



Gains in Language and Cognitive Scores Among Children in Their First and Second Years of Head Start: Technical Report



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Gains in Language and Cognitive Scores Among Children in Their First and Second Years of Head Start: Technical Report

This technical report accompanies the brief “Gains in Language and Cognitive Scores Among Children in Their First and Second Years of Head Start” (Harding et al. 2021). The brief examines why children in their second year (second-year children) made smaller gains in language and cognitive scores during the Head Start year than children in their first year (first-year children). This technical report provides more details about methods, full results tables for the main analyses, and supplementary analyses that support the main results. All findings and their implications are only described in the brief.

Sample

The brief included data from fall 2014 and spring 2015 of the Head Start Family and Child Experiences Survey (FACES) 2014. For FACES 2014, we selected a sample of Head Start programs from the 2012–2013 Head Start Program Information Report, with two centers per program and two classrooms per center. Within each classroom, we randomly selected 12 children for the study. In total, 176 programs, 346 centers, 667 classrooms, and 2,206 children (in 60 programs) were study participants in spring 2015. More information on the study methodology for FACES 2014 is available in the FACES 2014–2015 Data Tables and Study Design report (Aikens et al. 2017).

In spring 2015, 2,206 of the 2,462 children who participated in FACES in fall 2014 were still enrolled in Head Start. The sample included in this analysis is smaller because it included children who had at least one completed parent survey and either one or both of the following: (1) a fall and spring direct assessment and (2) a fall and spring teacher-child report ($n = 1,921$). We weighted all findings to represent children who were enrolled at both time points. These weights account for variations in the probabilities of selection as well as for eligibility and differences in cooperation rates among those selected. They also account for sample attrition over time. Although these weights account for unit nonresponse, they do not account for item-level missing data. Of these 1,921 children, we included in the analyses children for whom we had the key data elements, including children who were tested in English at both time points ($n = 1,538$).¹ To retain most of the full sample, we used missing data dummy codes for categorical variables with more than one percent of cases missing (see section on missing data dummy codes), but we included only children with information about race/ethnicity ($n = 1,535$) and teacher years of experience ($n = 1,477$). Finally, the sample included for the analyses for each of the five direct child assessments varied based on whether children completed the direct assessment and met the basal requirements for the assessment of interest in both fall and spring ($n = 1,296$ to 1,477).

We compared the key characteristics of the included sample ($n = 1,477$) and the full sample ($n = 1,921$) (Table 1). As expected, given that the sample included only children tested in English at both time points, the included children were more likely to be white, non-Hispanic and African American, non-Hispanic and less likely to be Hispanic/Latino. The included children were more likely to have English and less likely to have Spanish always or usually spoken to them at home. In addition, the included children were more likely to live only with their mother and less likely to live with both parents, and their parents were more likely to have some college education and less likely to have less than a high school diploma. Therefore, these results are not generalizable to all Head Start children.

Missing data dummy codes

To account for missing data on some family background characteristics, we included in the analyses missing data dummy codes for who lived in the household, parent education, and parent employment. Five to 14 percent of children were missing information on these variables. We did not include data dummy codes for variables with no or less than 1 percent missing data (child age, race/ethnicity, sex, and the language that was always or usually spoken to children). We also did not include a missing dummy for household poverty threshold because income was imputed. We coded each dummy variable as 1 for every child missing data on the applicable variable and as 0 for every child with valid data on that variable. For example, for children missing information about who lived in the house, including a separate missing value dummy variable in our regression model allowed children with missing information to have a different mean outcome value than that of non-missing children, without influencing the relationship between the other household categories and the outcome. Including the missing value category allowed us to retain the full sample while providing additional statistical power. In addition, if the children who were missing information were not randomly missing information, the coefficient on the missing value category can account for that, providing a more accurate picture of the true mean of the outcome variable.

Language and Cognitive Assessments

We examined five directly assessed language and cognitive skills (Table 1). We used gain scores that subtracted fall scores from spring scores. Gain scores have some limitations because they can increase measurement error in the outcome, potentially attenuating associations. However, we used the gain scores because they are more intuitive to interpret than regression analyses that would predict spring outcomes by adjusting for the fall assessment. We have used gain scores in recent FACES analyses of children's outcomes (Kopack Klein et al. 2018; Hutchison et al. 2020). We used W/GSV and raw scores rather than standard scores to create the gain scores used in the analysis because they have more variability (Levine, Pollack, and Comfort 2011). These scores indicate absolute rather than relative performance. W/GSV scores permit measurement of change in performance on the same scale over time.

Table 1. Description of selected language and cognitive assessments

Language and cognitive assessment	Skills assessed
Expressive vocabulary (EOWPVT-4)	English expressive vocabulary knowledge, or how well children can name pictures
Receptive vocabulary (PPVT-4)	English receptive vocabulary knowledge, or the words children understand
Letter-word knowledge (WJ III Letter-Word Identification)	Alphabet knowledge, print concepts/conventions, and sight word recognition
Early writing (WJ III Spelling)	Early writing and spelling from memory
Early math (WJ III Applied Problems)	Math skills in the areas of number concepts and quantities, number relationships and operations, counting, and reasoning/problem solving

Note: WJ III = Woodcock-Johnson Tests of Achievement, Third Edition (Woodcock et al. 2001); EOWPVT-4 = Expressive One Word Picture Vocabulary Test-4 (Martin and Brownell 2010); PPVT-4 = Peabody Picture Vocabulary Test-Fourth Edition (Dunn and Dunn 2006).

We examined whether there was evidence of ceiling effects for these assessments (that is, whether any large groups of children had scores at the top of the distribution). We did this because, as described in the main brief, we found that second-year children made smaller gains in language and cognitive scores

during the Head Start year than first-year children (Harding et al. 2021).² One potential explanation could be that the assessments have ceiling effects, leaving less room for gains among second-year children who had higher fall scores. We examined the distribution of the five assessments graphically and did not observe evidence of ceiling effects. In addition, Head Start children typically score below national norms on standard scores that are normed to allow comparisons of a child's performance relative to that of others of the same age (Kopack Klein et al. 2018), suggesting that children could make continued gains on these assessments.

Analytic approach

Descriptive analyses

We first examined differences between first- and second-year children in child and family characteristics, fall language and cognitive scores, part-day enrollment,³ classroom quality,⁴ and teacher experience and education (Table A.1 in Harding et al. 2021).⁵ To assess whether there were statistically significant differences between first- and second-year children, we used t-tests to examine differences. All cited differences were statistically significant at the .05 level and lower.

In supplementary analyses, we also examined differences among children in their first year of Head Start who were age 3, children in their first year of Head Start who were age 4, and children in their second year of Head Start who were age 4 (Table 2) to confirm whether it was appropriate to combine children in their first year of Head Start who were age 3 or 4.⁶ We found that 3-year-olds in their first year made significantly smaller gains in expressive vocabulary but larger gains in early math than 4-year-olds in their first year. As we would expect, given that they were younger, 3-year-olds in their first year had lower scores on all five language and cognitive assessments in the fall than 4-year-olds in their first year. All other child, family, and classroom characteristics were similar for children in their first year of Head Start who were 3 or 4, suggesting it was appropriate to examine the two age groups together.

