmatched means and matched Hedge's g estimates, 2014/15 kindergarten cohort

Panel A: Kindergarten attendance outcome

Variables	Unmatched			Matched		
	FDK mean	HDK mean	Hedge's g/Cox's index	FDK mean	HDK mean	Hedge's g/Cox's index
Standardized early literacy: English letter naming score	0.355	0.182	-0.155	0.355	0.182	-0.155
Early literacy: Test score for English letter sounds recognition	0.318	0.163	-0.133	0.318	0.163	-0.133
Early math: Raw score (number of correct responses items)	8.985	8.540	-0.129	8.985	8.540	-0.129
Approaches to learning: Combined average score for the two subdomains	3.782	3.682	-0.135	3.782	3.682	-0.135
Age on September 1 of first kindergarten year, in years	5.528	5.499	-0.098	5.528	5.499	-0.098
Free or reduced-price lunch in this year	0.389	0.398	-0.024	0.389	0.398	-0.024
Female	0.486	0.467	0.047	0.486	0.467	0.047
Asian (using post-2010 codes, mode since 2011)	0.157	0.135	0.107	0.157	0.135	0.107
Black (using post-2010 codes, mode since 2011)	0.028	0.020	0.192	0.028	0.020	0.192
Latinx (using post-2010 codes, mode since 2011)	0.262	0.268	-0.020	0.262	0.268	-0.020
White (using post-2010 codes, mode since 2011)	0.476	0.488	-0.030	0.476	0.488	-0.030
Multiracial (using post-2010 codes, mode since 2011)	0.067	0.079	-0.108	0.067	0.079	-0.108
Student received limited English proficiency services in given year	0.262	0.276	-0.043	0.262	0.276	-0.043
Special education in this year	0.077	0.091	-0.113	0.077	0.091	-0.113
Number of FDK students	870			870		
Number of HDK students	1729			1729		

Panel B: Grade 1 attendance outcome

Variables	Unmatched			Matched		
	FDK mean	HDK mean	Hedge's g/Cox's index	FDK mean	HDK mean	Hedge's g/Cox's index
Standardized early literacy: English letter naming score	0.392	0.193	-0.179	0.392	0.193	-0.179
Early literacy: Test score for English letter sounds recognition	0.361	0.168	-0.164	0.361	0.168	-0.164
Early math: Raw score (number of correct responses items)	9.127	8.607	-0.149	9.127	8.607	-0.149
Approaches to learning: Combined average score for the two subdomains	3.800	3.699	-0.137	3.800	3.699	-0.137
Age on September 1 of first kindergarten year, in years	5.535	5.502	-0.112	5.535	5.502	-0.112
Free or reduced-price lunch in this year	0.373	0.395	-0.056	0.373	0.395	-0.056
Female	0.487	0.467	0.049	0.487	0.467	0.049
Asian (using post-2010 codes, mode since 2011)	0.159	0.138	0.100	0.159	0.138	0.100
Black (using post-2010 codes, mode since 2011)	0.025	0.021	0.115	0.025	0.021	0.115
Latinx (using post-2010 codes, mode since 2011)	0.264	0.275	-0.033	0.264	0.275	-0.033
White (using post-2010 codes, mode since 2011)	0.471	0.484	-0.031	0.471	0.484	-0.031
Multiracial (using post-2010 codes, mode since 2011)	0.069	0.073	-0.030	0.069	0.073	-0.030

Variables	Unmatched			Matched		
	FDK mean	HDK mean	Hedge's g/Cox's index	FDK mean	HDK mean	Hedge's g/Cox's index
Student received limited English proficiency services in given year	0.258	0.284	-0.078	0.258	0.284	-0.078
Special education in this year	0.076	0.086	-0.087	0.076	0.086	-0.087
Number of FDK students	794			794		
Number of HDK students	1530			1530		

Panel C: Grade 2 attendance outcome

Variables	Unmatched			Matched		
	FDK mean	HDK mean	Hedge's g/Cox's index	FDK mean	HDK mean	Hedge's g/Cox's index
Standardized early literacy: English letter naming score	0.410	0.205	-0.183	0.410	0.205	-0.183
Early literacy: Test score for English letter sounds recognition	0.391	0.176	-0.181	0.391	0.176	-0.181
Early math: Raw score (number of correct responses items)	9.177	8.599	-0.165	9.177	8.599	-0.165
Approaches to learning: Combined average score for the two subdomains	3.802	3.707	-0.131	3.802	3.707	-0.131
Age on September 1 of first kindergarten year, in years	5.535	5.504	-0.105	5.535	5.504	-0.105
Free or reduced-price lunch in this year	0.361	0.393	-0.081	0.361	0.393	-0.081
Female	0.480	0.467	0.032	0.480	0.467	0.032
Asian (using post-2010 codes, mode since 2011)	0.164	0.137	0.126	0.164	0.137	0.126
Black (using post-2010 codes, mode since 2011)	0.026	0.022	0.110	0.026	0.022	0.110
Latinx (using post-2010 codes, mode since 2011)	0.260	0.277	-0.053	0.260	0.277	-0.053
White (using post-2010 codes, mode since 2011)	0.472	0.484	-0.028	0.472	0.484	-0.028
Multiracial (using post-2010 codes, mode since 2011)	0.068	0.072	-0.039	0.068	0.072	-0.039
Student received limited English proficiency services in given year	0.263	0.289	-0.081	0.263	0.289	-0.081
Special education in this year	0.077	0.086	-0.073	0.077	0.086	-0.073
Number of FDK students	739			739		
Number of HDK students	1393			1393		

Panel D: Grade 3 attendance outcome

Variables	Unmatched			Matched		
	FDK mean	HDK mean	Hedge's g/Cox's index	FDK mean	HDK mean	Hedge's g/Cox's index
Standardized early literacy: English letter naming score	0.398	0.207	-0.170	0.398	0.207	-0.170
Early literacy: Test score for English letter sounds recognition	0.389	0.181	-0.174	0.389	0.181	-0.174
Early math: Raw score (number of correct responses items)	9.205	8.633	-0.164	9.205	8.633	-0.164
Approaches to learning: Combined average score for the two subdomains	3.792	3.712	-0.108	3.792	3.712	-0.108
Age on September 1 of first kindergarten year, in years	5.537	5.498	-0.130	5.537	5.498	-0.130
Free or reduced-price lunch in this year	0.358	0.382	-0.062	0.358	0.382	-0.062
Female	0.475	0.469	0.015	0.475	0.469	0.015
Asian (using post-2010 codes, mode since 2011)	0.163	0.137	0.121	0.163	0.137	0.121
Black (using post-2010 codes, mode since 2011)	0.026	0.021	0.150	0.026	0.021	0.150
Latinx (using post-2010 codes, mode since 2011)	0.257	0.280	-0.071	0.257	0.280	-0.071
White (using post-2010 codes, mode since 2011)	0.474	0.483	-0.023	0.474	0.483	-0.023
Multiracial (using post-2010 codes, mode since 2011)	0.070	0.071	-0.012	0.070	0.071	-0.012
Student received limited English proficiency services in given year	0.262	0.292	-0.093	0.262	0.292	-0.093
Special education in this year	0.074	0.084	-0.080	0.074	0.084	-0.080
Number of FDK students	688			688		
Number of HDK students	1266			1266		

Panel E: Grade 3 math standardized assessment outcome

Variables	Unmatched			Matched		
	FDK mean	HDK mean	Hedge's g/Cox's index	FDK mean	HDK mean	Hedge's g/Cox's index
Standardized early literacy: English letter naming score	0.416	0.227	-0.170	0.416	0.227	-0.170
Early literacy: Test score for English letter sounds recognition	0.401	0.195	-0.173	0.401	0.195	-0.173
Early math: Raw score (number of correct responses items)	9.250	8.703	-0.157	9.250	8.703	-0.157
Approaches to learning: Combined average score for the two subdomains	3.805	3.741	-0.091	3.805	3.741	-0.091
Age on September 1 of first kindergarten year, in years	5.539	5.498	-0.137	5.539	5.498	-0.137
Free or reduced-price lunch in this year	0.351	0.377	-0.067	0.351	0.377	-0.067
Female	0.478	0.479	-0.003	0.478	0.479	-0.003
Asian (using post-2010 codes, mode since 2011)	0.162	0.134	0.135	0.162	0.134	0.135
Black (using post-2010 codes, mode since 2011)	0.022	0.020	0.072	0.022	0.020	0.072
Latinx (using post-2010 codes, mode since 2011)	0.256	0.286	-0.092	0.256	0.286	-0.092
White (using post-2010 codes, mode since 2011)	0.476	0.484	-0.019	0.476	0.484	-0.019
Multiracial (using post-2010 codes, mode since 2011)	0.073	0.070	0.023	0.073	0.070	0.023
Student received limited English proficiency services in given year	0.257	0.294	-0.111	0.257	0.294	-0.111
Special education in this year	0.068	0.072	-0.034	0.068	0.072	-0.034

Variables	Unmatched			Matched		
	FDK mean	HDK mean	Hedge's g/Cox's index	FDK mean	HDK mean	Hedge's g/Cox's index
Number of FDK students	672			672		
Number of HDK students	1207			1207		

Panel F: Grade 3 reading standardized assessment outcome

Variables	Unmatched			Matched		
	FDK mean	HDK mean	Hedge's g/Cox's index	FDK mean	HDK mean	Hedge's g/Cox's index
Standardized early literacy: English letter naming score	0.412	0.223	-0.169	0.412	0.223	-0.169
Early literacy: Test score for English letter sounds recognition	0.398	0.191	-0.173	0.398	0.191	-0.173
Early math: Raw score (number of correct responses items)	9.237	8.696	-0.156	9.237	8.696	-0.156
Approaches to learning: Combined average score for the two subdomains	3.805	3.741	-0.090	3.805	3.741	-0.090
Age on September 1 of first kindergarten year, in years	5.539	5.500	-0.134	5.539	5.500	-0.134
Free or reduced-price lunch in this year	0.355	0.377	-0.059	0.355	0.377	-0.059
Female	0.478	0.477	0.001	0.478	0.477	0.001
Asian (using post-2010 codes, mode since 2011)	0.162	0.135	0.131	0.162	0.135	0.131
Black (using post-2010 codes, mode since 2011)	0.022	0.020	0.072	0.022	0.020	0.072
Latinx (using post-2010 codes, mode since 2011)	0.260	0.286	-0.080	0.260	0.286	-0.080
White (using post-2010 codes, mode since 2011)	0.473	0.483	-0.024	0.473	0.483	-0.024
Multiracial (using post-2010 codes, mode since 2011)	0.073	0.071	0.015	0.073	0.071	0.015
Student received limited English proficiency services in given year	0.261	0.295	-0.102	0.261	0.295	-0.102
Special education in this year	0.070	0.073	-0.027	0.070	0.073	-0.027
Number of FDK students	674			674		
Number of HDK students	1211			1211		

Panel G: English language proficiency assessment reading, speaking, and writing outcomes, grade 1

Variables	Unmatched			Matched		
	FDK mean	HDK mean	Hedge's g/Cox's index	FDK mean	HDK mean	Hedge's g/Cox's index
Standardized early literacy: English letter naming score	-0.653	-0.626	0.040	-0.653	-0.623	0.045
Early literacy: Test score for English letter sounds recognition	-0.503	-0.519	-0.032	-0.503	-0.523	-0.041
Early math: Raw score (number of correct responses items)	6.416	6.585	0.058	6.416	6.851	0.149
Approaches to learning: Combined average score for the two subdomains	3.721	3.469	-0.342	3.721	3.653	-0.099
Age on September 1 of first kindergarten year, in years	5.483	5.473	-0.035	5.483	5.484	0.002
Free or reduced-price lunch in this year	0.826	0.743	0.298	0.826	0.802	0.096
Female	0.472	0.447	0.060	0.472	0.461	0.026
Asian (using post-2010 codes, mode since 2011)	0.090	0.172	-0.450	0.090	0.127	-0.232
Black (using post-2010 codes, mode since 2011)	0.028	0.016	0.353	0.028	0.019	0.227
Latinx (using post-2010 codes, mode since 2011)	0.753	0.698	0.166	0.753	0.744	0.030

Variables	Unmatched			Matched		
	FDK mean	HDK mean	Hedge's g/Cox's index	FDK mean	HDK mean	Hedge's g/Cox's index
White (using post-2010 codes, mode since 2011)	0.101	0.098	0.022	0.101	0.091	0.071
Multiracial (using post-2010 codes, mode since 2011)	0.011	0.013	-0.100	0.011	0.016	-0.226
Special education in this year	0.118	0.101	0.109	0.118	0.097	0.130
Number of FDK students	178			178		
Number of HDK students	378			308		

Panel H: English language proficiency assessment listening outcome, grade 1

Variables	Unmatched			Matched		
	FDK mean	HDK mean	Hedge's g/Cox's index	FDK mean	HDK mean	Hedge's g/Cox's index
Standardized early literacy: English letter naming score	-0.653	-0.627	0.038	-0.653	-0.624	0.043
Early literacy: Test score for English letter sounds recognition	-0.503	-0.519	-0.033	-0.503	-0.523	-0.042
Early math: Raw score (number of correct responses items)	6.416	6.578	0.056	6.416	6.841	0.146
Approaches to learning: Combined average score for the two subdomains	3.721	3.468	-0.344	3.721	3.652	-0.102
Age on September 1 of first kindergarten year, in years	5.483	5.473	-0.036	5.483	5.484	0.001
Free or reduced-price lunch in this year	0.826	0.744	0.296	0.826	0.803	0.093
Female	0.472	0.446	0.063	0.472	0.460	0.030
Asian (using post-2010 codes, mode since 2011)	0.090	0.172	-0.448	0.090	0.126	-0.230
Black (using post-2010 codes, mode since 2011)	0.028	0.016	0.355	0.028	0.019	0.229
Latinx (using post-2010 codes, mode since 2011)	0.753	0.699	0.163	0.753	0.744	0.027
White (using post-2010 codes, mode since 2011)	0.101	0.098	0.024	0.101	0.091	0.073
Multiracial (using post-2010 codes, mode since 2011)	0.011	0.013	-0.098	0.011	0.016	-0.224
Special education in this year	0.118	0.103	0.093	0.118	0.100	0.110
Number of FDK students	178			178		
Number of HDK students	379			309		

Panel I: English language proficiency assessment reading, writing, and speaking outcomes, grade 2

Variables	Unmatched			Matched		
	FDK mean	HDK mean	Hedge's g/Cox's index	FDK mean	HDK mean	Hedge's g/Cox's index
Standardized early literacy: English letter naming score	-0.682	-0.749	-0.118	-0.691	-0.690	0.001
Early literacy: Test score for English letter sounds recognition	-0.502	-0.581	-0.183	-0.500	-0.481	0.037
Early math: Raw score (number of correct responses items)	6.233	6.216	-0.007	6.221	6.823	0.225
Approaches to learning: Combined average score for the two subdomains	3.670	3.404	-0.361	3.671	3.682	0.015
Age on September 1 of first kindergarten year, in years	5.480	5.460	-0.065	5.478	5.518	0.134
Free or reduced-price lunch in this year	0.840	0.794	0.187	0.846	0.823	0.100
Female	0.413	0.412	0.004	0.409	0.424	-0.036
Asian (using post-2010 codes, mode since 2011)	0.067	0.147	-0.533	0.067	0.063	0.038

Variables	Unmatched			Matched		
	FDK mean	HDK mean	Hedge's g/Cox's index	FDK mean	HDK mean	Hedge's g/Cox's index
Black (using post-2010 codes, mode since 2011)	0.033	0.010	0.755	0.027	0.019	0.214
Latinx (using post-2010 codes, mode since 2011)	0.800	0.758	0.147	0.805	0.785	0.076
White (using post-2010 codes, mode since 2011)	0.080	0.072	0.070	0.081	0.114	-0.232
Multiracial (using post-2010 codes, mode since 2011)	0.013	0.010	0.188	0.013	0.013	0.036
Special education in this year	0.140	0.111	0.160	0.141	0.196	-0.240
Number of FDK students	150			149		
Number of HDK students	306			158		

Panel J: English language proficiency assessment listening outcome, grade 2

Variables	Unmatched			Matched		
	FDK mean	HDK mean	Hedge's g/Cox's index	FDK mean	HDK mean	Hedge's g/Cox's index
Standardized early literacy: English letter naming score	-0.682	-0.750	-0.120	-0.696	-0.764	-0.124
Early literacy: Test score for English letter sounds recognition	-0.502	-0.581	-0.184	-0.499	-0.588	-0.215
Early math: Raw score (number of correct responses items)	6.233	6.208	-0.009	6.209	6.642	0.162
Approaches to learning: Combined average score for the two subdomains	3.670	3.403	-0.363	3.667	3.692	0.036
Age on September 1 of first kindergarten year, in years	5.480	5.460	-0.065	5.477	5.492	0.050
Free or reduced-price lunch in this year	0.840	0.795	0.184	0.845	0.827	0.078
Female	0.413	0.410	0.007	0.412	0.419	-0.017
Asian (using post-2010 codes, mode since 2011)	0.067	0.147	-0.531	0.068	0.061	0.061
Black (using post-2010 codes, mode since 2011)	0.033	0.010	0.757	0.020	0.017	0.117
Latinx (using post-2010 codes, mode since 2011)	0.800	0.759	0.145	0.811	0.832	-0.089
White (using post-2010 codes, mode since 2011)	0.080	0.072	0.072	0.081	0.067	0.124
Multiracial (using post-2010 codes, mode since 2011)	0.013	0.010	0.190	0.014	0.017	-0.132
Special education in this year	0.140	0.114	0.142	0.142	0.173	-0.143
Number of FDK students	150			148		
Number of HDK students	307			179		

Panel K: English language proficiency assessment reading and writing outcomes, grade 3

Variables	Unmatched			Matched		
	FDK mean	HDK mean	Hedge's g/Cox's index	FDK mean	HDK mean	Hedge's g/Cox's index
Standardized early literacy: English letter naming score	-0.727	-0.824	-0.187	-0.740	-0.807	-0.126
Early literacy: Test score for English letter sounds recognition	-0.546	-0.602	-0.144	-0.544	-0.596	-0.140
Early math: Raw score (number of correct responses items)	6.196	6.000	-0.071	6.179	6.327	0.052
Approaches to learning: Combined average score for the two subdomains	3.590	3.359	-0.306	3.590	3.594	0.004
Age on September 1 of first kindergarten year, in years	5.488	5.466	-0.071	5.485	5.499	0.046

Variables	Unmatched			Matched		
	FDK mean	HDK mean	Hedge's g/Cox's index	FDK mean	HDK mean	Hedge's g/Cox's index
Free or reduced-price lunch in this year	0.907	0.805	0.515	0.915	0.918	-0.025
Female	0.393	0.412	-0.048	0.387	0.428	-0.102
Asian (using post-2010 codes, mode since 2011)	0.065	0.109	-0.335	0.066	0.082	-0.139
Black (using post-2010 codes, mode since 2011)	0.028	0.009	0.695	0.019	0.013	0.249
Latinx (using post-2010 codes, mode since 2011)	0.832	0.801	0.125	0.840	0.824	0.068
White (using post-2010 codes, mode since 2011)	0.065	0.072	-0.066	0.066	0.069	-0.030
Multiracial (using post-2010 codes, mode since 2011)	0.009	0.009	0.020	0.009	0.013	-0.176
Special education in this year	0.168	0.104	0.335	0.170	0.126	0.213
Number of FDK students	107			106		
Number of HDK students	221			159		

Panel L: English language proficiency assessment speaking outcome, grade 3

Variables	Unmatched			Matched		
	FDK mean	HDK mean	Hedge's g/Cox's index	FDK mean	HDK mean	Hedge's g/Cox's index
Standardized early literacy: English letter naming score	-0.723	-0.825	-0.195	-0.734	-0.816	-0.154
Early literacy: Test score for English letter sounds recognition	-0.544	-0.601	-0.145	-0.541	-0.595	-0.145
Early math: Raw score (number of correct responses items)	6.160	6.005	-0.057	6.154	6.297	0.051
Approaches to learning: Combined average score for the two subdomains	3.588	3.354	-0.310	3.612	3.585	-0.038
Age on September 1 of first kindergarten year, in years	5.492	5.466	-0.085	5.487	5.497	0.034
Free or reduced-price lunch in this year	0.906	0.806	0.505	0.913	0.897	0.116
Female	0.396	0.410	-0.034	0.394	0.430	-0.090
Asian (using post-2010 codes, mode since 2011)	0.066	0.108	-0.326	0.067	0.085	-0.151
Black (using post-2010 codes, mode since 2011)	0.028	0.009	0.704	0.010	0.012	-0.141
Latinx (using post-2010 codes, mode since 2011)	0.830	0.802	0.115	0.846	0.824	0.096
White (using post-2010 codes, mode since 2011)	0.066	0.072	-0.057	0.067	0.067	0.006
Multiracial (using post-2010 codes, mode since 2011)	0.009	0.009	0.028	0.010	0.012	-0.141
Special education in this year	0.170	0.108	0.316	0.173	0.133	0.186
Number of FDK students	106			104		
Number of HDK students	222			165		

