



# Denver Preschool Program

## Child Outcomes Study 2017 – 2018

### *Part B*

### *Longitudinal Follow-up*

### *Evaluation Cohorts 1-9 Report*

#### ***Document Summary***

The Part B longitudinal report of 2017-2018 student data focuses on the developmental outcomes of Denver Preschool Evaluation Cohorts 1 through 9 comprised of randomly selected, stratified samples of students who participated in DPP. The outcomes focus on student progress on assessments collected by Denver Public Schools during the 2017-2018 school year and provided for analysis in fall 2019. Denver Preschool Program graduates are compared to the overall population of Denver Public Schools' students in the same school year. In addition, DPP graduates' preschool scores are used to predict later school performance.



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## Executive Summary

The longitudinal component of the Denver Preschool Program Child Outcomes Study was designed to follow each evaluation cohort into K-12 public school to assess how the students fare over time and to determine how preschool outcomes predict later academic performance. These data help support understanding of the sustainability of DPP effects. This report presents the results of follow-up on DPP graduates' academic performance in the 2017-2018 school year. In the analyses, subgroup comparisons were explored, including reading proficiency differences by demographics and the type of DPP site that students attended. The direct assessment preschool data were also used to predict later K-12 school performance. A summary of results by the evaluation questions is provided below.

### **Do DPP graduates (i.e., students who received DPP tuition credits) compare favorably with the district as a whole on assessments administered by Denver Public Schools (DPS) in kindergarten and beyond?**

To address this question, the proportions of DPP graduates who were reading *at or above grade level* as measured by the READ Act early literacy and language assessments (for Cohorts 7-9) was examined. For Cohorts 1-6, the proportions of students who *met or exceeded expectations* on the Colorado Measures of Academic Success (CMAS ELA and Math) was analyzed. DPP graduates were compared with the DPS district average in the same grade level. The overall finding for 2017-2018 is that students from the DPP preschool cohorts (samples of approximately 200 each) have a generally higher rate of being *at or above grade level*, or in later cohorts *meeting or exceeding expectations*, compared with the overall across-district averages. This is the case for DPP graduates assessed in English and in Spanish in kindergarten through second grade, as well as for reading and math proficiency in third through eighth grade.

### **Do DPP graduates across demographic subgroups differ in their reading proficiency in kindergarten and beyond?**

Demographic subgroup comparisons showed how longitudinal findings differed by students' gender, income, or racial/ethnic background. Please use caution in interpreting findings for subgroups with small sample sizes. These findings are provided to describe the within sample/cohort differences to examine trends rather than for population-level generalization.

Findings indicate there were statistically significant differences between females and males on reading proficiency levels in 3 of the 9 cohorts analyzed (in two cases a larger proportion of females, and in one case males, exceeded expectations). Overall across 6 of the 9 cohorts, females tended to have generally higher proportions *meeting or exceeding expectations* of the CMAS assessment than males.

Family income during preschool plays an important role in later reading proficiency. These analyses indicated overall that as preschool income tier increased, higher reading scores can be expected. Among the higher reported-income tiers, 60% to 75% of students *met or exceeded expectations* on the CMAS assessment (not including the income-not-reported tier). For students in kindergarten, first, and second grades, over 90% of students in the higher income tiers were *at or above grade level* on the READ Act assessments. For the lowest income tier, for Cohorts 1-6, this proportion averaged 27% of students *meeting or exceeding expectations*.

Reading proficiency levels on the CMAS assessment among students of color are consistently lower than those of their White peers, although some cohorts show positive findings among the small samples of Asian and multi-ethnic students. For the READ Act measures for kindergarten through second grade,

while the vast majority of White DPP graduates are *at or above grade level*, high proportions of Hispanic, Asian, and multi-ethnic students are also *at or above grade level*. About 60% of Black DPP graduates are *at or above grade level* in the early public school years.

**Do DPP graduates from different DPP provider types (DPS vs. community sites) differ in their reading proficiency in kindergarten and beyond?**

These analyses resulted in mixed findings. Of the eight comparisons possible, three cohorts' results showed significant differences between scores of students who had attended community versus DPS preschools (i.e., two cohorts with community sites and one within DPS sites yielding significantly higher proportions of reading proficient students).

**Are DPP graduates' direct assessment scores in prekindergarten associated with later reading proficiency in kindergarten and beyond?**

To address this question, we examined associations between academic assessments administered in the spring of the preschool year and students' reading proficiency in later school grades as assessed by the CMAS and the Denver Public Schools K-2 measures. During the preschool year, all students were assessed in English. Those who were identified by parents and/or teachers as dual language learners were additionally assessed in Spanish. In later school years, however, students were only assessed in one of the two languages. For all Cohorts, we used logistic regression models to predict later school performance outcomes using preschool assessment scores.

Findings show a consistent pattern of positive association between the child assessments administered in English in preschool and later school reading assessment scores for students whose primary language was English in preschool. The practical finding is generally that as scores on the preschool assessment go up by one point, the likelihood of *meeting or exceeding expectations* or being *at or above grade level* increases by approximately 10% on average.

For students who were dual language Spanish-English learners in preschool, the findings are less consistent. Among preschool dual language learners, the English-administered preschool assessments were not predictive of later reading proficiency. The math assessment administered in Spanish in preschool was predictive of later reading in 5 of the 9 cohorts. Preschool Spanish vocabulary only predicted later school reading proficiency for a third of the cohorts.

## Introduction

The Denver Preschool Program (DPP) is a taxpayer-funded initiative, created in 2006 and reauthorized by voters in 2014, that champions, funds, and increases access to high-quality preschools in Denver. DPP supports every family in Denver with a 4-year-old by offering tuition credits to access a high-quality preschool of their choosing and gives approved providers access to quality improvement resources. The vision of DPP is that children in Denver enter kindergarten ready to reach their full potential.

The Clayton Early Learning Research and Evaluation Department conducted a cross-sequential study, which gathers year-of and longitudinal data for each DPP cohort. The study started during the 2008-2009 school year and has continued every year, uninterrupted. The study helps DPP understand student progress over the course of the preschool year, kindergarten readiness, and the impact of receiving tuition credits on academic outcomes through the end of high school.

During the 2017-2018 school year, the research team welcomed prekindergarten Cohort 10 and Cohort 1 was expected to be enrolled in eighth grade (see Table 1). The Part B longitudinal follow-up report focuses on the K-12 public school academic outcomes in 2017-2018 of DPP Preschool Cohorts 1 (attended DPP in 2008-2009) through 9 (attended DPP in 2016-2017) comprised of randomized, stratified samples of children who participated in DPP.

## Evaluation Cohort Longitudinal Evaluation Questions

- Do DPP graduates (i.e., students who received DPP tuition credits) compare favorably with the district as a whole on assessments administered by Denver Public Schools (DPS) in kindergarten and beyond?
- Do DPP graduates across demographic subgroups differ in their reading proficiency in kindergarten and beyond?
- Do DPP graduates from different DPP provider types (DPS vs. community sites) differ in their reading proficiency in kindergarten and beyond??
- Are DPP graduates' direct assessment scores in prekindergarten associated with later reading proficiency in kindergarten and beyond?

## Method and Procedures

The 2017-2018 school year marked the 10th year of the DPP child outcomes evaluation. The cohort from the second year of DPP's operation was the first group of students with whom the program's full evaluation design was implemented. Table 1 shows the evaluation study cohorts by school year. The blue highlighted area shows the study sample and data represented in this report.

*Table 1. DPP Evaluation Cohorts and Expected Grade Levels by School Year*

	08-09	09-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18
Cohort 1	P	K	1st	2nd	3rd	4th	5th	6th	7th	8th
Cohort 2		P	K	1st	2nd	3rd	4th	5th	6th	7th
Cohort 3			P	K	1st	2nd	3rd	4th	5th	6th
Cohort 4				P	K	1st	2nd	3rd	4th	5th

Cohort 5					P	K	1st	2nd	3rd	4th
Cohort 6						P	K	1st	2nd	3rd
Cohort 7							P	K	1st	2nd
Cohort 8								P	K	1st
Cohort 9									P	K
Cohort 10										P

Each year, a representative sample of over 200 DPP students are selected to take part in the child outcomes study that examines progress made over the preschool year, spring school readiness, and longitudinal outcomes. Families, teachers and students are invited via a variety of methods to participate in the study. They receive gift card incentives and the results of the child assessments that are conducted throughout the year.

Students take part in direct child assessments once in the fall and once in the spring in English. Dual language learners are additionally assessed in Spanish. Secondary data are obtained in partnership with Denver Public Schools (DPS) each year for DPP graduates from each cohort who attend in their kindergarten year and beyond. The 2017-2018 data were provided to the evaluation team in the fall of 2019 per the approved protocol and data sharing agreement. The K-12 public school measures are described below.

*Public School Follow-up Measures*

For DPP graduates, student reading proficiency was measured using a variety of measures in the early elementary and middle school years. In 2017-2018 school year, Colorado students in kindergarten through second grade were administered the newer Istation, a computer adaptive early reading assessment<sup>1</sup> or other measures allowable within the Colorado READ Act. Thus, findings from the latest cohort for kindergarten through second grade (Cohorts 7-9) show their scores represented by proficient/non proficient based on the measures’ respective cut points.

In 2014-2015 students began (starting in third grade) to take the PARCC Assessment<sup>2</sup> which includes the ELA (literacy and language arts) and math tests. PARCC data were available for Cohorts 1-6 representing the 2017-2018 school year. For a comprehensive description of the differences between the PARCC and the prior TCAP assessment, please see the Denver Preschool Program Memorandum *DPP 2010-2011 Cohort Sample of 200 Analysis and Third Grade PARCC Results Analysis* (APA Consulting, 2016). Table 2 shows the available secondary measures by year. Colorado Department of Education now formally

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<sup>1</sup> Mathes, P., Torgeson, J., & Herron, J. (2016). Istation’s indicators of progress (ISIP) Early Reading Technical Report: Computer Adaptive Testing System for Continuous Progress Monitoring of Reading Growth for Students Pre-K through Grade 3. [www.istation.com](http://www.istation.com)

[https://www.istation.com/Content/downloads/studies/er\\_technical\\_report.pdf](https://www.istation.com/Content/downloads/studies/er_technical_report.pdf)

<sup>2</sup> PARCC: Partnership for Assessment of Readiness for College and Careers, <http://www.parcconline.org/>

refers to this assessment as the Colorado Measures of Academic Success (CMAS), thus that terminology is used in this report.

*Table 2. Denver Public Schools Follow-up Measures Used with DPP Graduates*

Grade	Up to 2013-2014	2014-2015	2015-2016	2016-2017	2017-2018
Kindergarten through Second Grade	DRA2 and EDL2	DRA2 and EDL2	DRA2 and EDL2, Teaching Strategies GOLD, Istation, Other Assessments	Istation (majority), STAR, i-Ready, DIBELS	Istation (majority), STAR, i-Ready, DIBELS
Third Grade and Beyond	TCAP	CMAS (PARCC)	CMAS (PARCC)	CMAS (PARCC)	CMAS (PARCC)

## Longitudinal Results

For the 2017-2018 analysis, the report presents data from follow-up with Cohorts 1-9 into their K-8 school years. In 2017-2018, Cohort 1 was in Grade 8, Cohort 2 was in Grade 7, Cohort 3 was in Grade 6, Cohort 4 was in Grade 5, Cohort 5 was in Grade 4, and Cohort 6 was in Grade 3, while Cohort 7 was in Grade 2, Cohort 8 was in Grade 1, and Cohort 9 was in kindergarten.

*How similar are DPP graduates to the population of students in the district as a whole?*

Prior to making comparisons between assessment scores for DPP graduates and DPS students as a whole, it is important to consider whether the samples of DPP graduates are similar demographically to the district as a whole. The Colorado Department of Education (CDE) provides demographic data on school districts in Colorado in the fall of each school year.<sup>3</sup> CDE provides information about free or reduced lunch status for the district as a whole as well as sex and race/ethnicity for each grade level.

The findings consistently indicate that DPP Cohort 1 through 9 samples are very similar to DPS students as a whole on sex and ethnic/race composition. In terms of income level, the proportion of free and reduced lunch-eligible DPP students fluctuates slightly from year to year (e.g., in 2017-2018 there were 58% in the DPP student population compared with 67% of DPS students districtwide). Any differences between DPP students and the district as a whole may be due to the DPP program or other unmeasured factors. Additionally, DPS is unable to provide updated FRL data for DPP graduates each year due to data privacy rules.

**Do DPP graduates (i.e., students who received DPP tuition credits compare favorably with the district as a whole on assessments administered by Denver Public Schools (DPS) in kindergarten and beyond?**

To address this question, the proportion of DPP graduates who were performing on grade level as measured by the CMAS and other assessments were examined alongside statistics for the district as a whole, as a point of reference. The analyses focused on the DPP graduates who were enrolled in the

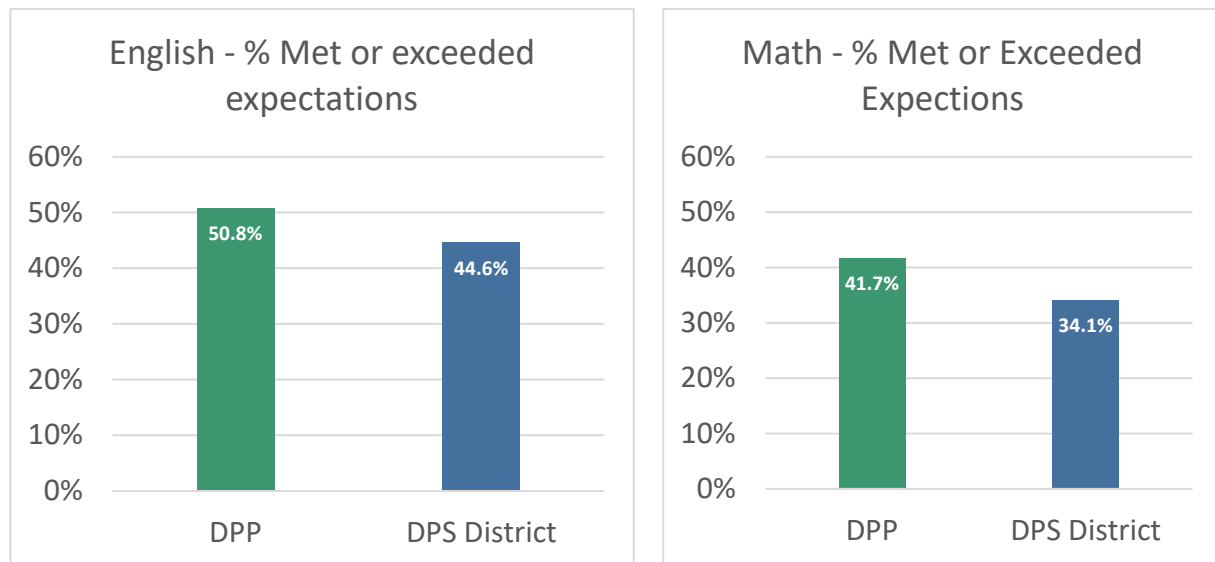
<sup>3</sup> Available at: <http://www.cde.state.co.us/cdereval/rvprioryearpmdata>

expected grades. The sample of DPP graduates in other grades (e.g., retained) was too small to permit analysis. It is important to keep in mind that the statistics for the district as a whole include the DPP graduates in the evaluation study, as well as students who were previously enrolled in DPP but did not participate in the study. The statistics for the district may also include students who may have attended DPP preschools but did not actually enroll in DPP to receive tuition credits. In the larger DPP population longitudinal analysis performed by another DPP evaluation contractor, National Opinion Research Center (NORC) – University of Chicago, they use a non-DPP matched comparison sample for greater precision of longitudinal estimates.<sup>4</sup> This report’s focus is only on the longitudinal performance among the 200+ students who enrolled in the Child Outcomes Evaluation Study by annual cohort and the connection between their preschool and later school performance.