Regression analyses

We then conducted a series of multilevel regression models predicting gains in language and cognitive scores based on whether children were in their first or second year of Head Start.⁷ For the regression analyses, we report whether coefficients were significant at the .05 level and lower or whether there was a trend in the association at the .10 level and lower. We added sets of variables in a stepwise fashion, with each model including a variable indicating whether children were in their first or second year along with the variables that were included in the previous models. We did this to determine whether accounting for these characteristics would explain why second-year children made smaller gains than first-year children. For example, if the relationship between year in Head Start and gains in language and cognitive scores disappeared only when we added teacher years of experience, this would suggest that second-year children made smaller gains because they were more likely to be placed in classrooms with teachers with fewer years of experience. We included variables in the models based on whether (1) they were theoretically important control variables (that is, we expected them to be associated with gains in children's language and cognitive scores), (2) first- and second-year children differed on these variables, and (3) they differed in ways that could explain why second-year children made smaller gains. Based on these factors, the five sets of variables included:

- Months between fall and spring direct assessments
- Child's age in months at the spring direct assessment

- Other child and family background characteristics (race/ethnicity, sex, the language that was always or usually spoken to children, who lived in the house, parent education, parent employment, and household poverty threshold)⁸
- Fall scores on the language and cognitive assessment
- Teacher years of experience

We first conducted a set of regression models with second- versus first-year status and months between the fall and spring direct assessments as the only predictors. To measure how children's gains differed for first- versus second-year children, we estimated Equation (1) as follows:

$$(1) \quad G_{ijkl} = \beta_0 + \beta_1 AssessTime_{ijkl} + \delta Year2_{ijkl} + (e_{ijkl} + u_{jkl} + v_{kl} + \zeta_l),$$

where G_{ijk} represents the gains in the outcome of interest for child i in classroom j in center k in program l ; $Year2_{ijkl}$ is a binary variable indicating whether a child was in the second year of Head Start;

$AssessTime_{ijkl}$ is the months between the fall and spring direct assessments; β_0 , β_1 , and δ are

parameters to be estimated, with β_0 representing the intercept; and $(e_{ijk} + u_{jk} + v_{kl} + \zeta_l)$ representing random error terms at the child, classroom, center, and program levels. In the model, δ represents the extent to which gains differ for second- versus first-year children, without accounting for any differences in the characteristics of the two groups of children. For example, a coefficient estimate of -0.05 would indicate that second-year children made gains that were 0.05 lower than those of first-year children, after accounting for any differences in the months between fall and spring direct assessments.

We used a hierarchical linear model (HLM) in the estimation, represented here as a single equation for simplicity. The model took into account that children were nested within classrooms (teachers) that, in turn, were nested within centers within programs. Given that children (and classrooms, teachers, and centers) were nested within programs, outcomes for children (and classroom quality) within a given program were more highly correlated with one another than with those of children (and classrooms) across different programs.

The next step in the analysis was to measure the difference in gains for second- versus first-year children after accounting for differences in the child and family background characteristics of the two groups. We initially accounted for age, which was strongly related to a child's year in Head Start. We estimated Equation (2) as follows:

$$(2) \quad G_{ijkl} = \beta_0 + \beta_1 AssessTime_{ijkl} + \beta_2 Age_{ijkl} + \delta Year2_{ijkl} + (e_{ijkl} + u_{jkl} + v_{kl} + \zeta_l),$$

with Age_{ijkl} as the child's age in months at the time of the spring direct assessment.

We then added other family and child characteristics to the model and estimated Equation (3) as follows:

$$(3) \quad G_{ijkl} = \beta_0 + \beta_1 AssessTime_{ijkl} + \beta_2 Age_{ijkl} + \beta_3 X_{ijkl} + \delta Year2_{ijkl} + (e_{ijkl} + u_{jkl} + v_{kl} + \zeta_l),$$

This is analogous to Equation (2) except that the model now controls for a larger set of child and family background characteristics (X_{ijkl}) rather than just for age, including race/ethnicity, sex, the language that was always or usually spoken to children at home, who lived in the household, parent education, parent employment, and household poverty threshold. This analysis tells us whether differences in family background characteristics explained differences in gains between first- and second-year children.

We next added fall scores of the assessment examined in that particular model. We did not include all fall language and cognitive scores in each model because fall scores were highly correlated and would complicate interpretation of results. We estimated Equation (4) as follows:

$$(4) \quad G_{ijkl} = \beta_0 + \beta_1 AssessTime_{ijkl} + \beta_2 Age_{ijkl} + \beta_3 X_{ijkl} + \beta_4 FallScore_{ijkl} + \delta Year2_{ijkl} + \\ (e_{ijkl} + u_{jkl} + v_{kl} + \zeta_l)$$

We focused on how the value of δ changed when we added fall scores to the model. If, for example, the value was negative in Equation (3) but became 0 in Equation (4) when we added children's fall expressive vocabulary scores, it would indicate that fall scores explained the association. Stated another way, second-year children began the program year with higher language and cognitive scores, and all children (regardless of Head Start exposure) who started at those levels made smaller gains during the Head Start program year.

We then added teacher years of experience and estimated Equation (5) as follows:

$$(5) \quad G_{ijkl} = \beta_0 + \beta_1 AssessTime_{ijkl} + \beta_2 Age_{ijkl} + \beta_3 X_{ijkl} + \beta_4 FallScore_{ijkl} + \beta_4 TeacherExp_{jkl} + \\ \delta Year2_{ijkl} + (e_{ijkl} + u_{jkl} + v_{kl} + \zeta_l)$$

Again, we focused on how the value of δ changed when we added teacher experience to the model. We were interested in determining whether differences between first- and second-year children in their teachers' years of experience explained differences in children's gains during the Head Start program year.

In Table A.2 (Harding et al. 2021) and Table 3, we present the coefficients illustrating the effect of second-year status in Head Start. In Table A.2, we present the raw coefficients and, in Table 3, the coefficients that were standardized to have a mean of 0 and a standard deviation of 1, which can be interpreted as effect sizes. In Tables 4 through 8, we present the full regression coefficients for all five models for each assessment.

Regression analyses examining moderation by mixed-age classroom status

In a model that included the five sets of variables described above as well as a binary indicator of whether children were in a mixed-age classroom, we next examined whether the differences in gains varied for children in mixed-age classrooms by including the interaction between second-year status in Head Start and being in a mixed-age classroom.⁹ The analysis included only those children with information about being in a mixed-age classroom ($n = 1,434$).

The reason that being in a mixed-age classroom might moderate differences in gains between first- and second-year children is that, in classrooms without much differentiated instruction, gains for a given child could be influenced by the level of instruction provided by the teacher. If teachers in mixed-age classroom tended to direct their instruction mostly to the younger first-year children, then those children could have benefited more (made larger gains) than second-year children.

To conduct this analysis, we included mixed-age classroom status in the model and interacted this variable with the second- versus first-year variable. We estimated Equation (6) as follows:

$$(6) \quad G_{ijkl} = \beta_0 + \beta_1 AssessTime_{ijkl} + \beta_2 Age_{ijkl} + \beta_3 X_{ijkl} + \beta_4 FallScore_{ijkl} + \beta_4 TeacherExp_{jkl} + \gamma_1 Mixedage_{ijkl} + \gamma_2 Mixedage_{ijkl} * Year2_{ijkl} + \delta Year2_{ijkl} + (e_{ijkl} + u_{jkl} + v_{kl} + \zeta_l)$$

If the coefficient on the interaction (γ_2) was statistically significant, then the variable moderated this association, and the value of the coefficient on being in a mixed-age classroom and the coefficient on the interaction would reveal the nature of the moderation. For example, suppose that $\gamma_1 = 0$ but that γ_2 is negative and significant. The results would suggest that second-year status was not related to children's gains among children in single-age classrooms, because $\gamma_1 = 0$ and the fact that $Mixedage_{ijkl} = 0$ would drop the interaction term from the equation. For children in mixed-age classrooms, by contrast, second-year status would be associated with smaller gains because the effect of a second year would be measured by $(\gamma_1 + \gamma_2)$.

In Table 9, we show the regression coefficients for the interaction terms. As previously reported, none of these was statistically significant, indicating that being in a mixed-age classroom does not moderate the effect.

Manual adjustment of standard errors

Standard HLM software cannot account for the design effect attributable to unequal weighting of the sample. Therefore, we manually adjusted the standard error estimates to account for the design effect related to unequal weighting of the sample (Kopack Klein et al. 2017). We did so by multiplying the standard error by the square root of the design effect (1.18). We then calculated an adjusted p -value. The adjusted p -value for the coefficient on whether children were in their second year of Head Start changed only from significant at $p \leq 0.05$ to significant at trend at $p \leq 0.10$ for models 4 and 5 for letter-word knowledge. Therefore, we report the difference in gains between first- and second-year children as significant at trend for letter-word knowledge in Harding et al. 2021.