Panel M: English language proficiency assessment listening outcome, grade 3

Variables	Unmatched			Matched		
	FDK mean	HDK mean	Hedge's g/Cox's index	FDK mean	HDK mean	Hedge's g/Cox's index
Standardized early literacy: English letter naming score	-0.727	-0.821	-0.179	-0.738	-0.811	-0.138
Early literacy: Test score for English letter sounds recognition	-0.546	-0.602	-0.146	-0.543	-0.597	-0.149
Early math: Raw score (number of correct responses items)	6.196	5.973	-0.081	6.190	6.249	0.021
Approaches to learning: Combined average score for the two subdomains	3.590	3.344	-0.324	3.613	3.565	-0.068

Variables	Unmatched			Matched		
	FDK mean	HDK mean	Hedge's g/Cox's index	FDK mean	HDK mean	Hedge's g/Cox's index
Age on September 1 of first kindergarten year, in years	5.488	5.463	-0.083	5.483	5.495	0.040
Free or reduced-price lunch in this year	0.907	0.809	0.501	0.914	0.899	0.107
Female	0.393	0.404	-0.030	0.390	0.426	-0.089
Asian (using post-2010 codes, mode since 2011)	0.065	0.111	-0.351	0.067	0.089	-0.187
Black (using post-2010 codes, mode since 2011)	0.028	0.009	0.706	0.010	0.012	-0.133
Latinx (using post-2010 codes, mode since 2011)	0.832	0.800	0.128	0.848	0.822	0.110
White (using post-2010 codes, mode since 2011)	0.065	0.071	-0.054	0.067	0.065	0.015
Multiracial (using post-2010 codes, mode since 2011)	0.009	0.009	0.031	0.010	0.012	-0.133
Special education in this year	0.168	0.116	0.264	0.171	0.142	0.135
Number of FDK students	107			105		
Number of HDK students	225			169		

Panel N: Retained by grade 3 and disciplined by grade 3 outcomes

Variables	Unmatched			Matched		
	FDK mean	HDK mean	Hedge's g/Cox's index	FDK mean	HDK mean	Hedge's g/Cox's index
Standardized early literacy: English letter naming score	0.389	0.198	-0.171	0.389	0.198	-0.171
Early literacy: Test score for English letter sounds recognition	0.380	0.174	-0.173	0.380	0.174	-0.173
Early math: Raw score (number of correct responses items)	9.177	8.601	-0.165	9.177	8.601	-0.165
Approaches to learning: Combined average score for the two subdomains	3.782	3.703	-0.106	3.782	3.703	-0.106
Age on September 1 of first kindergarten year, in years	5.535	5.496	-0.133	5.535	5.496	-0.133
Free or reduced-price lunch in this year	0.359	0.382	-0.060	0.359	0.382	-0.060
Female	0.473	0.470	0.008	0.473	0.470	0.008
Asian (using post-2010 codes, mode since 2011)	0.161	0.136	0.122	0.161	0.136	0.122
Black (using post-2010 codes, mode since 2011)	0.026	0.020	0.152	0.026	0.020	0.152
Latinx (using post-2010 codes, mode since 2011)	0.259	0.281	-0.067	0.259	0.281	-0.067
White (using post-2010 codes, mode since 2011)	0.473	0.483	-0.025	0.473	0.483	-0.025
Multiracial (using post-2010 codes, mode since 2011)	0.071	0.073	-0.019	0.071	0.073	-0.019
Student received limited English proficiency services in given year	0.264	0.292	-0.086	0.264	0.292	-0.086
Special education in this year	0.076	0.088	-0.090	0.076	0.088	-0.090
Number of FDK students	694			694		
Number of HDK students	1280			1280		

FDK is full-day kindergarten. HDK is half-day kindergarten.
Source: Authors' analysis of data from the Oregon Department of Education and one large Oregon school district.

The study team estimated the ordinary least squares model shown in equation 1 for each cohort of interest—the 2013/14 and 2014/15 kindergarten cohorts—for the continuous outcomes of interest: grade 3 math and reading assessment scores (transformed into z-scores), attendance in kindergarten to grade 3, and English proficiency (only for English learner students) in grades 1, 2, and 3.

$$Y_{is} = \alpha + \beta K_i + \gamma X_i + \delta C_s + \varepsilon_{is} \qquad (1),$$

where Y_{is} is the dependent variable for student *i* in school *s;* K_i is a binary indicator for whether the student attended an FDK program (students with a "0" for this indicator are in the comparison group of HDK students); X_i is a vector of student characteristics (measured in kindergarten); C_s is a vector of school characteristics; and ε_{is} is an error term that includes both idiosyncratic error and a clustered (group) error at the school level. The student-level covariates X_i were age at kindergarten entry; gender; indicators for the following racial/ethnic groups: Asian, Latinx, White, and a combined group of American Indian and Alaska Native, Black, multiracial, and Native Hawaiian and other Pacific Islander students;[3] kindergarten entry assessment domain scores (early literacy letter naming, early literacy letter sound recognition, early math, approaches to learning average score); indicators for the grades the student was in the district (kindergarten through grade 3, kindergarten through grade 2, kindergarten through grade 1, and kindergarten only); and kindergarten eligibility/identification for free or reduced-price lunch, IEP services, and English learner services. (Student-level weights were not employed since baseline equivalence was achieved through removing observations for which there was no corresponding observation in the treatment group.) School-level covariates included percentage of students who are 6 years old or older at time of kindergarten entry, number of students enrolled, percentage of students proficient in reading and math (not included for test score outcomes), percentage of Latinx students, percentage of combined Black and Native Hawaiian and other Pacific Islander students, percentage of students eligible for free or reduced-price lunch, percentage of English learner students, and percentage of students with an IEP.

For the binary outcomes of interest—retained by grade 3 or involved in a disciplinary event by grade 3—the study team modified this approach to use a logistic regression model (equation 2):

$$\log\left(\frac{P_i}{1-P_i}\right) = \alpha + \beta K_i + \gamma X_i + \delta C_s + \varepsilon_{is} \qquad (2),$$

where P_i is the probability of the event for the binary outcome measure for student *i*, K_i is a binary indicator for whether the student attended FDK, X_i is a vector of student characteristics (measured in kindergarten), C_s is a vector of school characteristics, and ε_{is} is an error term that includes both idiosyncratic error and a clustered (group) error at the school level.

The study team also conducted student group analyses, looking at the impact of FDK on kindergarten through grade 3 attendance and grade 3 test score outcomes for certain student groups, focusing on historically disadvantaged groups. These groups were Latinx students; American Indian and Alaska Native, Black, multiracial, and Native Hawaiian and other Pacific Islander students; students eligible for free or reduced-price lunch, and English learner students. The group analyses consisted of the same ordinary least squares model specified in equation 1 but with an interaction term between the FDK indicator and group characteristic. The study team specified for the analysis that the reference category is HDK students of the group of interest, which results in a coefficient that can be interpreted as the impact of FDK on students of the group of interest (as well as two additional coefficients related to the group of students not in the group of interest).

[3] These groups had small numbers in the data and thus needed to be combined for matching and analysis in order to include them in the sample.

In addition, the study team examined whether the impact of FDK on kindergarten through grade 3 attendance and grade 3 test score outcomes differed by student age at kindergarten entry, as well as by the school characteristic of the percentage of economically disadvantaged students at the school. For continuous characteristics (age at kindergarten entry and percentage of economically disadvantaged students at the school), the analysis model used equation 1 but added an interaction term with the FDK indicator multiplied against the continuous variable of interest.

Missing data

The study team examined the extent of missing data in the ODE administrative data, the district administrative data, the FDK district survey, and the FDK practices survey. Within the matched sample of students in the district, missing data for outcomes and key demographic information did not exceed 7.51 percent of students in the administrative data. For the FDK district survey, only 3 percent of districts were missing in 2013/14 and 4 percent in 2014/15. In the FDK practices survey, the response rates for teachers and principals were not representative. Thus, these data should be considered examples of district practices, and these results include caveats in the report.

Protocols

The survey protocols ODE administered are included below for reference. For the FDK practices survey, items prefaced with "ECLS-K" indicate the Early Childhood Longitudinal Study-Kindergarten item number that they correspond with to facilitate ease of comparing survey results in Oregon to the national survey.

Full-day kindergarten practices survey – kindergarten teachers and principals

The Oregon Department of Education (ODE) would like to understand how kindergarten teachers and principals are implementing FDK across the state. The purpose of this survey is to help ODE craft policy and support schools in this area.

This survey asks you about classroom practices and your perspective on FDK. It should take no more than 15 minutes to complete. There are no risks to filling out this survey, and your participation is voluntary. There are no consequences if you choose not to participate. Your answers are confidential and will only be seen by ODE personnel and research partners at Education Northwest and the RAND Corporation. A report with aggregated survey results will be published. Your school will only be used to link your response to your school characteristics. Your individual responses will never be published along with your school name. You may choose not to participate, decline to answer any question, or exit the survey at any time.

If you have any questions regarding this survey, please contact [ROLE] [NAME] [EMAIL] [PHONE].

Do you agree to participate in this survey?

- Yes [*if yes, proceed to Q1]*
- No [*if no, exit survey to screen saying: "Thank you for considering taking this survey."]*

Section I. Background information

1. What is your role? *required
    - Teacher [go to Q2]
    - Principal [go to Q5]
    - Other (please specify) [go to Q5]

(If Q1 = teacher)

2. What grade do you teach? [dropdown]
    - If not K, skip to thank-you page.

3. Including the current school year, how many years have you taught kindergarten in Oregon public schools? [field restricted to numbers]

4. Have you ever taught preschool-age children? [yes/no]

5. (If Q1 = principal or other) Have you ever taught preschool-age children or kindergarten? [yes/no]

6. (If Q1 = other) Do you work at multiple school sites? *required
    - Yes (skip to district question)
    - No (proceed to school question)

7. What school do you currently work at? [text box with predictive text to fill in names] *required

8. What district do you currently work at? [text box with predictive text to fill in names] *required

9. What is the highest level of education you have completed?
    - Bachelor's degree
    - Master's degree
    - Doctorate
    - Other (please specify)

10. [ECLS-K: C4] Which best describes your race/ethnicity? Mark one or more to indicate what you consider yourself to be.
    - American Indian or Alaska Native
    - Asian
    - Black or African American
    - Hispanic or Latino
    - Native Hawaiian or other Pacific Islander
    - White

** If Q1=teacher, continue to Section II. Otherwise skip to Section IV.**

Section II. Schedule and program features

11. [ECLS-K: A2.] How many hours per day does your class normally meet? [dropdown with half hour increments]

12. [ECLS-K: A13.] In a typical day, how much time does a child in your class spend in the following activities? Mark one response on each row. Do not include lunch or recess breaks. [table with radio buttons]

	No time	Half hour or less	About one hour	About two hours	About three hours	Four hours or more
Teacher-directed whole class activities						
Teacher-directed small group activities						
Teacher-directed individual activities						
Child-selected activities						

13. [ECLS-K: B9.] In a typical day, how much time do children in your class spend in the following activities? Mark one on each row. [table with radio buttons]

	No time	1-15 minutes	16-30 minutes	31-45 minutes	Longer than 45 minutes
Lunch					
Free play indoors					
Free play outdoors (including recess)					

14. [ECLS-K: A14.] Does your classroom have the following interest areas or centers for activities? Mark yes or no on each row. (table with radio buttons)
    a. Reading area with books
    b. Listening center
    c. Writing center or area
    d. Math area with manipulatives
    e. Area for playing with puzzles and blocks (Legos, etc.)
    f. Water or sand table
    g. Computer area
    h. Science or nature area with manipulatives
    i. Dramatic play area or corner
    j. Art area

15. What kindergarten curriculum do you use, if any? Please check all that apply.
    a. Benchmark Literacy Common Core K-6
    b. Bridges in Mathematics
    c. Building Blocks of Science
    d. Everyday Mathematics
    e. Exploring Science
    f. GO Math!
    g. Health and Wellness
    h. Imagine Learning (English Language Proficiency)
    i. Inspire Science

j. Journeys K–6
k. Math Expressions
l. My Math
m. Reach for Reading
n. Reach Level A/Kindergarten, Levels B-C (English Language Proficiency)
o. Reading Wonders Grades K-6
p. Ready Common Core Mathematics
q. Science Techbook
r. Scott Foresman Reading Street
s. STEMscopes Oregon
t. Stepping Stones
u. The Great Body Shop
v. Other (please specify)

16. [ECLS-K: B2a.] In an average week, how <u>often</u> does the typical child in your class participate in these general subject areas, whether as a whole class, in small groups, or in individualized arrangements? Mark one on each row. (table with radio buttons)

	Never	Less than once a week	1 day a week	2 days a week	3 days a week	4 days a week	5 days a week
Reading and language arts							
Mathematics							
Social studies							
Science							
Music							
Art							
Physical education							

17. [ECLS-K: B2b.] On the days children work in these areas, how much time does the typical child in your class spend in these general subject areas? Mark one on each row. (table with radio buttons)

	Not applicable / never	Less than ½ hour	½ hour to less than 1 hour	1 hour to less than 1 ½ hours	1 ½ hours to less than 2 hours	2 hours to less than 2 ½ hours	2 ½ hours to less than 3 hours	3 hours or more
Reading and language arts								
Mathematics								
Social studies								
Science								

	Not applicable / never	Less than ½ hour	½ hour to less than 1 hour	1 hour to less than 1 ½ hours	1 ½ hours to less than 2 hours	2 hours to less than 2 ½ hours	2 ½ hours to less than 3 hours	3 hours or more
Music								
Art								
Physical education								

18. In your kindergarten program, do you do any of the following things? Please check all that apply.
    - Literacy block
    - Vocabulary development
    - Math block
    - Hands-on learning
    - Child-directed activities
    - Students using technology
    - Explicit teaching of social, emotional, and behavioral skills
    - Cooperative group activities
    - Active play
    - Observational assessment
    - Library
    - Structured interaction with children in other grades
    - Family engagement opportunities
    - Home visits

19. Do you have a 90-minute literacy block in your classroom?
    - Yes [*continue]*
    - No [*skip next question]*
    - Not sure [*skip next question]*

20. How often do you have a 90-minute literacy block in your classroom?
    - Less than 1 day a week
    - 1 day a week
    - 2 days a week
    - 3 days a week
    - 4 days a week
    - 5 days a week

21. In which area(s) would you like to devote more class time than you are currently able to devote? Please select your top <u>three</u> priority areas from the list below.
    - Reading and language arts
    - Mathematics
    - Social studies
    - Science

- Music
- Art
- Physical education
- Play
- Social and emotional learning
- Self-regulation
- Complex problem solving
- Critical thinking
- Time to build classroom community
- Other (please specify)

22. What kindergarten transition practices/supports are available for your students? Please check all that apply.
    - Website with information about kindergarten
    - Kindergarten handbook or other written information about the kindergarten program sent home to parents
    - Preschool visits to kindergarten
    - Entering kindergarteners attend a summer transition program
    - Parents and children visit kindergarten prior to the start of the school year
    - Parents attend an orientation prior to the school year (open house, roundup, etc.)
    - Soft start (e.g., delayed or staggered schedule)
    - Kindergarten classroom starts out looking like a preschool classroom
    - Kindergarten teacher visits children's homes
    - Kindergarten teachers meet with preschool/preK teachers to share information
    - Kindergarten teacher participates in school-age special education transition meeting
    - Other (please specify)

23. How do you use the results of the Oregon Kindergarten Assessment in your classroom?
    [Open ended]

24. What support or materials would you like that could help you use the results of the Oregon Kindergarten Assessment in your classroom more effectively?
    [Open ended]

25. How familiar are you with Oregon's Early Learning and Kindergarten Guidelines?
    - Not familiar at all
    - Somewhat familiar
    - Moderately familiar
    - Very familiar

26. To what extent do you use Oregon's Early Learning and Kindergarten Guidelines to inform your instruction?
    - Not at all
    - To some extent
    - To a moderate extent
    - To a great extent

27. [if “Not at all”] What supports would you need to start using the guidelines to inform your instruction? [text box]

Section III. Professional Development

28. [ECLS-K: F2.revised] What kind(s) of professional development do you find most helpful for learning new information/skills and applying knowledge in your classroom? Please select your top **three** types of professional development from the list below.
    a. Workshops involving study groups or small-group problem-solving
    b. Direct instruction from an outside consultant on a specific topic
    c. Peer observation and feedback
    d. Visits to, or observations of, other schools
    e. Release time for attending professional conferences
    f. Enrollment in college or university courses related to your profession
    g. Professional development via distance learning (web-based classes, etc.)
    h. Workshops on using computers and technology in the classroom
    i. Peer collaboration or peer learning communities
    j. Other (please specify)

29. In which area(s) do you feel you need additional professional development or other supports for **managing student behavior** in your classroom? Please check all that apply.
    - Classroom behavior management strategies
    - Social and emotional learning
    - Trauma-informed practices
    - Other (please specify)

Section IV. Principal or Other questions

30. Does your school/district offer preschool?
    - Yes (go to next question)
    - No (skip to joint PD question)

31. How is preschool funded in your school or district? Please check all that apply.
    - District
    - Community
    - Head Start
    - Preschool Promise
    - Other (please specify)

32. How well does the preschool curriculum align with the kindergarten curriculum?
    - Not aligned at all
    - Somewhat aligned
    - Moderately aligned
    - Completely aligned
    - Not sure
    - Not applicable

33. Does your school/district ever have joint professional development for kindergarten and preschool teachers? [yes/no]

34. [if yes to previous question] What kind(s) of professional development are held jointly for preschool and kindergarten teachers? Please check all that apply.
    a. Workshops involving study groups or small-group problem solving
    b. Direct instruction from an outside consultant on a specific topic
    c. Peer observation and feedback
    d. Visits to, or observations of, other schools
    e. Release time for attending professional conferences
    f. Enrollment in college or university courses related to their profession
    g. Professional development via distance learning (web-based classes, etc.)
    h. Workshops on using computers and technology in the classroom
    i. Peer collaboration or peer learning communities
    j. Other (please specify)

35. What kindergarten transition practices/supports are available for your students? Please check all that apply.
    - Website with information about kindergarten
    - Kindergarten handbook or other written information about the kindergarten program sent home to parents
    - Preschool visits to kindergarten
    - Entering kindergarteners attend a summer transition program
    - Parents and children visit kindergarten prior to the start of the school year
    - Parents attend an orientation prior to the school year (open house, roundup, etc.)
    - Soft start (e.g., delayed or staggered schedule)
    - Kindergarten classroom starts out looking like a preschool classroom
    - Kindergarten teacher visits children's homes
    - Kindergarten teachers meet with preschool/preK teachers to share information
    - Kindergarten teacher participates in school-age special education transition meeting
    - Other (please specify)

36. Are any children in your school/district placed in a full-day kindergarten program for only a half day?
    - Yes [*continue*]
    - No [*skip to joint PD question*]

37. Why are these children placed in a full-day kindergarten program for only a half day?
[Open text]

38. Are there plans to reintroduce these children to a full-day schedule during kindergarten?
    - Yes
    - No
    - Not sure

39. Does your school/district ever have joint professional development for kindergarten and grade 1–3 teachers? [yes/no]

40. How well does the kindergarten reading and language arts curriculum in your school or district align with the grade 1–3 curriculum?
    - Not aligned at all
    - Somewhat aligned
    - Moderately aligned
    - Completely aligned
    - Not sure

41. How well does the kindergarten mathematics curriculum in your school or district align with the grade 1–3 curriculum?
    - Not aligned at all
    - Somewhat aligned
    - Moderately aligned
    - Completely aligned
    - Not sure

42. Does your district have a preK–grade 3 coordinator or a similar position where a staff member is tasked with ensuring alignment from preschool through third grade?
    - Yes
    - No
    - Not sure

43. How confident are you in leading early educators in your school/district?
    - Not at all confident
    - Somewhat confident
    - Moderately confident
    - Very confident

44. What topics would you like support in to increase your confidence in leading early educators? [text box]

45. Does your school/district use specific classroom management strategies to manage student behavior (such as Positive Behavior Interventions & Supports, or PBIS)?
    - Yes
    - No
    - Not sure

43. If yes, which classroom management strategies or framework do you use? [text box]

44. To what extent is your school/district implementing trauma-informed practices?

    - Not at all
    - To some extent
    - To a moderate extent
    - To a great extent

Section V. Share your materials

45. Are you willing to share written information about how you structure your kindergarten classroom? Examples include schedules, guidance from principals or fellow teachers, family outreach materials, professional development materials, other conceptual guidance/models, curriculum, or anything else in writing that is distributed at the board/district/school level. We need these materials to help us understand how kindergarten programs are implemented in Oregon.
    - Yes [*continue]*
    - No [*skip next question]*

46. What is your email address? We will email you to ask for materials and will not connect your email address or any materials you provide with your survey responses. [text box]

Closing:

Do you have any additional thoughts on full-day kindergarten or feedback on this survey that you would like to share with us? If so, please use the space below. [text box]

Thank you for completing this survey. Your answers will help ODE support full-day kindergarten implementation across the state.

