



Encouraging Early Literacy in Alaska: An Evaluation of the Imagination Library Program *Full Report*

Executive Summary

The Imagination Library (IL) program in Alaska provides age-appropriate books by mail each month for children from birth up to age 5. The books are selected by a committee of early learning experts and include family engagement and child development tips. In Alaska, IL is leveraged to engage the whole community in reading through community events like arts activities, parades, holiday events, or music classes. This program is coordinated by Best Beginnings, who also operates the largest affiliate in Anchorage.

Alaska Imagination Library Goals

Through its early literacy and family engagement efforts, the IL program aims to support:

- Improvements in children's home literacy environments,
- Positive impacts on parent-child bonds, and
- Increases in early academic outcomes including social-emotional readiness for school.

Evaluation Questions

1. What are the characteristics of IL participants? Do they differ from those of nonparticipants?
2. To what extent is participation in IL associated with the home literacy environment and the bond between parent and child?
3. What is the relationship between IL participation and kindergarten readiness, grade 3 standardized assessments in math and reading, early elementary school attendance, and grade progression?
 - a. Does the relationship of the IL program vary by economic disadvantage status, English learner status, and race/ethnicity (in particular, for Alaska Native students)?

Key Findings

Between 2010 and 2018, Imagination Library expanded to serve more children across the state

- In 2010, there were 18 IL affiliates, which expanded to 36 in 2018, an increase of 100 percent.
- In 2010, IL served 14,582 unique children, which expanded to 24,586 children in 2018, an increase of 67 percent.
- In 2010, IL sent out 109,608 books, which expanded to 204,828 books in 2018, an increase of 87 percent.

Imagination Library participation had a small positive association with some aspects of home literacy environment and parent-child bond

- Children who participated in IL were slightly more likely to have 6 or more books in the home than children who did not participate.
- Children who participated in IL were slightly less likely to be exposed to alcoholism and mental health disorders than children that did not participate.
- Neither of these associations was statistically significant.

Imagination Library participants were better prepared for kindergarten

- Children who participated in IL were more ready for kindergarten than peers who did not participate.
- The relationship with kindergarten readiness was found for IL participants who were:
 - English learners,
 - Eligible for free and reduced-price lunch, and
 - Alaska Native students.

Imagination Library participants had positive early academic outcomes

- Children who participated in IL were more likely to demonstrate skills on the Alaska Developmental Profile (ADP), including goals related to literacy, than children who did not participate.
- Children who participated in IL had higher attendance in kindergarten through grade 3 than children who did not participate.
- Children who participated in IL had higher reading and math achievement scores in grade 3 than children who did not participate.

Program Overview

The Imagination Library (IL) program in Alaska provides age-appropriate books by mail each month for children from birth up to age 5. The program is supported statewide by Best Beginnings, an Anchorage-based public-private partnership. Best Beginnings provides training and financial assistance to local organizations that manage the program in their own communities. Best Beginnings also administers Anchorage Imagination Library, the largest program in the state. The Dollywood Foundation in Tennessee selects and sends books directly to the homes of enrolled children. The books are selected by a committee of early learning experts and include family engagement and child development tips.

In Alaska, IL is leveraged to engage the whole community in reading through community events like arts activities, parades, holiday events, or music classes. Through IL, local organizations (called affiliates) distribute resources like newsletters, board books, and DVDs with developmentally appropriate ways for families to support young children, in addition to supporting families with age-appropriate books each month.

Table 1 provides information on the number of children served by IL in Alaska between 2010 and 2018. In 2010, there were 18 active affiliates which grew to 36 by 2018. These affiliates provide books each month to 112 Alaska communities. The program has expanded to serve more children and distribute more books each year with over 200,000 books distributed in 2018 and nearly 25,000 Alaska children served.

Table 1. IL footprint by year

Year	Number of active affiliates	Unique children served	Number of books distributed
2010	18	14,582	109,608
2011	23	20,230	152,843
2012	28	25,355	216,699
2013	32	28,189	247,480
2014	36	29,227	243,906
2015	36	29,738	279,309
2016	36	26,646	194,501
2017	37	25,447	231,594
2018	36	24,586	204,828

Source: Authors' analysis of Dollywood Foundation data.

IL communities are located across the state in both urban and rural areas. Figure 1 shows each IL community in 2018.

Figure 1. Imagination Library communities, 2018



Source: Authors' analysis of Dollywood Foundation data.

Evaluation Overview

Through its early literacy and family engagement efforts, the IL program aims to support children's home literacy environments, parent-child bonds, early academic outcomes, and social-emotional skills. This evaluation examines the extent to which the Alaska IL program supports these goals. The three evaluation questions guiding this work focus on understanding who is participating in the program and whether participation has an influence on individual child outcomes.

1. To what extent is participation in IL associated with the home literacy environment and the bond between parent and child?
2. What are the characteristics of IL participants and do they differ from those of nonparticipants?
4. What is the relationship between IL participation and kindergarten readiness, grade 3 standardized assessments in math and reading, early elementary school attendance, and grade progression?
 - a. Does the relationship of the IL program vary by economic disadvantage status, English learner status, and race/ethnicity (in particular, for Alaska Native students)?

Data and Methods

To address these questions, we leveraged data from three different sources: the Alaska Department of Health and Social Services (DHSS) Division of Public Health, the Dollywood Foundation, and the Alaska Department of Education and Early Development (DEED). We determined participation status for children through records from the Dollywood Foundation for each month from 2010 to 2018. To answer evaluation question 1, we compared participant characteristics with nonparticipant characteristics using information from DEED data on all public school students in Alaska. For evaluation question 2, we used publicly available data from the Childhood Understanding Behaviors Survey (CUBS) from 2012 through 2017 (available from DHSS). This data is reported at the public health region¹ level. We used data from the Dollywood Foundation to calculate the number of unique children served by IL in each public health region annually and analyzed evaluation question 2 at the region level. For evaluation question 3, we linked the Dollywood Foundation records to DEED student records for children who entered kindergarten in Alaska from 2012 through 2019. Details on the data and methods for each question are provided below.

Evaluation question 1: Home literacy environment and parent-child bond

We conducted region-level analyses of CUBS data between 2012 and 2017 to address evaluation question 1. We selected six CUBS items that were relevant to the outcomes of interest: home literacy environment and parent-child bond (see table 2).

Table 2. CUBS items and description of outcomes

Outcome	CUBS item	Aggregate summary measure
Home literacy environment	Yesterday, how much time did you or someone else read aloud to your child? [hours and minutes]	Proportion of children who were read to yesterday (time reported was greater than 0 minutes)
	How many children's picture books are in your home <i>now</i> , including library books?	Proportion of homes with 6 or more books
	During the past week, how many days did you or someone else in your household [read a book or story] with your child?	Proportion of children that were read to 3 or more days in the past week
Parent-child bond	Has your child ever experienced any of the following events or situations? Alcoholism or mental health disorder among household members	Proportion of children whose parent responded "No"

¹ Alaska Public Health Regions are based upon the Alaska Department of Labor and Workforce Development's six economic regions: Anchorage and Matanuska-Susitna (Mat-Su), Gulf Coast, Interior, Northern, Southeast, and Southwest. For public health purposes, the Matanuska-Susitna Borough is reported separately from the Municipality of Anchorage. Source: http://dhss.alaska.gov/dph/InfoCenter/Pages/ia/geo_phr.aspx

Has your child ever experienced any of the following events or situations?
 Witnessed violence or physical abuse between household members

Proportion of children whose parent responded “No”

This question is about things that may have happened to you since your 3-year-old child was born. For each item, check No if it did not happen to you or check Yes if it did.