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Endnotes

¹ The group of children assessed in English comprised (1) children who most often used English at home; (2) children who most often used a language other than English or Spanish at home and who made 12 or fewer errors on the direct assessment language screener—and therefore were assessed in English; and (3) children who most often used Spanish at home and who made 12 or fewer errors on the direct assessment language screener—and therefore were primarily assessed in English, with some Spanish assessments also administered. English expressive vocabulary (with the EOWPVT-4) was assessed for only those children who most often used English or a non-English language other than Spanish at home. The expressive vocabulary of children who used Spanish most often at home was measured with the EOWPVT-4: Spanish-Bilingual Edition. For more information on children’s language paths in the direct assessment, see the FACES 2014–2015 Data Tables and Study Design report (Aikens et al. 2017). Seventy-nine percent of first-year children and 83 percent of second-year children were assessed in English at both time points ($p = 0.06$).

² First or second year in Head Start came from information gathered from Head Start programs: child’s date of birth, whether the child was attending his/her first year of Head Start, and date the child first enrolled in any Head Start program. We used data on the children’s date of birth and whether they were attending for their first year of Head Start—which were collected before the spring 2015 data collection—to construct this variable for the majority of children. Drawing on follow-up inquiries, we also used the date a child first enrolled in any Head Start program for a subset of children.

³ Part-day enrollment was measured by teacher reports of whether children’s classroom was a part-day classroom. We also found no difference in the number of hours per week children attended ECE other than Head Start (as reported by parents) for children in their first year (mean = 5.8, standard deviation = 0.53) and second year (mean = 5.5, standard deviation = 0.61; $p = 0.671$). However, there was a substantial amount of missing data on that variable, so we did not include it in the main analyses.

⁴ We examined several assessments of classroom quality. We examined the three domains (Emotional Support, Classroom Organization, and Instructional Support) on the Classroom Assessment Scoring System-Pre-K (Pre-K CLASS). We examined two subscales (Teaching and Interactions and Provisions for Learning) on the Early Childhood Environment Rating Scale, revised edition, short form (ECERS-R short form). Teachers rated how frequently they worked on activities with children on a 1 to 5 scale from “never” to “every day”. We examined the frequency of literacy activities, which was the mean of responses to 11 literacy activities, such as working on learning the names of letters. We examined the mean frequency of math activities, which was the mean of response to 10 math activities, such as working on counting out loud. We examined a binary indicator of whether teachers reported they used assessment information to individualize activities for children.

⁵ We did not explore center or program characteristics because almost all centers and programs include both first- and second-year children. Therefore, differences in center or program characteristics cannot explain differences in gains between first- and second-year children.

⁶ Forty percent of children in their first year were 4-years-old at the start of the Head Start year. Ninety percent of children in their second year were 4-years-old at the start of the Head Start year. Of those children still enrolled in Head Start in spring 2015, only 8 percent of all children completing a second year were 3-years-old. Therefore, we did not compare 3-year-olds completing their first year to 4-year-olds completing their second year. However, we included these children in the regression analyses that predicted gains in language and cognitive scores based on year in Head Start because we controlled for age in months.

⁷ We also examined whether there were differences in gains in behavior problems and social skills. Teachers reported on children's cooperative classroom behavior or social skills and their problem behaviors in the classroom using items from the Behavior Problems Index (Peterson and Zill 1986), the Personal Maturity Scale (Entwistle et al. 1997), and the Social Skills Rating Scale (Gresham and Elliott 1990). We found that second-year children initially had smaller increases in behavior problems than first-year children but that first- and second-year children had similar increases in social skills. After accounting for children's fall behavior problems, first- and second-year children had similar increases in behavior problems.

⁸ We collected characteristics of children and families primarily during fall 2014. In some instances, parents did not complete a parent survey for the first time until the spring. In those instances, characteristics drew on spring 2015 data. In Tables 4 through 8, we show how the child and family background characteristics were coded into dummies and the referent group for each set of dummy variables.

⁹ Similar percentages of children were in mixed-age classrooms in their first year (67 percent) and second year of Head Start (59 percent; $p = 0.186$).

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Table 1. Key characteristics of the full sample of children who were enrolled in Head Start in fall 2014 and spring 2015 and the analysis sample

Variable	Full sample			Analysis sample				
	n	Mean or percentage	SD	n	Mean or percentage	SD	p-value	Range
In second year of Head Start	1,921	64.9	2.35	1,477	63.6	2.69	0.188	0–1
Age in months at spring direct assessment	1,835	55.6	0.36	1,477	56.0	0.37	< 0.001*	38–70
Sex	1,921			1,477				
Female		49.7	1.20		50.5	1.45	0.188	0–1
Male		50.3	1.20		49.5	1.45	0.188	0–1
Race/ethnicity	1,918			1,477				
White, non-Hispanic/Latino		27.2	3.31		31.1	3.38	< 0.001*	0–1
African American, non-Hispanic/Latino		22.6	3.44		26.5	3.83	< 0.001*	0–1
Hispanic/Latino		41.6	4.32		33.1	4.16	< 0.001*	0–1
Other, non-Hispanic/Latino		8.6	1.69		9.3	1.38	0.321	0–1
Language always or usually spoken to the child at home	1,920			1,477				
English		75.1	2.92		85.1	2.17	0.003*	0–1
Spanish		20.1	2.56		11.4	1.75	< 0.001*	0–1
Other (non-Spanish) language		4.8	1.03		3.4	0.87	0.003*	0–1
Children living with	1,921			1,477				
Biological/adoptive mother and biological/adoptive father		43.8	2.09		40.5	2.12	< 0.001*	0–1
Biological/adoptive mother only		40.0	1.90		43.4	2.19	< 0.001*	0–1
Biological/adoptive father only		2.6	0.55		2.8	0.53	0.282	0–1
Neither biological/ adoptive mother nor biological/adoptive father		3.9	0.41		4.1	0.57	0.590	0–1
Missing family structure		9.7	0.88		9.2	1.00	0.248	0–1
Highest level of education completed by parents of children living with either or both biological/adoptive parents	1,921			1,477				
Less than high school diploma		21.1	1.98		15.4	1.19	< 0.001*	0–1
High school diploma or GED		31.7	1.20		32.3	1.33	0.430	0–1

Table 1 (continued)

Variable	Full sample			Analysis sample				
	n	Mean or percentage	SD	n	Mean or percentage	SD	p-value	Range
Some college/vocational/technical		33.0	1.50		37.5	1.36	< 0.001*	0–1
Bachelor's degree or higher		9.3	0.92		9.8	1.18	0.389	0–1
Missing education		4.8	0.46		5.0	0.71	0.533	0–1
Employment status of the most-employed parent of children living with either or both biological/adoptive parents	1,921			1,477				
Working full-time		45.5	1.96		45.4	2.37	0.894	0–1
Working part-time		19.0	1.24		19.6	1.41	0.273	0–1
Looking for work		9.7	0.79		10.0	0.92	0.435	0–1
Not in labor force		11.5	1.23		11.1	1.52	0.552	0–1
Missing employment		14.3	0.87		13.8	1.14	0.501	0–1
Household poverty threshold	1,921			1,477				
50 percent or less		28.1	1.50		27.1	1.42	0.148	0–1
50 to 131 percent		44.5	1.63		45.2	1.90	0.453	0–1
131 percent or more		17.7	1.72		18.6	1.94	0.099	0–1
Missing household poverty threshold		9.7	0.88		9.2	1.00	0.248	0–1

Source: Fall 2014 and Spring 2015 Parent Survey and Survey Management System.

Note: Statistics are weighted to represent all children who were enrolled in Head Start in fall 2014 and were still enrolled in spring 2015.

The n column in this table includes unweighted sample sizes to identify the number of children with valid data on each of the constructs.

* Asterisk indicates that the differences from fall to spring between children in their first year and children in their second year are statistically significant at the $p \leq 0.05$ level.

SD = standard deviation.