### Cohort 1 Eighth Grade

Figure 1 displays the proportion of Cohort 1 DPP graduates who *met or exceeded expectations* on the eighth grade CMAS ELA and math assessments. All students were assessed in English. Over 50 percent of Cohort 1 DPP graduates *met or exceeded expectations* on literacy/language ( $n=61$ ), compared with 44.6% of the district as a whole ( $n=2,679$ ). For math, 41.7% of DPP graduates *met or exceeded expectations* ( $n=50$ ), while 34.1% of the DPS students as a whole *met or exceeded expectations* ( $n=2,043$ ).

Figure 1. Cohort 1 2017-2018 English and Math CMAS Results



### Cohort 2 Seventh Grade

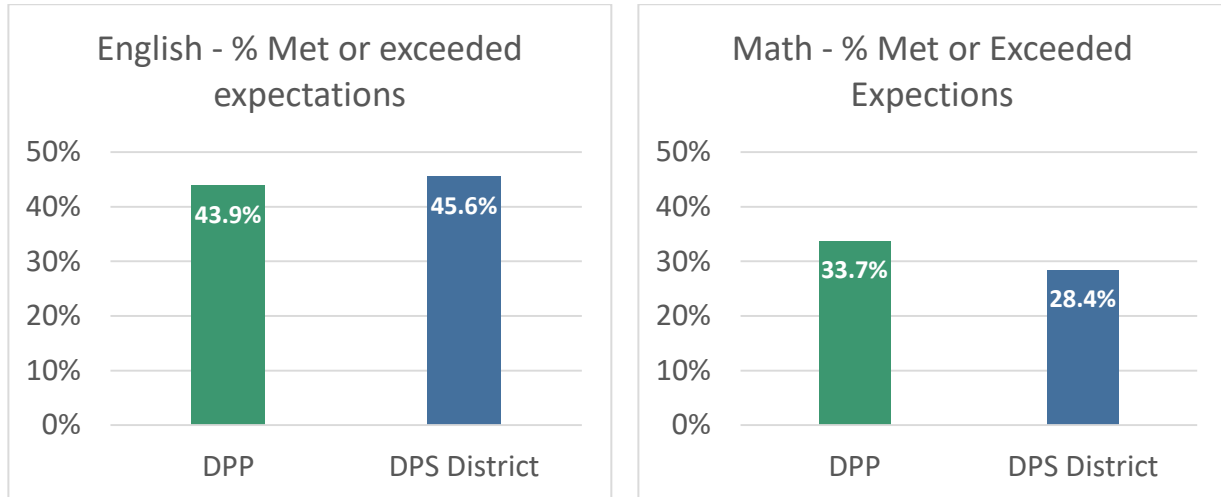
Figure 2 displays the proportion of Cohort 2 DPP graduates who *met or exceeded expectations* on the seventh grade CMAS ELA and math assessments. All students were assessed in English. Nearly 44 percent of Cohort 2

<sup>4</sup> See DPP website results: <https://dpp.org/research-and-results/our-results>



DPP graduates *met or exceeded expectations* on literacy/language ( $n=43$ ), compared with 45.6% of the district as a whole ( $n=2,852$ ). For math, 33.7% of DPP graduates *met or exceeded expectations* ( $n=33$ ), while 28.4% of the DPS students as a whole *met or exceeded expectations* on the measure ( $n=1,793$ ).

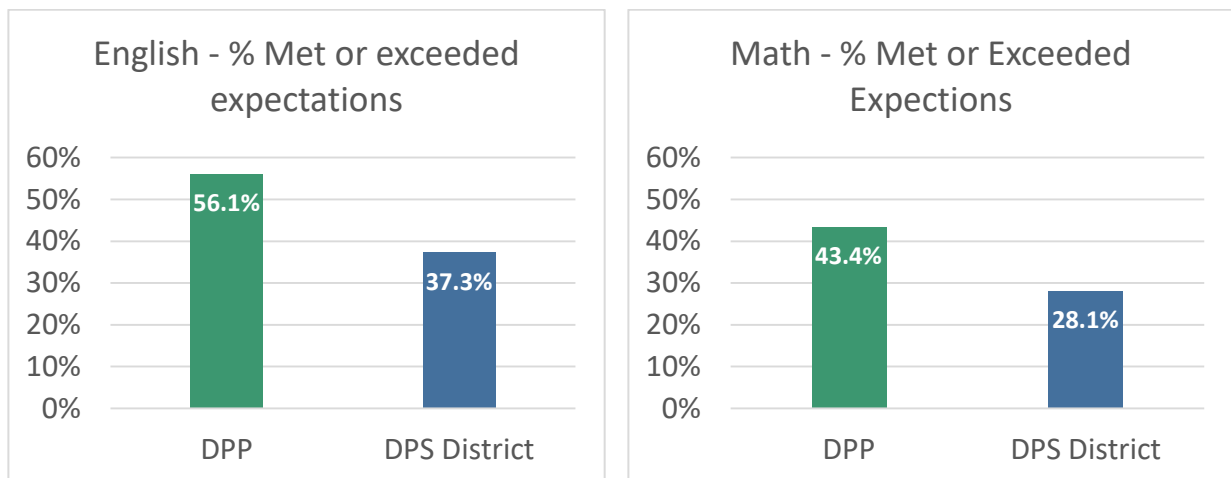
Figure 2. Cohort 2 2017-2018 English and Math CMAS Results



### Cohort 3 Sixth Grade

Figure 3 displays the proportion of Cohort 3 DPP graduates who *met or exceeded expectations* on the sixth grade CMAS ELA and math assessments. All students were assessed in English. Over 56 percent of Cohort 3 DPP graduates *met or exceeded expectations* on literacy/language ( $n=46$ ), compared with 39.1% of the district as a whole ( $n=2,499$ ). For math, 51.2% of DPP graduates *met or exceeded expectations* ( $n=42$ ), compared with 26.1% of the DPS students as a whole ( $n=1,681$ ).

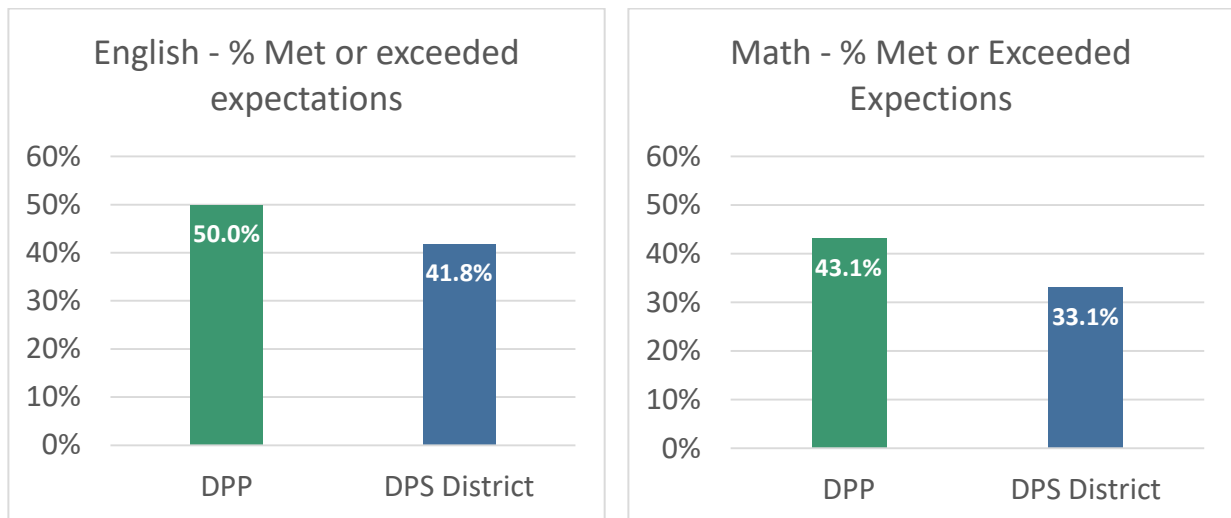
Figure 3. Cohort 3 2017-2018 English and Math CMAS Results



### Cohort 4 Fifth Grade

Figure 4 displays the proportion of Cohort 4 DPP graduates who *met or exceeded expectations* on the fifth grade CMAS ELA and math assessments. All students were assessed in English. Fifty percent of Cohort 4 DPP graduates *met or exceeded expectations* on literacy/language ( $n=58$ ), compared with 41.8% of the district as a whole ( $n=2,872$ ). For math, 43.1% of DPP graduates *met or exceeded expectations* ( $n=50$ ), compared with 33.1% of the DPS students as a whole ( $n=2,286$ ).

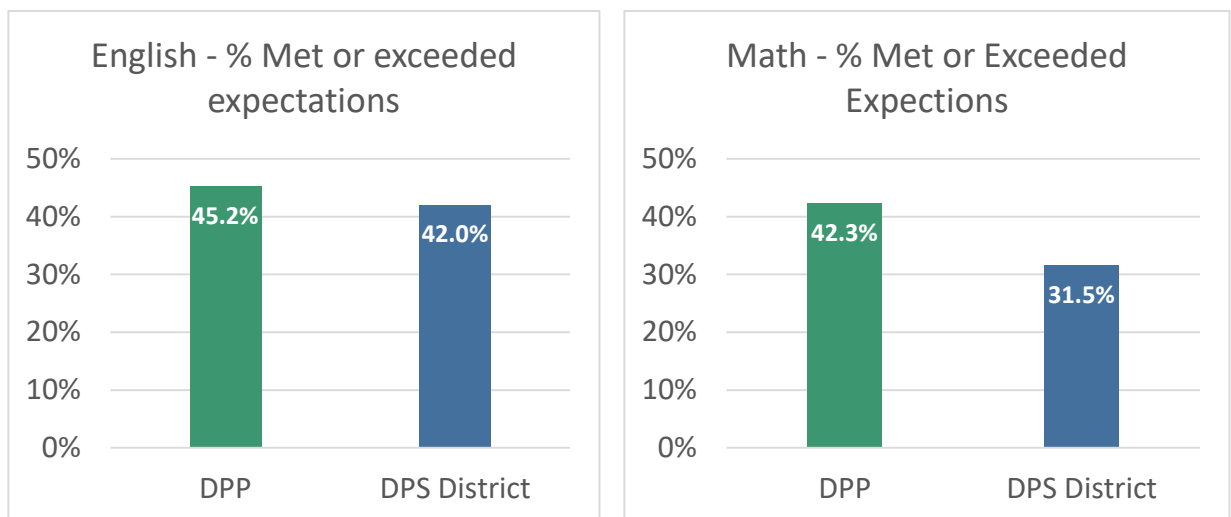
Figure 4. Cohort 4 2017-2018 English and Math CMAS Results



### Cohort 5 Fourth Grade

Figure 5 displays the proportion of Cohort 5 DPP graduates who *met or exceeded expectations* on the fourth grade CMAS ELA and math assessments. All students were assessed in English. Over 45 percent of Cohort 5 DPP graduates *met or exceeded expectations* on literacy/language ( $n=47$ ), compared with 42.0% of the district as a whole ( $n=2,659$ ). For math, 42.3% of DPP graduates *met or exceeded expectations* ( $n=44$ ), compared with 31.5% of the DPS students as a whole ( $n=2,254$ ).

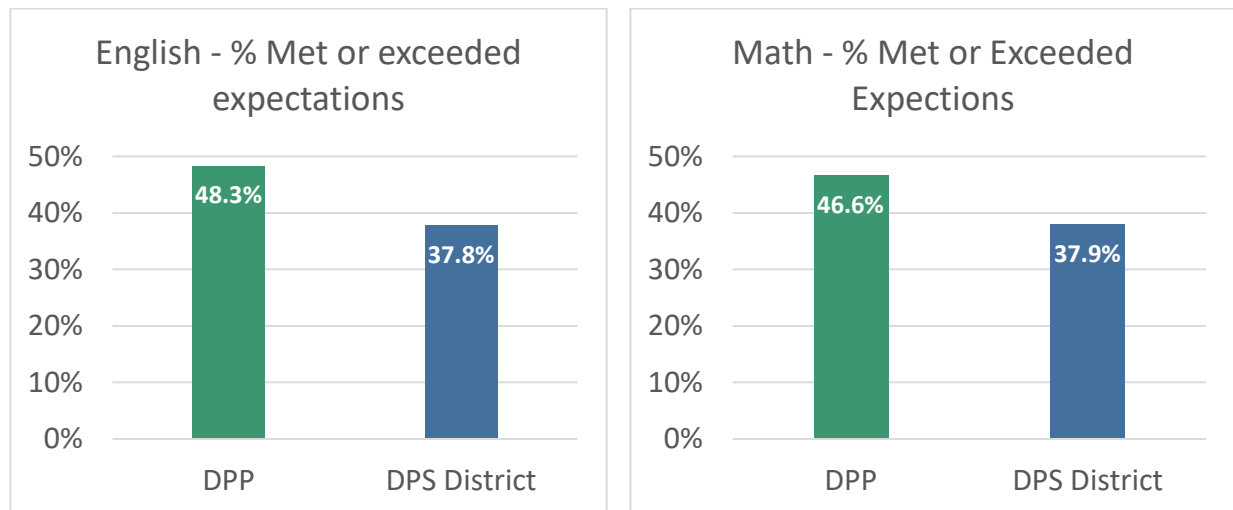
Figure 5. Cohort 5 2017-2018 English and Math CMAS Results



### Cohort 6 Third Grade

Figure 6 displays the proportion of Cohort 6 DPP graduates who *met or exceeded expectations* on the third grade CMAS ELA and math assessments. All students were assessed in English. Over 48 percent of Cohort 6 DPP graduates *met or exceeded expectations* on literacy/language ( $n=56$ ), compared with 37.8% of the district as a whole ( $n=2,167$ ). For math, 46.6% of DPP graduates *met or exceeded expectations* ( $n=54$ ), compared with 37.9% of the DPS students as a whole ( $n=2,650$ ).