Proportion of children whose parent responded “No”

My husband, partner or I went to jail

Of the seven public health regions in Alaska, only 3 had consistent estimates of the selected items: Anchorage, Interior, and Mat-Su. We excluded the Gulf Coast, Northern, Southeast, and Southwest regions due to small sample size or because the survey results were marked unreliable for other reasons (e.g., low response rates).

As an indicator of the IL presence in each region, we used the number of unique children served in the years 2010 through 2018 in each of the three regions for which reliable CUBS data was available. The Anchorage IL affiliate served children in Anchorage while multiple affiliates served children in the Interior and Mat-Su regions. Table 3 provides the number of children who received at least one book in the given year by affiliate and region.

Table 3. Children served by IL affiliate within public health regions, 2010-2018

Public Health Region	IL Affiliate	2010	2011	2012	2013	2014	2015	2016	2017	2018
Anchorage	Anchorage	4932	7047	9373	10959	12091	12390	11466	11207	11120
Interior	All*	4750	5034	5547	5483	5299	5696	5048	4828	4599
	Delta			165	259	272	320	298	321	312
	Galena				18	11	26	33	24	17
	North Star Bor	4630	4887	5249	5066	4894	5246	4621	4384	4176
	Upr Tanana	120	147	133	140	123	113	102	104	96
Mat-Su	All*	1494	2738	3653	4027	4216	4226	3652	3242	3060
	Meadowlakes	1494	2738	3653	4027	3834	2294	1928	1606	1377
	Wasilla					1811	2047	1780	1682	1723

*This total is unduplicated across affiliates and may not equal the sum of affiliate counts, as children may have been served by more than one affiliate in a year.

Source: Authors' analysis of Dollywood Foundation data.

For context, we also provide the total number of children under age 5 in Table 4 and calculate the proportion of those children served by IL (if available) for each year. The total number of children was available by borough, which aligns to the Anchorage and Mat-Su public health regions, but not the Interior region. The only available data for the Interior region was for the North Star Borough, so that proportion is calculated using only the children served by the North Star Borough IL affiliate.

Table 4. Children served by IL by borough 2010-2018

		2010	2011	2012	2013	2014	2015	2016	2017	2018
Anchorage Municipality	Children served by IL	4932	7047	9373	10959	12091	12390	11466	11207	11120
	Children under 5 years	22084	22170	22059	21987	21787	22917	21661	21557	20944
	Percent of children served by IL	22%	32%	42%	50%	55%	54%	53%	52%	53%
North Star Borough	Children served by IL	4630	4887	5249	5066	4894	5246	4621	4384	4176
	Number of children under 5 years	7734	7516	7550	8062	7046	7216	7185	7032	7382
	Percent of children served by IL	60%	65%	70%	63%	69%	73%	64%	62%	57%
Mat-Su	Children served by IL*	1494	2738	3653	4027	4216	4226	3652	3242	3060
	Number of children under 5 years	7045	7025	6533	6737	6947	7068	7301	7728	7442
	Percent of children served by IL	21%	39%	56%	60%	61%	60%	50%	42%	41%

*Includes Meadowlakes and Wasilla

Sources: Authors' analysis of Dollywood Foundation and United States Census Bureau (ACS 1-Year estimates accessed at <https://data.census.gov/cedsci/table?q=All%20counties%20in%20Alaska&tid=ACSDP1Y2019.DP05&hidePreview=false>) data.

We calculated Pearson correlations between the aggregated CUBS items for each outcome (home literacy environment and parent-child bond) and IL participation counts to assess the direction and magnitude of a linear relationship between variables. These correlations do not indicate a causal relationship but can tell us about the association between IL participation and outcomes. Correlations range from -1 to 1, with values near 0 indicating a weak relationship and values close to 1 or -1 indicating a strong relationship. Using the correlation guidance from Evans (1996)² shown in Table 5, we classified each of the resulting correlations from very weak to very strong. We used the indicated shading in order to inspect the results, organized into a table, for patterns across items and regions.

Table 5. Correlation classification guidance from Evans (1996)

Correlation magnitude range	Classification
0.00 – 0.19	“Very weak”
0.20 – 0.39	“Weak”
0.40 – 0.59	“Moderate”
0.60 – 0.79	“Strong”
0.80 – 1.00	“Very strong”

Additionally, we calculated the p-value for each correlation to assess whether the correlation was statistically significant within each region. Statistical significance is largely dependent on sample size, and the sample size for each correlation calculation was relatively small. Anchorage and Mat-Su had observations for each year between 2012 and 2017, however, the

² Evans, J. D. (1996). *Straightforward statistics for the behavioral sciences*. Thomson Brooks/Col Publishing Co.

estimates for the Interior were flagged as unreliable in 2015 and were therefore not included in the calculation. As we do not expect to find many statistically significant results with such small sample sizes, we used a more liberal alpha value of 0.10, instead of the commonly used 0.05, to determine significance. Additionally, because we were running multiple statistical tests using the same analytic sample, which increases the likelihood of spurious correlations, we used the Benjamini-Hochberg correction for multiple testing on the correlations within each region.

Evaluation question 2: IL participant characteristics

This analysis drew from two sources of data: administrative student records from DEED dating back to 2012 and IL participation records from the Dollywood Foundation from 2010 to 2018. To compare the IL population to the non-IL population, we identified a set of student characteristics and outcomes. The student characteristics are race/ethnicity, economically disadvantaged (based on free or reduced-price lunch eligibility), English learner status, home language, whether the student has an individualized education program (IEP), and the urbanicity (urban, urban fringe, rural hub/fringe, rural remote) of the school attended. Student outcomes included kindergarten readiness based on Alaska Developmental Profile (ADP) scores, attendance rates in kindergarten through grade 3, grade progression rates for kindergarten through grade 3, and average achievement on state standardized math and reading tests in grade 3. For each characteristic and outcome, we calculated the proportion of student groups in the IL and non-IL populations by kindergarten cohort as well as the combined proportion across cohorts.

Evaluation question 3: Relationship of IL participation with student outcomes

This analysis also used administrative student records from DEED dating back to 2012 and IL participation records from the Dollywood Foundation from 2010 to 2018. We focused our analysis on students who enrolled in kindergarten in public school in Alaska. The analysis sample was organized into seven cohorts, based on the year of enrollment in kindergarten.

We linked DEED records to Dollywood Foundation records using a matching technique that incorporated child name, date of birth, and city of residence/school attendance. Table 6 provides the number of DEED records by cohort and the number of Dollywood Foundation records that were successfully linked to DEED records and included in the analysis. Unlinked Dollywood Foundation records may represent either students who entered public school in Alaska at grade 1 or after, who did not attend public school in Alaska in kindergarten through grade 3, who left the state of Alaska prior to attending public kindergarten, or whose record could not be matched for other reasons (e.g., name change).

Table 6. Summary of DEED and Dollywood Foundation data linking

Kindergarten cohort	Number of DEED student records	Number of linked Dollywood Foundation child records included in the analysis sample	Years of available Dollywood Foundation data prior to kindergarten entry	Average number of months of IL participation among participants
2011/12	10,973	2,351	2.75	10.7
2012/13	10,797	3,344	3.75	16.7

2013/14	10,872	4,242	4.75	22.7
2014/15	10,804	4,734	5.75	28.2
2015/16	10,621	4,992	From birth*	31.7
2016/17	10,415	5,188	From birth	35.6
2017/18	10,358	5,248	From birth	36.8
2018/19	10,204	5,268	From birth	37.4
All	85,044	35,367	N/A	N/A

*Assuming kindergarten entry at age 5.