[if principal/other]

Please also send the survey to all of your kindergarten teachers. ODE would like to hear their perspectives and learn about classroom practices. Teachers can access the survey here: [link]

Full-day kindergarten district survey

1. District name
2. Contact name
3. Contact email address
4. Contact phone number
5. Does your district offer half-day kindergarten? Districtwide/in some schools/do not offer
6. Does your district offer full-day kindergarten? Y/N
7. Is full-day kindergarten open to all students? Y/N
8. If not open to all students, how are the full-day students selected? Risk factors/Lottery/Not applicable/Other
9. How many schools in your district are offering full-day kindergarten in the [2013/14–2014/15] school year?
10. How many full-day kindergarten classes are in your district in the [2013/14–2014/15] school year?
11. How many students in your district are participating in full-day kindergarten (as of November 1, 2013/October 1, 2014)?
12. How is full-day kindergarten funded in your district's schools? District funds/Title I funds/Charter funds/School Improvement Grant funds/Parent tuition/Other
13. How many days per week do students attend full-day kindergarten? 3 days per week/4 days per week/4.5 days per week/5 days per week/2 days one week, 3 days the next week

14. How many days per week do first graders attend school?
15. [2014/15 only] How many HOURS PER DAY do children attend full-day kindergarten?
16. Are you planning to offer full-day kindergarten in the [2014-15/2015-16/2016-17] school year? Yes, district wide/Yes, in some schools/No
17. [2014/15 only] Does your district operate a preschool program?
18. [2014/15 only] How many SCHOOLS are offering district-run preschool programs? - Open-Ended Response
19. [2014/15 only] How are district-run preschool programs funded?
20. [2014/15 only] Does your district plan to offer preschool in 2015-16?
21. [2013/14 only] What types of training or resources on the subject of full day kindergarten would be most helpful to your district? Check all that apply.

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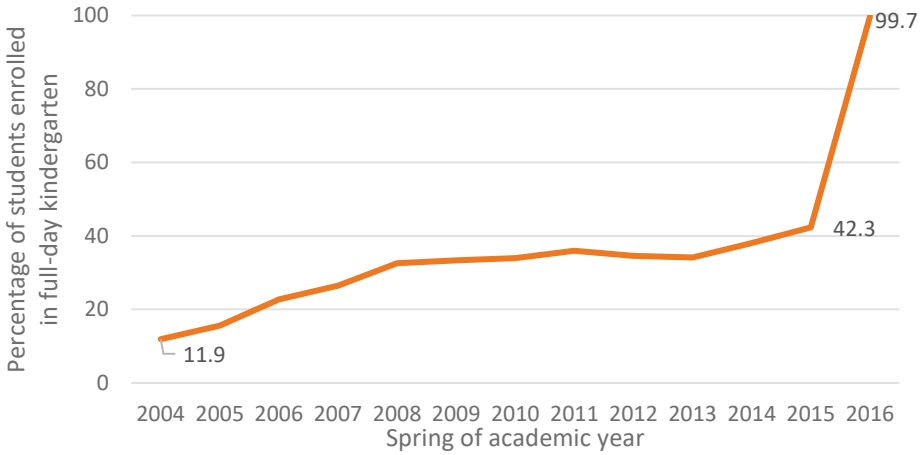
Appendix C. Supporting analysis

This appendix presents results referenced in the findings section of the main report as well as a figure referenced in the first section.

Figure C1. The percentage of Oregon kindergarten students enrolled in full-day kindergarten programs grew from 11.9 percent in 2003/04 to 42.3 percent in 2014/15 and then to nearly 100 percent after the policy shift in 2015/16



Note: These numbers are estimates based on responses to the full-day kindergarten district survey conducted by the Oregon Department of Education. This figure is recreated from a published Oregon Department of Education figure; calculations were not made by the study team, as data were only available to the team for 2013/14 and 2014/15. The question on the survey was: "How many students in your district are participating in full-day kindergarten as of [fall date], [year]?" and the denominator was all kindergarten students enrolled in the fall of that academic year.
Source: Oregon Department of Education (2016a, 2016b).

Table C1. Percentages of districts using different funding sources among those districts offering full-day kindergarten, 2013/14 and 2014/15

Funding sources of full-day kindergarten	2013/14 (percentage)	2014/15 (percentage)
District funding	81.7	80.2
Title I funds	33.3	27.0
Charter funds	2.5	1.6
Parent tuition	13.3	10.3
Other sources	5.0	4.8

Source: Authors' analysis of the Oregon Department of Education 2013/14 and 2014/15 full-day kindergarten district survey.

Table C2. Summary statistics and percentages of hours per day and days per week of full-day kindergarten among those districts offering full-day kindergarten and among one large Oregon school district in the study, 2014/15

Data element	All FDK districts	Large Oregon district in study
Hours per day of FDK		
Average	6.6	6.5
Minimum	4.25	na
Maximum	10	na
Hours per day of FDK (percentages)		
Less than 6 hours	5.6	0
6 to 7.5 hours	90.5	100
More than 7.5 hours	4.0	0
Days per week of FDK		
Average	4.6	5
Minimum	2.5	na
Maximum	5	na
Days per week of FDK (percentages)		
Less than 4 days	1.6	0
4 to 5 days	98.4	100

FDK is full-day kindergarten. na is not applicable.
Note: Percentages may not sum to 100 due to rounding.
Source: Authors' analysis of the Oregon Department of Education 2014/15 full-day kindergarten district survey.

Table C3. Characteristics of districts offering only full-day kindergarten, districts offering both full-day and half-day kindergarten, districts offering only half-day kindergarten, districts with unknown kindergarten status, and the state, 2013/14 and 2014/15

	Districts offering FDK only		Districts offering FDK and HDK		Districts offering HDK only		Unknown FDK/HDK status		State	
	2013/14	2014/15	2013/14	2014/15	2013/14	2014/15	2013/14	2014/15	2013/14	2014/15
Number of districts	82	79	38	47	60	52	9	10	189	188
Number of schools	145	155	361	373	206	170	12	26	724	724
Number of rural schools	100	88	41	76	80	57	10	10	231	231
Percentage of rural schools	69.0	56.8	11.4	20.4	38.8	33.5	83.3	38.5	31.9	31.9
Number of kindergarten students	7,634	8,592	24,992	24,429	11,808	9,266	115	1,129	44,549	43,416
Number of full-day kindergarten classes	—	—	—	—	—	—	na	na	715	699
Percentages:										
American Indian and Alaska Native	3.0	2.3	0.6	0.7	1.4	1.6	[a]	[a]	1.2	1.2
Asian	2.3	3.0	4.7	4.6	1.4	1.1	[a]	3.5	3.4	3.5
Native Hawaiian and other Pacific Islander	0.5	0.7	1.0	0.8	0.4	0.3	[a]	[a]	0.7	0.7
Black	2.4	3.0	3.1	3.0	1.1	0.8	[a]	0.9	2.4	2.5
Latinx	27.4	29.2	27.2	26.7	22.5	20.4	20.9	17.6	25.9	25.6
White	58.8	56.0	56.8	58.1	67.2	70.0	66.1	71.2	59.9	60.6
Multiracial	5.6	5.8	6.7	6.0	6.1	5.9	12.2	5.4	6.4	5.9
Female	48.6	48.7	48.9	48.1	47.8	47.1	51.3	46.9	48.5	48.0
English learner	18.4	21.6	21.2	20.2	13.1	10.6	[a]	11.5	18.5	18.2
Students with an individualized education program	10.7	11.3	10.7	11.0	11.1	12.1	[a]	8.1	10.8	11.2
Economically disadvantaged	68.0	70.3	52.9	55.8	58.2	60.3	41.7	41.1	56.9	59.2
Retained (repeated grade) by grade 3	5.7	4.4	3.5	3.8	4.0	4.5	13.9	3.7	4.0	4.1
Disciplined by grade 3	7.4	6.8	5.4	5.2	5.7	5.4	9.6	2.7	5.8	5.5
Proficient in math in grade 3	31.0	31.3	39.8	40.0	35.6	37.2	40.0	49.4	37.2	37.9
Proficient in reading in grade 3	30.3	31.8	39.3	40.5	35.2	37.4	44.3	48.3	36.7	38.3
Average annual attendance rate in kindergarten	92.6	92.2	94.5	93.9	93.4	93.6	94.6	94.4	93.9	93.5

— is not available. FDK is full-day kindergarten. HDK is half-day kindergarten. na is not applicable.

Note: Unknown FDK/HDK status refers to districts that did not respond to the Oregon Department of Education 2013/14 and 2014/15 full-day kindergarten district survey.

a. Data not shown due to small student numbers.

Source: Authors' analysis of the Oregon Department of Education 2013/14 and 2014/15 full-day kindergarten district survey.

Table C4. Characteristics of full-day kindergarten, half-day kindergarten, and all students in the large Oregon district, 2013/14 and 2014/15

	Half-day kindergarten		Full-day kindergarten		District	
	2013/14	2014/15	2013/14	2014/15	2013/14	2014/15
Number of kindergarten students	2072	1974	827	899	2900	2876
English learner	26.8	27.3	24.1	25.9	26	26.8
Students with an individualized education program	9.4	10.0	6.8	7.6	8.7	9.5
American Indian and Alaska Native	0.05	0.03	0.01	0.04	0.04	0.03
Asian	13.8	13.8	16.3	15.6	14.6	14.4
Native Hawaiian and other Pacific Islander	0.07	0.06	.05	0.04	0.06	0.06
Black	2.1	2.2	2.5	3.0	2.2	2.4
Latinx	28.1	27.1	26.6	26.5	27.7	26.9
White	46.7	48.2	46.1	47.6	46.5	48.1
Multiracial	8.1	7.8	7.9	6.5	8.0	7.3
Female	49.1	46.7	49.5	48.7	49.2	47.3
Economically disadvantaged	44.3	40.2	37.6	39.5	42.3	40.0
Retained (repeated grade)	0.06	0.01	0.08	0	0.07	0
Disciplined	1.4	1.2	1.5	1.6	1.4	1.3
Average annual attendance rate	96.2	94.4	95.7	95.3	96.1	94.7
Average grade 3 reading score (standardized)	0.21	0.24	0.45	0.42	0.28	.30
Average grade 3 math score (standardized)	0.31	0.29	0.58	0.54	0.39	.37
Average English Language Proficiency Assessment score (standardized)	-	0.41	-	0.66	-	0.49
Average age at kindergarten entry	5.5	5.5	5.5	5.5	5.5	5.5

Source: Authors' analysis of data from the Oregon Department of Education and one large Oregon school district.

Table C5. Impact of full-day kindergarten on attendance in kindergarten through grade 3 in one large Oregon school district, 2013/14 and 2014/15 kindergarten cohorts

	2013/14 cohort				2014/15 cohort			
	Kindergarten attendance	Grade 1 attendance	Grade 2 attendance	Grade 3 attendance	Kindergarten attendance	Grade 1 attendance	Grade 2 attendance	Grade 3 attendance
Attended full-day kindergarten	-0.008**	0.009**	0.004	0.006*	0.006*	0.009***	0.007***	0.007***
	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)
Age on September 1 of first kindergarten year, in years	-0.002	-0.000	-0.008*	-0.004	-0.001	-0.003	-0.000	-0.002
	(0.002)	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)	(0.004)
Female	-0.003*	-0.001	-0.002	-0.004	0.004	0.005**	0.001	0.004
	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Asian	-0.001	-0.000	0.003	0.004	0.001	0.004	0.004	0.005*
	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)
Latinx	-0.005*	-0.005	-0.006*	-0.007	-0.002	0.001	-0.001	-0.003
	(0.002)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.003)	(0.003)
American Indian or Alaska Native, Black, multiracial, or Native Hawaiian or other Pacific Islander	-0.001	-0.000	0.001	0.000	0.004	0.002	0.001	0.002
	(0.002)	(0.003)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Student in district grades K to 2 only	-0.012***	-0.011**	-0.026**	na	-0.016**	-0.015***	-0.024***	na
	(0.003)	(0.003)	(0.008)		(0.005)	(0.003)	(0.006)	
Student in district grades K to 1 only	-0.012***	-0.021***	na	na	-0.004	-0.009*	na	na
	(0.003)	(0.005)			(0.003)	(0.004)		
Student in district grade K only	-0.011***	na	na	na	-0.006	na	na	na
	(0.002)				(0.004)			
Kindergarten entry assessment standardized letter naming score	0.003***	0.002	0.003*	0.004**	0.005***	0.004**	0.004*	0.003*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)
Kindergarten entry assessment standardized letter sound recognition score	-0.000	0.001	0.001	0.001	-0.003*	-0.001	-0.002	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Kindergarten entry assessment early math total score	0.000	0.000	0.000	-0.000	0.001	0.000	0.001*	0.001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Kindergarten entry assessment approaches to learning average score	0.005***	0.003	0.002	0.004	0.007***	0.005***	0.005***	0.003*
	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)
Economically disadvantaged	-0.007***	-0.010***	-0.007*	-0.006**	-0.014***	-0.010***	-0.008**	-0.007*
	(0.002)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.003)

	2013/14 cohort				2014/15 cohort			
	Kindergarten attendance	Grade 1 attendance	Grade 2 attendance	Grade 3 attendance	Kindergarten attendance	Grade 1 attendance	Grade 2 attendance	Grade 3 attendance
English learner	0.006**	0.019***	0.015***	0.012***	0.003	0.003	0.007*	0.010***
	(0.002)	(0.002)	(0.003)	(0.003)	(0.004)	(0.002)	(0.003)	(0.002)
Has an individualized education program	-0.003	0.005	-0.002	0.000	0.003	0.000	-0.002	-0.007
	(0.002)	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)	(0.004)	(0.005)
Percentage of students age 6 or older at kindergarten entry at school	0.014	0.013	0.006	-0.014	0.007	0.014*	0.015	0.011
	(0.010)	(0.012)	(0.010)	(0.008)	(0.009)	(0.006)	(0.010)	(0.008)
Number of students at school	-0.000	-0.000	-0.000	0.000	-0.000*	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Percentage proficient in math at school	0.000	0.000	0.000	-0.000	-0.001	-0.000	-0.001	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)
Percentage proficient in reading at school	0.000	-0.000	-0.000	0.000	0.001	0.000	0.001*	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)
Percentage Latinx at school	-0.018	0.025	-0.002	0.015	0.061*	0.119***	0.066	0.055
	(0.035)	(0.045)	(0.044)	(0.036)	(0.027)	(0.031)	(0.040)	(0.029)
Percentage American Indian or Alaska Native, Black, multiracial, or Native Hawaiian or other Pacific Islander at school	0.065	0.008	0.012	0.053	0.009	-0.001	0.079	0.002
	(0.040)	(0.045)	(0.047)	(0.048)	(0.042)	(0.045)	(0.042)	(0.070)
Percentage economically disadvantaged at school	0.023	-0.018	0.005	-0.012	-0.043**	-0.059***	-0.036*	-0.034
	(0.015)	(0.020)	(0.018)	(0.013)	(0.012)	(0.014)	(0.013)	(0.021)
Percentage English learner at school	-0.008	-0.018	-0.006	-0.015	-0.008	-0.065*	-0.008	-0.015
	(0.034)	(0.031)	(0.032)	(0.028)	(0.025)	(0.029)	(0.051)	(0.034)
Percentage of students who have an individualized education program at school	0.044	-0.051	-0.039	0.003	0.036	0.004	-0.030	0.052
	(0.031)	(0.043)	(0.036)	(0.034)	(0.050)	(0.037)	(0.038)	(0.041)
Constant	0.933***	0.952***	0.998***	0.949***	0.918***	0.964***	0.916***	0.938***
	(0.022)	(0.018)	(0.024)	(0.019)	(0.030)	(0.025)	(0.026)	(0.032)
Observations	2,535	2,252	2,085	1,918	2,599	2,324	2,132	1,954
R-squared	0.122	0.104	0.069	0.077	0.125	0.103	0.099	0.072

*** Significant at $p < 0.001$; ** significant at $p < 0.01$; * significant at $p < 0.05$.
na is not applicable.
Note: Robust standard errors clustered at the school level in parentheses.
Source: Authors' analysis of data from the Oregon Department of Education and one large Oregon school district.

Table C6. Impact of full-day kindergarten on English language proficiency in grades 1 to 3 in one large Oregon school district, 2013/14 and 2014/15 kindergarten cohorts

Panel A. 2013/14 cohort

	Standardized LEP score in specified domain and grade								
	English language proficiency score in grade 1	Reading score in grade 2	Writing score in grade 2	Speaking score in grade 2	Listening score in grade 2	Reading score in grade 3	Writing score in grade 3	Speaking score in grade 3	Listening score in grade 3
Attended full-day kindergarten	-0.040	-0.053	-0.116	0.008	-0.096	-0.115	-0.112	-0.093	-0.158*
	(0.082)	(0.140)	(0.112)	(0.111)	(0.127)	(0.082)	(0.068)	(0.049)	(0.075)
Age on September 1 of first kindergarten year, in years	0.029	0.000	0.103	0.195	-0.047	-0.159	-0.162	0.042	-0.276
	(0.108)	(0.142)	(0.139)	(0.178)	(0.147)	(0.169)	(0.123)	(0.155)	(0.151)
Female	-0.022	-0.044	0.021	0.133	-0.001	0.037	0.096	0.169	-0.070
	(0.069)	(0.089)	(0.077)	(0.072)	(0.066)	(0.102)	(0.086)	(0.086)	(0.107)
Asian	0.208	-0.533	-0.310	-0.241	-0.473	-0.760*	-0.849*	-0.679*	-0.868*
	(0.201)	(0.385)	(0.365)	(0.399)	(0.377)	(0.303)	(0.322)	(0.304)	(0.340)
Latinx	-0.252	-0.148	-0.061	-0.042	-0.092	-0.118	0.027	-0.115	-0.227
	(0.161)	(0.244)	(0.250)	(0.213)	(0.232)	(0.203)	(0.159)	(0.131)	(0.166)
American Indian or Alaska Native, Black, multiracial, or Native Hawaiian or other Pacific Islander	-0.171	0.245	0.335	-0.028	-0.011	-0.155	0.017	-0.229	-0.254
	(0.304)	(0.426)	(0.415)	(0.281)	(0.333)	(0.307)	(0.236)	(0.233)	(0.250)
Student in district grades K to 2 only	-0.037	0.014	-0.000	0.001	0.121	na	na	na	na
	(0.152)	(0.276)	(0.315)	(0.302)	(0.202)				
Student in district grades K to 1 only	-0.206	na	na	na	na	na	na	na	na
	(0.169)								
Kindergarten entry assessment standardized letter naming score	0.181*	0.184**	0.177**	0.087	0.095	0.077	0.105	0.015	-0.012
	(0.077)	(0.061)	(0.054)	(0.089)	(0.061)	(0.102)	(0.084)	(0.078)	(0.084)
Kindergarten entry assessment standardized	0.033	0.044	0.124	0.028	0.094	0.079	0.006	0.159	0.087

	Standardized LEP score in specified domain and grade								
	English language proficiency score in grade 1	Reading score in grade 2	Writing score in grade 2	Speaking score in grade 2	Listening score in grade 2	Reading score in grade 3	Writing score in grade 3	Speaking score in grade 3	Listening score in grade 3
letter sound recognition score									
	(0.088)	(0.127)	(0.129)	(0.124)	(0.137)	(0.118)	(0.101)	(0.119)	(0.109)
Kindergarten entry assessment early math total score	0.093***	0.110***	0.102***	0.092***	0.093***	0.116***	0.108***	0.070***	0.092***
	(0.013)	(0.015)	(0.017)	(0.015)	(0.011)	(0.015)	(0.017)	(0.013)	(0.019)
Kindergarten entry assessment approaches to learning average score	0.190***	0.101	0.087	0.017	0.120*	0.046	0.018	0.003	0.107
	(0.037)	(0.052)	(0.050)	(0.073)	(0.056)	(0.055)	(0.052)	(0.061)	(0.063)
Economically disadvantaged	-0.097	-0.137	-0.131	0.082	-0.119	0.049	-0.016	0.129	-0.062
	(0.157)	(0.244)	(0.266)	(0.203)	(0.184)	(0.190)	(0.177)	(0.193)	(0.151)
Has an individualized education program	-0.547***	-0.633***	-0.610***	-0.582***	-0.625***	-0.646**	-0.648***	-0.400**	-0.408*
	(0.115)	(0.114)	(0.140)	(0.130)	(0.161)	(0.202)	(0.166)	(0.124)	(0.165)
Percentage of students age 6 or older at kindergarten entry at school	1.007	1.256*	1.286*	0.843	1.379*	0.165	0.297	0.353	0.450
	(0.795)	(0.551)	(0.603)	(0.773)	(0.640)	(0.414)	(0.372)	(0.362)	(0.382)
Number of students at school	-0.000	-0.000	-0.000	-0.000	-0.001*	0.001	0.000	0.001	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Percentage proficient in math at school	-0.005	0.017	0.010	0.006	0.001	0.009	0.011	0.003	-0.002
	(0.010)	(0.013)	(0.010)	(0.012)	(0.009)	(0.009)	(0.010)	(0.007)	(0.008)
Percentage proficient in reading at school	0.014	-0.019	-0.011	-0.024	-0.013	-0.021	-0.003	-0.008	-0.013
	(0.021)	(0.026)	(0.026)	(0.027)	(0.020)	(0.022)	(0.021)	(0.015)	(0.017)
Percentage Latinx at school	-1.330	-0.171	-1.690	2.871	-0.358	0.797	-0.010	1.610	-0.812
	(1.780)	(2.045)	(1.792)	(2.303)	(1.589)	(1.246)	(1.524)	(1.355)	(0.762)