Table 2. Comparing first- and second-year children, by age

Variable	First-year 3-year-olds			First-year 4-year-olds			Second-year 4-year-old			p-value
	n	Mean	SD	n	Mean	SD	n	Mean	SD	
Children's gains in language and cognitive scores										
Gains in receptive vocabulary (PPVT-4 GSV score) ^a	513	8.7	0.69	360	8.7	0.68	510	7.3	0.69	0.094
Gains in expressive vocabulary (EOWPVT-4 raw score)	513	0.6 ^b	0.65	360	3.0 ^c	0.67	510	1.5	0.66	0.025*
Gains in letter-word knowledge (WJ III Letter-Word Identification W score)	538	16.0	1.30	360	15.5	1.55	503	12.9	1.18	0.058
Gains in early writing (WJ III Spelling W score)	549	18.1 ^c	1.95	363	14.4	1.72	512	12.0	1.34	0.011*
Gains in early math (WJ III Applied Problems W score)	542	18.5 ^{b,c}	1.03	363	10.9	1.17	507	12.7	1.08	0.000*
Fall language and cognitive scores										
Receptive vocabulary (PPVT-4 GSV score)	515	100.7 ^{b,c}	1.21	361	114.7	1.25	512	114.6	0.87	0.000*
Expressive vocabulary (EOWPVT-4 raw score)	508	94.4	1.31	325	96.9	1.16	407	96.2	1.05	0.274
Letter-word knowledge (WJ III Letter-Word Identification W score)	542	301.6 ^{b,c}	1.00	361	320.1 ^c	1.57	509	326.8	1.70	0.000*
Early writing (WJ III Spelling W score)	549	325.3 ^{b,c}	2.03	363	358.8 ^c	2.63	512	367.9	1.43	0.000*
Early math (WJ III Applied Problems W score)	543	361.5 ^{b,c}	1.89	363	390.0	2.28	507	390.9	1.41	0.000*
Child and family characteristics										
Months between fall and spring direct assessments	549	5.6	0.07	363	5.5	0.05	512	5.6	0.07	0.092
Percentage of children served in pre-K in child's state ^d	550	27.8	3.39	368	23.1 ^c	2.57	468	27.5	3.03	0.038*
Age in months at spring direct assessment	549	43.3 ^{b,c}	0.29	363	54.8 ^c	0.25	512	55.5	0.22	0.000*
Female	549	50.8	2.45	363	49.4	2.62	512	50.5	2.56	0.929
Race/ethnicity										
White, non-Hispanic/Latino		32.1 ^c	4.72		42.0 ^c	5.09		22.8	3.62	0.001*
African American, non-Hispanic/Latino		29.5	5.52		20.7	5		26.7	5.26	0.413

Table 2 (continued)

Variable	First-year 3-year-olds			First-year 4-year-olds			Second-year 4-yearold			p-value
	n	Mean	SD	n	Mean	SD	n	Mean	SD	
Hispanic/Latino		29.3 ^c	4.91		27.8 ^c	4.46		40.4	5.93	0.045*
Other, non-Hispanic/Latino ^e		9.1	1.64		9.5	1.93		10.1	1.87	0.880
Language always or usually spoken to the child at home	549			363			512			
English		88.6 ^c	2.38		88.8 ^c	2.77		78.0	3.70	0.002*
Spanish		8.2 ^c	2.09		9.2 ^c	2.25		17.5	3.17	0.004*
Other (non-Spanish) language		3.2	1.14		2.0	1.05		4.5	1.23	0.230
Children living with	549			363			512			
Biological/adoptive mother and biological/adoptive father		40.2	2.95		43.2	2.92		40.2	4.11	0.774
Biological/adoptive mother only		42.9	2.88		41.8	2.74		45.3	3.94	0.701
Biological/adoptive father only		3.0	1.07		3.2	0.95		2.1	0.68	0.638
Neither biological/ adoptive mother nor biological/ adoptive father		3.8	0.74		4.7	1.37		4.1	0.92	0.805
Missing family structure		10.0	1.47		7.1	1.44		8.3	1.32	0.268
Highest level of education completed by parents of children living with at least one biological/adoptive parent	549			363			512			
Less than high school diploma		14.8	1.76		14.5	1.90		17.4	1.91	0.464
High school diploma or GED		31.9	1.86		33.0	3.02		33.8	2.60	0.861
Some college/vocational/technical		39.2	2.00		36.2	3.28		35.9	2.07	0.562
Bachelor's degree or higher		10.0	1.62		10.5	2.06		7.8	1.36	0.403
Missing education		4.0	0.79		5.8	1.63		5.1	1.11	0.512
Employment status of the most-employed parent of children living with at least one biological/adoptive parent	549			363			512			
Working full-time		45.1	3.16		42.9	3.96		48.4	3.38	0.458
Working part-time		18.8	1.84		21.1	2.83		19.3	1.91	0.717
Looking for work		10.6	1.53		11.8	1.78		8.9	1.60	0.485
Not in labor force		10.8	2.05		11.9	2.97		10.7	1.75	0.908

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Table 2 (continued)

Variable	First-year 3-year-olds			First-year 4-year-olds			Second-year 4-yearold			<i>p</i> -value
	n	Mean	SD	n	Mean	SD	n	Mean	SD	
Missing employment		14.6	1.64		12.3	2.06		12.6	1.35	0.499
Household poverty threshold	549			363			512			
50 percent or less		28.6	2.78		26.0	2.83		27.8	2.18	0.783
50 to 131 percent		45.1	3.42		43.8	3.50		47.5	3.06	0.751
131 percent or more		16.3	2.38		23.1	4.49		16.4	2.78	0.224
Missing household poverty threshold		10.0	1.47		7.1	1.44		8.3	1.32	0.268
Part-day enrollment										
Enrolled in part-day classroom	545	45.8	6.3	362	56.1	8.15	511	46.1	5.87	0.276
Head Start classroom quality										
Pre-K CLASS Emotional Support	512	5.4	0.06	349	5.5	0.06	486	5.4	0.07	0.194
Pre-K CLASS Classroom Organization	512	4.7	0.09	349	4.9 ^c	0.08	486	4.7	0.09	0.025*
Pre-K CLASS Instructional Support	512	2.4	0.14	349	2.5	0.12	486	2.6	0.11	0.426
ECERS-R short form Teaching and Interactions	516	5.2	0.12	350	5.3	0.11	487	5.1	0.12	0.185
ECERS-R short form Provisions for Learning	516	4.4	0.17	350	4.6	0.14	487	4.6	0.14	0.265
Frequency of literacy activities	541	5.0 ^c	0.07	361	5.1 ^c	0.07	504	5.2	0.07	0.021*
Frequency of math activities	539	4.9	0.10	361	5.0	0.10	504	5.1	0.09	0.270
Teacher uses assessment information to individualize instruction	495	89.4 ^c	3.66	333	95.4	2.57	442	96.8	1.41	0.011*
Head Start teacher education and experience										
Teacher has associate's degree or less (versus bachelor's degree or higher)	549	31.3	5.68	363	27.8	5.29	512	29.2	5.03	0.770
Teacher years of experience	549	16.0	1.13	363	14.4	1.18	512	13.8	0.91	0.178

Source: Fall 2014 and Spring 2015 Direct Child Assessment, Parent Survey, Teacher Survey, Classroom Observation, and Survey Management System.

Note: Statistics were weighted to represent all children who were enrolled in Head Start in fall 2014 and were still enrolled in spring 2015.

The n column in this table includes unweighted sample sizes to identify the number of children with valid data on each of the constructs.

^aW/GSV/raw scores are absolute scores rather than scores that illustrate relative performance by age. W/GSV scores permit measurement of change or growth in performance on the same scale over time.

^bIndicates first-year 3-year-olds were significantly different from first-year 4-year-olds at the *p* ≤ .05 level.

^cIndicates first-year 3-year-olds or first-year 4-year-olds were significantly different from second-year 4-year-olds at the *p* ≤ .05 level.

Table 2 (*continued*)

^dThis variable was coded based on the NIEER state of pre-K yearbook (Friedman-Krauss et al. 2018) and includes the percentage of children served in pre-K and pre-K special education.

^eOther, non-Hispanic includes respondents who specified a language or religion, or who did not fit into a specified category.

* Asterisk indicates that the difference between groups was statistically significant at the $p \leq .05$ level.

CLASS = Classroom Assessment Scoring System-Pre-K; ECERS-R = Early Childhood Environment Rating Scale, revised edition.