Figure 6. Cohort 6 2017-2018 English and Math CMAS Results



### Cohort 7 Second Grade

In 2017-2018, schools across DPS selected from a variety of child reading assessments for kindergarten through second grade. For Cohort 7, available data for students in second grade were comprised of scores from the following assessments: 4.3% DIBELS, 10.1% i-Ready, 72.7% Istation (of those English Reading was 65% and Spanish Reading was 35%), and 12.9% STAR. DPS computes the scores into 4 proficiency categories with various cut points: Above Grade (AG), Grade Level (GL), Below Grade (BG) and Significantly Below (SB).

Aggregated over different assessments, 79.1% of 139 Cohort 7 DPP graduates assessed in either English or Spanish were reading *at or above grade level* at the end of second grade. Eighty percent of DPP graduates assessed in Spanish were reading at or above grade level at the end of second grade ( $n=28$  of 35), while 78.8% of students tested in English (combined tests) were at or above grade level ( $n=82$  of 104). Comparisons with the district are provided in Table 3 below by each READ Act assessment.

Table 3. Cohort 7 2017-2018 Reading Proficiency Results

<b>READ Act Assessment</b>	<b>Cohort 7 DPP Graduates (% Proficient)</b>	<b>District Average (% Proficient)</b>
DIBELS*	66.7%	69.9%
i-Ready*	85.7%	68.8%
Istation	80.0% (Span) and 81.8% (Engl)	72.3% (Span) and 73.0% (Engl)
STAR*	66.7%	67.8%

\*Please use caution interpreting results due to small sample sizes.

### Cohort 8 First Grade

For Cohort 8, available data for students in first grade were comprised of the following assessments: 2.6% DIBELS, 13.6% i-Ready, 74.7% Istation (of those English Reading was 63% and Spanish Reading was 37%), and 9.1% STAR.

Aggregated over different assessments, 83.8% of Cohort 8 DPP graduates assessed in either English or Spanish were reading *at or above grade level* at the end of second grade (total  $n=154$ ). The majority, 88.6%, of DPP graduates assessed in Spanish were reading *at or above grade level* at the end of first grade ( $n=39$  of 44), while 81.8% of students tested in English (combined tests) were *at or above grade level* ( $n=90$  of 110). Comparisons with the district are provided in Table 4 below by each READ Act assessment.

Table 4. Cohort 8 2017-2018 Reading Proficiency Results

<b>READ Act Assessment</b>	<b>Cohort 7 DPP Graduates (% Proficient)</b>	<b>District Average (% Proficient)</b>
DIBELS*	100%	70.3%
i-Ready*	85.7%	75.6%
Istation	88.4% (Span) and 81.9% (Engl)	76.6% (Span) and 68.8% (Engl)
STAR*	71.4%	70.8%

\*Please use caution interpreting results due to small sample sizes.

### Cohort 9 Kindergarten

For Cohort 9, available data for students in kindergarten were comprised of the following assessments: 3.0% DIBELS, 15.1% i-Ready, 69.9% Istation (of those English Reading was 74% and Spanish Reading was 26%), and 12.0% STAR.

Aggregated over different assessments, 83.7% of Cohort 9 DPP graduates assessed in either English or Spanish were reading *at or above grade level* at the end of kindergarten (total  $n=166$ ). The majority, 90.3%, of DPP graduates assessed in Spanish were reading *at or above grade level* at the end of kindergarten ( $n=28$  of 31), while 82.2% of students tested in English (combined tests) were *at or above grade level* ( $n=111$  of 135). Comparisons with the district are provided in Table 5 below by each READ Act assessment.

Table 5. Cohort 9 2017-2018 Reading Proficiency Results

<b>READ Act Assessment</b>	<b>Cohort 7 DPP Graduates (% Proficient)</b>	<b>District Average (% Proficient)</b>
DIBELS*	100%	77.4%
i-Ready*	76.0%	75.7%
Istation	90.0% (Span) and 83.7% (Engl)	81.8% (Span) and 73.5% (Engl)
STAR*	80.0%	71.2%

\*Please use caution interpreting results due to small sample sizes.

### **Do DPP graduates across demographic subgroups differ in their reading proficiency in kindergarten and beyond?**

To address this question, we examined CMAS or other K-2 reading scores by proficiency level for each cohort by demographic characteristics (sex, income tier<sup>5</sup> and race/ethnicity). Results reflect differences within subgroups for each proficiency level, thus each demographic subgroup totals to 100% within that group. Please use caution interpreting data for subgroups with smaller sample sizes. These findings are sample specific and demonstrate how students within each evaluation cohort are faring longitudinally.

#### **Cohort 1 Eighth Grade**

Table 6. Cohort 1 CMAS ELA Proficiency by Sex (n=117)

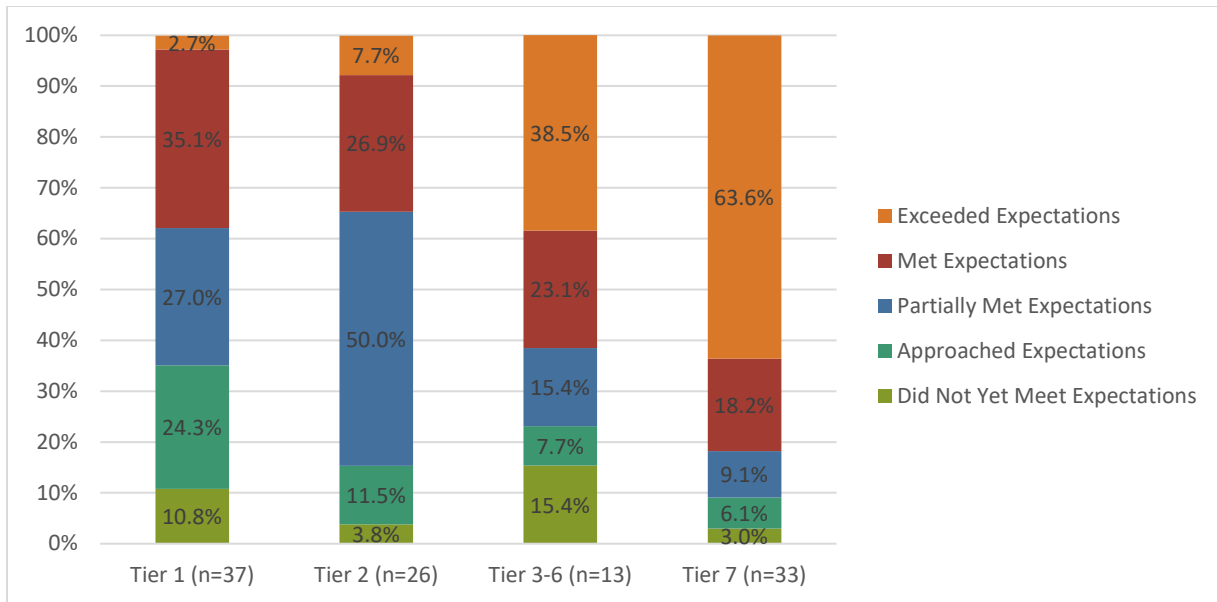
	<b>Female (n=64)</b>	<b>Male (n=53)</b>
<b>1 – Did not meet expectations</b>	4.7%	9.4%
<b>2 – Partially met expectations</b>	9.4%	22.6%
<b>3 – Approached expectations</b>	29.7%	20.8%
<b>4 – Met expectations</b>	26.6%	28.3%
<b>5 – Exceeded expectations</b>	29.7%	18.9%

While no statistically significant differences were observed for sex<sup>6</sup>, a higher proportion of males partially expectations (13.2% difference, category 2) and a higher proportion of females exceeded expectations (10.8% difference on category 5) on the CMAS ELA assessment in eighth grade.

<sup>5</sup> DPP originally used a seven-level income tier structure, but this changed by Cohort 3 to a six-level income tier system. Typically, over half of the students in the samples were from the lowest two income tiers. Since sample sizes within tiers become too small for comparison purposes, a four-level income tier was created that combined levels 3-6 for Cohorts 1 and 2 and levels 3-5 for Cohorts 3 and beyond. Some families were also assigned to the highest tier, Tier 7 (Cohort 1 and 2) Tier 6 (Cohort 3 forward), because they opted out of the requirement to provide their income.

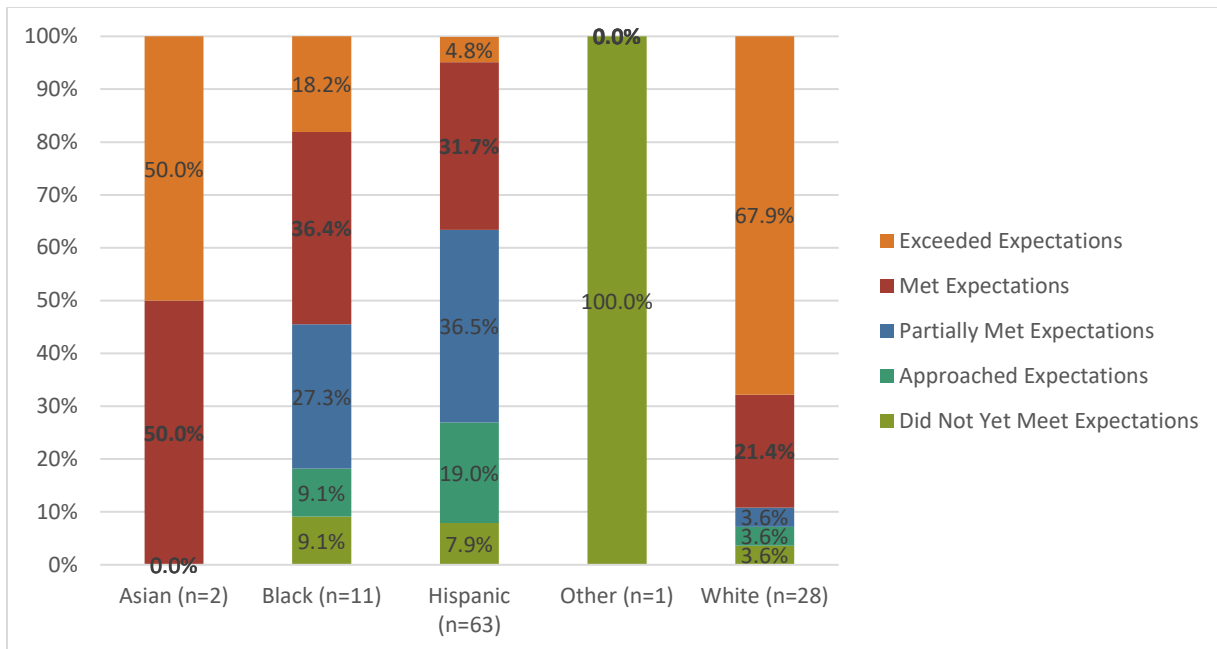
<sup>6</sup>  $\chi^2_4=6.58$ ,  $p=n.s.$

Figure 7. Cohort 1 CMAS ELA Proficiency by Income Tier (n=109)



In 2008-2009, Tier 7 was the *income not reported* category comprised of mostly students from higher income families. Preschool income tier data were available for 109 of the students who had eighth grade CMAS data. Student reading proficiency was statistically significantly different across the groups.<sup>7</sup> Higher proficiency levels in eighth grade were associated with higher income tiers in preschool.

Figure 8. Cohort 1 CMAS ELA by Race/Ethnicity (n=105)



<sup>7</sup>  $\chi^2_{12} = 49.1, p < .001$ .

Preschool ethnicity data were available for 105 of the students who had eighth grade CMAS data. Student reading proficiency was statistically significantly different across the groups.<sup>8</sup> Again, please use caution interpreting for subgroups with small sample sizes. Higher proportions of students of Asian (100.0%) and White (89.3%) racial/ethnic backgrounds *met or exceeded expectations*, while 36.5% Hispanic and 54.6% of Black DPP graduates *met or exceeded expectations*.

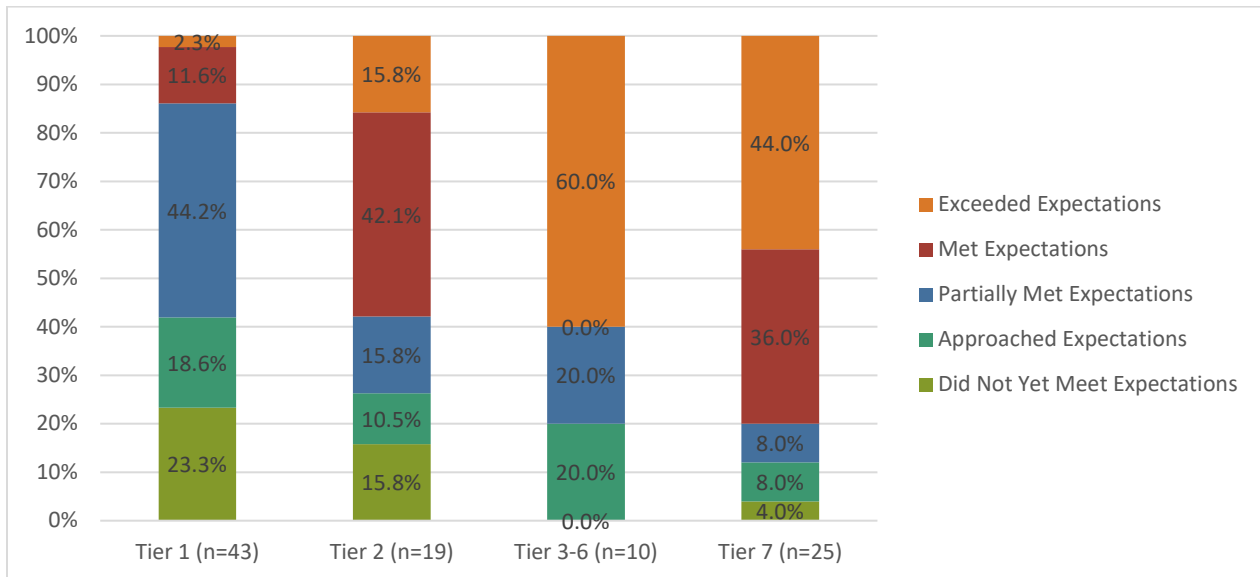
### Cohort 2 Seventh Grade

Table 7. Cohort 2 CMAS ELA by Sex (n=97)

	Female (n=46)	Male (n=51)
<b>1 – Did not meet expectations</b>	10.9%	17.6%
<b>2 – Partially met expectations</b>	15.2%	13.7%
<b>3 – Approached expectations</b>	23.9%	29.4%
<b>4 – Met expectations</b>	19.6%	25.5%
<b>5 – Exceeded expectations</b>	30.4%	13.7%

Overall, no statistically significant difference was observed for sex.<sup>9</sup> However, a higher proportion of females than males *met or exceeded expectations* (10.8% difference, categories 4 and 5) on the CMAS ELA assessment in seventh grade.