	Standardized LEP score in specified domain and grade								
	English language proficiency score in grade 1	Reading score in grade 2	Writing score in grade 2	Speaking score in grade 2	Listening score in grade 2	Reading score in grade 3	Writing score in grade 3	Speaking score in grade 3	Listening score in grade 3
Percentage American Indian or Alaska Native, Black, multiracial, or Native Hawaiian or other Pacific Islander at school	-1.515	-0.832	-2.616	-1.680	0.784	-0.316	1.433	2.446	-1.297
	(2.692)	(4.497)	(4.663)	(4.320)	(3.515)	(3.556)	(3.298)	(2.286)	(2.273)
Percentage economically disadvantaged at school	1.886*	1.258	2.216*	-1.195	1.167	0.337	0.920	-0.175	1.216*
	(0.876)	(1.132)	(1.033)	(1.231)	(0.918)	(0.901)	(0.981)	(0.567)	(0.453)
Percentage English learner at school	-0.799	-1.402	-0.855	-3.084	-1.086	-2.290	-1.309	-2.196*	-1.447
	(1.481)	(1.864)	(1.671)	(1.944)	(1.472)	(1.188)	(1.036)	(0.994)	(0.776)
Percentage of students who have an individualized education program at school	-1.562	-2.282	-2.957	-1.322	-3.475*	-0.694	-1.058	-3.065*	-3.283*
	(1.223)	(1.861)	(1.487)	(2.192)	(1.521)	(1.731)	(1.834)	(1.387)	(1.364)
Constant	-0.757	-0.065	-0.519	0.038	0.667	0.839	-0.099	-0.139	2.104
	(1.059)	(1.532)	(1.449)	(1.430)	(1.222)	(1.661)	(1.144)	(1.064)	(1.209)
Observations	513	394	394	394	394	314	314	315	314
R-squared	0.459	0.249	0.266	0.186	0.262	0.222	0.253	0.191	0.212

Panel B. 2014/15 cohort

	Standardized LEP score in specified domain and grade											
	Reading score in grade 1	Writing score in grade 1	Speaking score in grade 1	Listening score in grade 1	Reading score in grade 2	Writing score in grade 2	Speaking score in grade 2	Listening score in grade 2	Reading score in grade 3	Writing score in grade 3	Speaking score in grade 3	Listening score in grade 3
Attended full-day kindergarten	-0.112	-0.103	0.005	-0.138	-0.085	-0.048	-0.039	-0.040	-0.074	-0.037	-0.253**	-0.101
	(0.105)	(0.115)	(0.094)	(0.075)	(0.081)	(0.082)	(0.082)	(0.071)	(0.087)	(0.100)	(0.086)	(0.097)
Age on September 1 of first	0.056	0.103	-0.192	-0.024	-0.024	-0.039	-0.123	-0.053	-0.107	-0.096	-0.134	-0.070

	Standardized LEP score in specified domain and grade											
	Reading score in grade 1	Writing score in grade 1	Speaking score in grade 1	Listening score in grade 1	Reading score in grade 2	Writing score in grade 2	Speaking score in grade 2	Listening score in grade 2	Reading score in grade 3	Writing score in grade 3	Speaking score in grade 3	Listening score in grade 3
kindergarten year, in years												
	(0.161)	(0.152)	(0.102)	(0.172)	(0.167)	(0.156)	(0.137)	(0.125)	(0.163)	(0.155)	(0.220)	(0.174)
Female	0.317***	0.192*	0.191**	0.151	0.196	0.239*	0.263***	0.046	0.246*	0.290**	0.403***	0.176*
	(0.082)	(0.073)	(0.068)	(0.078)	(0.133)	(0.103)	(0.071)	(0.093)	(0.101)	(0.095)	(0.093)	(0.082)
Asian	-0.115	-0.152	-0.454*	-0.282	0.437	0.203	-0.044	-0.08	0.423	0.449	-0.219	0.498*
	(0.196)	(0.142)	(0.168)	(0.179)	(0.321)	(0.255)	(0.269)	(0.262)	(0.293)	(0.250)	(0.380)	(0.220)
Latinx	-0.087	-0.046	-0.019	0.036	0.318*	0.195	0.107	0.297*	0.412	0.272	-0.049	0.603*
	(0.149)	(0.120)	(0.127)	(0.103)	(0.152)	(0.149)	(0.139)	(0.129)	(0.227)	(0.180)	(0.146)	(0.226)
American Indian or Alaska Native, Black, multiracial, or Native Hawaiian or other Pacific Islander	-0.091	-0.019	0.032	-0.197	0.058	0.075	0.132	-0.012	0.126	-0.112	-0.308	0.107
	(0.205)	(0.158)	(0.139)	(0.241)	(0.291)	(0.287)	(0.315)	(0.248)	(0.449)	(0.479)	(0.507)	(0.512)
Student in district grades K to 2 only	-0.155	-0.138	0.059	-0.149	0.076	0.010	0.059	0.258	na	na	na	na
	(0.112)	(0.090)	(0.150)	(0.113)	(0.179)	(0.166)	(0.160)	(0.207)				
Student in district grades K to 1 only	-0.281	-0.104	-0.271	0.051	na	na	na	na	na	na	na	na
	(0.178)	(0.177)	(0.163)	(0.179)								
Kindergarten entry assessment standardized letter naming score	0.420***	0.367***	0.205**	0.295***	0.312***	0.307***	0.180*	0.253**	0.249*	0.238*	0.104	0.147
	(0.077)	(0.061)	(0.061)	(0.070)	(0.079)	(0.077)	(0.066)	(0.078)	(0.106)	(0.110)	(0.100)	(0.120)
Kindergarten entry assessment standardized letter sound recognition score	-0.041	-0.024	-0.001	-0.030	-0.116	-0.096	-0.110	-0.214*	-0.103	-0.132	-0.027	-0.103
	(0.085)	(0.070)	(0.052)	(0.072)	(0.104)	(0.094)	(0.112)	(0.097)	(0.120)	(0.129)	(0.105)	(0.120)

	Standardized LEP score in specified domain and grade											
	Reading score in grade 1	Writing score in grade 1	Speaking score in grade 1	Listening score in grade 1	Reading score in grade 2	Writing score in grade 2	Speaking score in grade 2	Listening score in grade 2	Reading score in grade 3	Writing score in grade 3	Speaking score in grade 3	Listening score in grade 3
Kindergarten entry assessment early math total score	0.054***	0.040**	0.049	0.056**	0.049*	0.041*	0.034	0.057**	0.043*	0.045*	0.022	0.042*
	(0.015)	(0.013)	(0.025)	(0.018)	(0.023)	(0.016)	(0.018)	(0.016)	(0.018)	(0.019)	(0.026)	(0.015)
Kindergarten entry assessment approaches to learning average score	0.358***	0.373***	0.243***	0.268***	0.426***	0.449***	0.287***	0.461***	0.357**	0.355**	0.431***	0.326***
	(0.063)	(0.067)	(0.059)	(0.068)	(0.072)	(0.076)	(0.068)	(0.101)	(0.104)	(0.102)	(0.094)	(0.082)
Economically disadvantaged	-0.471**	-0.404***	-0.370**	-0.436***	-0.472*	-0.448*	-0.251	-0.511**	-0.217	-0.121	-0.302	-0.441**
	(0.147)	(0.087)	(0.106)	(0.110)	(0.211)	(0.193)	(0.141)	(0.152)	(0.171)	(0.215)	(0.155)	(0.143)
Has an individualized education program	-0.312**	-0.437***	-0.516***	-0.483**	-0.321	-0.269	-0.095	-0.270	-0.525**	-0.551**	-0.161	-0.352*
	(0.099)	(0.110)	(0.135)	(0.145)	(0.193)	(0.168)	(0.120)	(0.171)	(0.152)	(0.172)	(0.132)	(0.147)
Percentage of students age 6 or older at kindergarten entry at school	0.538	0.721	0.758	0.249	1.562**	1.356**	1.324***	0.455	0.503	0.533	0.357	0.705
	(0.423)	(0.392)	(0.375)	(0.203)	(0.515)	(0.440)	(0.359)	(0.371)	(0.595)	(0.552)	(0.673)	(0.453)
Number of students at school	-0.000	-0.001	-0.000	-0.000	-0.000	-0.000	-0.000	0.001	0.000	0.000	-0.000	0.001
	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)
Percentage proficient in math at school	-0.002	-0.002	-0.018	0.021	0.025	0.021	-0.002	0.019	0.012	-0.004	0.021	0.034
	(0.035)	(0.036)	(0.028)	(0.022)	(0.043)	(0.033)	(0.027)	(0.023)	(0.034)	(0.038)	(0.025)	(0.034)
Percentage proficient in reading at school	-0.006	0.005	0.011	-0.019	0.003	0.010	-0.001	0.035	-0.003	0.012	-0.061	-0.023
	(0.031)	(0.033)	(0.024)	(0.020)	(0.045)	(0.037)	(0.026)	(0.026)	(0.040)	(0.044)	(0.034)	(0.038)

	Standardized LEP score in specified domain and grade											
	Reading score in grade 1	Writing score in grade 1	Speaking score in grade 1	Listening score in grade 1	Reading score in grade 2	Writing score in grade 2	Speaking score in grade 2	Listening score in grade 2	Reading score in grade 3	Writing score in grade 3	Speaking score in grade 3	Listening score in grade 3
Percentage Latinx at school	1.087	1.442	-1.109	-0.082	-2.655	-1.618	-3.262*	-2.694	-0.417	-0.823	-1.664	0.503
	(3.005)	(2.939)	(2.012)	(1.545)	(2.809)	(2.297)	(1.367)	(1.370)	(2.695)	(2.463)	(1.809)	(3.159)
Percentage American Indian or Alaska Native, Black, multiracial, or Native Hawaiian or other Pacific Islander at school	-2.271	-3.476	-4.509*	-1.368	-0.525	0.576	-3.326	-0.265	-4.063	-5.686	-5.58	-1.773
	(3.838)	(3.271)	(2.039)	(2.160)	(3.664)	(2.849)	(2.409)	(2.011)	(3.879)	(3.501)	(2.863)	(2.413)
Percentage economically disadvantaged at school	-0.462	0.079	0.485	0.556	1.316	1.143	1.143	1.888*	0.434	1.022	0.454	0.244
	(1.294)	(1.295)	(0.815)	(0.815)	(1.421)	(1.182)	(0.738)	(0.710)	(1.506)	(1.404)	(0.963)	(1.287)
Percentage English learner at school	-1.182	-2.041	-0.150	-1.100	2.938	2.076	2.291	2.113	-0.110	-0.451	-0.648	-0.807
	(2.627)	(2.566)	(1.704)	(1.254)	(2.501)	(2.077)	(1.434)	(1.231)	(2.564)	(2.222)	(1.825)	(2.806)
Percentage of students who have an individualized education program at school	-2.423	-1.789	1.254	-1.653	2.820	1.279	-0.588	1.439	0.251	-0.944	-0.660	0.513
	(1.785)	(1.984)	(2.020)	(1.094)	(3.184)	(2.499)	(1.355)	(1.496)	(1.823)	(1.564)	(1.681)	(2.067)
Constant	0.136	-0.425	1.227	0.196	-3.216	-2.905	0.110	-3.843**	-1.021	-0.649	2.059	-1.715
	(1.606)	(1.484)	(1.176)	(1.484)	(2.319)	(1.873)	(1.548)	(1.223)	(2.076)	(1.728)	(1.695)	(1.798)
Observations	486	486	486	487	307	307	307	327	265	265	269	274
R-squared	0.414	0.402	0.280	0.318	0.294	0.325	0.189	0.341	0.299	0.303	0.275	0.277

*** Significant at $p < 0.001$; ** significant at $p < 0.01$; * significant at $p < 0.05$.
LEP is limited English proficiency. Na is not applicable. — is not available.
Note: Robust standard errors clustered at the school level in parentheses. Available data changed between the years shown. Overall scores were available in 2013/14 and four domain scores and a three-level proficiency measure were available in 2014/15. Standardized English language proficiency in kindergarten was not available for the 2013/14 cohort.
Source: Authors' analysis of data from the Oregon Department of Education and one large Oregon school district.

Table C7. Impact of full-day kindergarten on grade 3 math and reading test scores in one large Oregon school district, 2013/14 and 2014/15 kindergarten cohorts

	2013/14 cohort		2014/15 cohort	
	Grade 3 math	Grade 3 reading	Grade 3 math	Grade 3 reading
Attended full-day kindergarten	0.056	0.027	0.071	0.018
	(0.057)	(0.048)	(0.061)	(0.043)
Age on September 1 of first kindergarten year, in years	-0.086	0.046	-0.060	-0.043
	(0.064)	(0.064)	(0.054)	(0.049)
Female	-0.195***	0.138***	-0.211***	0.108**
	(0.040)	(0.037)	(0.033)	(0.032)
Asian	0.282***	0.144**	0.316***	0.019
	(0.050)	(0.052)	(0.075)	(0.074)
Latinx	-0.093	-0.152*	-0.159**	-0.207***
	(0.050)	(0.061)	(0.056)	(0.054)
American Indian or Alaska Native, Black, multiracial, or Native Hawaiian or other Pacific Islander	0.081	-0.030	-0.050	-0.040
	(0.046)	(0.052)	(0.055)	(0.067)
Kindergarten entry assessment standardized letter naming score	0.151***	0.150***	0.090***	0.086***
	(0.037)	(0.032)	(0.018)	(0.022)
Kindergarten entry assessment standardized letter sound recognition score	0.020	0.072**	0.071***	0.099***
	(0.024)	(0.022)	(0.018)	(0.022)
Kindergarten entry assessment early math total score	0.094***	0.071***	0.086***	0.071***
	(0.008)	(0.008)	(0.007)	(0.007)
Kindergarten entry assessment approaches to learning average score	0.228***	0.154***	0.327***	0.256***
	(0.020)	(0.027)	(0.032)	(0.031)
Economically disadvantaged	-0.243***	-0.183**	-0.301***	-0.250***
	(0.060)	(0.063)	(0.050)	(0.051)
English learner	0.033	-0.090	-0.038	-0.136*
	(0.062)	(0.070)	(0.064)	(0.059)
Has an individualized education program	-0.184*	-0.201*	-0.278***	-0.342***
	(0.080)	(0.093)	(0.076)	(0.064)
Percentage of students age 6 or older at kindergarten entry at school	0.288	0.207	0.861***	0.556**
	(0.207)	(0.200)	(0.162)	(0.166)
Number of students at school	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Percentage Latinx at school	1.493	0.602	1.645	0.428
	(1.121)	(1.001)	(1.367)	(0.819)

	2013/14 cohort		2014/15 cohort	
	Grade 3 math	Grade 3 reading	Grade 3 math	Grade 3 reading
Percentage American Indian or Alaska Native, Black, multiracial, or Native Hawaiian or other Pacific Islander at school	-2.078	-2.102	-5.213***	-3.217**
	(1.037)	(1.042)	(1.241)	(0.976)
Percentage economically disadvantaged at school	-0.512	-0.235	-0.040	0.118
	(0.569)	(0.566)	(0.512)	(0.378)
Percentage English learner at school	-1.461	-0.875	-1.795	-0.693
	(0.780)	(0.673)	(1.228)	(0.823)
Percentage of students who have an individualized education program at school	-1.299	-1.123	-2.837	-2.215
	(1.342)	(1.209)	(1.628)	(1.210)
Constant	-0.130	-0.646	-0.180	-0.283
	(0.378)	(0.407)	(0.540)	(0.453)
Observations	1,852	1,862	1,879	1,885
R-squared	0.517	0.484	0.546	0.521

*** Significant at $p < 0.001$; ** significant at $p < 0.01$; * significant at $p < 0.05$.
Note: Robust standard errors clustered at the school level in parentheses.
Source: Authors' analysis of data from the Oregon Department of Education and one large Oregon school district.

Table C8. Impact of full-day kindergarten on the likelihood of being retained or disciplined before or in grade 3 in one large Oregon school district, 2013/14 and 2014/15 kindergarten cohorts

	2013/14 cohort		2014/15 cohort	
	Retained in or before grade 3	Disciplined in or before grade 3	Retained in or before grade 3	Disciplined in or before grade 3
Attended full-day kindergarten	-0.279	0.044	0.689	0.189
	(0.545)	(0.207)	(0.508)	(0.237)
Age on September 1 of first kindergarten year, in years	-3.709***	0.173	-3.564**	-0.637
	(1.069)	(0.406)	(1.124)	(0.349)
Female	0.576	-1.803***	0.464	-1.479***
	(0.582)	(0.377)	(0.486)	(0.450)
Asian	-0.081	-0.702	-0.804	-0.341
	(0.891)	(0.616)	(1.119)	(0.836)
Latinx	-0.425	-0.236	0.408	0.229
	(0.552)	(0.301)	(0.697)	(0.421)
American Indian or Alaska Native, Black, multiracial, or Native Hawaiian or other Pacific Islander	-0.112	0.214	0.525	0.608
	(0.821)	(0.451)	(0.683)	(0.439)

	2013/14 cohort		2014/15 cohort	
	Retained in or before grade 3	Disciplined in or before grade 3	Retained in or before grade 3	Disciplined in or before grade 3
Kindergarten entry assessment standardized letter naming score	-0.971*	0.155	-0.413	-0.053
	(0.394)	(0.199)	(0.374)	(0.223)
Kindergarten entry assessment standardized letter sound recognition score	1.100***	0.055	0.200	0.130
	(0.254)	(0.164)	(0.259)	(0.259)
Kindergarten entry assessment early math total score	-0.157	-0.055	-0.146	0.070
	(0.148)	(0.042)	(0.083)	(0.044)
Kindergarten entry assessment approaches to learning average score	-1.015***	-0.983***	-0.651*	-1.125***
	(0.236)	(0.163)	(0.304)	(0.193)
Economically disadvantaged	-0.434	0.248	-0.357	1.123**
	(0.693)	(0.284)	(0.597)	(0.351)
English learner	1.588**	-0.876**	-0.261	-1.592***
	(0.563)	(0.326)	(0.684)	(0.401)
Has an individualized education program	1.573**	-0.004	1.621**	1.025**
	(0.609)	(0.391)	(0.556)	(0.332)
Percentage of students age 6 or older at kindergarten entry at school	0.094	3.747**	0.493	2.140*
	(1.758)	(1.340)	(1.663)	(0.947)
Number of students at school	-0.003	0.000	-0.001	-0.001
	(0.003)	(0.001)	(0.002)	(0.001)
Percentage proficient in math at school	0.146	0.059	-0.268*	-0.095
	(0.102)	(0.033)	(0.122)	(0.087)
Percentage proficient in reading at school	-0.155	-0.070	0.288**	0.079
	(0.104)	(0.057)	(0.110)	(0.080)
Percentage Latinx at school	-4.458	-15.802**	0.977	-4.710
	(11.377)	(5.966)	(7.971)	(3.094)
Percentage American Indian or Alaska Native, Black, multiracial, or Native Hawaiian or other Pacific Islander at school	1.604	16.669*	-5.070	3.740
	(12.121)	(7.191)	(8.515)	(4.672)
Percentage economically disadvantaged at school	0.942	8.114**	-0.710	2.728
	(4.950)	(2.773)	(2.846)	(1.743)
Percentage English learner at school	0.821	14.208***	-0.937	4.933*
	(8.151)	(3.842)	(6.704)	(2.496)
Percentage of students who have an individualized education program at school	10.998	-7.529	0.439	-1.857

	2013/14 cohort		2014/15 cohort	
	Retained in or before grade 3	Disciplined in or before grade 3	Retained in or before grade 3	Disciplined in or before grade 3
	(10.570)	(4.224)	(6.007)	(4.428)
Constant	19.814**	-3.946	17.743*	1.925
	(7.508)	(3.151)	(7.144)	(2.531)
Observations	1,934	1,934	1,974	1,974

*** Significant at $p < 0.001$; ** significant at $p < 0.01$; * significant at $p < 0.05$.
na is not applicable. — is not available.
Note: Robust standard errors clustered at the school level in parentheses. Available data changed between the years shown. Overall scores were available in 2013/14 and four domain scores and a three-level proficiency measure were available in 2014/15. Standardized English language proficiency in kindergarten was not available for the 2013/14 cohort.
Source: Authors' analysis of data from the Oregon Department of Education and one large Oregon school district.

