School Readiness Assessment

The ASR Model™

Kindergarten Readiness and Later Achievement

A Longitudinal Study in Alameda County

Comprehensive Report 2018

ASR
Helping People
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FIRST 5
ALAMEDA COUNTY

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Executive Summary

KINDERGARTEN READINESS IN ALAMEDA COUNTY

First 5 Alameda County (First 5) supports an integrated early childhood system with the goal of ensuring all children arrive at school ready to learn and are free from abuse and neglect. Every two years, First 5 partners with Applied Survey Research (ASR) to assess kindergarten readiness in Alameda County.

The kindergarten readiness assessment identifies and measures some factors that predict a child's readiness for school. At every assessment period, concrete needs, such as arriving at school healthy, well-rested, and well-fed are top factors predicting kindergarten readiness. Since 2015, formal early childhood education (ECE) participation is also a top factor. This longitudinal study conducted in 2018, analyzing the relationship between kindergarten readiness and later achievement, reveals the impact of concrete needs on children's outcomes is long-term and ECE participation alone will not address the achievement gap.

WHAT IS THE CONNECTION BETWEEN KINDERGARTEN READINESS AND LATER ACHIEVEMENT IN ALAMEDA COUNTY?

For the current study, ASR looked at children's trajectories from kindergarten through elementary school in Alameda County in order to better understand the predictive nature of kindergarten readiness and to inform investment, policy, and program decisions. Kindergarten readiness data for a total of 1,168 students, attending 40 different schools in kindergarten, were pooled from prior kindergarten readiness studies in Hayward Unified and Oakland Unified School Districts in 2010, 2011, and 2013, and then matched to data from at least one grade level (third, fourth, fifth, and sixth) of English Language Arts (ELA) and Math Smarter Balanced Assessment Consortium (SBAC) tests. Kindergarten data were collected using Kindergarten Observation Forms (KOFs) completed by teachers and Parent Information Forms completed by parents or primary caregivers. This report focuses on third grade outcomes, as a growing body of research has documented the importance of third grade proficiency in predicting outcomes over the life course,[i] and the most robust sample size was available for this grade.

FINDINGS

- Skill gaps observed in kindergarten between different subgroups generally persisted into third grade and even widened for some children
- The strongest predictors of third grade proficiency included:
  - When entering kindergarten:
    - Being healthy, well-rested, and well-fed
    - Coming from a family with higher socioeconomic status
    - Being proficient in English
  - Regularly attending school in third grade
- Consistent with longitudinal research conducted by ASR in Santa Clara, San Mateo, and San Francisco Counties,[ii] the findings indicate that children's kindergarten readiness skills, particularly *Self-Regulation* and *Kindergarten Academics*, are important drivers of later achievement

RECOMMENDATIONS

Findings point to the importance of efforts to:

- Address families' basic needs
- Improve children's health and well-being
- Use policy and systems change to reduce inequities, structural racism, and implicit bias
- Encourage consistent school attendance
- Strengthen children's kindergarten readiness skills by improving access to high quality ECE and supporting parents' capacity to offer enriching early experiences at home

FIRST 5 ALAMEDA COUNTY POLICY PRIORITIES

Consistent with study results, First 5 Alameda County's policy priorities include:

- Sustaining programs and investments with proven results for kindergarten readiness
- Addressing inequity and childhood poverty
- Supporting family engagement, leadership, and community well-being

The findings suggest several opportunities for programs and policies, particularly those that increase access to and utilization of supports and community resources that address families' basic needs, improve child health and well-being, and encourage school attendance. Given the finding that achievement gaps generally do not close between kindergarten and third grade, it is imperative that these interventions take place early in the child's life, thereby setting them up for later success.

EVALUATION QUESTIONS AND WHAT WE LEARNED

1. What is the relationship between kindergarten readiness and later achievement in elementary school? What academic paths were taken by the most- and least-ready kindergarteners?