Figure 9. Cohort 2 CMAS ELA by Income Tier (n=97)



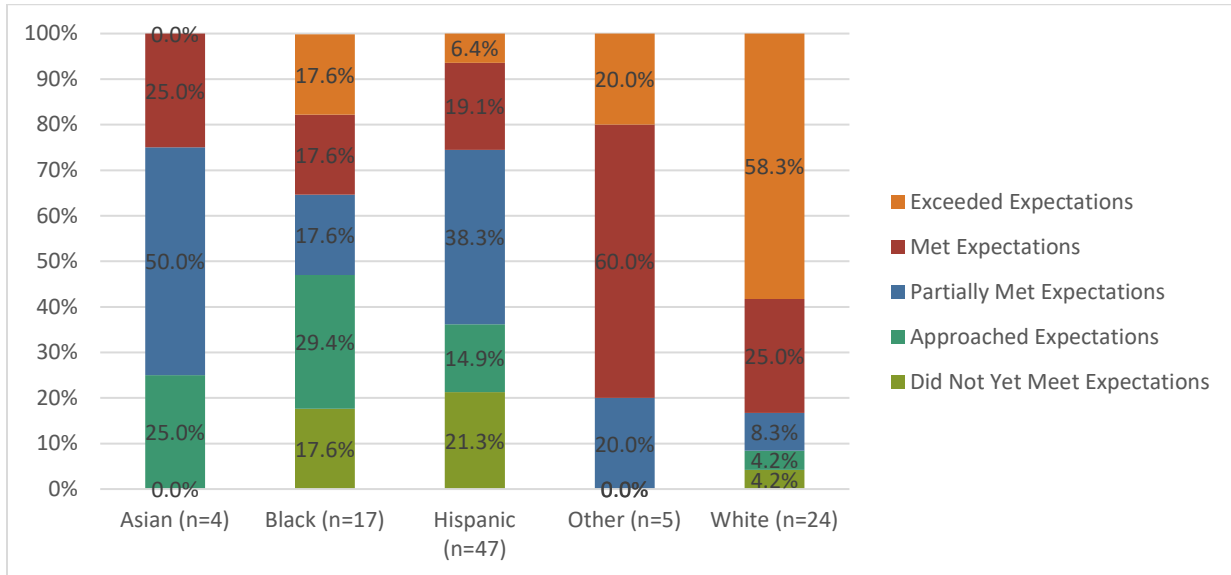
Note: In 2009-2010, Tier 7 is the income not reported category comprised of mostly students from higher income families.

<sup>8</sup>  $\chi^2_{16} = 59.9, p < .001$ .

<sup>9</sup>  $\chi^2_4 = 4.57, p = n.s.$

Preschool income tier data were available for 97 of the students who had seventh grade CMAS data. Student reading proficiency was statistically significantly different across the groups.<sup>10</sup> As with Cohort 1, higher proficiency levels were associated with higher income tiers in preschool.

Figure 10. Cohort 2 CMAS ELA by Race/Ethnicity (n=97)



Preschool ethnicity data were available for 97 of the students who had seventh grade CMAS data. Student reading proficiency was statistically significantly different across the groups.<sup>11</sup> For this cohort, higher proficiency levels (meet or exceed expectations) are associated with DPP graduates of White and Other ethnic background designations (83.3% and 80.0%, respectively). Meeting or exceeding expectations proportions were 25.5% for Hispanic, 35.2%, for Black, and 25.0% for Asian DPP graduates in seventh grade.

### Cohort 3 Sixth Grade

Table 8. Cohort 3 CMAS ELA by Sex (n=82)

	Female (n=40)	Male (n=42)
<b>1 – Did not meet expectations</b>	11.9%	2.5%
<b>2 – Partially met expectations</b>	11.9%	25.0%
<b>3 – Approached expectations</b>	16.7%	20.0%
<b>4 – Met expectations</b>	26.2%	40.0%
<b>5 – Exceeded expectations</b>	33.3%	12.5%

A statistically significant difference was observed for sex for Cohort 3 reading performance in sixth grade.<sup>12</sup> Most notably, a higher proportion of females than males exceeded expectations (20.8%

<sup>10</sup>  $\chi^2_{12} = 46.5, p < .001$ .

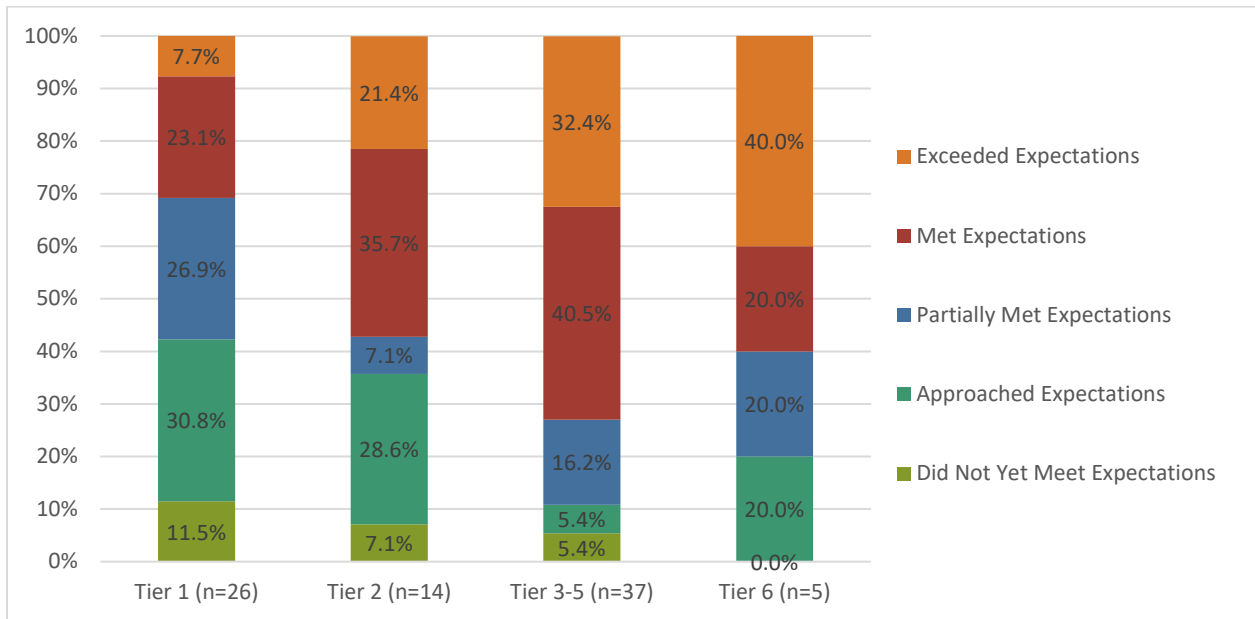
<sup>11</sup>  $\chi^2_{16} = 41.5, p < .001$ .

<sup>12</sup>  $\chi^2_4 = 9.55, p < .05$ .



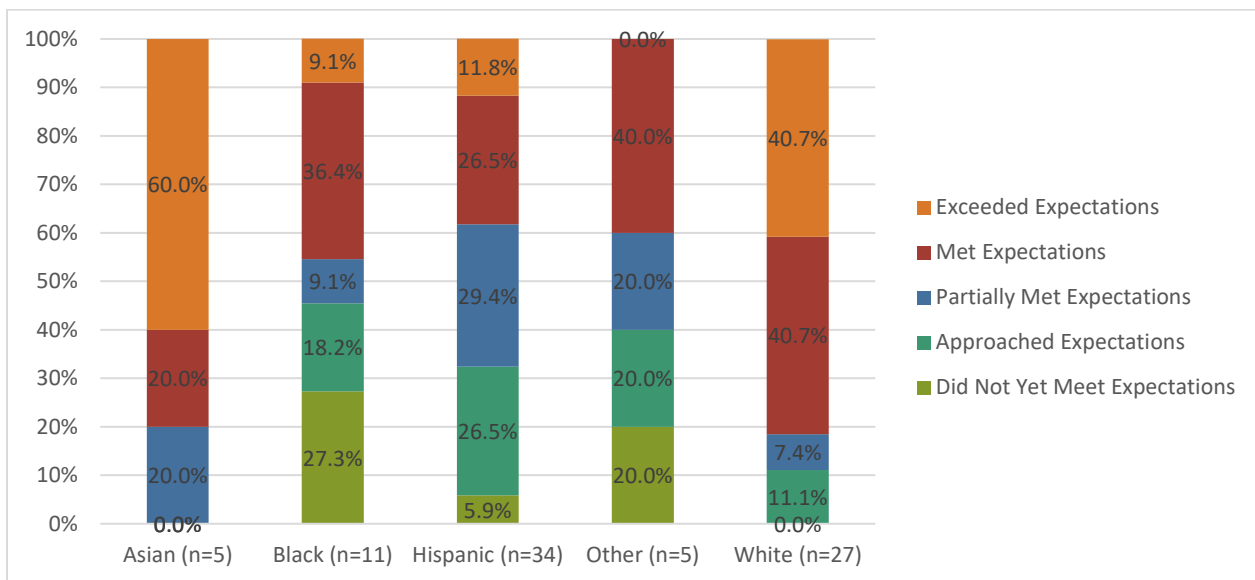
difference, category 5) on the CMAS ELA assessment in sixth grade; though equivalent proportions were found when combining meet and exceed expectation categories.

Figure 11. Cohort 3 CMAS ELA by Income Tier (n= 82)



For Cohort 3 on, the DPP income tier structure changed from 7 to 6-levels, thus the chart reflects this new grouping where Tier 6 represents those not reporting their income. Preschool income tier data were available for 82 of the students who had sixth grade CMAS data. Student reading proficiency in sixth grade was not statistically significantly different across the income groups.<sup>13</sup>

Figure 12. Cohort 3 CMAS ELA by Race/Ethnicity (n=82)



<sup>13</sup>  $\chi^2_{12} = 16.1$ .  $p = n.s.$

Preschool ethnicity data were available for 82 of the students who had sixth grade CMAS data. Student reading proficiency was statistically significantly different across the groups.<sup>14</sup> The biggest differences among the highest two proficiency levels were observed between DPP graduates of White (81.4%) and Hispanic (38.3%) racial/ethnic backgrounds.

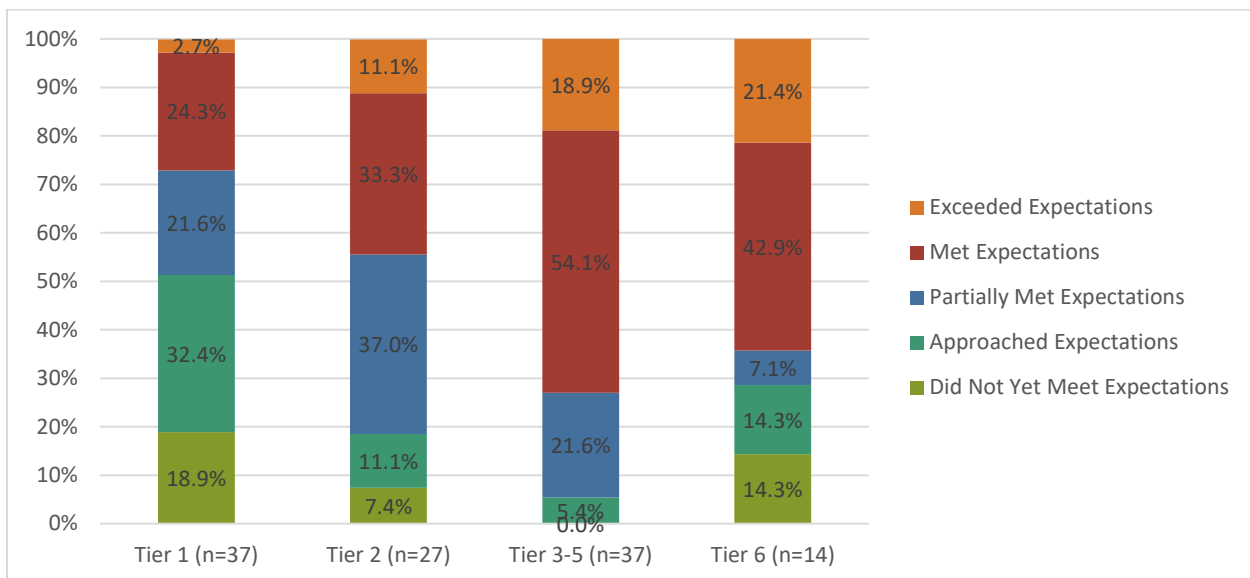
### Cohort 4 Fifth Grade

Table 9. Cohort 4 CMAS ELA by Sex (n=115)

	Female (n=58)	Male (n=57)
<b>1 – Did not meet expectations</b>	6.9%	12.3%
<b>2 – Partially met expectations</b>	8.6%	24.6%
<b>3 – Approached expectations</b>	27.6%	19.3%
<b>4 – Met expectations</b>	41.4%	35.1%
<b>5 – Exceeded expectations</b>	15.5%	8.8%

While no statistically significant differences were observed for sex<sup>15</sup>, a slightly higher proportion of males than females *did not meet* expectations (5.4% difference, category 1) and a higher proportion of females than males *met or exceeded expectations* (13% difference, categories 4 and 5 combined) on the CMAS ELA assessment in fifth grade.