Table C9. Group analysis of the relationship between full-day kindergarten and attendance in kindergarten through grade 3 in one large Oregon school district, 2013/14 and 2014/15 kindergarten cohorts

Panel A. Latinx group analysis

	2013/14 cohort				2014/15 cohort			
	Kindergarten attendance	Grade 1 attendance	Grade 2 attendance	Grade 3 attendance	Kindergarten attendance	Grade 1 attendance	Grade 2 attendance	Grade 3 attendance
Impact of FDK on Latinx students, compared to Latinx students in HDK	-0.009**	0.006	0.003	0.004	0.010	0.011**	0.008*	0.005
	(0.003)	(0.004)	(0.007)	(0.005)	(0.006)	(0.004)	(0.003)	(0.004)
Impact of HDK on non-Latinx students compared to Latinx students in HDK	0.005*	0.004	0.006	0.006	0.003	0.001	0.002	0.002
	(0.002)	(0.003)	(0.003)	(0.004)	(0.005)	(0.005)	(0.003)	(0.003)
Impact of FDK on non-Latinx students, compared to Latinx students in HDK	-0.004	0.014**	0.011*	0.012**	0.009*	0.009*	0.008*	0.010**
	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)
Age on September 1 of first kindergarten year, in years	-0.002	-0.000	-0.008*	-0.004	-0.001	-0.003	-0.000	-0.002
	(0.002)	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)	(0.004)
Female	-0.003*	-0.001	-0.002	-0.004	0.004	0.005**	0.001	0.004
	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Asian	-0.001	0.000	0.003	0.005	0.001	0.004	0.004	0.005*
	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)
American Indian or Alaska Native, Black, multiracial, or Native Hawaiian or other Pacific Islander	-0.001	-0.000	0.001	0.000	0.004	0.002	0.001	0.002

	2013/14 cohort				2014/15 cohort			
	Kindergarten attendance	Grade 1 attendance	Grade 2 attendance	Grade 3 attendance	Kindergarten attendance	Grade 1 attendance	Grade 2 attendance	Grade 3 attendance
	(0.002)	(0.003)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)
Student in district grades K to 2 only	-0.012***	-0.011**	-0.026**	na	-0.016**	-0.015***	-0.024***	na
	(0.003)	(0.003)	(0.008)		(0.005)	(0.003)	(0.006)	
Student in district grades K to 1 only	-0.012***	-0.021***	na	na	-0.004	-0.009*	na	na
	(0.003)	(0.005)			(0.003)	(0.004)		
Student in district grade K only	-0.011***	na	na	na	-0.006	na	na	na
	(0.002)				(0.004)			
Kindergarten entry assessment standardized letter naming score	0.003***	0.002	0.003*	0.004**	0.005***	0.004**	0.004*	0.003*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)
Kindergarten entry assessment standardized letter sound recognition score	-0.000	0.001	0.001	0.001	-0.003*	-0.001	-0.002	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
	0.000	0.000	0.000	-0.000	0.001	0.000	0.001*	0.001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Kindergarten entry assessment approaches to learning average score	0.005***	0.003	0.002	0.004	0.007***	0.004**	0.005***	0.004*
	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)
Economically disadvantaged	-0.007***	-0.010***	-0.007*	-0.006**	-0.014***	-0.010***	-0.008**	-0.007*
	(0.002)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.003)
English learner	0.006**	0.019***	0.015***	0.012***	0.003	0.003	0.006*	0.011***
	(0.002)	(0.003)	(0.003)	(0.003)	(0.004)	(0.002)	(0.003)	(0.002)
Has an individualized education program	-0.003	0.005	-0.002	0.001	0.003	0.000	-0.002	-0.007
	(0.002)	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)	(0.004)	(0.005)
Percentage of students age 6 or older at kindergarten entry at school	0.014	0.012	0.006	-0.014	0.008	0.014*	0.015	0.010
	(0.010)	(0.011)	(0.010)	(0.009)	(0.009)	(0.006)	(0.010)	(0.008)
Number of students at school	-0.000	-0.000	-0.000	0.000	-0.000*	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Percentage proficient in math at school	0.000	0.000	0.000	-0.000	-0.001	-0.000	-0.001	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
Percentage proficient in reading at school	0.000	-0.000	-0.000	0.000	0.001	0.000	0.001*	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)

	2013/14 cohort				2014/15 cohort			
	Kindergarten attendance	Grade 1 attendance	Grade 2 attendance	Grade 3 attendance	Kindergarten attendance	Grade 1 attendance	Grade 2 attendance	Grade 3 attendance
Percentage Latinx at school	-0.018	0.025	-0.002	0.014	0.063*	0.120***	0.066	0.053
	(0.035)	(0.044)	(0.044)	(0.035)	(0.028)	(0.031)	(0.041)	(0.029)
Percentage American Indian or Alaska Native, Black, multiracial, or Native Hawaiian or other Pacific Islander at school	0.065	0.013	0.013	0.056	0.006	-0.003	0.078	0.004
	(0.040)	(0.046)	(0.048)	(0.048)	(0.041)	(0.045)	(0.042)	(0.070)
Percentage economically disadvantaged at school	0.023	-0.018	0.005	-0.012	-0.044**	-0.059***	-0.036**	-0.033
	(0.015)	(0.020)	(0.018)	(0.013)	(0.013)	(0.014)	(0.013)	(0.021)
Percentage English learner at school	-0.008	-0.017	-0.006	-0.016	-0.008	-0.065*	-0.008	-0.015
	(0.034)	(0.031)	(0.032)	(0.028)	(0.025)	(0.030)	(0.052)	(0.034)
Percentage of students who have an individualized education program at school	0.044	-0.051	-0.039	0.004	0.036	0.004	-0.029	0.052
	(0.031)	(0.042)	(0.036)	(0.034)	(0.051)	(0.038)	(0.038)	(0.040)
Constant	0.929***	0.948***	0.992***	0.943***	0.915***	0.963***	0.914***	0.935***
	(0.022)	(0.018)	(0.023)	(0.020)	(0.029)	(0.025)	(0.027)	(0.032)
Observations	2,535	2,252	2,085	1,918	2,599	2,324	2,132	1,954
R-squared	0.122	0.104	0.069	0.077	0.125	0.104	0.099	0.072

Panel B. American Indian or Alaska Native, Black, multiracial, or Native Hawaiian or other Pacific Islander group analysis

	2013/14 cohort				2014/15 cohort			
	Kindergarten attendance	Grade 1 attendance	Grade 2 attendance	Grade 3 attendance	Kindergarten attendance	Grade 1 attendance	Grade 2 attendance	Grade 3 attendance
Impact of FDK on American Indian or Alaska Native, Black, multiracial, or Native Hawaiian or other Pacific Islander students, compared to American Indian or Alaska Native, Black, multiracial, or Native Hawaiian or other Pacific Islander students in HDK	-0.008	0.009	0.004	0.006	0.009	0.008	0.003	0.001
	(0.006)	(0.005)	(0.006)	(0.005)	(0.006)	(0.005)	(0.006)	(0.006)
Impact of HDK on non-group students compared to American Indian or Alaska Native, Black, multiracial, or Native Hawaiian or other Pacific Islander students in HDK	0.001	0.000	-0.001	-0.000	-0.003	-0.003	-0.003	-0.004
	(0.002)	(0.004)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.005)

	2013/14 cohort				2014/15 cohort			
	Kindergarten attendance	Grade 1 attendance	Grade 2 attendance	Grade 3 attendance	Kindergarten attendance	Grade 1 attendance	Grade 2 attendance	Grade 3 attendance
Impact of FDK on non-group students, compared to American Indian or Alaska Native, Black, multiracial, or Native Hawaiian or other Pacific Islander students in HDK	-0.007*	0.009*	0.004	0.006	0.003	0.007	0.005	0.003
	(0.003)	(0.004)	(0.003)	(0.003)	(0.005)	(0.004)	(0.004)	(0.004)
Age on September 1 of first kindergarten year, in years	-0.002	-0.000	-0.008*	-0.004	-0.001	-0.003	-0.001	-0.002
	(0.002)	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)	(0.004)
Female	-0.003*	-0.001	-0.002	-0.004	0.004	0.005**	0.001	0.004
	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Asian	-0.001	0.000	0.003	0.004	0.001	0.004	0.004	0.005*
	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)
Latinx	-0.005*	-0.005	-0.006*	-0.007	-0.002	0.001	-0.001	-0.003
	(0.002)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.003)	(0.003)
Student in district grades K to 2 only	-0.012***	-0.011**	-0.026**	na	-0.016**	-0.015***	-0.024***	na
	(0.003)	(0.003)	(0.008)		(0.005)	(0.003)	(0.006)	
Student in district grades K to 1 only	-0.012***	-0.021***	na	na	-0.004	-0.009*	na	na
	(0.003)	(0.005)			(0.003)	(0.004)		
Student in district grade K only	-0.011***	na	na	na	-0.006	na	na	na
	(0.002)				(0.004)			
Kindergarten entry assessment standardized letter naming score	0.003***	0.002	0.003*	0.004**	0.005***	0.004**	0.004*	0.003*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)
Kindergarten entry assessment standardized letter sound recognition score	-0.000	0.001	0.001	0.001	-0.003*	-0.001	-0.002	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Kindergarten entry assessment early math total score	0.000	0.000	0.000	-0.000	0.001	0.000	0.001*	0.001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Kindergarten entry assessment approaches to learning average score	0.005***	0.003	0.002	0.004	0.007***	0.005***	0.005***	0.003*
	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)

	2013/14 cohort				2014/15 cohort			
	Kindergarten attendance	Grade 1 attendance	Grade 2 attendance	Grade 3 attendance	Kindergarten attendance	Grade 1 attendance	Grade 2 attendance	Grade 3 attendance
Economically disadvantaged	-0.007***	-0.010***	-0.007*	-0.006**	-0.014***	-0.010***	-0.008**	-0.007
	(0.002)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.003)
English learner	0.006**	0.019***	0.015***	0.012***	0.003	0.003	0.007	0.010***
	(0.002)	(0.003)	(0.003)	(0.003)	(0.004)	(0.002)	(0.003)	(0.002)
Has an individualized education program	-0.003	0.005	-0.002	0.000	0.003	0.000	-0.002	-0.007
	(0.002)	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)	(0.004)	(0.005)
Percentage of students age 6 or older at kindergarten entry at school	0.014	0.013	0.006	-0.014	0.007	0.014*	0.015	0.011
	(0.011)	(0.012)	(0.010)	(0.008)	(0.009)	(0.006)	(0.010)	(0.008)
Number of students at school	-0.000	-0.000	-0.000	0.000	-0.000*	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Percentage proficient in math at school	0.000	0.000	0.000	-0.000	-0.001	-0.000	-0.001	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)
Percentage proficient in reading at school	0.000	-0.000	-0.000	0.000	0.001	0.000	0.001*	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)
Percentage Latinx at school	-0.018	0.025	-0.002	0.015	0.062*	0.119***	0.065	0.054
	(0.035)	(0.045)	(0.044)	(0.036)	(0.027)	(0.030)	(0.040)	(0.029)
Percentage American Indian or Alaska Native, Black, multiracial, or Native Hawaiian or other Pacific Islander at school	0.065	0.008	0.012	0.053	0.009	-0.002	0.079	0.002
	(0.040)	(0.045)	(0.047)	(0.048)	(0.041)	(0.045)	(0.042)	(0.070)
Percentage economically disadvantaged at school	0.023	-0.018	0.005	-0.012	-0.043**	-0.059***	-0.036*	-0.034
	(0.015)	(0.020)	(0.018)	(0.013)	(0.012)	(0.014)	(0.013)	(0.021)
Percentage English learner at school	-0.008	-0.016	-0.006	-0.015	-0.009	-0.065*	-0.007	-0.013
	(0.034)	(0.031)	(0.032)	(0.028)	(0.025)	(0.029)	(0.051)	(0.034)
Percentage of students who have an individualized education program at school	0.044	-0.051	-0.039	0.003	0.036	0.004	-0.029	0.053
	(0.031)	(0.043)	(0.036)	(0.034)	(0.050)	(0.037)	(0.038)	(0.040)
Constant	0.932***	0.952***	0.999***	0.949***	0.920***	0.966***	0.919***	0.943***
	(0.022)	(0.018)	(0.024)	(0.019)	(0.031)	(0.025)	(0.027)	(0.032)

	2013/14 cohort				2014/15 cohort			
	Kindergarten attendance	Grade 1 attendance	Grade 2 attendance	Grade 3 attendance	Kindergarten attendance	Grade 1 attendance	Grade 2 attendance	Grade 3 attendance
Observations	2,535	2,252	2,085	1,918	2,599	2,324	2,132	1,954
R-squared	0.122	0.104	0.069	0.077	0.125	0.103	0.099	0.072

Panel C. Economically disadvantaged group analysis

	2013/14 cohort				2014/15 cohort			
	Kindergarten attendance	Grade 1 attendance	Grade 2 attendance	Grade 3 attendance	Kindergarten attendance	Grade 1 attendance	Grade 2 attendance	Grade 3 attendance
Impact of FDK on economically disadvantaged students, compared to economically disadvantaged students in HDK	-0.010**	0.006	0.002	0.003	0.013**	0.011**	0.009*	0.006
	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)	(0.003)	(0.004)	(0.004)
Impact of HDK on non-economically disadvantaged students compared to economically disadvantaged students in HDK	0.007***	0.009***	0.007*	0.005*	0.017***	0.011***	0.009*	0.007
	(0.002)	(0.002)	(0.003)	(0.002)	(0.004)	(0.003)	(0.004)	(0.004)
Impact of FDK on non-economically disadvantaged students, compared to economically disadvantaged students in HDK	-0.001	0.020***	0.012***	0.013***	0.019***	0.019***	0.015***	0.014***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)	(0.004)
Age on September 1 of first kindergarten year, in years	-0.002	-0.000	-0.008*	-0.004	-0.001	-0.003	-0.000	-0.002
	(0.002)	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)	(0.004)
Female	-0.003*	-0.001	-0.002	-0.004	0.004	0.005**	0.001	0.004
	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Asian	-0.001	0.000	0.003	0.004	0.001	0.004	0.004	0.005*
	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)
Latinx	-0.005*	-0.005	-0.006*	-0.006	-0.002	0.001	-0.001	-0.003
	(0.002)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.003)	(0.003)
American Indian or Alaska Native, Black, multiracial, or Native Hawaiian or other Pacific Islander	-0.001	-0.000	0.001	-0.000	0.003	0.002	0.001	0.002
	(0.002)	(0.003)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)
Student in district grades K to 2 only	-0.012***	-0.011**	-0.026**	na	-0.016**	-0.015***	-0.023***	na
	(0.003)	(0.003)	(0.008)		(0.005)	(0.003)	(0.006)	

	2013/14 cohort				2014/15 cohort			
	Kindergarten attendance	Grade 1 attendance	Grade 2 attendance	Grade 3 attendance	Kindergarten attendance	Grade 1 attendance	Grade 2 attendance	Grade 3 attendance
Student in district grades K to 1 only	-0.012***	-0.021***	na	na	-0.004	-0.009*	na	na
	(0.003)	(0.005)			(0.003)	(0.004)		
Student in district grade K only	-0.011***	na	na	na	-0.006	na	na	na
	(0.002)				(0.004)			
Kindergarten entry assessment standardized letter naming score	0.003***	0.002	0.003*	0.004**	0.005***	0.004**	0.004*	0.003*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)
Kindergarten entry assessment standardized letter sound recognition score	-0.000	0.001	0.001	0.001	-0.003*	-0.001	-0.002	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Kindergarten entry assessment early math total score	0.000	0.000	0.000	-0.000	0.001	0.000	0.001*	0.001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Kindergarten entry assessment approaches to learning average score	0.005***	0.003	0.002	0.004	0.007***	0.004**	0.005***	0.004*
	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)
English learner	0.006**	0.019***	0.015***	0.012***	0.003	0.003	0.006*	0.010***
	(0.002)	(0.003)	(0.003)	(0.003)	(0.004)	(0.002)	(0.003)	(0.002)
Has an individualized education program	-0.003	0.005	-0.002	0.001	0.003	0.000	-0.002	-0.007
	(0.002)	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)	(0.004)	(0.005)
Percentage of students age 6 or older at kindergarten entry at school	0.014	0.012	0.005	-0.014	0.009	0.014*	0.016	0.010
	(0.010)	(0.012)	(0.010)	(0.009)	(0.009)	(0.006)	(0.009)	(0.008)
Number of students at school	-0.000	-0.000	-0.000	0.000	-0.000*	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Percentage proficient in math at school	0.000	0.000	0.000	-0.000	-0.001	-0.000	-0.001	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
Percentage proficient in reading at school	0.000	-0.000	-0.000	0.000	0.002*	0.000	0.001*	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)
Percentage Latinx at school	-0.018	0.025	-0.002	0.014	0.068*	0.121***	0.068	0.054
	(0.036)	(0.045)	(0.045)	(0.036)	(0.029)	(0.032)	(0.040)	(0.029)
Percentage American Indian or Alaska Native, Black, multiracial, or Native Hawaiian or other Pacific Islander at school	0.069	0.014	0.016	0.059	-0.004	-0.006	0.075	0.005

	2013/14 cohort				2014/15 cohort			
	Kindergarten attendance	Grade 1 attendance	Grade 2 attendance	Grade 3 attendance	Kindergarten attendance	Grade 1 attendance	Grade 2 attendance	Grade 3 attendance
	(0.040)	(0.044)	(0.048)	(0.049)	(0.041)	(0.045)	(0.042)	(0.069)
Percentage economically disadvantaged at school	0.023	-0.017	0.005	-0.012	-0.047**	-0.060***	-0.037**	-0.033
	(0.015)	(0.020)	(0.018)	(0.013)	(0.013)	(0.014)	(0.013)	(0.020)
Percentage English learner at school	-0.008	-0.017	-0.007	-0.016	-0.010	-0.066*	-0.008	-0.014
	(0.034)	(0.031)	(0.032)	(0.027)	(0.026)	(0.031)	(0.052)	(0.034)
Percentage of students who have an individualized education program at school	0.043	-0.052	-0.040	0.002	0.038	0.004	-0.029	0.052
	(0.031)	(0.043)	(0.036)	(0.034)	(0.053)	(0.039)	(0.039)	(0.040)
Constant	0.926***	0.943***	0.991***	0.943***	0.903***	0.953***	0.907***	0.931***
	(0.022)	(0.018)	(0.025)	(0.019)	(0.030)	(0.024)	(0.025)	(0.033)
Observations	2,535	2,252	2,085	1,918	2,599	2,324	2,132	1,954
R-squared	0.122	0.105	0.069	0.078	0.127	0.104	0.099	0.072

Panel D. English learner group analysis

	2013/14 cohort				2014/15 cohort			
	Kindergarten attendance	Grade 1 attendance	Grade 2 attendance	Grade 3 attendance	Kindergarten attendance	Grade 1 attendance	Grade 2 attendance	Grade 3 attendance
Impact of FDK on English learner students, compared to English learner students in HDK	-0.011**	0.002	-0.003	-0.001	0.005	0.007*	0.004	0.004
	(0.003)	(0.004)	(0.007)	(0.005)	(0.006)	(0.004)	(0.004)	(0.004)
Impact of HDK on non-English learner students compared to English learner students in HDK	-0.007**	-0.021***	-0.017***	-0.014***	-0.004	-0.004	-0.008*	-0.012***
	(0.002)	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)	(0.003)
Impact of FDK on non-English learner students, compared to English learner students in HDK	-0.015***	-0.010**	-0.011**	-0.007	0.003	0.005	0.000	-0.004
	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.003)	(0.004)	(0.003)
Age on September 1 of first kindergarten year, in years	-0.002	-0.001	-0.008*	-0.004	-0.001	-0.003	-0.001	-0.002
	(0.002)	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)	(0.004)
Female	-0.003*	-0.001	-0.002	-0.004	0.004	0.005**	0.001	0.004
	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Asian	-0.001	-0.000	0.003	0.004	0.001	0.004	0.004	0.005*
	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)
Latinx	-0.005*	-0.005	-0.006*	-0.006	-0.002	0.001	-0.001	-0.003