Students who were more prepared for kindergarten had higher achievement in third grade. Of all **third grade students** enrolled in the two school districts during the study years, just over **1** in **4** were proficient in ELA and fewer than **1** in **3** were proficient in Math. For children in the subgroup of third graders who were assessed in kindergarten and were "fully ready," 37% were proficient in ELA and/or Math in third grade, compared to only 21% of children who were "not ready" in kindergarten.
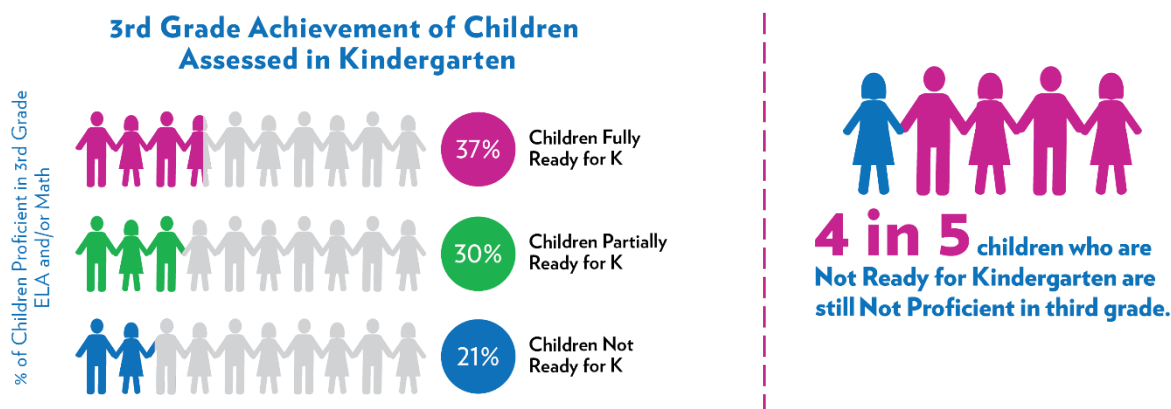
Although overall readiness predicted third grade outcomes, two domains of kindergarten readiness, *Kindergarten Academics* and *Self-Regulation*, most strongly predicted performance on ELA and Math standardized tests taken 3 ½ years later. In addition, kindergarten readiness continued to predict later academic outcomes in fourth, fifth, and sixth grades.

1a. Readiness gaps were observed between subgroups at the time of kindergarten entry. Did these gaps narrow or widen later in elementary school?

Disparities in kindergarten readiness generally did not close by third grade, and widened for some children.
By third grade:

- ■ The gap identified in kindergarten widened for:
  - ▪ Children who came to kindergarten tired, sick, or hungry
  - ▪ African-American and Latino children
  - ▪ Children from households earning less than $50,000 annually
- ■ A non-significant gap during kindergarten between English Learners and their peers increased to significance in ELA

■ The gap first identified in kindergarten between boys and girls narrowed for the overall sample by third grade. However, the gender gap favoring girls persisted in ELA among African American and Latino students

1b. By third grade, some students "beat the odds" by demonstrating proficiency in third grade when they were not ready in kindergarten, and some "fell behind" in third grade even though they were fully ready in kindergarten. How were these children different from their peers?

Factors associated with those who "beat the odds" and those who "fell behind"

We explored whether child and family characteristics and experiences (e.g., child's age and gender, family income, attendance at a formal early care and education program) and available data on school characteristics predicted a child's trajectory from kindergarten to third grade. Some potential factors contributing to children's trajectories such as family stressors, parent engagement at school, and curricula could not be examined in this study. The results were only marginally significant, with the exception of *school characteristics.*

Schools where children "beat the odds"

The characteristics of schools with a higher than average percentage of children who "beat the odds" in third grade were:

■ More socioeconomically advantaged, as measured by the proportion of students enrolled in the Free or Reduced Price Lunch Program

■ Higher performing in math as measured by average scores on the SBAC assessments

2. What child, family, and kindergarten readiness factors predict later academic outcomes? Are there cumulative effects of protective factors?

We also explored the child and family characteristics linked to third grade achievement, controlling for other factors, including kindergarten readiness. The following factors accounted for about 25% of the variance in children's third grade achievement scores:

■ The less frequently a child demonstrated **well-being** concerns in kindergarten, the higher he or she scored on third grade standardized assessments.

■ Being **proficient in English** at kindergarten entry was also positively associated with ELA and Math achievement.

■ **Higher socioeconomic status** (mother had at least a high school education OR household income was more than $50,000) in kindergarten predicted higher ELA scores, but not Math scores.

■ **Regular attendance** in third grade was significantly associated with higher ELA and Math scores. Notably, well-being in kindergarten was significantly related to attendance in third grade.