Figure 13. Cohort 4 CMAS ELA by Income Tier (n= 115)



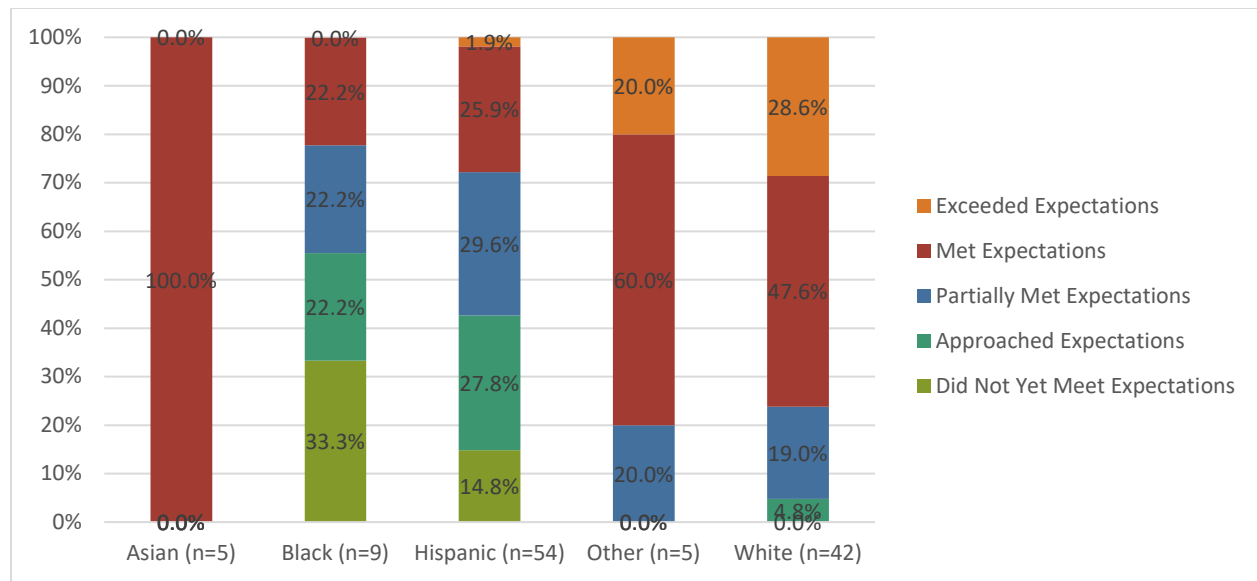
Preschool income tier data were available for 115 of the students who had fifth grade CMAS data. Student reading proficiency was statistically significantly different across the groups.<sup>16</sup> Higher income tiers in preschool predict higher proficiency levels in fifth grade reading.

<sup>14</sup>  $\chi^2_{16} = 28.9, p < .05$ .

<sup>15</sup>  $\chi^2(4) = 7.5, p = n.s.$

<sup>16</sup>  $\chi^2_{12} = 29.8, p < .01$

Figure 14. Cohort 4 CMAS ELA by Ethnicity (n=115)



Preschool ethnicity data were available for 115 of the students who had fifth grade CMAS data. Student reading proficiency was statistically significantly different across the groups.<sup>17</sup> In this cohort, higher proficiency levels were associated with students of White, Asian and Other backgrounds, while a higher proportion of students who were *approaching or not yet meeting* expectations in fifth grade were of Hispanic (42.6%) and Black (55.5%) backgrounds.

### Cohort 5 Fourth Grade

Table 10. Cohort 5 Fourth Grade Reading Proficiency by Sex (n=99)

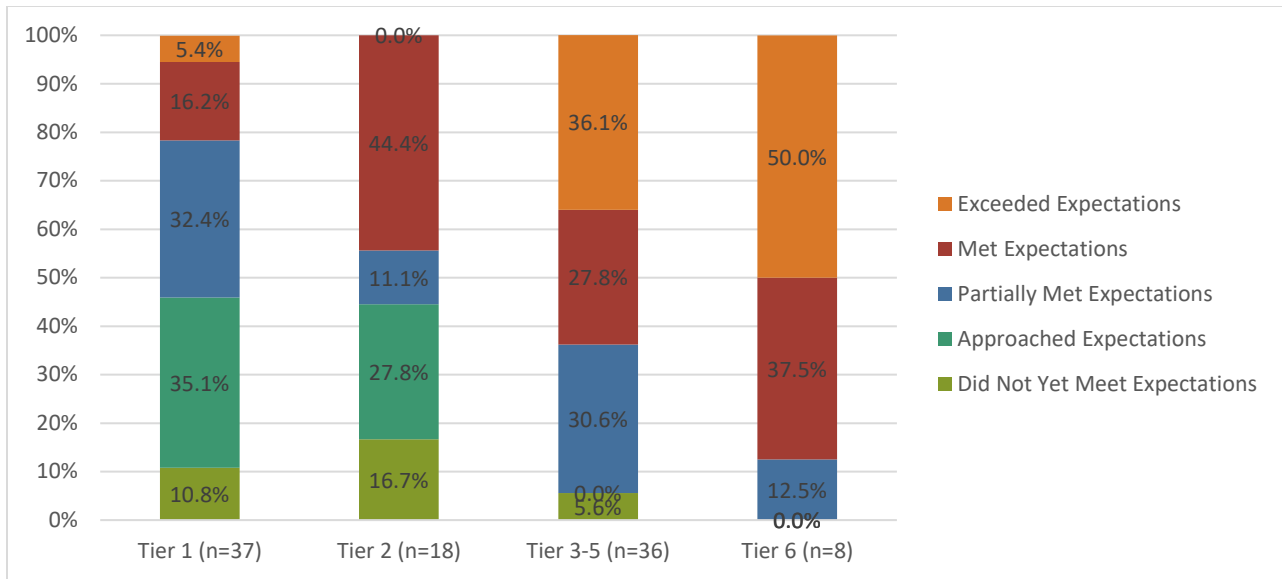
	Female (n=49)	Male (n=50)
<b>1 – Did not meet expectations</b>	12.2%	6.0%
<b>2 – Partially met expectations</b>	12.2%	24.0%
<b>3 – Approached expectations</b>	16.3%	36.0%
<b>4 – Met expectations</b>	26.5%	28.0%
<b>5 – Exceeded expectations</b>	32.7%	6.0%

Statistically significant differences were observed for sex.<sup>18</sup> A slightly higher proportion of females than males *did not meet* expectations (6.2% difference, category 1) and a higher proportion of females than males *met or exceeded expectations* (25.2% difference, categories 4 and 5 combined) on the CMAS ELA assessment in fourth grade.

<sup>17</sup>  $\chi^2_{16} = 49.0, p < .001$ .

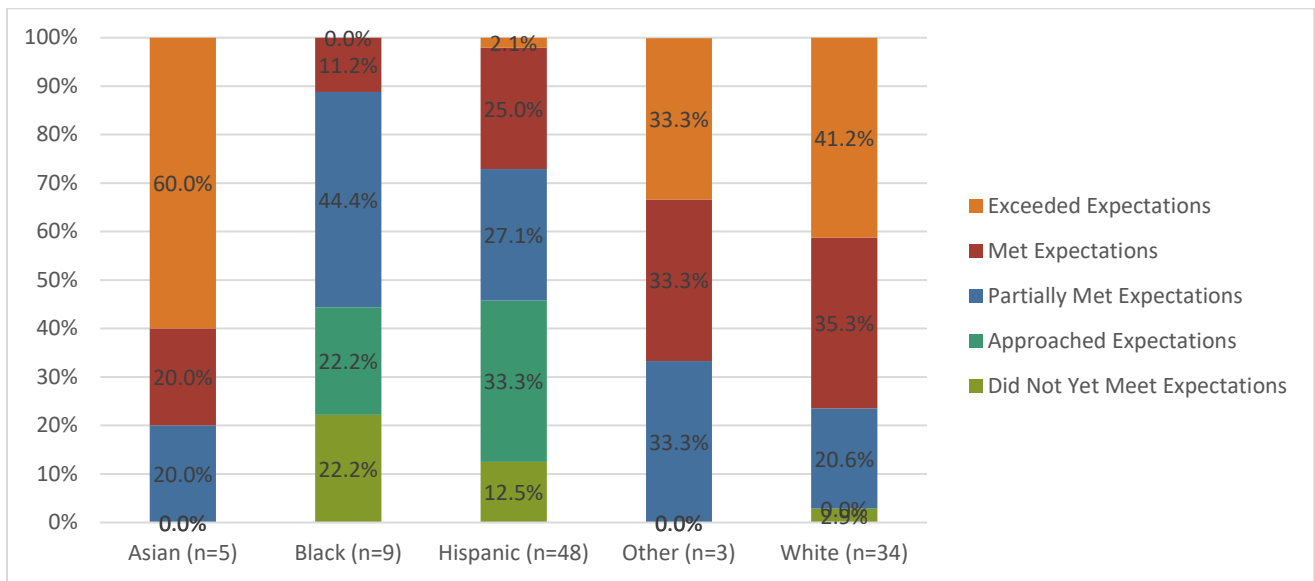
<sup>18</sup>  $\chi^2_4 = 15.8, p < .01$ .

Figure 15. Cohort 5 Fourth Grade Reading Proficiency by Income Tier (n=99)



Preschool income tier data were available for 99 of the students who had fourth grade CMAS data. Student reading proficiency was statistically significantly different across the groups.<sup>19</sup> Higher income tiers in preschool are associated with higher proficiency levels in fourth grade reading.

Figure 16. Cohort 5 Fourth Grade Reading by Ethnicity (n=99)



Preschool ethnicity data were available for 99 of the students who had fourth grade CMAS data. Student reading proficiency was statistically significantly different across the groups.<sup>20</sup> In this cohort, higher proficiency levels were associated with students of White (76.5%), Asian (80.0%) and Other (66.6%)

<sup>19</sup>  $\chi^2_{12} = 40.5, p < .001$ .

<sup>20</sup>  $\chi^2_{16} = 44.1, p < .001$ .

racial/ethnic backgrounds. DPP graduates with Hispanic and Black backgrounds, had 27.1% and 11.2% who met or exceeded expectations, respectively.

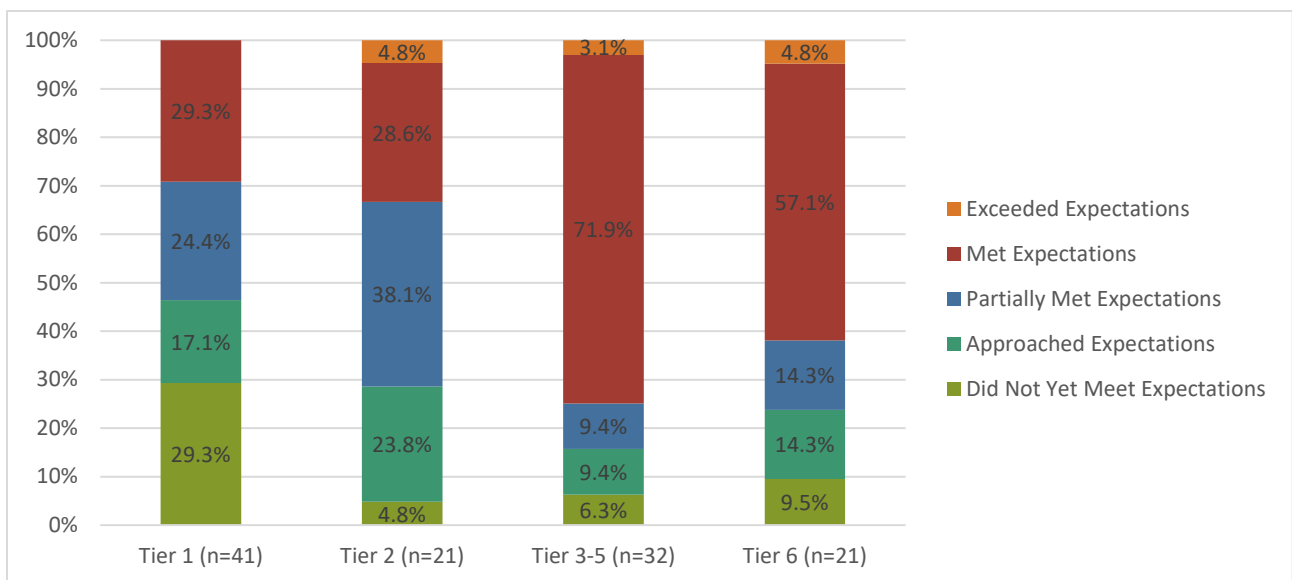
### Cohort 6 Third Grade

Table 11. Cohort 6 Third Grade Reading Proficiency by Sex (n=115)

	Female (n=58)	Male (n=57)
<b>1 – Did not meet expectations</b>	13.8%	15.8%
<b>2 – Partially met expectations</b>	17.2%	14.0%
<b>3 – Approached expectations</b>	20.7%	21.1%
<b>4 – Met expectations</b>	43.1%	49.1%
<b>5 – Exceeded expectations</b>	5.2%	0.0%

No statistically significant differences were observed between males and females<sup>21</sup> on reading proficiency in third grade for Cohort 6.

Figure 17. Cohort 6 Third Grade Reading Proficiency by Income Tier (n=115)

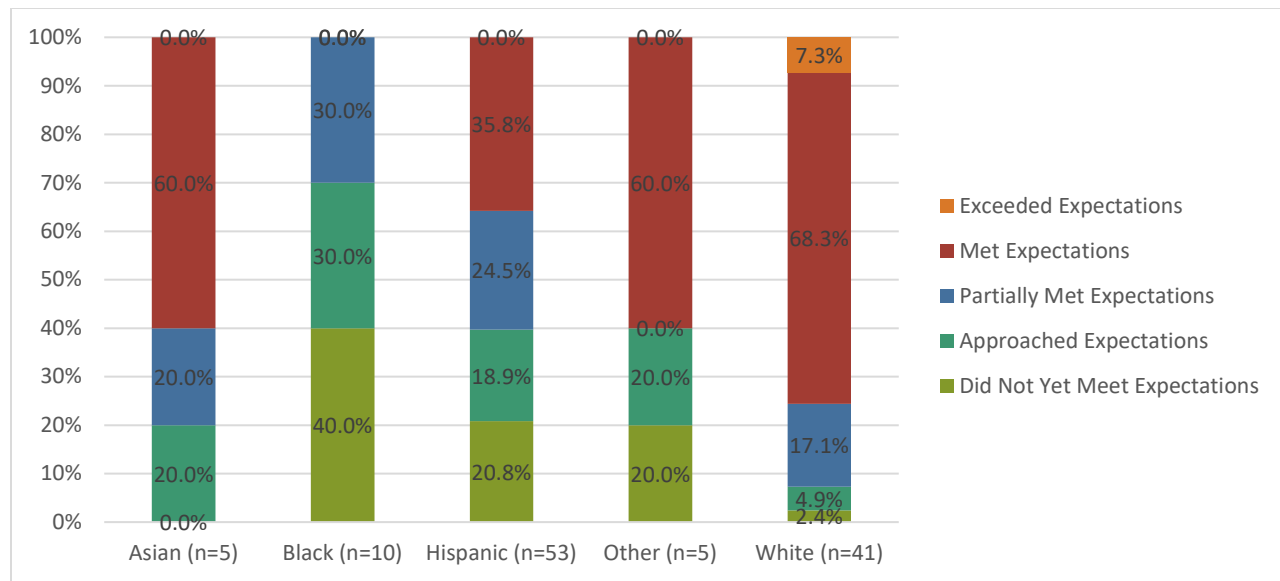


Preschool income tier data were available for 115 of the students who had third grade reading data. Student reading proficiency was statistically significantly different across the income groups;<sup>22</sup> the highest proportion of students proficient in reading in third grade is associated with income tiers 3-5.