Table 3. Prediction of gains in children's language and cognitive scores based on being in the second year of Head Start, standardized coefficients

Outcome	Model 1 (unadjusted)			Model 2 (age)			Model 3 (child and family characteristics)			Model 4 (fall scores)			Model 5 (teacher experience)			p- value	N
	b	SE	p	b	SE	p	b	SE	p	b	SE	p	b	SE			
Receptive vocabulary (GSV score)	-0.09	0.06	0.18	-0.06	0.07	0.43	-0.06	0.08	0.40	-0.06	0.07	0.39	-0.06	0.07	0.39	1,444	
Expressive vocabulary (raw score)	-0.20	0.07	0.01	-0.25	0.08	0.00	-0.26	0.08	0.00	-0.24	0.08	0.00	-0.24	0.08	0.00	1,296	
Letter-word knowledge (W score)	-0.17	0.07	0.01	-0.21	0.07	0.01	-0.20	0.08	0.01	-0.14	0.07	0.06	-0.14	0.07	0.05	1,462	
Early writing (W score)	-0.17	0.07	0.01	-0.10	0.08	0.18	-0.10	0.08	0.18	-0.01	0.07	0.94	-0.01	0.07	0.93	1,477	
Early math (W score)	-0.14	0.07	0.03	0.01	0.08	0.91	-0.03	0.08	0.74	0.01	0.06	0.91	0.00	0.06	0.95	1,475	

Source: Fall 2014 and Spring 2015 Direct Child Assessment, Parent Survey, Teacher Survey, and Survey Management System.

Note: Statistics were weighted to represent all children who were enrolled in Head Start in fall 2014 and were still enrolled in spring 2015. Each successive model included all previous model variables plus the new variables for that model. Model 1 controlled for the months between the fall and spring direct child assessments; Model 2 also controlled for age in months at the spring direct child assessment; Model 3 also controlled for race/ethnicity, sex, language always or usually spoken to the child at home, who lived in the house, parent education, parent employment, and household poverty threshold; Model 4 also controlled for fall scores on the assessment; Model 5 also controlled for teacher years of experience. The coefficient shows the growth for children in their second year, so a negative coefficient demonstrated that gains among second-year children were smaller than gains among first-year children. Because of software limitations, we manually adjusted the standard error estimates to account for the design effect attributable to unequal weighting of the sample.

SE = standard error.

^aW/GSV/raw scores are absolute scores rather than scores that illustrate relative performance by age. W/GSV scores permit measurement of change or growth in performance on the same scale over time.

* Asterisk indicates that the difference in gains between fall and spring for first- and second-year children was statistically significant at the $p \leq .05$ level.

† Cross indicates that the difference in gains between fall and spring for first- and second-year children was statistically significant at trend level ($p \leq .10$).

Table 4. Prediction of gains in receptive vocabulary based on being in the second year of Head Start

Predictor	Model 1 (unadjusted)			Model 2 (age)			Model 3 (child and family characteristics)			Model 4 (fall scores)			Model 5 (teacher experience)		
	b	SE	p	b	SE	p	b	SE	p	b	SE	p	b	SE	p
Second year of Head Start	-1.00	0.74	0.177	-0.67	0.86	0.432	-0.72	0.87	0.404	-0.66	0.77	0.390	-0.66	0.77	0.389
Months between fall and spring direct assessments	0.10	0.63	0.872	0.09	0.63	0.884	0.13	0.63	0.842	-0.18	0.56	0.744	-0.18	0.56	0.745
Age in months at spring direct assessment				-0.05	0.06	0.441	-0.06	0.06	0.391	0.43	0.06	0.000*	0.43	0.06	<0.000*
African American, non-Hispanic/Latino (versus White, non-Hispanic/Latino)							1.73	1.18	0.143	-1.32	1.07	0.217	-1.32	1.07	0.219
Hispanic/Latino (versus White, non-Hispanic/Latino)							1.17	1.12	0.297	-0.47	1.00	0.639	-0.47	1.00	0.642
Other, non-Hispanic/Latino (versus White, non-Hispanic/Latino) ^a							1.77	1.36	0.194	0.91	1.20	0.447	0.92	1.20	0.445
Male							0.42	0.68	0.545	-0.99	0.60	0.103	-0.99	0.60	0.103
Language always or usually spoken to the child at home is not English							-0.82	1.20	0.497	-3.92	1.08	0.000*	-3.91	1.08	0.000*
Children living with biological/adoptive mother and biological/adoptive father (versus missing who lives in the house)							3.45	5.01	0.491	1.54	4.37	0.724	1.54	4.38	0.725
Children living with biological/adoptive mother only (versus missing who lives in the house)							2.72	4.95	0.583	1.01	4.32	0.816	1.00	4.33	0.817
Children living with biological/adoptive father only (versus missing who lives in the house)							3.71	5.10	0.468	1.33	4.46	0.765	1.33	4.46	0.766

Table 4 (continued)

Predictor	Model 1 (unadjusted)			Model 2 (age)			Model 3 (child and family characteristics)			Model 4 (fall scores)			Model 5 (teacher experience)		
	b	SE	p	b	SE	p	b	SE	p	b	SE	p	b	SE	p
Children living with neither biological/adoptive mother nor biological/adoptive father (versus missing who lives in the house)							-7.30	4.02	0.070 ^t	-3.04	3.53	0.390	-3.04	3.53	0.390
Parents have less than high school diploma (versus a bachelor's degree or higher) ^b							2.97	1.50	0.048*	-0.65	1.33	0.626	-0.65	1.33	0.627
Parents have a high school diploma or GED (versus a bachelor's degree or higher) ^b							1.13	1.32	0.394	-1.16	1.17	0.322	-1.15	1.17	0.323
Parents have some college/vocational/technical education (versus a bachelor's degree or higher) ^b							1.35	1.28	0.292	-0.03	1.12	0.979	-0.03	1.13	0.981
Parents are missing education (versus a bachelor's degree or higher) ^b							9.41	3.79	0.013*	2.93	3.35	0.381	2.94	3.35	0.380
Parents are working part-time (versus working full-time) ^c							0.10	0.97	0.918	-0.77	0.86	0.367	-0.77	0.86	0.368
Parents are looking for work (versus working full-time) ^c							3.13	1.31	0.017*	2.05	1.15	0.075 ^t	2.05	1.16	0.077 ^t
Parents are not in labor force (versus working full-time) ^c							0.56	1.24	0.655	0.46	1.10	0.676	0.46	1.10	0.676
Missing employment (versus working full-time) ^c							3.19	4.81	0.507	0.97	4.20	0.817	0.97	4.21	0.817
Household poverty threshold is 50 percent or less (versus 131 percent or more)							-1.41	1.11	0.205	-1.68	0.97	0.084 ^t	-1.68	0.97	0.084 ^t
Household poverty threshold is 50 to 131 percent (versus 131 percent or more)							-0.96	0.98	0.327	-0.82	0.86	0.339	-0.82	0.86	0.339

Table 4 (continued)

Predictor	Model 1 (unadjusted)			Model 2 (age)			Model 3 (child and family characteristics)			Model 4 (fall scores)			Model 5 (teacher experience)		
	b	SE	p	b	SE	p	b	SE	p	b	SE	p	b	SE	p
Fall receptive vocabulary										-0.39	0.02	0.000*	-0.39	0.02	0.000*
Teacher years of experience													0.00	0.04	0.997

Source: Fall 2014 and Spring Direct Child Assessment, Parent Survey, Teacher Survey, and Survey Management System (n = 1,444).

Note: Statistics were weighted to represent all children who were enrolled in Head Start in fall 2014 and were still enrolled in spring 2015. Because of software limitations, we manually adjusted the standard error estimates to account for the design effect attributable to unequal weighting of the sample.

SE = standard error.

* Asterisk indicates that the difference in gains between fall and spring for first- and second-year children was statistically significant at the p ≤ .05 level.

† Cross indicates that the difference in gains between fall and spring for first- and second-year children was statistically significant at trend level (p ≤ .10).

^a W/GSV/raw scores are absolute scores rather than scores that illustrate relative performance by age. W/GSV scores permit measurement of change or growth in performance on the same scale over time.