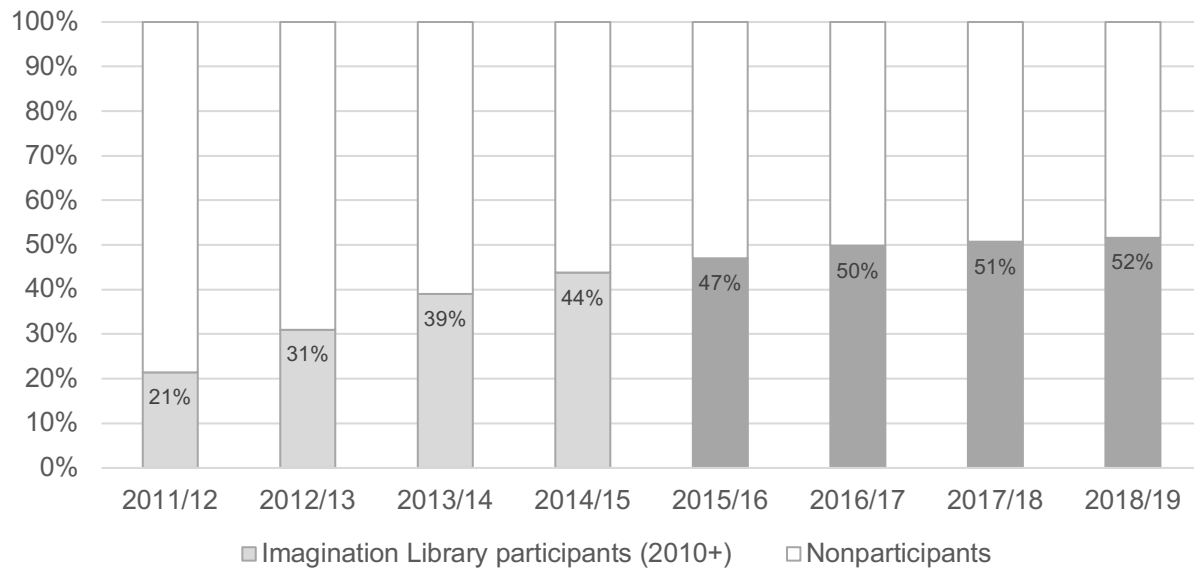
Note: There were 61,929 Dollywood Foundation child records from 2010 to 2018 which we attempted to match with DEED records. N/A means not available.

Source: Authors' analysis of DEED and Dollywood Foundation data.

Because Dollywood Foundation data was only available beginning in 2010, each cohort also differs with respect to the years of available IL participation data. We addressed this by running analyses separately for each cohort. For example, in the 2011/12 kindergarten cohort we could only identify students who were enrolled in IL at some point in the 2.75 years before kindergarten entry (January 2010 through September 2012). So, if a child was enrolled at birth but de-enrolled before January 2010, they would be coded as a nonparticipant in the analysis. However, for the 2015/16 cohort and beyond, we can assume that Dollywood Foundation data covers every month from birth to kindergarten entry. Thus, for these later cohorts, we have a more complete picture of which students participated in IL prior to kindergarten entry and a better understanding of how many months they participated from birth to kindergarten entry.

We created a binary variable denoting participation in IL. All students with at least 1 month of IL enrollment in the available data were counted as having participated in IL (treatment = 1). Students with no enrollment data were considered nonparticipants. The percent of IL participants increased in each cohort from 2011/12 to 2015/16 (Figure 2), but it is unclear whether there was a true increase in participation because the number of years of available data to determine the participation indicator also increased over this time period. However, there was a modest but steady increase in the participant numbers from the 2015/16 to 2018/19 cohorts, where all months of data are available.

Figure 2. Imagination Library participation, by kindergarten cohort



Note: Lighter bars represent cohorts where fewer than six years of data were available before kindergarten entry, while darker bars represent cohorts where complete data is available.

Source: Authors' analysis of DEED and Dollywood Foundation data.

To account for any observed differences in characteristics between the participant and nonparticipant groups in each cohort, we performed propensity score matching on the data. This creates a more comparable control group of nonparticipants in order to examine outcomes. In essence, we selected a control group of nonparticipants within each school and cohort that was similar in terms of gender, race/ethnicity, and home language—all of the characteristics available in the data that would not likely change since a child began participating in IL. Economic disadvantage, English learner, and IEP status were not used in the propensity score matching as these were all measured in kindergarten, after students had participated in IL, and only characteristics prior to participation are eligible to be used in matching.

The IL participants and the matched nonparticipant comparison group were the sample used for these analyses. Since the number of students in the kindergarten cohort changed across the subsequent grades (due to transferring in/out of public school), we created four different analytic samples using propensity score matching for each set of outcomes, one for each grade level through grade 3. Kindergarten outcomes are all ADP outcomes, attendance, and retention. Grades 1 and 2 outcomes are attendance and retention. Grade 3 outcomes are attendance, reading achievement, and math achievement.

Multilevel regression models with a random effect for school were run on the analytic samples separately for each of the 8 kindergarten cohorts. We also ran separate models for: (1) the full statewide analytic sample (all districts), (2) the Anchorage school district, and (3) all districts excluding Anchorage. The regression models included an indicator for IL participation (a treatment indicator, as defined above) and covariates of race/ethnicity, gender, home language, English learner status, economically disadvantaged status, IEP status, age at kindergarten entry, and urban/rural school location. Thus, for each outcome, there were up to 24 regression models

run based on the availability of outcome data. Results were not adjusted for multiple testing. We focus our discussion below on practical significance rather than statistical significance.

We were also interested to understand whether participation in IL had differential influence on student outcomes for certain groups of students and levels of treatment. For the statewide analytic samples, we also ran regression models that included interaction terms for economically disadvantaged status, English learner status, Alaska Native race/ethnicity, and the number of months of IL participation. This added up to 32 more “interaction” regression models run for each outcome.

Results

The section below details results for all evaluation analyses. We begin with the region-level analysis exploring the link between home literacy environment, parent-child bond, and IL participation. Then, we examine IL participant and non-participant characteristics and detail the influence of IL participation on student outcomes.

Home literacy environment and parent-child bond

We conducted descriptive and exploratory analyses of region-level CUBS data (see tables A1 to A6 in appendix A) to understand the correlation between IL participation and home literacy environment and parent-child bond. The correlations summarizing the direction and strength of the relationship between IL participation and the outcome of interest are provided in Table 9. A positive correlation means that as higher IL participation within a region was on average associated with a higher aggregate outcome measure. A negative correlation means that higher IL participation with a region was on average associated with a lower aggregate summary measure.

Region-level IL participation was positively associated with proportion of homes with 6 or more books and with children without reported exposure to alcoholism or mental health disorders, but results were not statistically significant

There is a consistent positive pattern across regions correlating region-level IL participation with the proportion of homes with 6 or more books and region-level IL participation with the proportion of children without reported exposure to alcoholism or mental health disorders. For both of these measures, the correlations range from weakly to moderately positive. All of the other measures have more variation in both direction and strength. After correcting for multiple testing, none of the correlations were found to be statistically significant. The shading and text coloring on the table allows us to inspect the results for practical significance, using the classification scheme described in the methods section (see Table 5).

Table 9. Correlations between children served and the given aggregated survey measure by region

Aggregate summary measure	Anchorage	Interior	Mat-Su
Proportion of children who were read to yesterday	-0.06	-0.12	0.86
Proportion of homes with 6 or more books	0.33	0.22	0.59
Proportion of children that were read to 3 or more days in the past week	0.46	-0.39	0.32
Proportion of children without reported exposure to alcoholism or mental health disorders	0.24	0.22	0.17
Proportion of children without reported exposure to violence or physical abuse	-0.23	0.83	0.28
Proportion of children without a parent who went to jail	0.41	-0.06	0.67

Note: After correcting for multiple testing within each region, no correlation was found to be statistically significantly different from 0. The darkness of the cell indicates the strength of the correlation (see Table 5 for the key).