<sup>21</sup>  $\chi^2_4 = 3.44$ , n.s.

<sup>22</sup>  $\chi^2_{12} = 27.6$ ,  $p < .01$ .

Figure 18. Cohort 6 Third Grade Reading Proficiency by Ethnicity (n=114)



Preschool ethnicity data were available for 114 of the students who had third grade reading data. Student reading proficiency was statistically significantly different across the groups.<sup>23</sup> Over 75% of DPP graduates with a White racial/ethnic background and 60% of Asian and Other subgroups *met or exceeded expectations* on third grade reading, compared with 0% of Black and 35.8% of Hispanic Cohort 6 students.

### Cohort 7 Second Grade

Recall that reading scores in kindergarten, first, and second grade were measured through a variety of READ Act assessments aggregated to proficiency levels by Denver Public Schools. Student performance is categorized as *Below or Significantly Below Grade Level* or *At or Above Grade Level*. For Cohort 7 in second grade, students were assessed in either English or Spanish (94 DPP graduates were assessed in English and 34 in Spanish). Comparisons by demographics are provided below.

Table 12. Cohort 7 Second Grade Reading Proficiency by Sex (n=128)

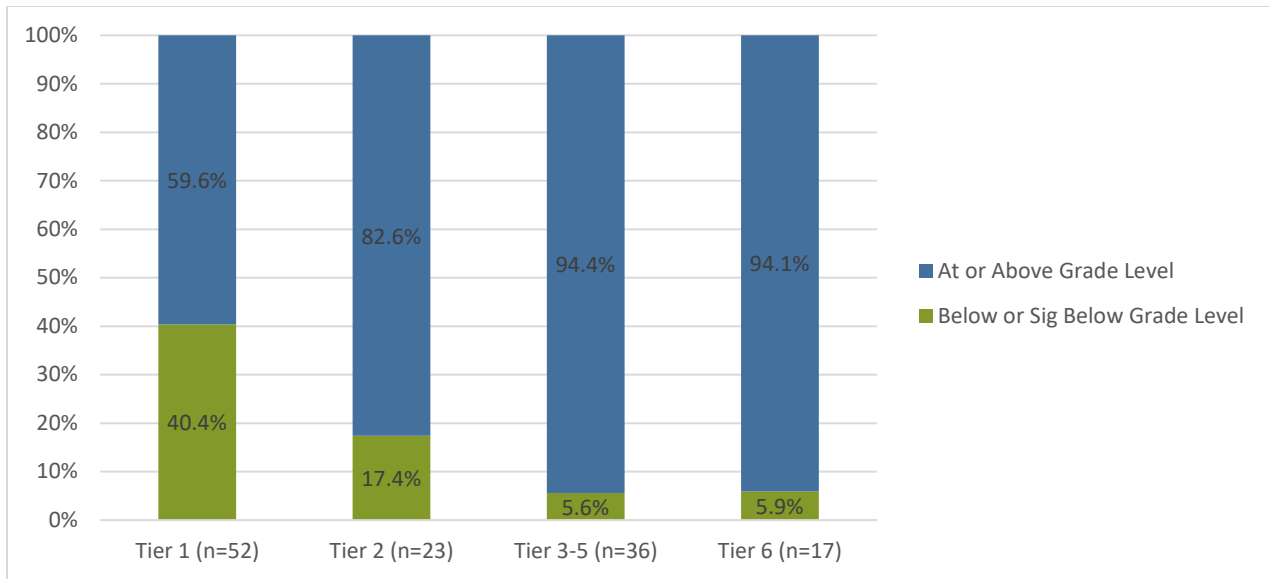
	Female (n=69)	Male (n=59)
<b>0 – Below or Significantly Below Grade Level</b>	30.4%	11.9%
<b>1 – At or Above Grade Level</b>	69.6%	88.1%

A statistically significant difference was observed between males and females on reading proficiency in second grade for Cohort 7 (i.e., 18.5% more males were at or above grade level).<sup>24</sup>

<sup>23</sup>  $\chi^2_{16} = 33.5, p < .001$ .

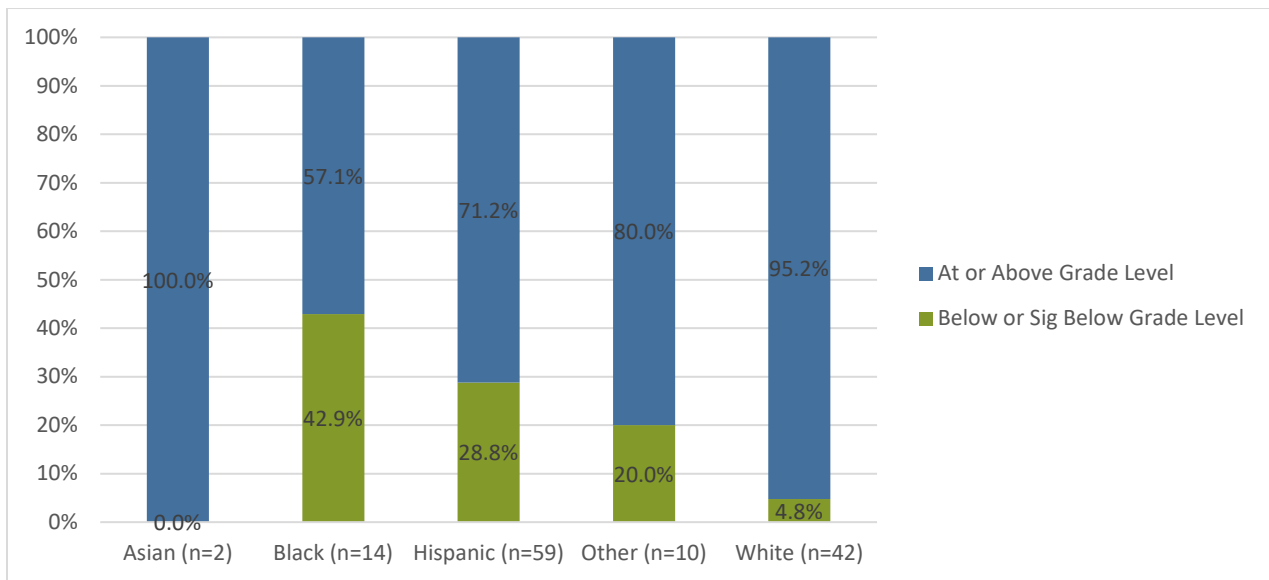
<sup>24</sup>  $\chi^2_1 = 6.42, p < .05$ .

Figure 19. Cohort 7 Second Grade Reading Proficiency by Income Tier (n= 128)



Preschool income tier data were available for 128 of the students who had second grade reading data. Student reading proficiency was statistically significantly different across the groups;<sup>25</sup> with a smaller proportion of DPP graduates who were in the lowest income tier in preschool *at or above grade level* in second grade.

Figure 20. Cohort 7 Second Grade Reading Proficiency by Ethnicity (n=127)



Preschool ethnicity data were available for 127 of the students who had second grade reading data. Student reading proficiency was statistically significantly different across the groups<sup>26</sup>; a higher proportion of students in the White (95.2%), Asian (100%), and Other (80.0%) racial categories were *at*

<sup>25</sup>  $\chi^2_3 = 18.9, p < .001$ .

<sup>26</sup>  $\chi^2_4 = 13.3, p < .05$ .

or above grade level for reading than DPP graduates who were Black or Hispanic. Again, use caution interpreting small samples.

### Cohort 8 First Grade

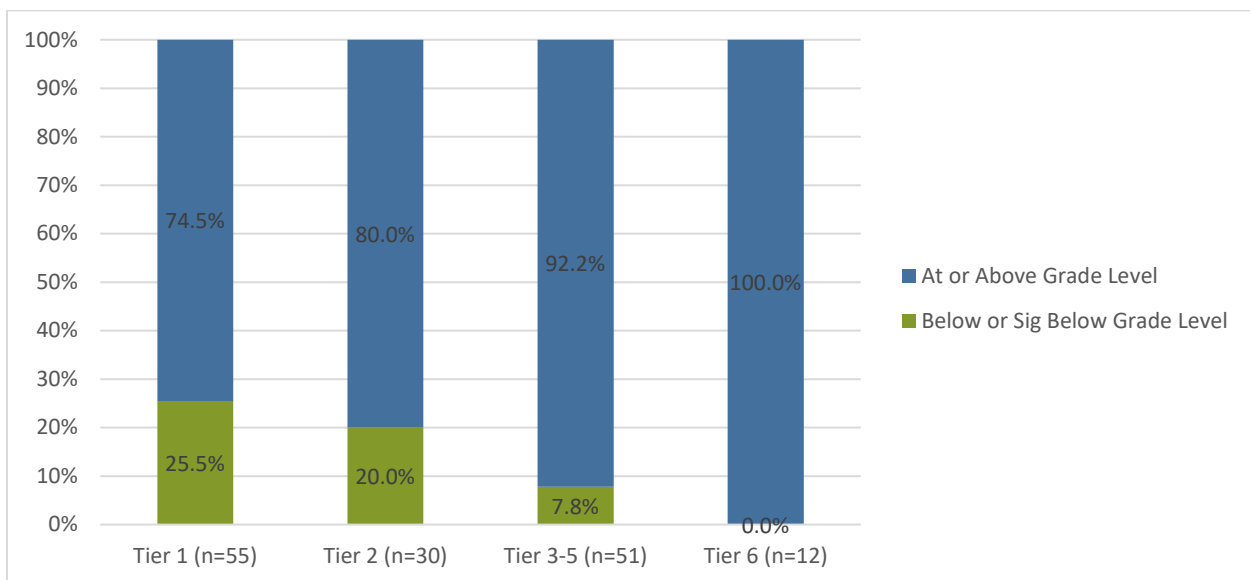
For Cohort 8 in first grade, students were assessed in either English or Spanish (106 DPP graduates were assessed in English and 42 in Spanish). Comparisons by demographics are provided below.

Table 13. Cohort 8 First Grade Reading Proficiency by Sex (n=148)

	Female (n=61)	Male (n=87)
<b>0 – Below or Significantly Below Grade Level</b>	18.0%	14.9%
<b>1 – At or Above Grade Level</b>	82.0%	85.1%

No statistically significant difference was observed between males and females on reading proficiency in first grade for Cohort 8.<sup>27</sup>

Figure 21. Cohort 8 First Grade Reading Proficiency by Income Tier (n= 148)



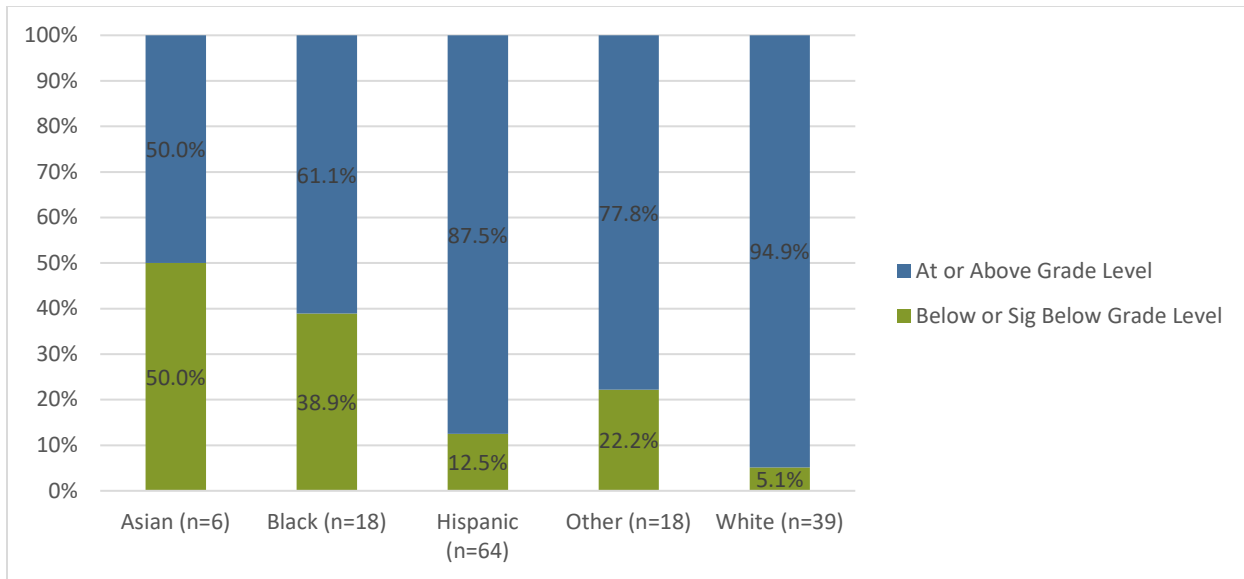
Preschool income tier data were available for 148 of the students who had first grade reading data. Student reading proficiency was statistically significantly different across the groups;<sup>28</sup> with a smaller proportion of DPP graduates who were in the lowest income tier in preschool *at or above grade level* in first grade.

<sup>27</sup>  $\chi^2_1 = .25$ , n.s.

<sup>28</sup>  $\chi^2_3 = 8.73$ ,  $p < .05$ .



Figure 22. Cohort 8 First Grade Reading Proficiency by Ethnicity (n=145)



Preschool ethnicity data were available for 145 of the students who had first grade reading data. Student reading proficiency was statistically significantly different across the groups<sup>29</sup>; a higher proportion of students in the White (95.2%), Hispanic (87.5%), and Other (80.0%) racial categories were *at or above grade level* for reading than was found for DPP graduates who were Black or Asian. Again, use caution interpreting small samples.

### Cohort 9 Kindergarten

For Cohort 9 in kindergarten, DPP graduates received reading assessment in either English or Spanish (135 in English and 31 in Spanish). Comparisons by demographics are provided below.