	2013/14 cohort				2014/15 cohort			
	Kindergarten attendance	Grade 1 attendance	Grade 2 attendance	Grade 3 attendance	Kindergarten attendance	Grade 1 attendance	Grade 2 attendance	Grade 3 attendance
	(0.002)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.003)	(0.003)
American Indian or Alaska Native, Black, multiracial, or Native Hawaiian or other Pacific Islander	-0.001	-0.000	0.001	0.000	0.004	0.002	0.002	0.002
	(0.002)	(0.003)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)
Student in district grades K to 2 only	-0.012***	-0.011**	-0.026**	na	-0.016**	-0.015***	-0.023***	na
	(0.003)	(0.003)	(0.008)		(0.005)	(0.003)	(0.006)	
Student in district grades K to 1 only	-0.012***	-0.021***	na	na	-0.004	-0.009*	na	na
	(0.003)	(0.005)			(0.003)	(0.004)		
Student in district grade K only	-0.011***	na	na	na	-0.006	na	na	na
	(0.002)				(0.004)			
Kindergarten entry assessment standardized letter naming score	0.003***	0.002	0.003*	0.004**	0.005***	0.004**	0.004*	0.003*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)
Kindergarten entry assessment standardized letter sound recognition score	-0.000	0.001	0.001	0.001	-0.003*	-0.001	-0.002	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Kindergarten entry assessment early math total score	0.000	0.001	0.000	-0.000	0.001	0.000	0.001*	0.001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Kindergarten entry assessment approaches to learning average score	0.005***	0.003	0.002	0.004*	0.007***	0.005***	0.006***	0.004*
	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)
Economically disadvantaged	-0.007***	-0.010***	-0.007*	-0.006**	-0.014***	-0.010***	-0.008**	-0.007*
	(0.002)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.003)
Has an individualized education program	-0.003	0.006	-0.002	0.001	0.003	0.000	-0.002	-0.007
	(0.002)	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)	(0.004)	(0.005)
Percentage of students age 6 or older at kindergarten entry at school	0.014	0.012	0.004	-0.015	0.007	0.013*	0.015	0.010
	(0.010)	(0.011)	(0.009)	(0.009)	(0.008)	(0.006)	(0.010)	(0.008)
Number of students at school	-0.000	-0.000	-0.000	0.000	-0.000*	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Percentage proficient in math at school	0.000	0.000	0.000	-0.000	-0.001	-0.000	-0.001	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)

	2013/14 cohort				2014/15 cohort			
	Kindergarten attendance	Grade 1 attendance	Grade 2 attendance	Grade 3 attendance	Kindergarten attendance	Grade 1 attendance	Grade 2 attendance	Grade 3 attendance
Percentage proficient in reading at school	0.000	-0.000	-0.000	0.000	0.001	0.000	0.001*	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)
Percentage Latinx at school	-0.019	0.023	-0.004	0.013	0.061*	0.118***	0.064	0.053
	(0.035)	(0.043)	(0.045)	(0.035)	(0.027)	(0.030)	(0.040)	(0.029)
Percentage American Indian or Alaska Native, Black, multiracial, or Native Hawaiian or other Pacific Islander at school	0.067	0.013	0.017	0.059	0.009	-0.001	0.079	0.004
	(0.039)	(0.045)	(0.048)	(0.048)	(0.041)	(0.045)	(0.042)	(0.070)
Percentage economically disadvantaged at school	0.024	-0.017	0.007	-0.011	-0.043**	-0.058***	-0.035*	-0.033
	(0.015)	(0.019)	(0.019)	(0.013)	(0.012)	(0.014)	(0.013)	(0.021)
Percentage English learner at school	-0.008	-0.017	-0.007	-0.016	-0.008	-0.066*	-0.008	-0.015
	(0.034)	(0.030)	(0.032)	(0.027)	(0.025)	(0.029)	(0.051)	(0.034)
Percentage of students who have an individualized education program at school	0.044	-0.050	-0.039	0.004	0.036	0.003	-0.030	0.050
	(0.031)	(0.042)	(0.036)	(0.034)	(0.050)	(0.037)	(0.038)	(0.041)
Constant	0.941***	0.973***	1.015***	0.963***	0.922***	0.968***	0.924***	0.950***
	(0.022)	(0.017)	(0.023)	(0.019)	(0.031)	(0.026)	(0.026)	(0.031)
Observations	2,535	2,252	2,085	1,918	2,599	2,324	2,132	1,954
R-squared	0.122	0.106	0.071	0.079	0.125	0.104	0.099	0.072

Panel E. Student age interaction

	2013/14 cohort				2014/15 cohort			
	Kindergarten attendance	Grade 1 attendance	Grade 2 attendance	Grade 3 attendance	Kindergarten attendance	Grade 1 attendance	Grade 2 attendance	Grade 3 attendance
Attended full-day kindergarten	-0.020	-0.021	0.020	-0.006	-0.062	-0.030	-0.029	0.015
	(0.027)	(0.027)	(0.037)	(0.023)	(0.032)	(0.031)	(0.037)	(0.037)
Age on September 1 of first kindergarten year, in years	-0.002	-0.002	-0.007	-0.004	-0.005	-0.006	-0.003	-0.002
	(0.003)	(0.004)	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)	(0.005)
Full-day kindergarten*age on September 1 of first kindergarten year, in years	0.002	0.005	-0.003	0.002	0.012*	0.007	0.007	-0.001
	(0.005)	(0.005)	(0.007)	(0.004)	(0.006)	(0.006)	(0.007)	(0.007)
Female	-0.003*	-0.001	-0.002	-0.004	0.004	0.005**	0.001	0.004
	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)

	2013/14 cohort				2014/15 cohort			
	Kindergarten attendance	Grade 1 attendance	Grade 2 attendance	Grade 3 attendance	Kindergarten attendance	Grade 1 attendance	Grade 2 attendance	Grade 3 attendance
Asian	-0.001	0.000	0.003	0.004	0.001	0.004	0.004	0.005*
	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)
Latinx	-0.005*	-0.005	-0.006*	-0.007	-0.002	0.000	-0.001	-0.003
	(0.002)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.003)	(0.003)
American Indian or Alaska Native, Black, multiracial, or Native Hawaiian or other Pacific Islander	-0.001	-0.000	0.001	0.000	0.004	0.002	0.002	0.002
	(0.002)	(0.003)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)
Student in district grades K to 2 only	-0.012***	-0.011**	-0.026**	na	-0.016**	-0.015***	-0.023***	na
	(0.003)	(0.003)	(0.008)		(0.005)	(0.003)	(0.006)	
Student in district grades K to 1 only	-0.012***	-0.021***	na	na	-0.004	-0.009*	na	na
	(0.003)	(0.005)			(0.003)	(0.004)		
Student in district grade K only	-0.011***	na	na	na	-0.006	na	na	na
	(0.002)				(0.004)			
Kindergarten entry assessment standardized letter naming score	0.003***	0.002	0.003*	0.004**	0.005***	0.004**	0.004*	0.003*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)
Kindergarten entry assessment standardized letter sound recognition score	-0.000	0.001	0.001	0.001	-0.003*	-0.001	-0.002	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Kindergarten entry assessment early math total score	0.000	0.000	0.000	-0.000	0.001	0.000	0.001*	0.001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Kindergarten entry assessment approaches to learning average score	0.005***	0.003	0.002	0.004	0.007***	0.005***	0.005***	0.003*
	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)
Economically disadvantaged	-0.007***	-0.010***	-0.007*	-0.006**	-0.014***	-0.010***	-0.008**	-0.007*
	(0.002)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.003)
English learner	0.006**	0.019***	0.015***	0.012***	0.003	0.003	0.007*	0.010***
	(0.002)	(0.002)	(0.003)	(0.003)	(0.004)	(0.002)	(0.003)	(0.002)
Has an individualized education program	-0.003	0.006	-0.002	0.000	0.003	0.000	-0.002	-0.007
	(0.002)	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)	(0.004)	(0.005)
Percentage of students age 6 or older at kindergarten entry at school	0.014	0.013	0.006	-0.014	0.007	0.014*	0.015	0.010

	2013/14 cohort				2014/15 cohort			
	Kindergarten attendance	Grade 1 attendance	Grade 2 attendance	Grade 3 attendance	Kindergarten attendance	Grade 1 attendance	Grade 2 attendance	Grade 3 attendance
	(0.010)	(0.012)	(0.010)	(0.008)	(0.009)	(0.006)	(0.010)	(0.008)
Number of students at school	-0.000	-0.000	-0.000	0.000	-0.000*	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Percentage proficient in math at school	0.000	0.000	0.000	-0.000	-0.001	-0.000	-0.001	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)
Percentage proficient in reading at school	0.000	-0.000	-0.000	0.000	0.001	0.000	0.001*	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)
Percentage Latinx at school	-0.018	0.024	-0.001	0.014	0.063*	0.119***	0.066	0.055
	(0.035)	(0.044)	(0.043)	(0.036)	(0.027)	(0.030)	(0.040)	(0.029)
Percentage American Indian or Alaska Native, Black, multiracial, or Native Hawaiian or other Pacific Islander at school	0.065	0.009	0.011	0.053	0.008	-0.002	0.079	0.002
	(0.040)	(0.045)	(0.046)	(0.048)	(0.042)	(0.046)	(0.042)	(0.070)
Percentage economically disadvantaged at school	0.023	-0.018	0.005	-0.012	-0.044**	-0.059***	-0.036*	-0.034
	(0.015)	(0.020)	(0.017)	(0.013)	(0.013)	(0.014)	(0.013)	(0.021)
Percentage English learner at school	-0.008	-0.015	-0.006	-0.015	-0.009	-0.066*	-0.008	-0.015
	(0.034)	(0.031)	(0.032)	(0.028)	(0.025)	(0.029)	(0.051)	(0.034)
Percentage of students who have an individualized education program at school	0.044	-0.051	-0.039	0.003	0.035	0.004	-0.030	0.052
	(0.031)	(0.043)	(0.036)	(0.034)	(0.050)	(0.037)	(0.038)	(0.041)
Constant	0.937***	0.961***	0.994***	0.953***	0.940***	0.977***	0.928***	0.935***
	(0.023)	(0.021)	(0.027)	(0.022)	(0.034)	(0.027)	(0.030)	(0.035)
Observations	2,535	2,252	2,085	1,918	2,599	2,324	2,132	1,954
R-squared	0.122	0.104	0.069	0.077	0.126	0.104	0.099	0.072

Panel F. Percentage of economically disadvantaged students in school interaction

	2013/14 cohort				2014/15 cohort			
	Kindergarten attendance	Grade 1 attendance	Grade 2 attendance	Grade 3 attendance	Kindergarten attendance	Grade 1 attendance	Grade 2 attendance	Grade 3 attendance
Attended full-day kindergarten	-0.008	0.006	0.005	0.003	-0.001	0.007**	0.005*	0.009**
	(0.005)	(0.004)	(0.004)	(0.003)	(0.004)	(0.002)	(0.003)	(0.003)
Percentage of economically disadvantaged students at school	0.023	-0.020	0.006	-0.015	-0.053***	-0.062***	-0.038*	-0.031
	(0.015)	(0.019)	(0.020)	(0.013)	(0.014)	(0.014)	(0.014)	(0.021)
Full-day kindergarten*percentage of economically disadvantaged students at school	-0.002	0.006	-0.003	0.006	0.017	0.006	0.004	-0.004
	(0.009)	(0.010)	(0.011)	(0.008)	(0.009)	(0.005)	(0.006)	(0.007)
Age on September 1 of first kindergarten year, in years	-0.002	0.000	-0.008*	-0.003	-0.001	-0.003	-0.000	-0.002
	(0.002)	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)	(0.004)
Female	-0.003*	-0.001	-0.002	-0.004	0.004	0.005**	0.001	0.004
	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Asian	-0.001	0.000	0.003	0.004	0.001	0.004	0.004	0.005*
	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)
Latinx	-0.005*	-0.005	-0.006*	-0.007	-0.002	0.000	-0.001	-0.004
	(0.002)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.003)	(0.003)
American Indian or Alaska Native, Black, multiracial, or Native Hawaiian or other Pacific Islander	-0.001	-0.000	0.001	0.000	0.004	0.002	0.002	0.002
	(0.002)	(0.003)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Student in district grades K to 2 only	-0.012***	-0.011**	-0.026**	na	-0.016**	-0.015***	-0.024***	na
	(0.003)	(0.003)	(0.008)		(0.005)	(0.003)	(0.006)	
Student in district grades K to 1 only	-0.012***	-0.021***	na	na	-0.004	-0.009*	na	na
	(0.003)	(0.005)			(0.003)	(0.004)		
Student in district grade K only	-0.011***	na	na	na	-0.006	na	na	na
	(0.002)				(0.004)			
Kindergarten entry assessment standardized letter naming score	0.003***	0.002	0.003*	0.004**	0.005***	0.004**	0.004*	0.003*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)
Kindergarten entry assessment standardized letter sound recognition score	-0.000	0.001	0.001	0.001	-0.003*	-0.001	-0.002	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)

	2013/14 cohort				2014/15 cohort			
	Kindergarten attendance	Grade 1 attendance	Grade 2 attendance	Grade 3 attendance	Kindergarten attendance	Grade 1 attendance	Grade 2 attendance	Grade 3 attendance
Kindergarten entry assessment early math total score	0.000	0.000	0.000	-0.000	0.001	0.000	0.001*	0.001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Kindergarten entry assessment approaches to learning average score	0.005***	0.003	0.002	0.003	0.007***	0.004**	0.005**	0.004*
	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)
Economically disadvantaged	-0.007***	-0.010***	-0.008*	-0.006**	-0.014***	-0.010***	-0.008**	-0.007*
	(0.002)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.003)
English learner	0.006**	0.019***	0.015***	0.012***	0.003	0.003	0.006*	0.010***
	(0.002)	(0.003)	(0.003)	(0.003)	(0.004)	(0.002)	(0.003)	(0.002)
Has an individualized education program	-0.003	0.005	-0.002	0.000	0.003	0.000	-0.002	-0.007
	(0.002)	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)	(0.004)	(0.005)
Percentage of students age 6 or older at kindergarten entry at school	0.014	0.014	0.005	-0.012	0.009	0.014*	0.016	0.010
	(0.011)	(0.013)	(0.010)	(0.009)	(0.009)	(0.006)	(0.009)	(0.008)
Number of students at school	-0.000	-0.000	-0.000	0.000	-0.000*	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Percentage proficient in math at school	0.000	0.000	0.000	-0.000	-0.001	-0.000	-0.001	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)
Percentage proficient in reading at school	0.000	-0.000	-0.000	0.000	0.002*	0.000	0.001*	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)
Percentage Latinx at school	-0.017	0.024	-0.001	0.013	0.068*	0.121***	0.068	0.053
	(0.036)	(0.045)	(0.044)	(0.036)	(0.030)	(0.032)	(0.039)	(0.029)
Percentage American Indian or Alaska Native, Black, multiracial, or Native Hawaiian or other Pacific Islander at school	0.067	0.001	0.014	0.046	-0.003	-0.006	0.076	0.005
	(0.039)	(0.046)	(0.049)	(0.048)	(0.042)	(0.045)	(0.042)	(0.070)
Percentage English learner at school	-0.008	-0.014	-0.007	-0.013	-0.007	-0.065*	-0.008	-0.015
	(0.035)	(0.032)	(0.032)	(0.030)	(0.027)	(0.031)	(0.052)	(0.034)
Percentage of students who have an individualized education program at school	0.043	-0.049	-0.040	0.004	0.044	0.006	-0.028	0.051
	(0.031)	(0.043)	(0.036)	(0.035)	(0.055)	(0.039)	(0.040)	(0.040)
Constant	0.933***	0.954***	0.998***	0.950***	0.918***	0.964***	0.916***	0.938***

	2013/14 cohort				2014/15 cohort			
	Kindergarten attendance	Grade 1 attendance	Grade 2 attendance	Grade 3 attendance	Kindergarten attendance	Grade 1 attendance	Grade 2 attendance	Grade 3 attendance
	(0.022)	(0.017)	(0.023)	(0.018)	(0.029)	(0.025)	(0.026)	(0.033)
Observations	2,535	2,252	2,085	1,918	2,599	2,324	2,132	1,954
R-squared	0.122	0.104	0.069	0.077	0.127	0.104	0.099	0.072

*** Significant at $p < 0.001$; ** significant at $p < 0.01$; * significant at $p < 0.05$.
na is not applicable.
Note: Robust standard errors clustered at the school level in parentheses.
Source: Authors' analysis of data from the Oregon Department of Education and one large Oregon school district.

Table C10. Group analysis of the relationship between full-day kindergarten and grade 3 math and reading test scores in one large Oregon school district, 2013/14 and 2014/15 kindergarten cohorts

Panel A. Latinx group analysis

	2013/14 cohort		2014/15 cohort	
	Grade 3 math	Grade 3 reading	Grade 3 math	Grade 3 reading
Impact of FDK on Latinx students, compared to Latinx students in HDK	0.002	-0.013	0.130	0.131
	(0.092)	(0.053)	(0.097)	(0.080)
Impact of HDK on non-Latinx students compared to Latinx students in HDK	0.070	0.136*	0.184**	0.256***
	(0.060)	(0.062)	(0.066)	(0.056)
Impact of FDK on non-Latinx students, compared to Latinx students in HDK	0.148	0.179*	0.233*	0.232**
	(0.077)	(0.081)	(0.088)	(0.074)
Age on September 1 of first kindergarten year, in years	-0.086	0.046	-0.060	-0.043
	(0.064)	(0.065)	(0.054)	(0.049)
Female	-0.194***	-0.139***	-0.210***	-0.110**
	(0.040)	(0.037)	(0.034)	(0.032)
Asian	0.284***	0.145**	0.317***	0.021
	(0.050)	(0.051)	(0.076)	(0.074)
American Indian or Alaska Native, Black, multiracial, or Native Hawaiian or other Pacific Islander	0.081	-0.031	-0.049	-0.038
	(0.046)	(0.052)	(0.054)	(0.066)
Kindergarten entry assessment standardized letter naming score	0.150***	0.150***	0.090***	0.086***
	(0.037)	(0.032)	(0.018)	(0.022)
Kindergarten entry assessment standardized letter sound recognition score	0.020	0.072**	0.070***	0.097***

	2013/14 cohort		2014/15 cohort	
	Grade 3 math	Grade 3 reading	Grade 3 math	Grade 3 reading
	(0.024)	(0.022)	(0.018)	(0.022)
Kindergarten entry assessment early math total score	0.094***	0.071***	0.086***	0.071***
	(0.008)	(0.008)	(0.007)	(0.007)
Kindergarten entry assessment approaches to learning average score	0.228***	0.155***	0.324***	0.251***
	(0.021)	(0.027)	(0.032)	(0.031)
Economically disadvantaged	-0.241***	-0.182**	-0.301***	-0.251***
	(0.060)	(0.063)	(0.049)	(0.050)
English learner	0.034	-0.090	-0.042	-0.143*
	(0.062)	(0.070)	(0.065)	(0.060)
Has an individualized education program	-0.182*	-0.199*	-0.278***	-0.343***
	(0.080)	(0.093)	(0.076)	(0.064)
Percentage of students age 6 or older at kindergarten entry at school	0.272	0.196	0.878***	0.588**
	(0.206)	(0.198)	(0.164)	(0.178)
Number of students at school	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Percentage Latinx at school	1.481	0.592	1.678	0.493
	(1.114)	(1.006)	(1.375)	(0.838)
Percentage American Indian or Alaska Native, Black, multiracial, or Native Hawaiian or other Pacific Islander at school	-2.010	-2.052	-5.262***	-3.317**
	(1.030)	(1.028)	(1.228)	(0.986)
Percentage economically disadvantaged at school	-0.494	-0.223	-0.057	0.086
	(0.569)	(0.575)	(0.518)	(0.387)
Percentage English learner at school	-1.484	-0.891	-1.798	-0.699
	(0.766)	(0.663)	(1.234)	(0.847)
Percentage of students who have an individualized education program at school	-1.286	-1.114	-2.841	-2.225
	(1.338)	(1.202)	(1.628)	(1.214)
Constant	-0.214	-0.792	-0.345	-0.501
	(0.385)	(0.423)	(0.544)	(0.460)
Observations	1,852	1,862	1,879	1,885
R-squared	0.517	0.484	0.546	0.522

Panel B. American Indian or Alaska Native, Black, multiracial, or Native Hawaiian or other Pacific Islander group analysis