^b Parent education was based on the highest level of education completed by parents of children living with at least one biological/adoptive parent.

^c Parent employment was based on the employment status of the most-employed parent of children living with at least one biological/adoptive parent.

Table 5. Prediction of gains in expressive vocabulary based on being in the second year of Head Start

Predictor	Model 1 (unadjusted)			Model 2 (age)			Model 3 (child and family characteristics)			Model 4 (fall scores)			Model 5 (teacher experience)		
	b	SE	p	b	SE	p	b	SE	p	b	SE	p	b	SE	p
Second year of Head Start	-2.31	0.82	0.005*	-2.87	0.95	0.003*	-2.93	0.96	0.002*	-2.66	0.91	0.004*	-2.67	0.92	0.004*
Months between fall and spring direct assessments	0.57	0.68	0.403	0.59	0.68	0.385	0.61	0.68	0.375	0.18	0.66	0.780	0.19	0.66	0.775
Age in months at spring direct assessment				0.08	0.07	0.238	0.08	0.07	0.242	0.37	0.07	0.000*	0.37	0.07	0.000*
African American, non-Hispanic/Latino (versus White, non-Hispanic/Latino)							-0.08	1.17	0.943	-1.94	1.15	0.091	-1.92	1.15	0.096†
Hispanic/Latino (versus White, non-Hispanic/Latino)							-1.53	1.15	0.183	-2.64	1.12	0.018*	-2.64	1.12	0.018*
Other, non-Hispanic/Latino (versus White, non-Hispanic/Latino) ^a							0.30	1.39	0.830	-0.04	1.32	0.974	-0.03	1.32	0.982
Male							0.37	0.75	0.620	-0.04	0.72	0.954	-0.03	0.72	0.963
Language always or usually spoken to the child at home is not English							2.22	1.78	0.211	-0.92	1.73	0.592	-0.92	1.73	0.595
Children living with biological/adoptive mother and biological/adoptive father (versus missing who lives in the house)							5.73	5.79	0.322	4.88	5.51	0.376	4.92	5.51	0.373
Children living with biological/adoptive mother only (versus missing who lives in the house)							8.13	5.74	0.157	7.23	5.47	0.186	7.26	5.47	0.185
Children living with biological/adoptive father only (versus missing who lives in the house)							5.97	5.83	0.306	5.01	5.55	0.367	5.05	5.55	0.363
Children living with neither biological/adoptive mother nor biological/adoptive father (versus missing who lives in the house)							-4.57	5.07	0.367	-2.30	4.83	0.634	-2.32	4.83	0.631

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Table 5 (continued)

Predictor	Model 1 (unadjusted)			Model 2 (age)			Model 3 (child and family characteristics)			Model 4 (fall scores)			Model 5 (teacher experience)		
	b	SE	p	b	SE	p	b	SE	p	b	SE	p	b	SE	p
Parents have less than high school diploma (versus a bachelor's degree or higher) ^b							-4.24	1.71	0.013*	-5.95	1.64	0.000*	-5.93	1.64	0.000*
Parents have a high school diploma or GED (versus a bachelor's degree or higher) ^b							-1.84	1.43	0.198	-3.20	1.36	0.019*	-3.19	1.37	0.019*
Parents have some college/vocational/technical education (versus a bachelor's degree or higher) ^b							-2.34	1.37	0.087 ^t	-2.73	1.30	0.036*	-2.72	1.30	0.037*
Parents are missing education (versus a bachelor's degree or higher) ^b							0.96	4.99	0.847	-2.36	4.76	0.620	-2.32	4.77	0.626
Parents are working part-time (versus working full-time) ^c							-0.76	1.10	0.486	-0.88	1.04	0.398	-0.89	1.04	0.395
Parents are looking for work (versus working full-time) ^c							0.33	1.38	0.809	0.24	1.31	0.853	0.28	1.32	0.831
Parents are not in labor force (versus working full-time) ^c							0.42	1.37	0.761	0.91	1.30	0.486	0.92	1.30	0.483
Missing employment (versus working full-time) ^c							5.13	5.63	0.363	4.63	5.36	0.388	4.67	5.36	0.384
Household poverty threshold is 50 percent or less (versus 131 percent or more)							-0.40	1.19	0.734	-0.89	1.14	0.432	-0.89	1.14	0.431
Household poverty threshold is 50 to 131 percent (versus 131 percent or more)							-0.40	1.05	0.703	-0.33	1.00	0.743	-0.32	1.00	0.746
Fall expressive vocabulary										-0.24	0.02	0.000*	-0.24	0.02	0.000*
Teacher years of experience													-0.01	0.04	0.769

Source: Fall 2014 and Spring 2015 Direct Child Assessment, Parent Survey, Teacher Survey, and Survey Management System (n = 1,296).

Note: Statistics were weighted to represent all children who were enrolled in Head Start in fall 2014 and were still enrolled in spring 2015. Because of software limitations, we manually adjusted the standard error estimates to account for the design effect attributable to unequal weighting of the sample.

Table 5 (*continued*)

SE = standard error.

* Asterisk indicates that the differences in growth from fall to spring between all children in their first year and all children in their second year was statistically significant at the $p \leq .05$ level.

† Cross indicates that the differences in growth from fall to spring between all children in their first year and all children in their second year was statistically significant at the $p \leq .10$ level.

^a W/GSV/raw scores are absolute scores rather than scores that illustrate relative performance by age. W/GSV scores permit measurement of change or growth in performance on the same scale over time.

^b Parent education was based on the highest level of education completed by parents of children living with at least one biological/adoptive parent.

^c Parent employment was based on the employment status of the most-employed parent of children living with at least one biological/adoptive parent.

Table 6. Prediction of gains in letter-word knowledge based on being in the second year of Head Start

Predictor	Model 1 (unadjusted)			Model 2 (age)			Model 3 (child and family characteristics)			Model 4 (fall scores)			Model 5 (teacher experience)		
	b	SE	p	b	SE	p	b	SE	p	b	SE	p	b	SE	p
Second year of Head Start	-3.45	1.34	0.010*	-4.22	1.53	0.006*	-4.14	1.55	0.008*	-2.82	1.49	0.058†	-2.86	1.49	0.055†
Months between fall and spring direct assessments	0.59	1.12	0.594	0.57	1.12	0.611	0.55	1.13	0.626	0.15	1.08	0.892	0.16	1.08	0.884
Age in months at spring direct assessment				0.12	0.11	0.292	0.11	0.11	0.349	0.55	0.12	0.000*	0.55	0.12	0.000*
African American, non- Hispanic/Latino (versus White, non-Hispanic/Latino)							0.69	2.06	0.738	1.99	2.03	0.327	2.07	2.03	0.307
Hispanic/Latino (versus White, non-Hispanic/Latino)							0.41	1.96	0.835	-0.15	1.89	0.937	-0.14	1.89	0.942
Other, non-Hispanic/Latino (versus White, non- Hispanic/Latino) ^a							0.43	2.40	0.859	1.87	2.29	0.414	1.90	2.29	0.408
Male							0.36	1.20	0.766	-1.04	1.15	0.364	-1.02	1.15	0.375
Language always or usually spoken to the child at home is not English							1.06	2.13	0.618	1.33	2.03	0.512	1.36	2.03	0.503
Children living with biological/adoptive mother and biological/adoptive father (versus missing who lives in the house)							13.26	8.80	0.132	15.62	8.31	0.060†	15.67	8.32	0.060†
Children living with biological/adoptive mother only (versus missing who lives in the house)							11.83	8.69	0.174	13.59	8.21	0.098†	13.63	8.21	0.097†
Children living with biological/adoptive father only (versus missing who lives in the house)							6.92	8.97	0.440	8.09	8.47	0.340	8.13	8.48	0.338

Table 6 (continued)