Next, we examined whether there were *cumulative* effects of having multiple positive malleable factors (i.e., those responsive to intervention) on the likelihood of third grade success. The figure that follows displays the relationship between third grade academic outcomes and the number of positive malleable factors influencing a child, such as having attended formal early care and education, having a parent who used community

resources, and being read to at home. As the chart illustrates, **the more positive malleable factors** influencing a child, **the more likely he or she was to meet standards** in math and/or ELA. For example, just 4% of children who had no more than one positive malleable factor were proficient in third grade, while 58% of children who had six to eight positive malleable factors met or exceeded standards in math and/or ELA.
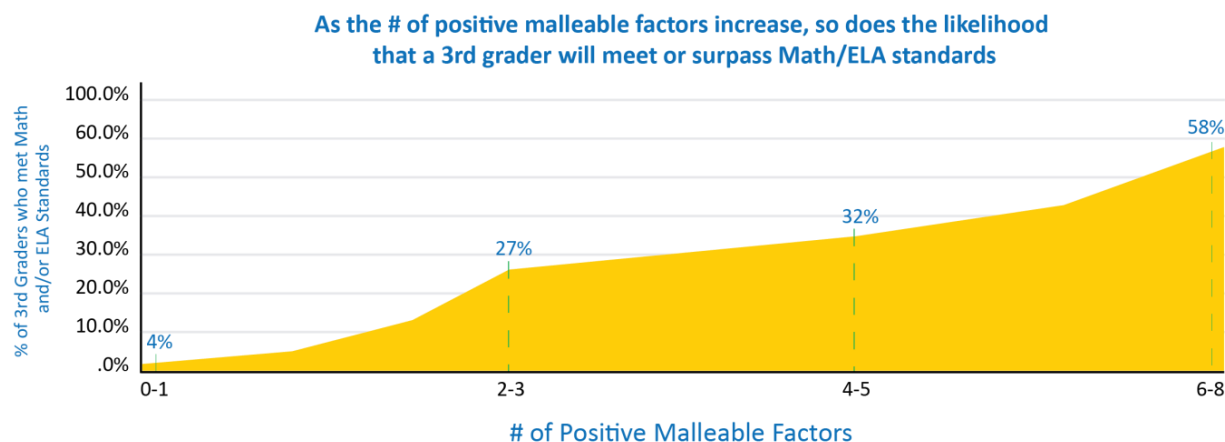
CONSIDERATIONS

The factors measured in the current study account for about a quarter of what contributes to children's third grade achievement. This is typical for social science research, simply because it is impossible to isolate and measure all the factors that influence outcomes. Information about other factors, including children's experiences inside and outside of the classroom between kindergarten and third grade, was not available. It should also be noted that the study sample was drawn from lower-performing schools relative to the two school districts and the county as a whole.

This study demonstrates the correlation between the socioeconomic realities of families and student achievement. Research has shown that children of color and those from lower income households have less exposure to high-quality early care settings and often attend schools in neighborhoods with fewer resources and less experienced teachers, leading to a cycle of poorer school performance; in addition, lower income children of color may experience the negative effects of structural racism and implicit bias leading to differential treatment in the classroom (e.g., differences in teaching and discipline practices).[iii,iv,v,vi] Furthermore, the ill effects of poverty on children's brain development,[vii] and exposure to stressors and toxins in the environment, can contribute to poorer school performance.[viii] It is also well-documented that children who are healthy, food secure, and well-rested have significantly higher levels of academic achievement,[ix] likely because improved health and well-being leads to better cognitive performance, particularly in memory and the ability to focus, as well as consistent school attendance.[x]

SUMMARY AND POLICY IMPLICATIONS

This longitudinal look at a sample of children who participated in earlier kindergarten readiness assessments and their third grade achievement showed a pattern whereby those children who began fully ready in kindergarten were more likely to succeed in third grade and beyond compared to their less ready peers. **Persistent achievement gaps may be explained by the consequences of long term community disinvestment, structural racism, and poverty**. **First 5 makes strategic investments that recognize the interplay between equity, place, health and child well-being and is committed to implementing targeted policies and practices to sustain programs and investments with proven results for kindergarten readiness.** This includes addressing inequity and childhood poverty and supporting programs and polices that promote family engagement, leadership, and community well-being. By implementing these policies, we may see an increase in the impact of positive, cumulative effects of interventions that promote the well-being of all children in our county.