Sources: Authors' analysis of Dollywood Foundation and Alaska Childhood Understanding Behaviors Survey (CUBS) data.

In the Mat-Su region, all correlations between IL and the aggregate summary measures are positive, though the magnitude ranges from very weak (0.17) to very strong (0.86). For example, the correlation between IL participation and the proportion of children who were read to yesterday in Mat-Su was 0.86 (see the top right cell of Table 9), indicating that children being read to and IL participation have a very strong, positive relationship. In Anchorage and the Interior region, some correlations were weakly negative.

These analyses did not produce statistically significant evidence of relationships between home literacy and parent-child bond items and region-level IL participation. This does not necessarily mean there is no relationship, as there were a number of limitations to this analysis due to the measures being region-level and an inability to control for other factors within regions that may have changed over time, such as availability of early learning programs. A more effective research approach to investigating home environment and parent-child bond would be to obtain child- or family-level data from CUBS or school climate surveys and link those measures to data on IL participation.

IL participant characteristics

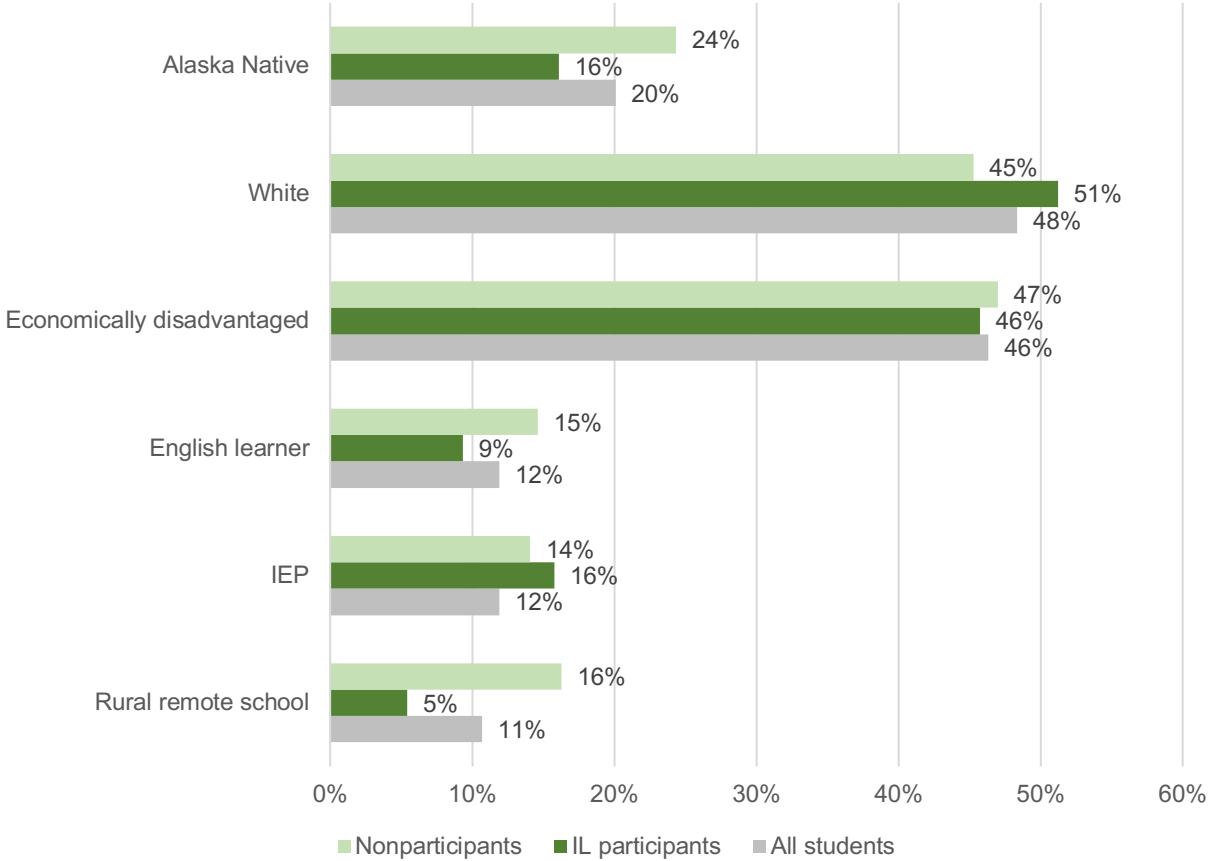
We examined the characteristics of IL participants and how they compared with nonparticipants and all students in the kindergarten cohort.

Among IL participants, there were more urban and White students and fewer English learner students compared to children who did not participate

Characteristics of the participant and nonparticipant groups are provided by cohort in Tables B1-B3 in appendix B. In all cohorts, relatively more IL participants than nonparticipants were in urban schools and fewer participants than nonparticipants were in rural schools. Relatively more IL participants are White than nonparticipants. Relatively fewer IL participants were Alaska Native; for example, in the 2018/19 kindergarten cohort, 16 percent of IL participants identified as Alaska Native, compared to 24 percent among nonparticipants (see figure 3). Nonparticipants had a relatively higher rate of being classified as an English learner in

kindergarten than participants. Descriptive statistics on the early elementary outcomes examined in this report are provided for participants and nonparticipants, with no adjustment for matching, in Tables B4-B6 in appendix B. Information for Anchorage only and for districts excluding Anchorage is provided in tables B7-B18 in appendix B.

Figure 3. Characteristics of IL participants and nonparticipants, 2018/19 kindergarten cohort



Note: IEP=individualized education program.
 Source: Authors’ analysis of DEED and Dollywood Foundation data.

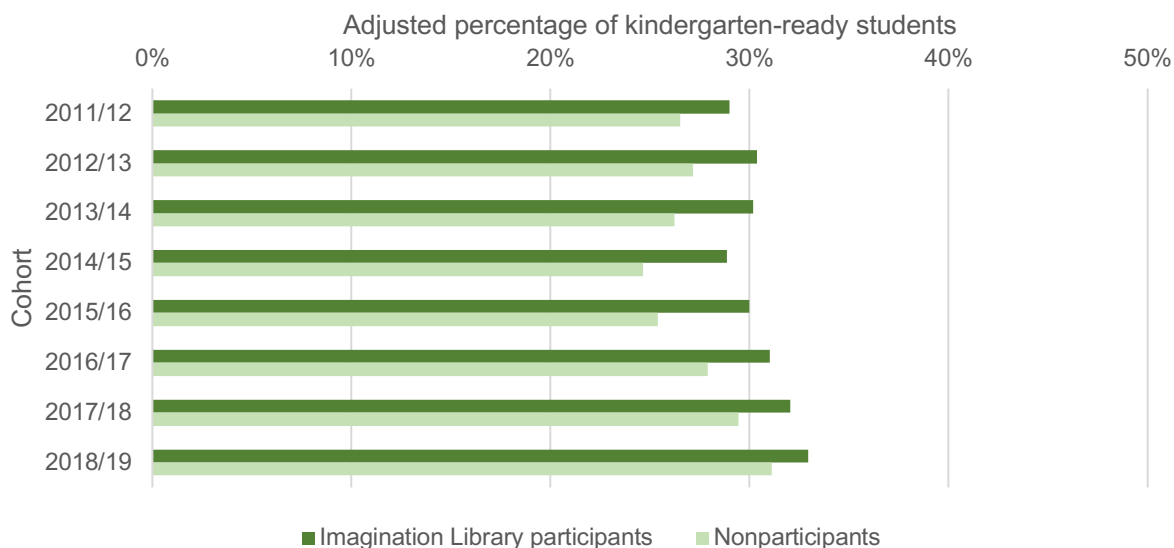
Relationship of IL participation with student outcomes

We looked at the relationship of IL participation with student outcomes through regression analysis on a matched group of participants and nonparticipants. Full results from regression analyses are available in appendix C (tables C1a through C16e).