Predictor	Model 1 (unadjusted)			Model 2 (age)			Model 3 (child and family characteristics)			Model 4 (fall scores)			Model 5 (teacher experience)		
	b	SE	p	b	SE	p	b	SE	p	b	SE	p	b	SE	p
Children living with neither biological/adoptive mother nor biological/adoptive father (versus missing who lives in the house)							3.22	7.12	0.651	5.64	6.74	0.403	5.68	6.74	0.399
Parents have less than high school diploma (versus a bachelor's degree or higher) ^b							1.24	2.62	0.636	-2.98	2.51	0.236	-2.92	2.51	0.245
Parents have a high school diploma or GED (versus a bachelor's degree or higher) ^b							1.51	2.32	0.516	-1.48	2.21	0.505	-1.43	2.21	0.517
Parents have some college/vocational/technical education (versus a bachelor's degree or higher) ^b							0.58	2.25	0.797	-1.16	2.14	0.589	-1.12	2.14	0.600
Parents are missing education (versus a bachelor's degree or higher) ^b							-5.50	6.73	0.413	-9.73	6.37	0.127	-9.72	6.37	0.128
Parents are working part-time (versus working full-time) ^c							1.82	1.73	0.292	0.73	1.64	0.656	0.69	1.64	0.674
Parents are looking for work (versus working full-time) ^c							4.05	2.29	0.077 ^t	3.39	2.17	0.118	3.48	2.17	0.110
Parents are not in labor force (versus working full-time) ^c							1.32	2.21	0.552	1.99	2.10	0.343	2.01	2.10	0.339
Missing employment (versus working full-time) ^c							13.35	8.46	0.115	14.79	8.00	0.065 ^t	14.86	8.00	0.064 ^t
Household poverty threshold is 50 percent or less (versus 131 percent or more)							-0.10	1.97	0.961	-0.66	1.86	0.722	-0.66	1.86	0.723
Household poverty threshold is 50 to 131 percent (versus 131 percent or more)							0.65	1.74	0.710	0.54	1.65	0.743	0.56	1.65	0.734

Table 6 (*continued*)

Predictor	Model 1 (unadjusted)			Model 2 (age)			Model 3 (child and family characteristics)			Model 4 (fall scores)			Model 5 (teacher experience)		
	b	SE	p	b	SE	p	b	SE	p	b	SE	p	b	SE	p
Fall letter-word knowledge										-0.27	0.02	0.000*	-0.27	0.02	0.000*
Teacher years of experience													-0.05	0.08	0.548

Source: Fall 2014 and Spring Direct Child Assessment, Parent Survey, Teacher Survey, and Survey Management System (n = 1,462).

Note: Statistics were weighted to represent all children who were enrolled in Head Start in fall 2014 and were still enrolled in spring 2015. Because of software limitations, we manually adjusted the standard error estimates to account for the design effect attributable to unequal weighting of the sample.

SE = standard error.

* Asterisk indicates that the differences in growth from fall to spring between all children in their first year and all children in their second year was statistically significant at the p ≤ .05 level.

† Cross indicates that the differences in growth from fall to spring between all children in their first year and all children in their second year was statistically significant at the p ≤ .10 level.

^a W/GSV/raw scores are absolute scores rather than scores that illustrate relative performance by age. W/GSV scores permit measurement of change or growth in performance on the same scale over time.

^b Parent education was based on the highest level of education completed by parents of children living with at least one biological/adoptive parent.

^c Parent employment was based on the employment status of the most-employed parent of children living with at least one biological/adoptive parent.

Table 7. Prediction of gains in early writing based on being in the second year of Head Start

Predictor	Model 1 (unadjusted)			Model 2 (age)			Model 3 (child and family characteristics)			Model 4 (fall scores)			Model 5 (teacher experience)		
	b	SE	p	b	SE	p	b	SE	p	b	SE	p	b	SE	p
Second year of Head Start	-5.26	2.04	0.010*	-3.17	2.34	0.176	-3.14	2.36	0.183	-0.16	2.04	0.937	-0.19	2.05	0.927
Months between fall and spring child assessments	0.46	1.70	0.786	0.45	1.69	0.791	0.05	1.70	0.979	0.35	1.47	0.813	0.35	1.47	0.813
Age in months at spring direct assessment				-0.31	0.17	0.074†	-0.30	0.17	0.081†	1.24	0.17	0.000*	1.24	0.17	0.000*
African American, non-Hispanic/Latino (versus White, non-Hispanic/Latino)							1.67	3.19	0.602	0.99	2.77	0.722	1.01	2.78	0.716
Hispanic/Latino (versus White, non-Hispanic/Latino)							-0.46	2.99	0.878	-0.91	2.60	0.725	-0.90	2.60	0.728
Other, non-Hispanic/Latino (versus White, non-Hispanic/Latino) ^a							0.33	3.60	0.926	1.95	3.11	0.530	1.95	3.11	0.529
Male							0.18	1.81	0.923	-6.19	1.60	0.000*	-6.18	1.60	0.000*
Language always or usually spoken to the child at home is not English							-0.95	3.24	0.771	1.08	2.80	0.700	1.09	2.80	0.697
Children living with biological/adoptive mother and biological/adoptive father (versus missing who lives in the house)							12.27	13.33	0.358	7.34	11.48	0.523	7.35	11.48	0.522
Children living with biological/adoptive mother only (versus missing who lives in the house)							15.74	13.18	0.232	8.28	11.35	0.466	8.29	11.35	0.465
Children living with biological/adoptive father only (versus missing who lives in the house)							14.14	13.60	0.299	9.15	11.71	0.435	9.17	11.71	0.434

Table 7 (continued)

Predictor	Model 1 (unadjusted)			Model 2 (age)			Model 3 (child and family characteristics)			Model 4 (fall scores)			Model 5 (teacher experience)		
	b	SE	p	b	SE	p	b	SE	p	b	SE	p	b	SE	p
Children living with neither biological/adoptive mother nor biological/adoptive father (versus who lives in the house)							17.60	10.78	0.103	12.40	9.29	0.182	12.42	9.29	0.181
Parents have less than high school diploma (versus a bachelor's degree or higher) ^b							6.43	3.98	0.106	-0.14	3.45	0.968	-0.10	3.45	0.976
Parents have a high school diploma or GED (versus a bachelor's degree or higher) ^b							-0.70	3.51	0.842	-4.04	3.03	0.183	-4.01	3.03	0.186
Parents have some college/vocational/technical education (versus a bachelor's degree or higher) ^b							-0.50	3.40	0.883	-2.19	2.94	0.456	-2.17	2.94	0.461
Parents are missing education (versus a bachelor's degree or higher) ^b							-5.98	10.21	0.558	-5.24	8.79	0.551	-5.22	8.79	0.553
Parents are working part-time (versus working full-time) ^c							-4.50	2.61	0.085 ^t	-3.01	2.25	0.182	-3.02	2.25	0.180
Parents are looking for work (versus working full-time) ^c							-0.28	3.49	0.936	-0.18	3.01	0.953	-0.13	3.02	0.965
Parents are not in labor force (versus working full-time) ^c							-8.08	3.35	0.016*	-5.72	2.90	0.048*	-5.72	2.90	0.049*
Missing employment (versus working full-time) ^c							5.16	12.83	0.687	1.23	11.05	0.912	1.25	11.05	0.910
Household poverty threshold is 50 percent or less (versus 131 percent or more)							3.20	2.96	0.280	2.05	2.55	0.423	2.05	2.55	0.422
Household poverty threshold is 50 to 131 percent (versus 131 percent or more)							-3.19	2.61	0.223	-1.12	2.25	0.620	-1.11	2.25	0.623
Fall early writing										-0.53	0.03	0.000*	-0.53	0.03	0.000*

Table 7 (*continued*)

Predictor	Model 1 (unadjusted)			Model 2 (age)			Model 3 (child and family characteristics)			Model 4 (fall scores)			Model 5 (teacher experience)		
	b	SE	p	b	SE	p	b	SE	p	b	SE	p	b	SE	p
Teacher years of experience													-0.03	0.12	0.823

Source: Fall 2014 and Spring Direct Child Assessment, Parent Survey, Teacher Survey, and Survey Management System (n = 1,477).

Note: Statistics were weighted to represent all children who were enrolled in Head Start in fall 2014 and were still enrolled in spring 2015. Because of software limitations, we manually adjusted the standard error estimates to account for the design effect attributable to unequal weighting of the sample.