	2013/14 cohort		2014/15 cohort	
	Grade 3 math	Grade 3 reading	Grade 3 math	Grade 3 reading
Impact of FDK on American Indian or Alaska Native, Black, multiracial, or Native Hawaiian or other Pacific Islander students, compared to American Indian or Alaska Native, Black, multiracial, or Native Hawaiian or other Pacific Islander students in HDK	0.074	-0.113	-0.248	-0.194
	(0.117)	(0.117)	(0.124)	(0.129)
Impact of HDK on non-group students compared to American Indian or Alaska Native, Black, multiracial, or Native Hawaiian or other Pacific Islander students in HDK	-0.075	-0.019	-0.083	-0.049
	(0.059)	(0.063)	(0.060)	(0.063)
Impact of FDK on non-group students, compared to American Indian or Alaska Native, Black, multiracial, or Native Hawaiian or other Pacific Islander students in HDK	-0.021	0.025	0.024	-0.006
	(0.079)	(0.079)	(0.076)	(0.065)
Age on September 1 of first kindergarten year, in years	-0.085	0.046	-0.064	-0.046
	(0.064)	(0.064)	(0.054)	(0.049)
Female	-0.195***	-0.138***	-0.210***	-0.109**
	(0.040)	(0.038)	(0.033)	(0.032)
Asian	0.283***	0.144**	0.313***	0.017
	(0.049)	(0.052)	(0.075)	(0.074)
Latinx	-0.093*	-0.151*	-0.160**	-0.208***
	(0.050)	(0.061)	(0.056)	(0.054)
Kindergarten entry assessment standardized letter naming score	0.151***	0.151***	0.089***	0.086***
	(0.037)	(0.032)	(0.019)	(0.022)
Kindergarten entry assessment standardized letter sound recognition score	0.020	0.072**	0.070***	0.098***
	(0.024)	(0.022)	(0.018)	(0.022)
Kindergarten entry assessment early math total score	0.094***	0.071***	0.087***	0.071***
	(0.009)	(0.008)	(0.007)	(0.007)
Kindergarten entry assessment approaches to learning average score	0.228***	0.153***	0.324***	0.254***
	(0.020)	(0.027)	(0.032)	(0.031)
Economically disadvantaged	-0.243***	-0.186**	-0.296***	-0.247***
	(0.061)	(0.062)	(0.049)	(0.051)
English learner	0.032	-0.088	-0.037	-0.135*
	(0.062)	(0.070)	(0.064)	(0.059)

	2013/14 cohort		2014/15 cohort	
	Grade 3 math	Grade 3 reading	Grade 3 math	Grade 3 reading
Has an individualized education program	-0.184*	-0.202*	-0.273**	-0.340***
	(0.080)	(0.092)	(0.076)	(0.064)
Percentage of students age 6 or older at kindergarten entry at school	0.287	0.221	0.874***	0.564**
	(0.207)	(0.203)	(0.166)	(0.171)
Number of students at school	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Percentage Latinx at school	1.491	0.614	1.611	0.405
	(1.120)	(1.004)	(1.399)	(0.844)
Percentage American Indian or Alaska Native, Black, multiracial, or Native Hawaiian or other Pacific Islander at school	-2.078	-2.102	-5.200***	-3.210**
	(1.036)	(1.052)	(1.244)	(0.981)
Percentage economically disadvantaged at school	-0.512	-0.236	-0.051	0.112
	(0.569)	(0.568)	(0.518)	(0.382)
Percentage English learner at school	-1.461	-0.874	-1.738	-0.656
	(0.780)	(0.680)	(1.258)	(0.845)
Percentage of students who have an individualized education program at school	-1.297	-1.141	-2.805	-2.199
	(1.340)	(1.216)	(1.626)	(1.217)
Constant	-0.056	-0.626	-0.091	-0.228
	(0.377)	(0.412)	(0.537)	(0.446)
Observations	1,852	1,862	1,879	1,885
R-squared	0.517	0.485	0.548	0.522

Panel C. Economically disadvantaged group analysis

	2013/14 cohort		2014/15 cohort	
	Grade 3 math	Grade 3 reading	Grade 3 math	Grade 3 reading
Impact of FDK on economically disadvantaged students, compared to economically disadvantaged students in HDK	0.003	-0.054	0.049	-0.037
	(0.093)	(0.061)	(0.104)	(0.086)
Impact of HDK on non-economically disadvantaged students compared to economically disadvantaged students in HDK	0.223***	0.153*	0.290***	0.223***
	(0.059)	(0.066)	(0.048)	(0.048)

	2013/14 cohort		2014/15 cohort	
	Grade 3 math	Grade 3 reading	Grade 3 math	Grade 3 reading
Impact of FDK on non-economically disadvantaged students, compared to economically disadvantaged students in HDK	0.310**	0.225*	0.374***	0.273***
	(0.090)	(0.090)	(0.077)	(0.062)
Age on September 1 of first kindergarten year, in years	-0.087	0.043	-0.060	-0.044
	(0.064)	(0.065)	(0.055)	(0.049)
Female	-0.194***	-0.139***	-0.211***	-0.107**
	(0.040)	(0.037)	(0.034)	(0.032)
Asian	0.283***	0.145**	0.316***	0.019
	(0.049)	(0.051)	(0.076)	(0.075)
Latinx	-0.088	-0.145*	-0.159**	-0.206***
	(0.051)	(0.061)	(0.056)	(0.054)
American Indian or Alaska Native, Black, multiracial, or Native Hawaiian or other Pacific Islander	0.080	-0.033	-0.050	-0.038
	-0.046	(0.052)	(0.055)	(0.067)
Kindergarten entry assessment standardized letter naming score	0.150***	0.149***	0.090***	0.086***
	(0.037)	(0.032)	(0.018)	(0.022)
Kindergarten entry assessment standardized letter sound recognition score	0.020	0.072**	0.071***	0.098***
	(0.024)	(0.022)	(0.018)	(0.022)
Kindergarten entry assessment early math total score	0.094***	0.071***	0.086***	0.070***
	(0.008)	(0.008)	(0.007)	(0.007)
Kindergarten entry assessment approaches to learning average score	0.229***	0.156***	0.328***	0.260***
	(0.020)	(0.027)	(0.033)	(0.031)
English learner	0.034	-0.088	-0.037	-0.133*
	(0.062)	(0.069)	(0.066)	(0.061)
Has an individualized education program	-0.182*	-0.197*	-0.277***	-0.339***
	(0.080)	(0.093)	(0.076)	(0.064)
Percentage of students age 6 or older at kindergarten entry at school	0.272	0.184	0.852***	0.531**
	(0.207)	(0.201)	(0.167)	(0.168)
Number of students at school	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)

	2013/14 cohort		2014/15 cohort	
	Grade 3 math	Grade 3 reading	Grade 3 math	Grade 3 reading
Percentage Latinx at school	1.479	0.580	1.623	0.371
	(1.116)	(1.006)	(1.371)	(0.809)
Percentage American Indian or Alaska Native, Black, multiracial, or Native Hawaiian or other Pacific Islander at school	-1.974	-1.946	-5.171***	-3.109**
	(1.051)	(1.030)	(1.216)	(0.948)
Percentage economically disadvantaged at school	-0.497	-0.211	-0.030	0.144
	(0.571)	(0.575)	(0.521)	(0.383)
Percentage English learner at school	-1.474	-0.894	-1.786	-0.669
	(0.760)	(0.660)	(1.224)	(0.803)
Percentage of students who have an individualized education program at school	-1.311	-1.143	-2.836	-2.212
	(1.342)	(1.212)	(1.624)	(1.202)
Constant	-0.368	-0.820	-0.485	-0.542
	(0.389)	(0.420)	(0.535)	(0.459)
Observations	1,852	1,862	1,879	1,885
R-squared	0.517	0.485	0.546	0.522

Panel D. English learner group analysis

	2013/14 cohort		2014/15 cohort	
	Grade 3 math	Grade 3 reading	Grade 3 math	Grade 3 reading
Impact of FDK on English learner students, compared to English learner students in HDK	0.006	-0.030	0.017	-0.039
	(0.101)	(0.081)	(0.100)	(0.081)
Impact of HDK on non-English learner students compared to English learner students in HDK	0.014	0.110*	0.014	0.110*
	(0.074)	(0.054)	(0.074)	(0.054)
Impact of FDK on non-English learner students, compared to English learner students in HDK	0.105	0.150	0.105	0.150
	(0.095)	(0.074)	(0.095)	(0.074)
Age on September 1 of first kindergarten year, in years	-0.088	0.043	-0.061	-0.045
	(0.064)	(0.065)	(0.055)	(0.050)
Female	-0.195***	0.139***	-0.211***	0.108**
	(0.040)	(0.037)	(0.034)	(0.032)
Asian	0.282***	0.144**	0.313***	0.015

	2013/14 cohort		2014/15 cohort	
	Grade 3 math	Grade 3 reading	Grade 3 math	Grade 3 reading
	(0.049)	(0.052)	(0.076)	(0.073)
Latinx	-0.091	-0.150*	-0.158**	-0.205***
	(0.050)	(0.061)	(0.056)	(0.054)
American Indian or Alaska Native, Black, multiracial, or Native Hawaiian or other Pacific Islander	0.081	-0.031	-0.050	-0.040
	(0.046)	(0.052)	(0.055)	(0.067)
Kindergarten entry assessment standardized letter naming score	0.150***	0.149***	0.090***	0.086***
	(0.037)	(0.032)	(0.018)	(0.022)
Kindergarten entry assessment standardized letter sound recognition score	0.020	0.072**	0.071***	0.099***
	(0.024)	(0.022)	(0.018)	(0.022)
Kindergarten entry assessment early math total score	0.094***	0.071***	0.086***	0.071***
	(0.008)	(0.008)	(0.007)	(0.007)
Kindergarten entry assessment approaches to learning average score	0.228***	0.155***	0.329***	0.258***
	(0.021)	(0.027)	(0.032)	(0.031)
Economically disadvantaged	-0.242***	-0.182**	-0.300***	-0.249***
	(0.060)	(0.063)	(0.049)	(0.050)
Has an individualized education program	-0.182*	-0.198*	-0.277***	-0.341***
	(0.080)	(0.092)	(0.076)	(0.064)
Percentage of students age 6 or older at kindergarten entry at school	0.276	0.193	0.850***	0.543**
	(0.208)	(0.204)	(0.164)	(0.165)
Number of students at school	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Percentage Latinx at school	1.477	0.584	1.617	0.399
	(1.123)	(1.004)	(1.361)	(0.804)
Percentage American Indian or Alaska Native, Black, multiracial, or Native Hawaiian or other Pacific Islander at school	-2.033	-2.051	-5.185***	-3.185**
	(1.041)	(1.036)	(1.236)	(0.967)
Percentage economically disadvantaged at school	-0.499	-0.222	-0.024	0.135
	(0.571)	(0.571)	(0.515)	(0.377)
Percentage English learner at school	-1.469	-0.885	-1.794	-0.690
	(0.768)	(0.667)	(1.222)	(0.810)
Percentage of students who have an individualized education program at school	-1.291	-1.116	-2.840	-2.215

	2013/14 cohort		2014/15 cohort	
	Grade 3 math	Grade 3 reading	Grade 3 math	Grade 3 reading
	(1.338)	(1.203)	(1.626)	(1.207)
Constant	-0.084	-0.720	-0.208	-0.408
	(0.385)	(0.399)	(0.549)	(0.450)
Observations	1,852	1,862	1,879	1,885
R-squared	0.517	0.484	0.546	0.521

Panel E. Student age interaction

	2013/14 cohort		2014/15 cohort	
	Grade 3 math	Grade 3 reading	Grade 3 math	Grade 3 reading
Attended full-day kindergarten	0.109	-0.413	0.709	0.611
	(0.611)	(0.781)	(0.562)	(0.681)
Full-day kindergarten*age on September 1 of first kindergarten year, in years	-0.010	0.080	-0.115	-0.107
	(0.110)	(0.142)	(0.102)	(0.123)
Age on September 1 of first kindergarten year, in years	-0.020	-0.006	-0.020	-0.006
	(0.063)	(0.063)	(0.063)	(0.063)
Female	-0.212***	0.107**	-0.212***	0.107**
	(0.034)	(0.032)	(0.034)	(0.032)
Asian	0.316***	0.019	0.316***	0.019
	(0.075)	(0.074)	(0.075)	(0.074)
Latinx	-0.158**	-0.206***	-0.158**	-0.206***
	(0.056)	(0.054)	(0.056)	(0.054)
American Indian or Alaska Native, Black, multiracial, or Native Hawaiian or other Pacific Islander	-0.051	-0.041	-0.051	-0.041
	(0.055)	(0.067)	(0.055)	(0.067)
Kindergarten entry assessment standardized letter naming score	0.151***	0.150***	0.090***	0.086***
	(0.037)	(0.032)	(0.018)	(0.022)
Kindergarten entry assessment standardized letter sound recognition score	0.020	0.072**	0.090***	0.086***
	(0.024)	(0.022)	(0.018)	(0.022)
Kindergarten entry assessment early math total score	0.094***	0.071***	0.072***	0.099***
	(0.008)	(0.008)	(0.018)	(0.023)
Kindergarten entry assessment approaches to learning average score	0.228***	0.155***	0.086***	0.071***

	2013/14 cohort		2014/15 cohort	
	Grade 3 math	Grade 3 reading	Grade 3 math	Grade 3 reading
	(0.021)	(0.027)	(0.007)	(0.007)
Economically disadvantaged	-0.244***	-0.183**	0.326***	0.255***
	(0.061)	(0.062)	(0.031)	(0.030)
English learner	0.033	-0.089	-0.300***	-0.249***
	(0.062)	(0.070)	(0.049)	(0.050)
Has an individualized education program	-0.184*	-0.201*	-0.039	-0.136*
	(0.080)	(0.093)	(0.065)	(0.060)
Percentage of students age 6 or older at kindergarten entry at school	0.289	0.206	-0.278***	-0.342***
	(0.207)	(0.200)	(0.076)	(0.064)
Number of students at school	-0.000	-0.000	0.858***	0.553**
	(0.000)	(0.000)	(0.163)	(0.166)
Percentage Latinx at school	1.495	0.588	-0.000	-0.000
	(1.120)	(1.008)	(0.000)	(0.000)
Percentage American Indian or Alaska Native, Black, multiracial, or Native Hawaiian or other Pacific Islander at school	-2.078	-2.103	1.629	0.413
	(1.037)	(1.043)	(1.368)	(0.817)
Percentage economically disadvantaged at school	-0.513	-0.228	-5.218***	-3.221**
	(0.569)	(0.569)	(1.240)	(0.975)
Percentage English learner at school	-1.461	-0.871	-0.035	0.123
	(0.780)	(0.676)	(0.511)	(0.375)
Percentage of students who have an individualized education program at school	-1.300	-1.114	-1.788	-0.684
	(1.344)	(1.212)	(1.228)	(0.823)
Constant	-0.146	-0.508	-0.397	-0.485
	(0.431)	(0.488)	(0.552)	(0.500)
Observations	1,852	1,862	1,879	1,885
R-squared	0.517	0.484	0.546	0.521

Panel F. Percentage of economically disadvantaged students in school interaction

	2013/14 cohort		2014/15 cohort	
	Grade 3 math	Grade 3 reading	Grade 3 math	Grade 3 reading
Attended full-day kindergarten	0.066	0.104	0.154	0.131
	(0.074)	(0.085)	(0.098)	(0.067)

	2013/14 cohort		2014/15 cohort	
	Grade 3 math	Grade 3 reading	Grade 3 math	Grade 3 reading
Full-day kindergarten*percentage of economically disadvantaged students at school	-0.025	-0.186	-0.202	-0.273
	(0.160)	(0.145)	(0.224)	(0.168)
Percentage of economically disadvantaged students at school	-0.502	-0.165	0.069	0.265
	(0.585)	(0.589)	(0.548)	(0.389)
Age on September 1 of first kindergarten year, in years	-0.086	0.044	-0.063	-0.046
	(0.064)	(0.065)	(0.054)	(0.049)
Female	-0.195***	0.140***	-0.215***	0.103**
	(0.041)	(0.038)	(0.035)	(0.033)
Asian	0.282***	0.143**	0.312***	0.013
	(0.049)	(0.052)	(0.077)	(0.074)
Latinx	-0.093	-0.151*	-0.163**	-0.212***
	(0.050)	(0.062)	(0.056)	(0.053)
American Indian or Alaska Native, Black, multiracial, or Native Hawaiian or other Pacific Islander	0.081	-0.033	-0.054	-0.044
	(0.046)	(0.052)	(0.055)	(0.068)
Kindergarten entry assessment standardized letter naming score	0.150***	0.149***	0.089***	0.084***
	(0.037)	(0.032)	(0.018)	(0.022)
Kindergarten entry assessment standardized letter sound recognition score	0.020	0.072**	0.072***	0.100***
	(0.024)	(0.022)	(0.018)	(0.021)
Kindergarten entry assessment early math total score	0.094***	0.071***	0.086***	0.070***
	(0.009)	(0.008)	(0.007)	(0.007)
Kindergarten entry assessment approaches to learning average score	0.228***	0.156***	0.333***	0.264***
	(0.020)	(0.027)	(0.032)	(0.032)
Economically disadvantaged	-0.244***	-0.185**	-0.299***	-0.248***
	(0.061)	(0.063)	(0.049)	(0.049)
English learner	0.033	-0.087	-0.035	-0.131*
	(0.061)	(0.070)	(0.065)	(0.059)
Has an individualized education program	-0.184*	-0.195*	-0.277***	-0.340***
	(0.080)	(0.093)	(0.075)	(0.064)
Percentage of students age 6 or older at kindergarten entry at school	0.284	0.176	0.811***	0.487**
	(0.200)	(0.191)	(0.178)	(0.166)
Number of students at school	-0.000	-0.000	-0.000	-0.000

	2013/14 cohort		2014/15 cohort	
	Grade 3 math	Grade 3 reading	Grade 3 math	Grade 3 reading
	(0.000)	(0.000)	(0.000)	(0.000)
Percentage Latinx at school	1.495	0.615	1.563	0.316
	(1.117)	(0.991)	(1.343)	(0.762)
Percentage American Indian or Alaska Native, Black, multiracial, or Native Hawaiian or other Pacific Islander at school	-2.054	-1.931	-5.013***	-2.941**
	(1.033)	(1.040)	(1.222)	(0.951)
Percentage economically disadvantaged at school	-1.467	-0.924	-1.768	-0.654
	(0.776)	(0.648)	(1.194)	(0.759)
Percentage of students who have an individualized education program at school	-1.300	-1.132	-2.873	-2.260
	(1.345)	(1.208)	(1.632)	(1.214)
Constant	-0.134	-0.675	-0.234	-0.357
	(0.372)	(0.401)	(0.526)	(0.447)
Observations	1,852	1,862	1,879	1,885
R-squared	0.517	0.485	0.546	0.522

*** Significant at $p < 0.001$; ** significant at $p < 0.01$; * significant at $p < 0.05$.
na is not applicable.
Note: Robust standard errors clustered at the school level in parentheses.
Source: Authors' analysis of data from the Oregon Department of Education and one large Oregon school district.

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Appendix D. Full-day kindergarten practices survey results

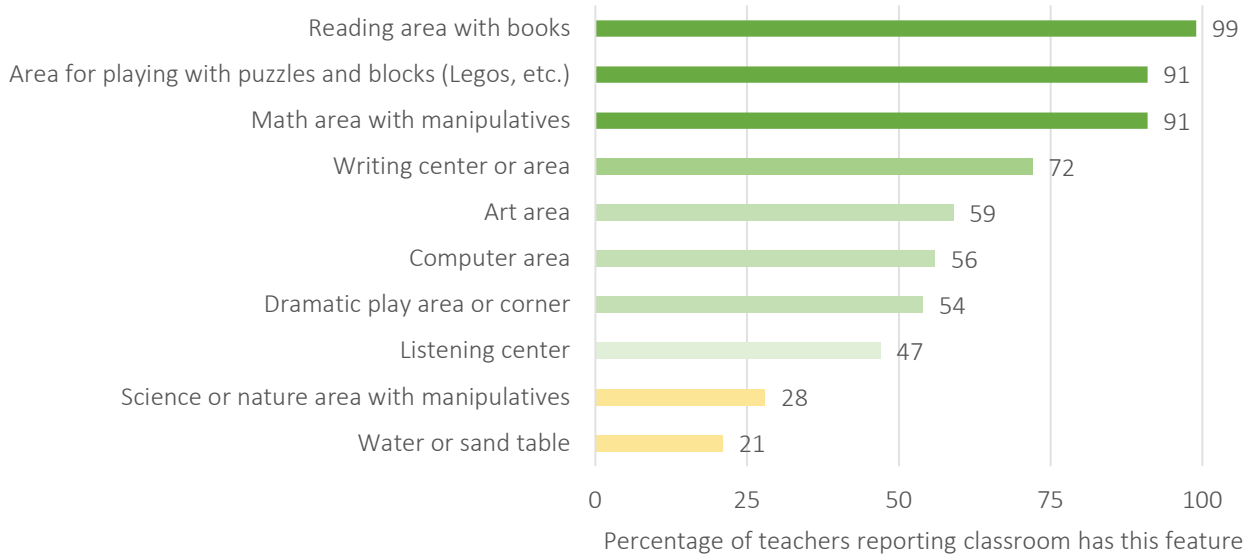
This appendix presents additional results from the full-day kindergarten (FDK) practices survey administered by the Oregon Department of Education in 2017/18. Although the results are not representative of all teachers and districts in the state, they do describe important aspects of schooling in many classrooms in Oregon, including the classroom environment and teaching practices, which provide insights that can guide policymakers and school leaders who are working to improve FDK implementation and quality.