IL participants had a higher probability of being kindergarten ready compared to their peers who did not participate

Across all cohorts, for the average student, IL participants had a higher probability of meeting the kindergarten readiness threshold on the ADP assessment. The difference in probabilities ranged from 2 percent (2018/19 cohort) to 5 percent (2015/16 cohort). This relationship was statistically significant in all cohorts except the 2011/12 cohort.

Figure 3. Adjusted percentages of kindergarten readiness for IL participants and nonparticipants, by cohort



Note: These are adjusted percentages that account for differences between the two groups being compared.
 Source: Authors' analysis of DEED and Dollywood Foundation data.

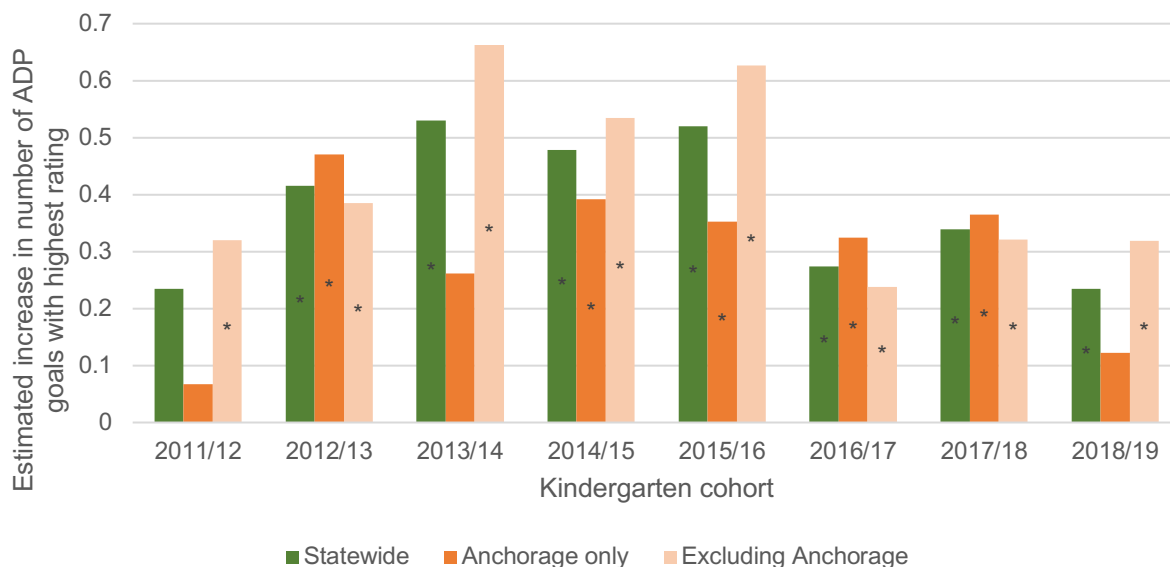
When examining if these results hold with Anchorage only and among districts excluding Anchorage, we found that results continued to be generally positive but fewer cohorts were statistically significant. This could be due to smaller numbers of students being included in these estimates compared to the statewide estimates.

We found no evidence of a differential relationship of IL participation with kindergarten readiness for EL, economically disadvantaged, or Alaska Native students. This means that for each of these student groups, IL participation had a similar positive relationship with kindergarten readiness as that for all students shown above.

IL participants were more likely to have higher ratings across all 13 Alaska Developmental Profile goals

Across all kindergarten cohorts, the average number of ADP ratings of 2 (meaning a student demonstrates the indicative skills and behaviors of the goal 80 percent or more of the time) were higher for IL participants than nonparticipants, and these relationships were statistically significant for all cohorts statewide with the exception of the 2012 cohort. For example, in the 2019 kindergarten cohort, IL participants earned an average of 0.24 more ratings of 2 than nonparticipants, controlling for other factors such as student demographic characteristics. The strongest effect was found in the 2014 cohort, in which IL participants earned an average of 0.53 more ratings of 2 than nonparticipants, controlling for other factors.

Figure 4. Estimated increase in number of ADP ratings of 2 among those participating in Imagination Library



Note: ADP is Alaska Developmental Profile. Effects that are statistically significant at the 0.05 level are denoted with an asterisk (*) on the bar.

Source: Authors' analysis of DEED and Dollywood Foundation data.

The effect in Anchorage was positive and statistically significant in all but three cohorts (2011/12, 2013/14, and 2018/19). For districts excluding Anchorage, all cohorts, including 2011/12, were statistically significant. This indicates that Anchorage is not driving these results, and that non-Anchorage districts as well show a positive relationship between IL participation and ADP scores.

We found no evidence of differential influence for EL, economically disadvantaged, or Alaska Native students except in one case. In the 2015/16 cohort, the effect for Alaska Native students was significantly stronger than for students who were not Alaska Native, indicating that for that cohort, IL participation had an additional positive relationship for Alaska Native students.

IL participants were more likely to have higher ratings on the five Alaska Developmental Profile goals related to literacy than children who did not participate

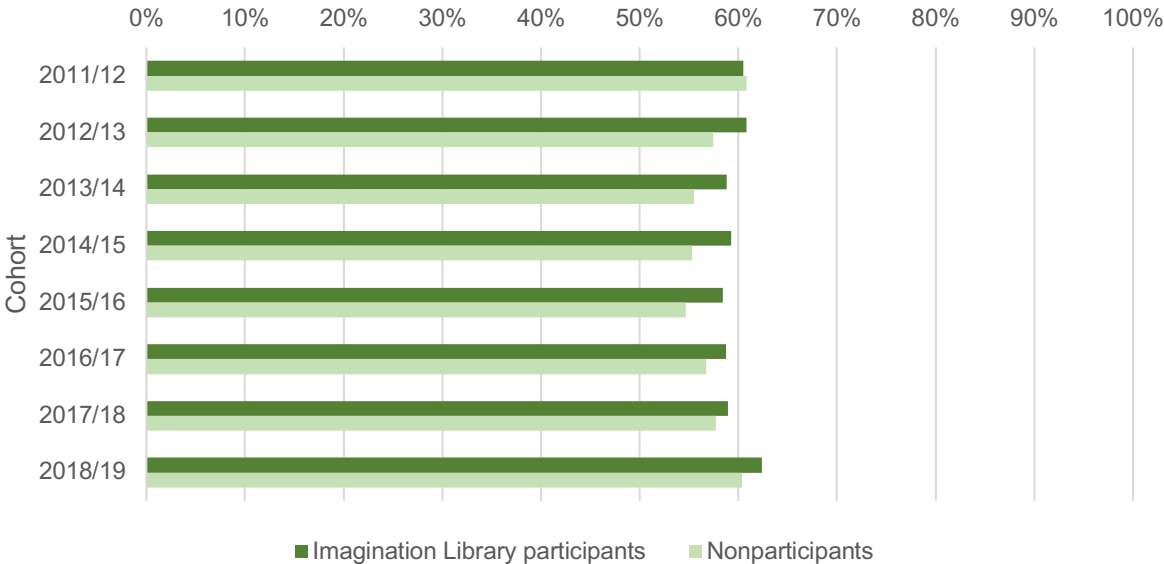
For the five literacy-related ADP goals, there are consistent positive relationships between IL participation and scoring higher on those goals. The strongest relationships were for demonstrating awareness of print concepts and demonstrating knowledge of letters and symbols.