Table 14. Cohort 9 Kindergarten Reading Proficiency by Sex (n=166)

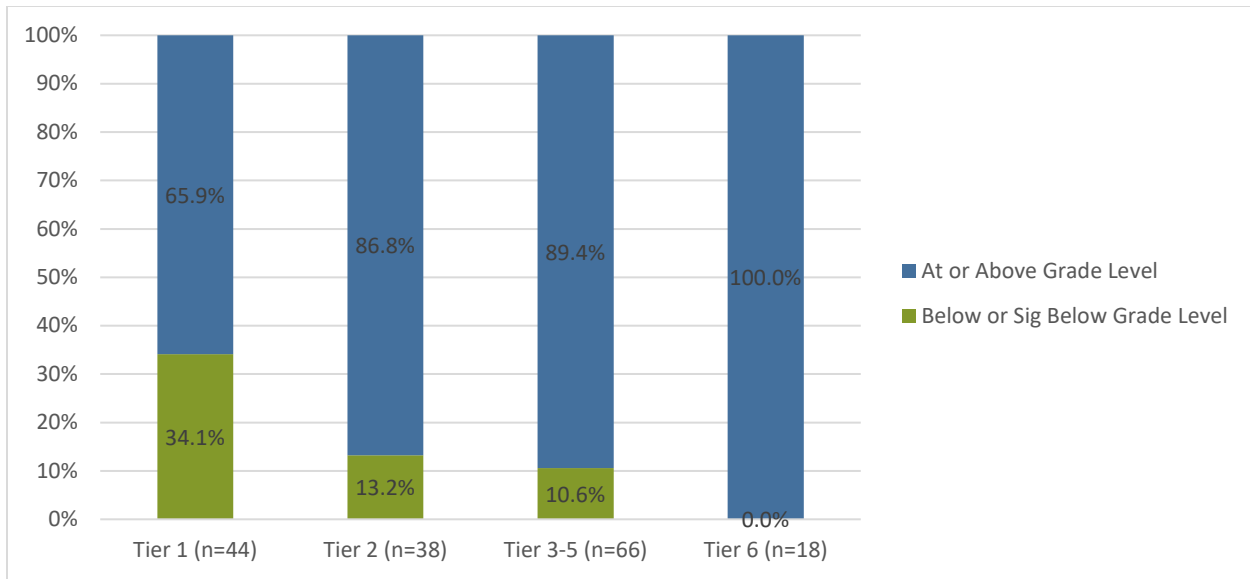
	Female (n=81)	Male (n=85)
<b>0 – Below or Significantly Below Grade Level</b>	17.3%	15.3%
<b>1 – At or Above Grade Level</b>	82.7%	84.7%

No statistically significant difference was observed between males and females on reading proficiency in kindergarten for Cohort 9.<sup>30</sup>

<sup>29</sup>  $\chi^2_4 = 16.2, p < .01$ .

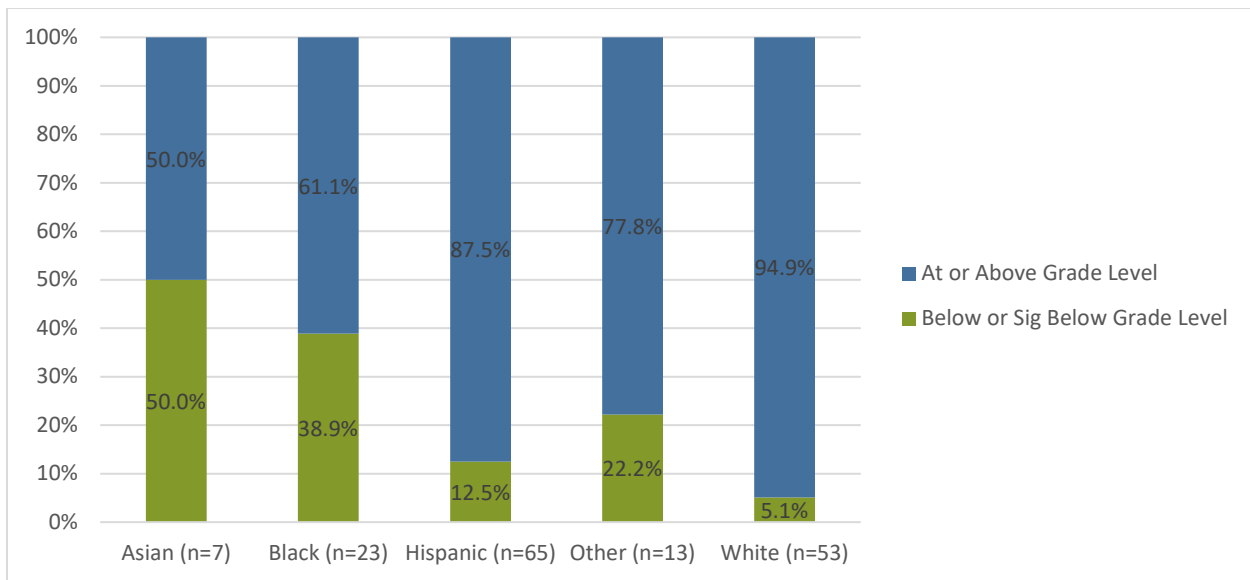
<sup>30</sup>  $\chi^2_1 = 0.12, n.s.$

Figure 23. Cohort 9 Kindergarten Reading Proficiency by Income Tier (n= 166)



Preschool income tier data were available for 166 of the students who had kindergarten reading data. Student reading proficiency was statistically significantly different across the groups;<sup>31</sup> with a smaller proportion of DPP graduates who were in the lowest income tier in preschool *at or above grade level* in kindergarten.

Figure 24. Cohort 9 Kindergarten Reading Proficiency by Ethnicity (n=161)



Preschool ethnicity data were available for 161 of the students who had kindergarten reading data. Student reading proficiency was statistically significantly different across the groups<sup>32</sup>; a higher proportion of students in the White (94.9%), Hispanic (87.5%) and Other (77.8%) racial categories were

<sup>31</sup>  $\chi^2_3 = 15.6, p < .01$ .

<sup>32</sup>  $\chi^2_4 = 11.8, p < .05$ .

at or above grade level for reading than was found for DPP graduates who were Black or Asian. Again, use caution interpreting small samples.

**Do DPP graduates from different DPP provider types (DPS vs. community sites) differ in their reading proficiency in kindergarten and beyond?**

The following table shows the comparisons of DPP community and DPS preschool sites in terms of the proportions of students meeting or exceeding expectations on the CMAS ELS assessment (i.e., reading proficiency) for each cohort. Sample sizes reflect the numbers with assessment data available from the 2017-2018 school year.

*Table 15. Reading Proficiency Comparisons between DPP Community and DPP DPS Site Participation by Cohort*

	Sample Sizes		Finding
	DPS	Community	
<b>Cohort 1 Eighth Grade</b>	106	6	Comparisons of results from DPS and Community sites were not conducted for Cohort 1, because in the early years of the evaluation the sample was not evenly distributed between the two groups.
<b>Cohort 2 Seventh Grade</b>	57	40	No statistically significant difference between groups was found for seventh grade reading proficiency. <sup>33</sup>
<b>Cohort 3 Sixth Grade</b>	44	38	A statistically significant difference was found for sixth grade reading proficiency. <sup>34</sup> A greater proportion of students from community preschool sites (68.4%) than DPS sites (45.5%) <i>met or exceeded expectations</i> on reading.
<b>Cohort 4 Fifth Grade</b>	71	44	A statistically significant difference was found for fifth grade reading proficiency. <sup>35</sup> A greater proportion of students from community preschool sites (63.6%) than DPS sites (42.3%) <i>met or exceeded expectations</i> on reading.
<b>Cohort 5 Fourth Grade</b>	53	46	No statistically significant difference between groups was found for fourth grade reading proficiency. <sup>36</sup>
<b>Cohort 6 Third Grade</b>	76	39	No statistically significant difference between groups was found for third grade reading proficiency. <sup>37</sup>
<b>Cohort 7 Second Grade</b>	77	51	No statistically significant difference was found for second grade reading proficiency. <sup>38</sup>
<b>Cohort 8 First Grade</b>	85	63	A statistically significant difference was found for first grade reading proficiency. <sup>39</sup> A greater proportion of

<sup>33</sup>  $\chi^2_1 = 3.14$ , n.s.

<sup>34</sup>  $\chi^2_1 = 4.37$ ,  $p < .05$ .

<sup>35</sup>  $\chi^2_1 = 4.97$ ,  $p < .05$ .

<sup>36</sup>  $\chi^2_1 = 1.33$ , n.s.

<sup>37</sup>  $\chi^2_1 = .16$ , n.s.

<sup>38</sup>  $\chi^2_1 = 2.82$ , n.s.

<sup>39</sup>  $\chi^2_1 = 4.66$ ,  $p < .05$ .

			students from DPS preschool sites (89.4%) than community sites (76.2%) <i>met or exceeded expectations</i> on reading.
<b>Cohort 9 Kindergarten</b>	103	63	No statistically significant difference was found for second grade reading proficiency. <sup>40</sup>

### Are DPP student direct assessment scores in prekindergarten associated with later reading performance in kindergarten and beyond?

To address this question, we examined associations between pre-academic assessments administered in the spring of the preschool year and students' reading proficiency as assessed by the CMAS and the Denver Public Schools K-2 measures. During the preschool year, all students were assessed in English. Those who were identified by parents and/or teachers as dual language learners were additionally assessed in Spanish. In kindergarten through eighth grade, however, students were assessed in only one of the two languages. For all cohorts, we used logistic regression models to predict school outcomes with preschool assessment scores.<sup>41</sup> As with the previous evaluation question, our analyses focused only on the students who were in the expected grades in a given year.

#### Cohort 1 Eighth Grade

In spring 2018, 113 Cohort 1 students were enrolled in eighth grade and had both preschool scores and data from the English version of the CMAS ELA assessment. In preschool, all were assessed in English, 63 were tested in English only, and 50 were additionally tested in Spanish. Table 16 shows the results of the predictive models by preschool and DPS school measures.

Table 16. Cohort 1 Preschool to Eighth Grade Associations

<i>Student Preschool Language</i>	<i>Preschool Measures</i>	<i>Eighth Grade CMAS ELA (Language/Literacy)</i>
English	<b>English Vocabulary</b>	<b>Yes</b> → A 1-point increase on preschool vocabulary increases odds of meeting or exceeding expectations by 4.6%.
English	<b>English Literacy</b>	No → A significant association was not found.
English	<b>English Math</b>	<b>Yes</b> → A 1-point increase on preschool math increases odds of meeting or exceeding expectations by 10.2%.
Spanish	<b>English Vocabulary</b>	No → A significant association was not found.
Spanish	<b>English Literacy</b>	No → A significant association was not found.
Spanish	<b>English Math</b>	No → A significant association was not found.

<sup>40</sup>  $\chi^2_1 = 1.42$ , n.s.

<sup>41</sup> An alpha level of less than .05 was the criterion for all logistic regression models used for prediction, plus an examination of the odds ratios within the 95% confidence interval.

Spanish	<b>Spanish Vocabulary</b>	No → A significant association was not found.
Spanish	<b>Spanish Literacy</b>	No → A significant association was not found.
Spanish	<b>Spanish Math</b>	<b>Yes</b> → A 1-point increase on preschool math increases odds of meeting or exceeding expectations by 12.8%.

In sum, for DPP graduates who spoke only English in preschool, there was evidence for an association between kindergarten readiness in vocabulary and math, and their eighth grade reading proficiency. For dual language learners assessed in Spanish, a significant association was found between math and their eighth grade reading proficiency.

### Cohort 2 Seventh Grade

In spring 2018, 97 Cohort 2 students were enrolled in seventh grade and had both preschool scores and data from the English version of the CMAS ELA assessment. In preschool, all were assessed in English, 60 of those were tested in English only, and 37 were additionally tested in Spanish. Table 17 shows the results of the predictive models by preschool and DPS school measures.

Table 17. Cohort 2 Preschool to Seventh Grade Associations

<i>Student Preschool Language</i>	<i>Preschool Measures</i>	<i>Seventh Grade CMAS ELA (Language/Literacy)</i>
English	<b>English Vocabulary</b>	<b>Yes</b> → A 1-point increase on preschool vocabulary increases odds of meeting or exceeding expectations by 7.6%.
English	<b>English Literacy</b>	No → A significant association was not found.
English	<b>English Math</b>	<b>Yes</b> → A 1-point increase on preschool math increases odds of meeting or exceeding expectations by 6.9%.
Spanish	<b>English Vocabulary</b>	<b>Yes</b> → A 1-point increase on preschool vocabulary increases odds of meeting or exceeding expectations by 6.4%.
Spanish	<b>English Literacy</b>	No → A significant association was not found.
Spanish	<b>English Math</b>	No → A significant association was not found.
Spanish	<b>Spanish Vocabulary</b>	No → A significant association was not found.
Spanish	<b>Spanish Literacy</b>	No → A significant association was not found.
Spanish	<b>Spanish Math</b>	No → A significant association was not found.

For students who spoke only English in preschool, there was evidence for an association between kindergarten readiness in both vocabulary and math and their seventh grade reading proficiency. Among dual language learners, vocabulary in English in preschool was linked with seventh grade reading.

### Cohort 3 Sixth Grade

In spring 2018, 82 Cohort 3 students were enrolled in sixth grade and had data from both preschool and the grade-level CMAS ELA assessment. In preschool, all were assessed in English, 55 were tested in English only, and 27 were tested in Spanish during the preschool year. Table 18 shows the results of the predictive models by preschool and DPS school measures.

Table 18. Cohort 3 Preschool to Sixth Grade Associations

<i>Student Preschool Language</i>	<i>Preschool Measures</i>	<i>Sixth Grade CMAS ELA (Language/Literacy)</i>
English	<b>English Vocabulary</b>	<b>Yes</b> → A 1-point increase on preschool vocabulary increases odds of meeting or exceeding expectations by 8.9%.
English	<b>English Literacy</b>	<b>Yes</b> → A 1-point increase on preschool literacy increases odds of meeting or exceeding expectations by 10.4%.
English	<b>English Math</b>	<b>Yes</b> → A 1-point increase on preschool math increases odds of meeting or exceeding expectations by 11.1%.
Spanish	<b>English Vocabulary</b>	<b>Yes</b> → A 1-point increase on preschool vocabulary increases odds of meeting or exceeding expectations by 6.5%.
Spanish	<b>English Literacy</b>	No → A significant association was not found.
Spanish	<b>English Math</b>	No → A significant association was not found.
Spanish	<b>Spanish Vocabulary</b>	<b>Yes</b> → A 1-point increase on preschool vocabulary increases odds of meeting or exceeding expectations by 4.7%.
Spanish	<b>Spanish Literacy</b>	No → A significant association was not found.
Spanish	<b>Spanish Math</b>	<b>Yes</b> → A 1-point increase on preschool math increases odds of meeting or exceeding expectations by 15.4%.