SE = standard error.

* Asterisk indicates that the differences in growth from fall to spring between all children in their first year and all children in their second year was statistically significant at the p ≤ .05 level.

† Cross indicates that the differences in growth from fall to spring between all children in their first year and all children in their second year was statistically significant at the p ≤ .10 level.

^a W/GSV/raw scores are absolute scores rather than scores that illustrate relative performance by age. W/GSV scores permit measurement of change or growth in performance on the same scale over time.

^b Parent education was based on the highest level of education completed by parents of children living with at least one biological/adoptive parent.

^c Parent employment was based on the employment status of the most-employed parent of children living with at least one biological/adoptive parent.

Table 8. Prediction of gains in early math based on being in the second year of Head Start

Predictor	Model 1 (unadjusted)			Model 2 (age)			Model 3 (child and family characteristics)			Model 4 (fall scores)			Model 5 (teacher experience)		
	b	SE	p	b	SE	p	b	SE	p	b	SE	p	b	SE	p
Second year of Head Start	-3.34	1.55	0.032*	0.20	1.74	0.910	-0.58	1.78	0.743	0.16	1.47	0.914	0.10	1.47	0.947
Months between fall and spring direct assessments	-0.46	1.27	0.720	-0.55	1.25	0.658	-0.52	1.26	0.682	-0.90	1.04	0.391	-0.91	1.04	0.386
Age in months at spring direct assessment				-0.53	0.13	0.000*	-0.55	0.13	0.000*	0.61	0.12	0.000*	0.61	0.12	0.000*
African American, non- Hispanic/Latino (versus White, non- Hispanic/Latino)							2.23	2.17	0.305	-3.57	1.81	0.048*	-3.46	1.82	0.057†
Hispanic/Latino (versus White, non-Hispanic)							1.06	2.14	0.619	-0.31	1.76	0.860	-0.31	1.77	0.863
Other, non- Hispanic/Latino (versus White, non- Hispanic/Latino)†							2.34	2.75	0.394	0.13	2.28	0.954	0.15	2.28	0.948
Male							1.29	1.43	0.366	-1.39	1.19	0.244	-1.35	1.19	0.258
Language always or usually spoken to the child at home is not English							4.39	2.47	0.076†	-0.51	2.06	0.805	-0.47	2.06	0.818
Children living with biological/adoptive mother and biological/adoptive father (versus missing who lives in the house)							-15.53	10.65	0.145	-14.98	8.83	0.090†	-14.94	8.83	0.091†
Children living with biological/adoptive mother only (versus missing who lives in the house)							-13.16	10.53	0.212	-13.84	8.73	0.113	-13.79	8.73	0.115

Table 8 (continued)

Predictor	Model 1 (unadjusted)			Model 2 (age)			Model 3 (child and family characteristics)			Model 4 (fall scores)			Model 5 (teacher experience)		
	b	SE	p	b	SE	p	b	SE	p	b	SE	p	b	SE	p
Children living with biological/adoptive father only (versus missing who lives in the house)					-19.52	10.84	0.072 ^t	-18.89	8.99	0.036*	-18.87	8.99	0.036*		
Children living with neither biological/ adoptive mother nor biological/ adoptive father (versus missing who lives in the house)					-6.59	8.47	0.437	2.61	7.04	0.711	2.63	7.04	0.709		
Parents have less than high school diploma (versus a bachelor's degree or higher) ^b					3.94	3.10	0.204	-1.52	2.58	0.556	-1.45	2.58	0.573		
Parents have a high school diploma or GED (versus a bachelor's degree or higher) ^b					3.42	2.73	0.210	-2.12	2.27	0.351	-2.07	2.28	0.363		
Parents have some college/vocational/technical education (versus a bachelor's degree or higher) ^b					3.23	2.65	0.223	1.66	2.20	0.450	1.70	2.20	0.439		
Parents are missing education (versus a bachelor's degree or higher) ^b					15.41	7.99	0.054 ^t	1.60	6.65	0.809	1.61	6.65	0.809		
Parents are working part-time (versus working full-time) ^c					0.68	2.04	0.737	-0.01	1.69	0.995	-0.04	1.69	0.983		
Parents are looking for work (versus working full-time) ^c					-1.99	2.69	0.459	-2.44	2.23	0.274	-2.32	2.24	0.300		

Gains in Language and Cognitive Scores Among Children in Their First and Second Years of Head Start: Technical Report

Table 8 (continued)

Predictor	Model 1 (unadjusted)			Model 2 (age)			Model 3 (child and family characteristics)			Model 4 (fall scores)			Model 5 (teacher experience)		
	b	SE	p	b	SE	p	b	SE	p	b	SE	p	b	SE	p
Parents are not in labor force (versus working full-time) ^c							-1.59	2.60	0.541	-1.49	2.15	0.489	-1.44	2.15	0.503
Missing employment (versus working full-time) ^c							-17.30	10.26	0.092 ^f	-17.02	8.51	0.046*	-16.92	8.51	0.047*
Household poverty threshold is 50 percent or less (versus 131 percent or more)							1.05	2.31	0.649	0.28	1.91	0.884	0.29	1.92	0.878
Household poverty threshold is 50 to 131 percent (versus 131 percent or more)							0.96	2.03	0.637	0.75	1.69	0.655	0.79	1.69	0.639
Fall early math										-0.49	0.02	0.000*	-0.49	0.02	0.000*
Teacher years of experience													-0.05	0.07	0.539

Source: Fall 2014 and Spring Direct Child Assessment, Parent Survey, Teacher Survey, and Survey Management System (n = 1,475).

Note: Statistics were weighted to represent all children who were enrolled in Head Start in fall 2014 and were still enrolled in spring 2015. Because of software limitations, we manually adjusted the standard error estimates to account for the design effect attributable to unequal weighting of the sample.

SE = standard error.

* Asterisk indicates that the differences in growth from fall to spring between all children in their first year and all children in their second year was statistically significant at the p ≤ .05 level.

† Cross indicates that the differences in growth from fall to spring between all children in their first year and all children in their second year was statistically significant at the p ≤ .10 level.

^a W/GSV/raw scores are absolute scores rather than scores that illustrate relative performance by age. W/GSV scores permit measurement of change or growth in performance on the same scale over time.

^b Parent education was based on the highest level of education completed by parents of children living with at least one biological/adoptive parent.

^c Parent employment was based on the employment status of the most-employed parent of children living with at least one biological/adoptive parent.

Table 9. Prediction of gains in children's language and cognitive scores based on the interaction of being in the second year of Head Start and in a mixed-age classroom

Assessment	Model 6 (interaction)			
	b	SE	p-value	n
Receptive vocabulary (GSV score) ^a	-1.37	1.43	0.340	1,402
Expressive vocabulary (raw score)	0.23	1.71	0.892	1,265
Letter-word knowledge (W score)	2.76	2.78	0.321	1,421
Early writing (W score)	-2.48	3.84	0.518	1,434
Early math (W score)	1.29	2.76	0.640	1,433

Source: Fall 2014 and Spring 2015 Direct Child Assessment, Parent Survey, Teacher Survey, and Survey Management System.

Note: Statistics were weighted to represent all children who were enrolled in Head Start in fall 2014 and were still enrolled in spring 2015. Model 6 controlled for the months between the fall and spring direct child assessments, age in months at the spring direct child assessment, race/ethnicity, sex, language always or usually spoken to the child at home, who lived in the house, parent education, parent employment, household poverty threshold, fall scores on the assessment, teacher years of experience, being in a mixed-age classroom, and the interaction between being in the second year of Head Start and in a mixed-age classroom. The coefficient shows the growth for children in their second year and in a mixed-age classroom. Because of software limitations, we manually adjusted the standard error estimates to account for the design effect attributable to unequal weighting of the sample.

SE = standard error.

* Asterisk indicates that the coefficient on the interaction was statistically significant at the $p \leq .05$ level.

† Cross indicates that the coefficient on the interaction was statistically significant at the $p \leq .10$ level.

^a W/GSV/raw scores are absolute scores rather than scores that illustrate relative performance by age. W/GSV scores permit measurement of change or growth in performance on the same scale over time.