These relationships do not seem to be driven by Anchorage, as when examining Anchorage separately, fewer cohorts were statistically significant than the statewide estimates. When excluding Anchorage, all but one or two cohorts showed a statistically significant relationship for each of the five literacy-related goals, similar to the statewide estimates.

We found no evidence of any consistent differential influence based for EL, economically disadvantaged, or Alaska Native students across these five literacy-related goals, indicating that for each of these groups, IL participation had a similarly positive relationship with these literacy goals as for all students.

For the “uses receptive communication skills” ADP goal, IL participants had statistically significant and higher estimated percentages of scoring a 2 on that goal compared to nonparticipants in all cohorts except 2011/12 and 2017/18. In 2011/12 and 2017/18, the relationship between IL participation and scoring a 2 on this goal was not statistically significant. Differences between the percentages of IL participants and nonparticipants scoring a 2 on this goal (using adjusted percentages to account for differences between the two groups) ranged from 2.0 percent (2018/19 cohort) to 3.9 percent (2014/15 cohort).

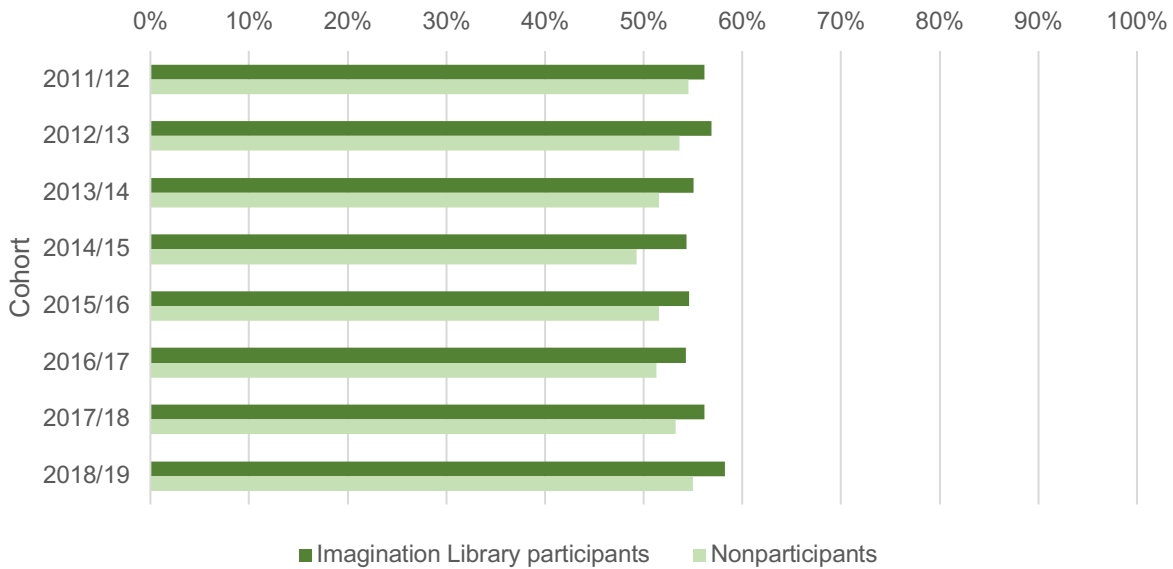
Figure 5. Adjusted percentages of scoring a 2 on the “Uses receptive communication skills” ADP goal, by IL participants and nonparticipants and cohort



Note: These are adjusted percentages that account for differences between the two groups being compared.
 Source: Authors’ analysis of DEED and Dollywood Foundation data.

For the “uses expressive communication skills” ADP goal, IL participants had statistically significant and higher estimated percentages of scoring a 2 on that goal compared to nonparticipants in all cohorts except 2011/12. In 2011/12, the relationship between IL participation and scoring a 2 on this goal was not statistically significant. Differences between the percentages of IL participants and nonparticipants scoring a 2 on this goal (using adjusted percentages to account for differences between the two groups) ranged from 2.9 percent (2017/18 cohort) to 5.0 percent (2014/15 cohort).

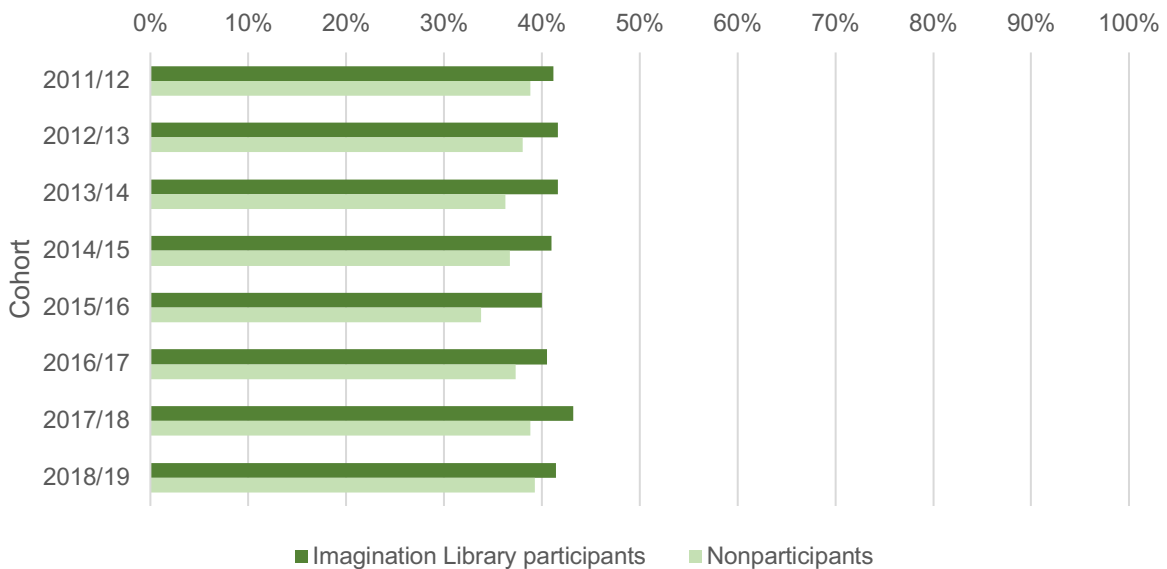
Figure 6. Adjusted percentages of scoring a 2 on the “Uses expressive communication skills” ADP goal, by IL participants and nonparticipants and cohort



Note: These are adjusted percentages that account for differences between the two groups being compared.
 Source: Authors’ analysis of DEED and Dollywood Foundation data.

For the “demonstrates phonological awareness” ADP goal, IL participants had statistically significant and higher estimated percentages of scoring a 2 on that goal compared to nonparticipants in all cohorts except 2011/12. In 2011/12, the relationship between IL participation and scoring a 2 on this goal was not statistically significant. Differences between the percentages of IL participants and nonparticipants scoring a 2 on this goal (using adjusted percentages to account for differences between the two groups) ranged from 2.1 percent (2018/19 cohort) to 6.2 percent (2015/16 cohort).