In 2017/18, full-day kindergarten teachers in Oregon focused on reading and math

Examining FDK implementation in 2017/18 from the FDK practices survey, the study team found that FDK teachers in Oregon focused on reading and math. In terms of time spent on subject areas, the most common were reading and language arts, with most teachers reporting spending time on reading for five days per week for 1.5 to 2 hours per day. Math was also common, with most teachers reporting focusing on math five days per week for 1 to 1.5 hours per day. Teachers typically taught social studies, science, and music only two days per week for 30 to 60 minutes, and art and physical education only one day per week for 30 to 60 minutes.

The survey included items targeted to two areas: the classroom environment or activity areas available and teacher pedagogy or practices. The focus on math and reading was reflected in the activity areas reported by teachers. Nearly all teacher respondents (99 percent) reported offering a reading area with books in their classroom, followed closely by a puzzle/block area (91 percent) and a math area (91 percent; figure D1). Teachers who reported having an art area (59 percent) or a dramatic play area (54 percent) also reported spending more time on child-selected activities (not shown). Only 28 percent of teachers reported a science or nature area.

Figure D1. More than 90 percent of responding teachers reported offering a reading area, puzzle area, and math area in their classrooms, 2017/18

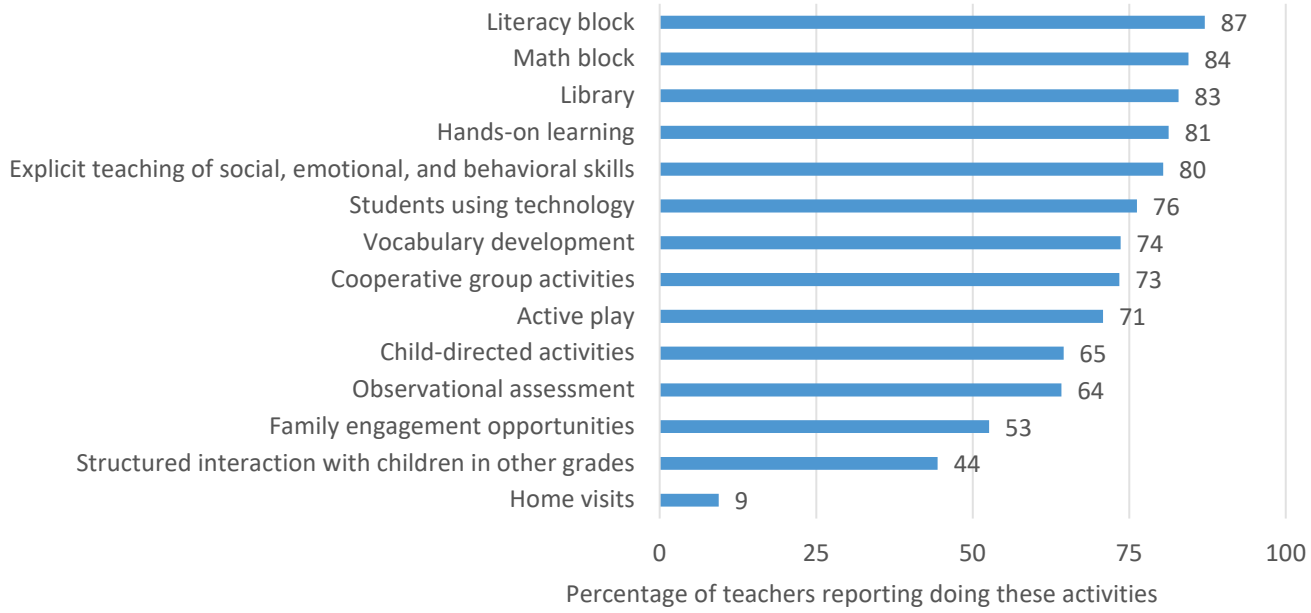


Source: Authors' analysis of data from the Oregon Department of Education full-day kindergarten practices survey, item 14.

As with classroom activity areas, reading and math were also the focus of teacher practices. The most common activity reported overall was a literacy block, with 87 percent of teachers reporting doing this at any point in their kindergarten program (figure D2). Seventy-two percent of teachers reported doing a 90-minute literacy block in their classroom, with two-thirds reporting doing this block five days per week and the remaining one-third four days per week (not shown). Other common activities include a math block (84 percent), library time (83 percent),

hands-on learning (81 percent), and explicit teaching of social, emotional, and behavioral skills (80 percent). Less common activities were family engagement opportunities, with slightly more than half of respondents reporting that (53 percent), and structured interaction with children in other grades (44 percent). Few teachers reported doing home visits (9 percent).

Figure D2. More than 80 percent of responding teachers reported literacy and math blocks in their kindergarten classroom schedules, while nearly two-thirds reported child-directed activities and about half reported family engagement opportunities, 2017/18

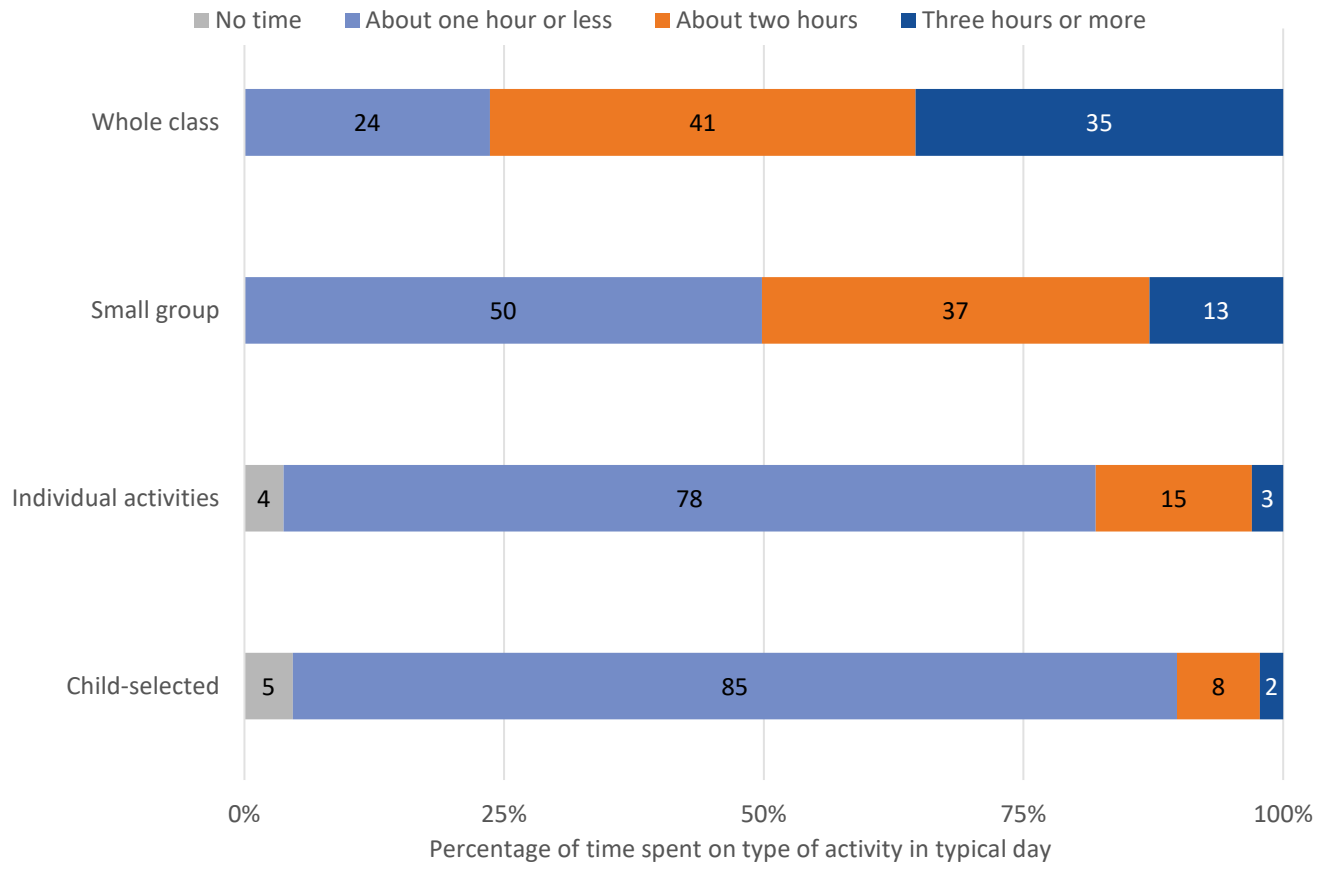


Source: Authors' analysis of data from the Oregon Department of Education full-day kindergarten practices survey, item 18.

In 2017/18, most teachers spent less time in a typical day on child-selected activities and free play and more time on teacher-directed activities

During the typical kindergarten day, teachers reported spending more time on teacher-directed activities and less time on child-selected activities and free play. A typical kindergarten day in 2017/18 was about 6.5 hours long, and 90 percent of teachers who responded to the survey reported that in a typical day they spent one hour or less on child-selected activities (figure D3). Most responding teachers—76 percent—reported spending two hours or more on teacher-directed whole-class activities. Fifty percent of responding teachers reported spending two hours or more on teacher-directed small group activities. Five percent of respondents reported spending no time on child-selected activities, and 48 percent of teachers reported spending only a half-hour or less on child-selected activities. Teachers answered a separate question about play and lunch. The most commonly reported play/lunch schedule was that children have 16–30 minutes of lunch, 16–30 minutes of free play indoors, and 31–45 minutes of free play outdoors in a typical day.

Figure D3. Teachers reported spending more time on teacher-directed whole-class activities and teacher-directed small-group activities than on individual activities and child-selected activities, 2017/18

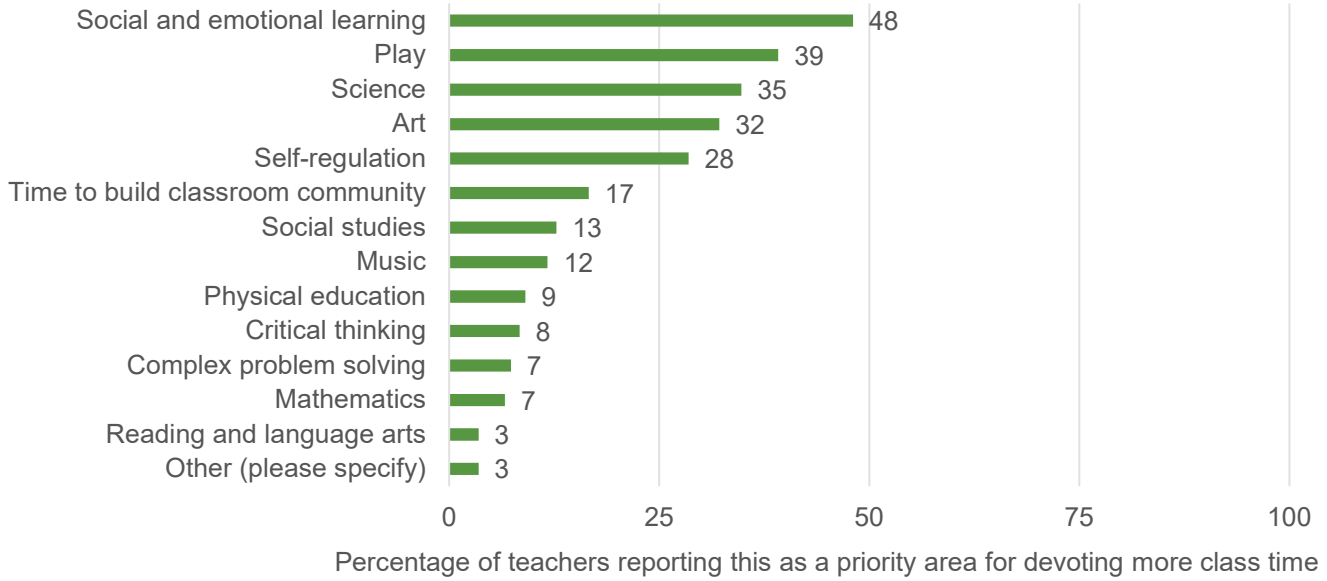


Source: Authors' analysis of data from the Oregon Department of Education full-day kindergarten practices survey, item 12.

Teachers reportedly wanted to spend more time on social and emotional learning, play, science, and art

Nearly half of teacher respondents said they would like to devote more class time than they were able to devote on social and emotional learning (48 percent; figure D4). The next three most popular areas that teachers reported wanting to spend more time on were play (39 percent), science (35 percent), and art (32 percent). Few teachers reported wanting to spend more time on math (7 percent) and reading and language arts (3 percent).

Figure D4. Teachers wanted to spend more time on social and emotional learning, play, science, and art, 2017/18



Source: Authors' analysis of data from the Oregon Department of Education full-day kindergarten practices survey, item 21.

Both kindergarten teachers and principals expressed interest in professional development on trauma-informed practice and social and emotional learning

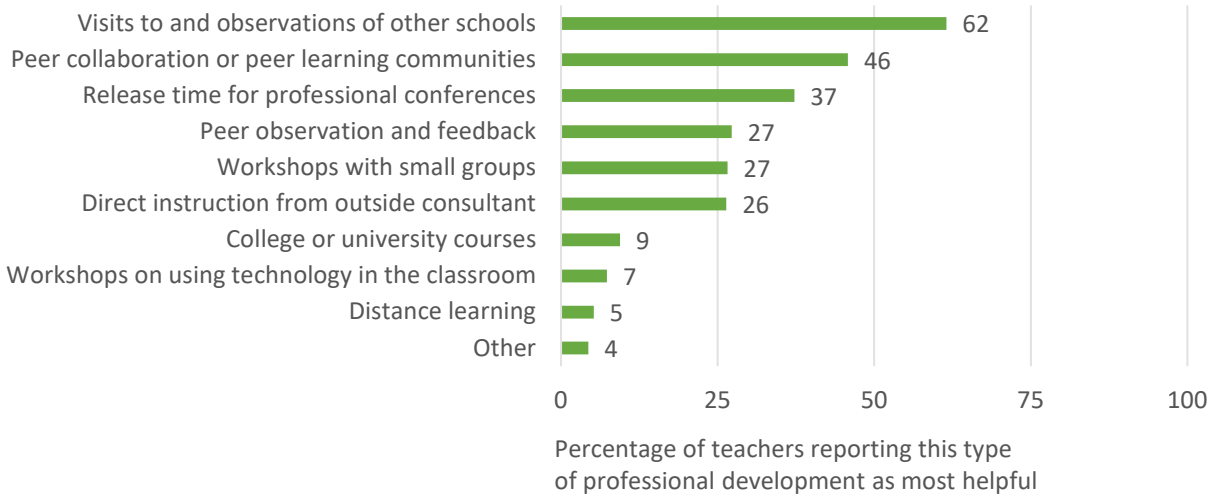
Teachers reported wanting additional professional development around trauma-informed practice (44 percent), social and emotional learning (42 percent), and classroom behavior management strategies (20 percent). Principals—19 percent of whom reported feeling not at all confident or somewhat confident in leading early educators—asked for professional development in early literacy, social and emotional learning, behavior management, trauma-informed practices, and developmentally appropriate practices (including play) to increase their confidence in leading early educators. Most principals (91 percent) reported that their schools are implementing trauma-informed practices, but most said trauma-informed practices are only being implemented to some extent (47 percent) rather than to a moderate extent (33 percent) or great extent (11 percent).

> *Social and emotional learning AND trauma-informed practices are equally vital supports I need for my specific school site.*
>
> —Kindergarten teacher, 2018 Oregon Department of Education FDK practices survey

About 60 percent of kindergarten teachers reported they prefer professional development that involves visits to and observations of other schools

The top three preferred professional development types among teachers were visiting other schools, collaborating with peers, and attending professional conferences (figure D5). These patterns were similar for teachers who had or had not taught preschool and for teachers who were new or experienced. However, these preferences differed by race/ethnicity of teachers, with more teachers of color identifying distance learning and workshops on using technology in the classroom as helpful.

Figure D5. About 60 percent of teachers preferred professional development that involves visits to and observations of other schools, 2017/18



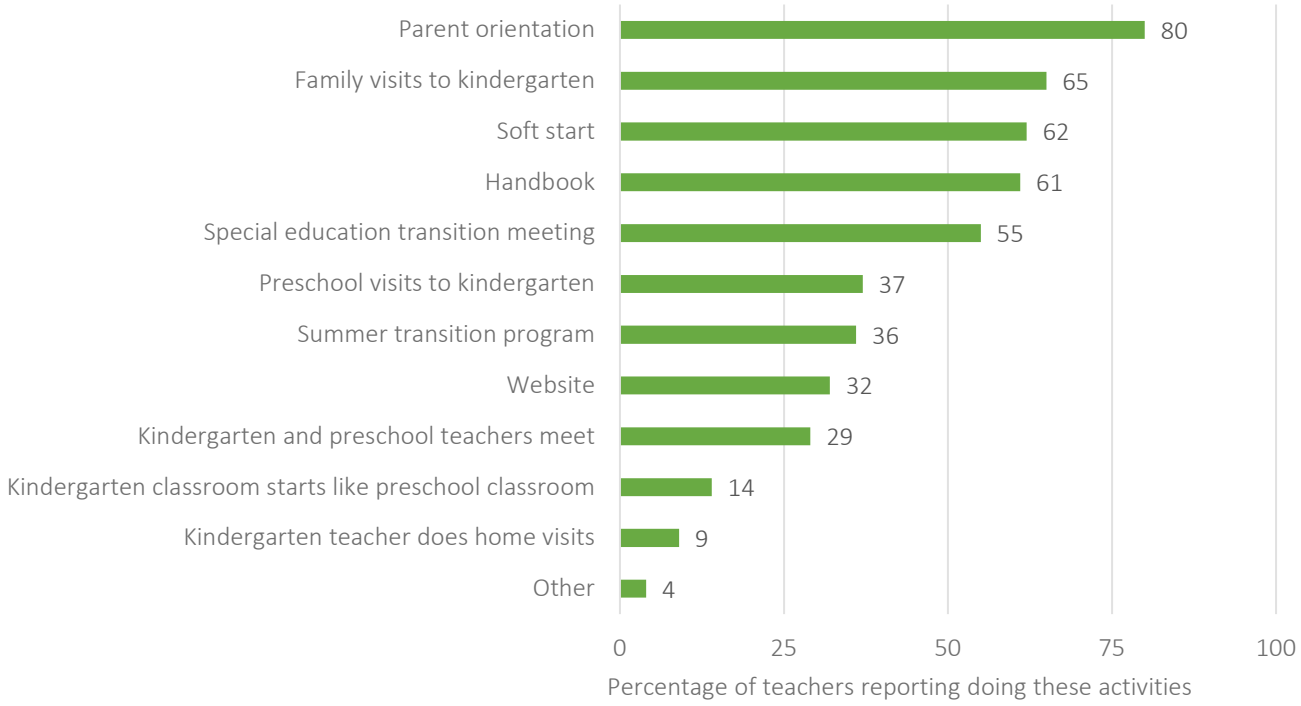
Source: Authors' analysis of data from the Oregon Department of Education full-day kindergarten practices survey, item 28.

The most common kindergarten transition activities that teachers reported were parent orientations, family visits to kindergarten, and a reduced schedule at the beginning of the kindergarten year

In terms of activities designed to support student transition to kindergarten, the most commonly reported activities were parent orientations (80 percent of teachers reported this), family visits to kindergarten (65 percent), and a "soft start"—a reduced schedule at the beginning of the kindergarten year to ease children into a school day (62 percent; figure D6).[1] Less commonly reported kindergarten transition activities included preschool visits to kindergarten (37 percent), a summer transition program (36 percent), and meeting with the preschool teachers (29 percent). About half of teachers reported a special education transition meeting (55 percent), and 60 percent of more experienced teachers (three or more years of teaching experience) reported this compared to 38 percent of newer teachers (less than three years of teaching experience).

[1] An example of a soft start schedule is one where during the first week of school, the child only attends kindergarten for one day that week.

Figure D6. The most popular kindergarten transition activities were parent orientations, family visits to kindergarten, and a reduced schedule at the beginning of the kindergarten year, 2017/18



Note: Soft start is a reduced schedule at the beginning of the kindergarten year to ease children into a school day.
Source: Authors' analysis of data from the Oregon Department of Education full-day kindergarten practices survey, item 22.