For DPP graduates who were tested only in English in preschool, there was evidence of an association between English vocabulary, literacy, math and their sixth grade reading proficiency. A significant association was also found between English vocabulary and sixth grade reading proficiency among dual language learners. Spanish vocabulary and math were also predictive of sixth grade reading among dual language learners.

### Cohort 4 Fifth Grade

In spring 2018, 115 Cohort 4 students were enrolled in fifth grade and had data from both preschool and the grade-level CMAS ELA assessment. In preschool, all were assessed in English, 74 were tested in English only, and 41 were additionally tested in Spanish during the preschool year. Table 19 shows the results of the predictive models by preschool and DPS school measures.

Table 19. Cohort 4 Preschool and Fifth Grade Associations

<i>Student Preschool Language</i>	<i>Preschool Measures</i>	<i>Fifth Grade CMAS ELA (Language/Literacy)</i>
English	<b>English Vocabulary</b>	Yes → A 1-point increase on preschool vocabulary increases odds of meeting or exceeding expectations by 4.2%.
English	<b>English Literacy</b>	No → A significant association was not found.
English	<b>English Math</b>	Yes → A 1-point increase on preschool math increases odds of meeting or exceeding expectations by 7.0%.
Spanish	<b>English Vocabulary</b>	No → A significant association was not found.
Spanish	<b>English Literacy</b>	No → A significant association was not found.
Spanish	<b>English Math</b>	No → A significant association was not found.
Spanish	<b>Spanish Vocabulary</b>	Yes → A 1-point increase on preschool vocabulary increases odds of meeting or exceeding expectations by 6.8%.
Spanish	<b>Spanish Literacy</b>	No → A significant association was not found.
Spanish	<b>Spanish Math</b>	Yes → A 1-point increase on preschool math increases odds of meeting or exceeding expectations by 10.6%.

For Cohort 4, among students only tested in English, vocabulary and math was associated with stronger scores English reading scores in fifth grade. Among preschool dual language learners, both Spanish vocabulary and math were positively associated reading proficiency in fifth grade.

#### Cohort 5 Fourth Grade

In spring 2018, 100 DPP graduates from Cohort 5 were enrolled in fourth grade and had available reading assessment data. Sixty-three (63) students were assessed only in English and 37 were assessed in both English and Spanish during their preschool year. At the end of fourth grade, 18 students were assessed in Spanish and 107 were tested in English. Analyses were conducted to examine the associations of both Spanish and English preschool test scores with fourth grade reading proficiency. Table 20 shows the results of these associations.

Table 20. Cohort 5 Preschool and Fourth Grade Associations

<i>Student Preschool Language</i>	<i>Preschool Measures</i>	<i>Fourth Grade Reading Proficiency</i>
English	<b>English Vocabulary</b>	Yes → A 1-point increase on preschool vocabulary increases odds of meeting or exceeding expectations by 9.8%.
English	<b>English Literacy</b>	Yes → A 1-point increase on preschool literacy increases odds of meeting or exceeding expectations by 5.2%.
English	<b>English Math</b>	Yes → A 1-point increase on preschool math increases odds of meeting or exceeding expectations by 11.6%.
Spanish	<b>English Vocabulary</b>	No → A significant association was not found.
Spanish	<b>English Literacy</b>	Yes → A 1-point increase on preschool literacy increases odds of meeting or exceeding expectations by 9.1%.
Spanish	<b>English Math</b>	No → A significant association was not found.

Spanish	<b>Spanish Vocabulary</b>	No → A significant association was not found.
Spanish	<b>Spanish Literacy</b>	No → A significant association was not found.
Spanish	<b>Spanish Math</b>	No → A significant association was not found.

For Cohort 5, among students only tested in English, preschool vocabulary, literacy, and math in English significantly predicted stronger English reading proficiency in fourth grade. Among preschool dual language learners, English preschool literacy also predicted reading proficiency in fourth grade; however, Spanish-administered assessments were not associated with later reading.

### Cohort 6 Third Grade

In spring 2018, 115 students from Cohort 6 attended third grade and had available reading assessment data. All were assessed in English, and, of those 83 students were assessed only in English and 31 students were additionally assessed in Spanish in their preschool year. Table 21 shows the results of the associations between preschool measures and third grade reading proficiency.

Table 21. Cohort 6 Preschool and Third Grade Associations

<i>Student Preschool Language</i>	<i>Preschool Measures</i>	<i>Third Grade Reading Proficiency</i>
English	<b>English Vocabulary</b>	Yes → A 1-point increase on preschool vocabulary increases odds of meeting or exceeding expectations by 6.7%.
English	<b>English Literacy</b>	Yes → A 1-point increase on preschool literacy increases odds of meeting or exceeding expectations by 9.6%.
English	<b>English Math</b>	Yes → A 1-point increase on preschool math increases odds of meeting or exceeding expectations by 9.4%.
Spanish	<b>English Vocabulary</b>	No → A significant association was not found.
Spanish	<b>English Literacy</b>	No → A significant association was not found.
Spanish	<b>English Math</b>	No → A significant association was not found.
Spanish	<b>Spanish Vocabulary</b>	No → A significant association was not found.
Spanish	<b>Spanish Literacy</b>	No → A significant association was not found.
Spanish	<b>Spanish Math</b>	No → A significant association was not found.

Among Cohort 6 students, vocabulary, literacy, and math assessed in English was associated with stronger scores English reading scores in third grade among those tested only in English. Among preschool dual language learners from Cohort 6, none of the preschool measures in English or Spanish predicted third grade reading proficiency.

### Cohort 7 Second Grade

In spring 2018, 128 DPP graduates from Cohort 7 were enrolled in second grade and had available reading assessment data. Ninety (90) students were assessed only in English and 52 were additionally assessed in Spanish in their preschool year. At the end of second grade, 94 students were assessed in English, while 34 received the assessment in Spanish. Analyses were conducted to examine the associations of both Spanish and English preschool test scores with second grade assessment data,



combining across languages of assessment to maximize the sample size. Table 22 shows the results of these associations.

Table 22. Cohort 7 Preschool and Second Grade Associations

<i>Student Preschool Language</i>	<i>Preschool Measures</i>	<i>Second Grade Reading Proficiency</i>
English	<b>English Vocabulary</b>	<b>Yes</b> → A 1-point increase on preschool vocabulary increases odds of being at or above grade level in reading by 8.2%.
English	<b>English Literacy</b>	<b>Yes</b> → A 1-point increase on preschool literacy increases odds of being at or above grade level in reading by 10.5%.
English	<b>English Math</b>	<b>Yes</b> → A 1-point increase on preschool math increases odds of being at or above grade level in reading by 13.6%.
Spanish	<b>English Vocabulary</b>	No → A significant association was not found.
Spanish	<b>English Literacy</b>	No → A significant association was not found.
Spanish	<b>English Math</b>	No → A significant association was not found.
Spanish	<b>Spanish Vocabulary</b>	<b>Yes</b> → A 1-point increase on preschool vocabulary increases odds of being at or above grade level in reading by 5.6%.
Spanish	<b>Spanish Literacy</b>	<b>Yes</b> → A 1-point increase on preschool literacy increases odds of being at or above grade level in reading by 12.5%.
Spanish	<b>Spanish Math</b>	<b>Yes</b> → A 1-point increase in math assessed increases odds of being at or above grade level in reading by 34.2%.

For DPP graduates in Cohort 7, preschool vocabulary, literacy, and math assessed in English among monolingual English speakers only was associated with stronger reading scores in second grade. Among preschool dual language learners, preschool vocabulary, literacy, and particularly math assessed in Spanish predicted their second grade reading proficiency.

### Cohort 8 First Grade

In spring 2018, 128 DPP graduates from Cohort 8 were enrolled in first grade and had available reading assessment data. Ninety (90) students were assessed only in English and 52 were additionally assessed in Spanish in their preschool year. At the end of first grade, 94 students were assessed in English, while 34 received the assessment in Spanish. Analyses were conducted to examine the associations of both Spanish and English preschool test scores with first grade assessment data, combining across languages of assessment to maximize the sample size. Table 23 shows the results of these associations.

Table 23. Cohort 8 Preschool and First Grade Associations

<i>Student Preschool Language</i>	<i>Preschool Measures</i>	<i>First Grade Reading Proficiency</i>
English	<b>English Vocabulary</b>	<b>Yes</b> → A 1-point increase on preschool vocabulary increases odds of being at or above grade level in reading by 6.3%.
English	<b>English Literacy</b>	<b>Yes</b> → A 1-point increase on preschool literacy increases odds of being at or above grade level in reading by 13.0%.
English	<b>English Math</b>	<b>Yes</b> → A 1-point increase on preschool math increases odds of being at or above grade level in reading by 12.5%.

Spanish	<b>English Vocabulary</b>	No → A significant association was not found.
Spanish	<b>English Literacy</b>	No → A significant association was not found.
Spanish	<b>English Math</b>	No → A significant association was not found.
Spanish	<b>Spanish Vocabulary</b>	No → A significant association was not found.
Spanish	<b>Spanish Literacy</b>	No → A significant association was not found.
Spanish	<b>Spanish Math</b>	No → A significant association was not found.

For DPP graduates in Cohort 8, preschool vocabulary, literacy, and math assessed in English among monolingual English speakers was associated with stronger reading scores in first grade. Among preschool dual language learners, preschool measures either administered in English or Spanish were not related to later first grade proficiency levels for this sample.

### Cohort 9 Kindergarten Grade

In spring 2018, 166 DPP graduates from Cohort 9 were enrolled in kindergarten and had available reading assessment data. In preschool, 119 students were assessed only in English and 47 were additionally assessed in Spanish. At the end of kindergarten, 135 students were assessed in English, while 31 received the reading assessment in Spanish. Analyses were conducted to examine the associations of both Spanish and English preschool test scores with kindergarten assessment data, combining across languages of kindergarten assessment to maximize the sample size. Table 24 shows the results of these associations.

Table 24. Cohort 9 Preschool and Kindergarten Associations

<i>Student Preschool Language</i>	<i>Preschool Measures</i>	<i>Kindergarten Reading Proficiency</i>
English	<b>English Vocabulary</b>	<b>Yes</b> → A 1-point increase on preschool vocabulary increases odds of being at or above grade level in reading by 3.7%.
English	<b>English Literacy</b>	<b>Yes</b> → A 1-point increase on preschool literacy increases odds of being at or above grade level in reading by 10.7%.
English	<b>English Math</b>	<b>Yes</b> → A 1-point increase on preschool math increases odds of being at or above grade level in reading by 10.9%.
Spanish	<b>English Vocabulary</b>	No → A significant association was not found.
Spanish	<b>English Literacy</b>	No → A significant association was not found.
Spanish	<b>English Math</b>	No → A significant association was not found.
Spanish	<b>Spanish Vocabulary</b>	No → A significant association was not found.
Spanish	<b>Spanish Literacy</b>	No → A significant association was not found.
Spanish	<b>Spanish Math</b>	<b>Yes</b> → A 1-point increase on preschool math increases odds of being at or above grade level in reading by 8.7%.

For DPP graduates in Cohort 9, preschool vocabulary, literacy, and math assessed in English among monolingual English speakers was associated with stronger reading scores in kindergarten. Among preschool dual language learners, no measures administered in English in preschool were predictive;

however, math administered in Spanish was associated with positive reading proficiency in kindergarten.

## Conclusion

The longitudinal component of the Denver Preschool Program Child Outcomes Study was designed to follow each evaluation cohort into K-12 public school to assess how the students fare over time and to determine how preschool outcomes predict later academic outcomes. This data helps support understanding of the sustainability of DPP effects. This report presented the results of this follow-up on DPP graduates' academic performance in the 2017-2018 school year. The overall finding for 2017-2018 is that students from the DPP preschool cohorts (samples of approximately 200 each) have a generally higher rate of being *at or above grade level* or in later cohorts *meeting or exceeding expectations* compared with the overall across-district averages. This is the case for DPP graduates assessed in English and in Spanish in kindergarten through second grade, as well as for reading and math proficiency in third through eighth grade.

In the analyses, subgroup comparisons were also explored, including reading proficiency differences by demographics and the type of DPP site that students attended. Findings indicate statistically significant differences between females and males on reading proficiency levels in 3 of the 9 cohorts analyzed (in two cases a larger proportion of females, and in one case males, exceeded expectations). Overall across 6 of the 9 cohorts, females tended to have generally higher proportions *meeting or exceeding expectations* of the CMAS assessment than males.

Preschool family income plays an important role in later reading proficiency. These analyses indicated overall that as preschool income tier increased, higher elementary (and beyond) reading scores can be expected. Reading proficiency levels on the CMAS assessment among students of color were consistently lower than those of their White peers, although some cohorts showed positive findings among the small samples of Asian and multi-ethnic students. For the READ Act measures for kindergarten through second grade, while the vast majority of White DPP graduates were *at or above grade level*, high proportions of Hispanic, Asian, and multi-ethnic students were also *at or above grade level*. About 60% of Black DPP graduates were *at or above grade level* in the early grades. Income, ethnicity and primary language in preschool are confounded in terms of explaining their influence on students' kindergarten readiness and later academic performance. A potential future study, taking more family risk and strength variables into account, would support a greater understanding of pathways and barriers to school readiness for low income students. Given the analytic results, students' later performance did not consistently differ based on whether they attended a DPS preschool or a community program. This suggests that, for these cohorts, programs offer similar access and quality for students.

Some of the direct assessment preschool data for each cohort predicted reading proficiency in later school years. These analyses can help the programs shape preschool classroom activities to boost student learning and development in positive ways leading to later success. Findings show a consistent pattern of positive association between the child assessments administered in English in preschool and later school reading assessment scores for students whose primary language was English in preschool. The practical finding is generally that as scores on the preschool assessment go up by one point, the likelihood of *meeting or exceeding expectations* or being *at or above grade level* increases by approximately 10% on average. For students who were dual language Spanish-English learners in

preschool, the findings were less consistent. Among preschool dual language learners, the English-administered preschool assessments were not predictive of later reading proficiency. The math assessment administered in Spanish in preschool was predictive of later reading in 5 of the 9 cohorts. Preschool Spanish vocabulary only predicted later reading proficiency for a third of the cohorts. These findings suggest that preschool programs may need different tools and strategies to meet the individualized needs of dual language learners.