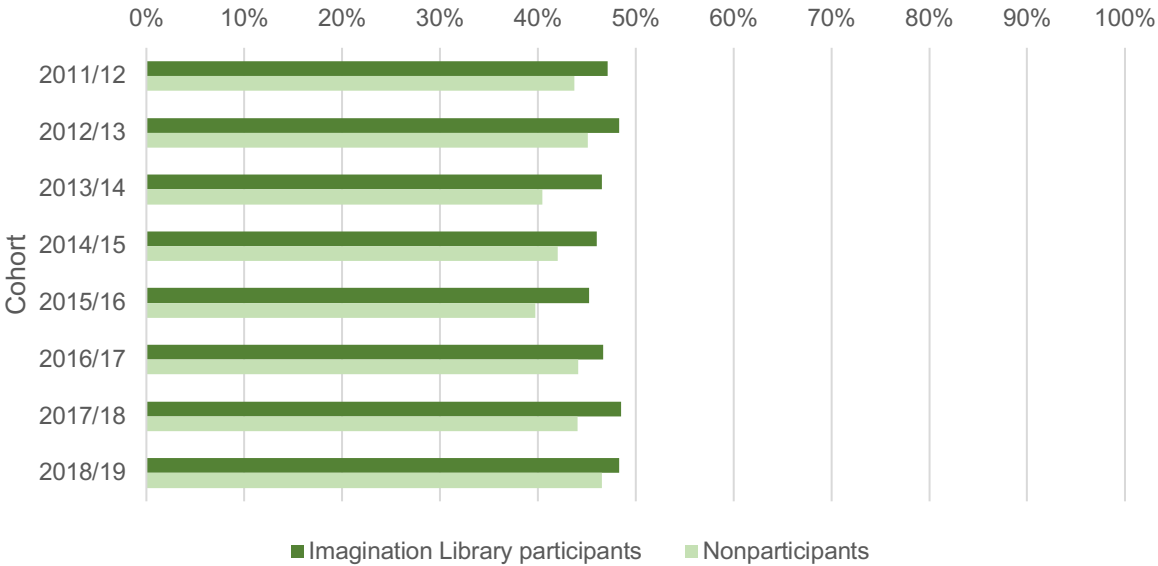
Figure 7. Adjusted percentages of scoring a 2 on the “Demonstrates phonological awareness” ADP goal, by IL participants and nonparticipants and cohort



Note: These are adjusted percentages that account for differences between the two groups being compared.
 Source: Authors' analysis of DEED and Dollywood Foundation data.

For the “demonstrates awareness of print concepts” ADP goal, IL participants had statistically significant and higher estimated percentages of scoring a 2 on that goal compared to nonparticipants in all cohorts except 2018/19. In 2018/19, the relationship between IL participation and scoring a 2 on this goal was not statistically significant. Differences between the percentages of IL participants and nonparticipants scoring a 2 on this goal (using adjusted percentages to account for differences between the two groups) ranged from 2.5 percent (2016/17 cohort) to 6.1 percent (2013/14 cohort).

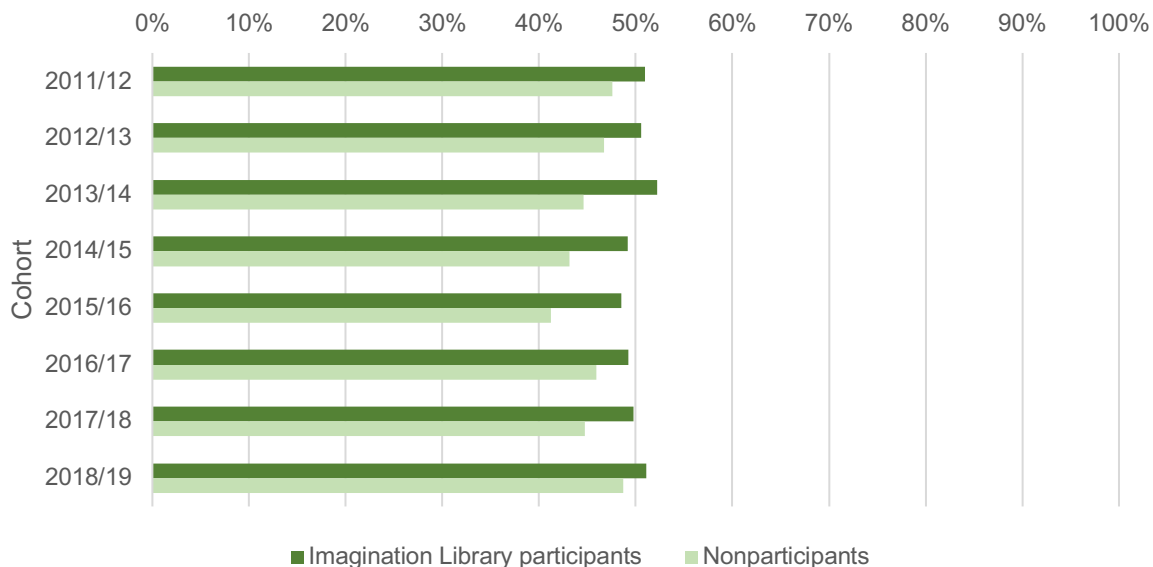
Figure 8. Adjusted percentages of scoring a 2 on the “Demonstrates awareness of print concepts” ADP goal, by IL participants and nonparticipants and cohort



Note: These are adjusted percentages that account for differences between the two groups being compared.
 Source: Authors' analysis of DEED and Dollywood Foundation data.

For the “demonstrates knowledge of letters and symbols” ADP goal, IL participants had statistically significant and higher estimated percentages of scoring a 2 on that goal compared to nonparticipants in all cohorts. Differences between the percentages of IL participants and nonparticipants scoring a 2 on this goal (using adjusted percentages to account for differences between the two groups) ranged from 2.4 percent (2018/19 cohort) to 7.6 percent (2013/14 cohort).

Figure 9. Adjusted percentages of scoring a 2 on the “Demonstrates knowledge of letters and symbols” ADP goal, by IL participants and nonparticipants and cohort



Note: These are adjusted percentages that account for differences between the two groups being compared.
 Source: Authors’ analysis of DEED and Dollywood Foundation data.

For Alaska Native students in the 2014/15 and 2015/16 cohorts, we found positive differential effects of IL on demonstrating phonological awareness, demonstrating awareness of print concepts, and demonstrating knowledge of letters and symbols. This indicates that participation in IL had a larger positive relationship for Alaska Native students than for non-Alaska Native students in those cohorts for those goals.

For EL and economically disadvantaged students, there were few consistent patterns across cohorts or ADP goals in terms of a higher positive or negative relationship between IL participation and scoring a 2 on the ADP goal. However, in the 2016/17 cohort, EL students who participated in IL showed a more positive relationship with IL participation and using receptive communication skills, demonstrating phonological awareness, and awareness of print concepts than non-EL students.

Participation in IL had a small positive relationship with student attendance in kindergarten through grade 3

Across all cohorts and across all grades from kindergarten to grade 3, the relationship of IL participation with student attendance rates was consistently positive but small; statistical significance was found for the 2012/13 through 2015/16 cohorts. The largest relationship was an estimated 0.6 percent increase for the 2015/16 cohort for kindergarten attendance, which translates to approximately 1 more day attended in a 180-day school year by IL participants than non-participants. These relatively small relationships were largest in kindergarten (see Table 10).

Table 10. Influence of IL on school attendance rates (%)

	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19
Kindergarten	0.3	0.4*	0.4*	0.6*	0.6*	0.1	0.2	0.2
Grade 1	0.1	0.5*	0.2*	0.0	0.3*	-0.2	0.1	na
Grade 2	0.4*	0.4*	0.1	0.4*	0.4*	0.1	na	na
Grade 3	0.5*	0.3	0.2	0.1	0.5*	na	na	na

Note: na = not available. Effects that are statistically significant at the 0.05 level are denoted with an asterisk (*).
Source: Authors' analysis of DEED and Dollywood Foundation data.

When examining results for Anchorage, fewer cohorts were statistically significant, but results remained positive and small for all cohorts except 2017/18. When excluding Anchorage, the 2013/14, 2014/15, and 2017/18 cohorts had statistically significant results, and estimates for all cohorts were positive and small. This indicates that, again, Anchorage was not driving the overall results.

There were no consistent patterns of differential relationships of IL participation with attendance for EL, economically disadvantaged, or Alaska Native students.

Few students did not have on-time grade progression in kindergarten through grade 2 and there was no difference between IL participants compared to non-participants

Across all cohorts, there was very little variation in on-time grade progression. Fewer than 1 percent of students in all cohorts and in kindergarten through grade 2 were retained. The relationship of IL participation with rates of on-time grade progression was not statistically significant for any cohort, meaning there was no difference in these on-time rates between participants and nonparticipants.

IL participation is associated with increases in grade 3 reading achievement, particularly for the 2013/14 and 2015/16 kindergarten cohorts

There were four cohorts for which an average treatment effect on grade 3 academic achievement (reading and math) could be estimated: the kindergarten cohorts of 2011/12, 2013/14, 2014/15, and 2015/16. The 2012/13 cohort was not tested in either reading or math in their grade 3 year due to testing difficulties statewide in 2015/16. The 2016/17 and beyond cohorts had not yet entered grade 3 in the available data at the time of analysis and thus were not included in these analyses.

For the 2013/14 and 2015/16 cohorts, there was a moderately positive relationship between IL participation and grade 3 reading achievement (see Table 11). The units used in this analysis can be interpreted as effect sizes (i.e., the number of standard deviations). Effect sizes of 0.10 in education, especially for an outcome measured multiple years after the end of treatment, may be considered practically significant.

There was a consistently positive relationship between IL participation and grade 3 reading achievement statewide, though the size of the relationship (the effect size) differs across cohorts. The effect is relatively weaker for the 2011/12 and 2014/15 cohorts (0.04 and 0.03, respectively)

and is not statistically significant. In the 2013/14 and 2015/16 cohorts (0.10 and 0.09, respectively). In the earliest cohorts, we are likely undercounting IL participation given that we only had records for those who had recently participated in IL prior to kindergarten, rather than records from birth through 5 (see Figure 2). Thus, the weak relationship for the earliest kindergarten cohort of 2011/12 is not unexpected. The reason for the weaker statewide effect with the 2014/15 cohort, however, is less clear, and may be driven by negative results for Anchorage in that cohort.

Table 11. Relationship of IL participation with grade 3 reading achievement (standardized effect sizes)

	2011/12	2012/13	2013/14	2014/15	2015/16
Statewide	0.04	na	0.10*	0.03	0.09*
Anchorage only	0.02	na	0.10*	-0.07*	0.05
Excluding Anchorage	0.05	na	0.10*	0.09*	0.11*

Note: na = not available. Effects that are statistically significant at the 0.05 level are denoted with an asterisk (*).
Source: Authors' analysis of DEED and Dollywood Foundation data.

To make these results more interpretable, we translated the effect sizes above into percentile change for IL participants compared to nonparticipants for the two cohorts with statistically significant statewide results. We looked at the test scores of nonparticipants at the 25th percentile (low achievers), 50th percentile (average achievers), and 75th percentile (high achievers) and estimated how much their scores would be expected to change if they had participated in IL:

- For the 2013/14 and 2015/16 cohorts, a student at the 25th percentile who participated in IL would be expected to score at the 28th percentile in reading
- For the 2013/14 cohort, a student at the 50th percentile who participated in IL would be expected to score at the 55th percentile; for the 2015/16 cohort, they would be expected to score at the 53rd percentile in reading
- For the 2013/14 and 2015/16 cohorts, a student at the 75th percentile who participated in IL would be expected to score at the 79th percentile in reading

Examining results for Anchorage, there was a statistically significant negative relationship between IL participation and grade 3 reading achievement for the 2014/15 kindergarten cohort. Results excluding Anchorage were statistically significant for the 2013/14, 2014/15, and 2015/16 cohorts and were the same or stronger than statewide results. This indicates again that results were not driven by Anchorage.

We found no consistent patterns of differential relationships between IL participation and grade 3 reading achievement for EL, economically disadvantaged, or Alaska Native students; there were few statistically significant differences across cohorts for these student groups with this outcome. This means that the results for these student groups were similar to the results for all students.

IL participation is associated with increases in grade 3 math achievement, particularly for the 2011/12, 2013/14, and 2015/16 kindergarten cohorts

We also see a consistently positive effect of IL on grade 3 math achievement statewide, though, again, the size of the relationship differs by cohort. The effect is not statistically significant for the 2015 cohort. For the 2011/12, 2013/14, and 2015/16 cohorts, the relationship is statistically significant and moderate in size (0.08, 0.12, and 0.11, respectively).

Table 12. Relationship of IL participation with grade 3 math achievement (standardized effect sizes)

	2011/12	2012/13	2013/14	2014/15	2015/16
Statewide	0.08*	na	0.12*	0.01	0.11*
Anchorage only	0.08	na	0.08*	-0.08*	0.10*
Excluding Anchorage	0.09*	na	0.14*	0.07*	0.12*

Note: na = not available. Effects that are statistically significant at the 0.05 level are denoted with an asterisk (*).

Source: Authors' analysis of DEED and Dollywood Foundation data.

We again translated the effect sizes above into percentile change for IL participants compared to nonparticipants for the three cohorts with statistically significant statewide results. We looked at the test scores of nonparticipants at the 25th percentile (low achievers), 50th percentile (average achievers), and 75th percentile (high achievers) and estimated how much their scores would be expected to change if they had participated in IL:

- A student at the 25th percentile who participated in IL would be expected to score at the 30th (2011/12 cohort), 29th (2013/14 cohort), or 28th percentile (2015/16 cohort) in math
- A student at the 50th percentile who participated in IL would be expected to score at the 53rd (2011/12 and 2015/16 cohorts) or the 56th percentile (2013/14 cohort) in math
- A student at the 75th percentile who participated in IL would be expected to score at the 77th (2011/12 cohort), 79th (2013/14 cohort), or 80th percentile (2015/16 cohort) in math

For Anchorage, there was a statistically significant negative relationship between IL participation and grade 3 math achievement for the 2014/15 kindergarten cohort (similar to the results for reading). Results excluding Anchorage were statistically significant for the 2011/12, 2013/14, 2014/15, and 2015/16 cohorts and were similar or larger than statewide results in terms of the size of the relationship.

We found no consistent patterns of differential relationships between IL participation and grade 3 math achievement for EL, economically disadvantaged, or Alaska Native students; similarly to reading achievement, there were few statistically significant differences across cohorts for these student groups with this outcome. This again means that the results for these student groups were similar to the results for all students.

Implications

These results from the first large-scale quantitative evaluation of the Imagination Library program in Alaska show promising connections between program participation and early elementary student outcomes. More research is needed to explore how participation is connected to other outcomes, such as student test performance in grades 1 and 2, and how the

influence of participation on student outcomes varies based on the number of years a child receives books through the program.

In addition, a more effective research approach to investigating home literacy environment and parent-child bond would be to obtain child- or family-level data from CUBS or school climate surveys and link those measures to data on IL participation. This could show more clearly whether participation in IL was linked to those measures, rather than the regional-level analyses included in this report.

For more information about Imagination Library in Alaska, contact [Best Beginnings](#) at admin@bestbeginningsalaska.org.