Introduction

First 5 Alameda County (First 5) supports an integrated early childhood system with the goal of ensuring all children arrive at school ready to learn and are free from abuse and neglect. Every two years, First 5 partners with Applied Survey Research (ASR) to assess kindergarten readiness in Alameda County. The early years of kindergarten readiness assessment data gathered in the Hayward Unified School District (HUSD) and in the Oakland Unified School District (OUSD) using the Kindergarten Observation Form (KOF) have already helped the Districts and First 5 better understand incoming kindergarteners' readiness skills, identify the skills these children need greater support in developing, examine changing readiness levels and related factors over time, and promote experiences and practices associated with greater kindergarten readiness.

A growing body of research demonstrates the robust link between children's readiness for school at kindergarten entry and their later school achievement. Prior studies by ASR in other California counties have found that kindergarten readiness strongly predicted performance on English-Language Arts (ELA) and Mathematics California Standards Tests (CSTs) taken 3 ½ years later.[xi] Likewise, other research has shown that kindergarten readiness, particularly possessing readiness skills across multiple domains, predicts academic success later in elementary school.[xii] The purpose of this longitudinal study is to examine how kindergarten readiness is linked to third grade outcomes for students in HUSD and OUSD in Alameda County.

There are several ways in which this study contributes to efforts to increase students' academic success and narrow the achievement gap. First, demonstration of the link between kindergarten readiness and later success will provide support for efforts to increase access to quality early childhood services and can serve as a springboard for collaboration between the pre-k and elementary school communities. Second, the findings also provide information about the particular domains of kindergarten readiness most predictive of later success, which can inform the content of early childhood services. Third, ascertaining the academic trajectories of students from kindergarten to third grade and beyond, including factors that impact these pathways, can inform strategies to implement in early elementary school to narrow the achievement gap. Finally, understanding these trajectories will also help to identify students most in need of support during the early elementary school years to ensure they are academically proficient by third grade.

RESEARCH QUESTIONS

This study addresses the following research questions:

1. What is the relationship between kindergarten readiness and later achievement in elementary school? What academic paths were taken by the most- and least-ready kindergarteners?

    a. Readiness gaps were observed between subgroups at the time of kindergarten entry. Did these gaps narrow or widen later in elementary school?

    b. By third grade, some students "beat the odds" by demonstrating proficiency in third grade when they were not ready in kindergarten, and some "fell behind" in third grade even though they were fully ready in kindergarten. How were these children different from their peers?

2. What child, family, and kindergarten readiness factors predict later academic outcomes? Are there cumulative effects of protective factors?

Methodology and Sample

This study draws from kindergarten readiness data collected in 2010, 2011, and 2013 in the Hayward Unified School District (HUSD) and Oakland Unified School District (OUSD) and matches them with third, fourth, fifth, and sixth grade academic outcome data at the individual child level. This section describes each data source. It should be noted that the study samples are not generalizable to the student populations in either school district or to the student population in Alameda County overall.

KINDERGARTEN READINESS ASSESSMENT DATA

In 2008, First 5 Alameda County partnered with Applied Survey Research to conduct the first of what would become annual Kindergarten Readiness Assessment (KRA) studies in Alameda County, through 2011. Since 2013, the KRA has been conducted every other year, with the most recent study completed for the entering 2017 kindergarten cohort.

The core of the Kindergarten Readiness Assessment is the *Kindergarten Observation Form* (KOF). In addition to the KOF, parents of the assessed children complete the *Parent Information Form* (PIF), a survey which collects information about family and community factors that are associated with kindergarten readiness. Each of these instruments will be described in greater detail next.

Table 1.   **Kindergarten Readiness Assessment Instruments**

Instrument	What Key Data Are Assessed?	Who Completes It?
Kindergarten Observation Form (KOF)	24 kindergarten readiness skills; basic well-being; demographics.	Participating kindergarten teachers
Parent Information Form (PIF)	Preschool experiences; kindergarten transition activities; activities and routines in the home; parental supports, attitudes, stressors; demographics.	Consenting parents/caregivers of children in the assessment

KINDERGARTEN OBSERVATION FORM (KOF)

The *Kindergarten Observation Form* was originally developed in 2001 using guidelines from the *National Education Goals Panel* (*NEGP*) framework of readiness. While the tool has undergone some refinement over the years, the KOF has consistently relied on teacher observation as the primary method of assessment across a set of readiness skills.

In the 2011 through the 2013 administrations, teachers were asked to observe and score each child according to his or her level of proficiency in each of 24 skill items, using the following response options: *Not Yet* (1), *Beginning* (2), *In Progress* (3), and *Proficient* (4). An option of *Don't Know / Not Observed* is provided as well. If teachers felt they could not provide an accurate assessment on items that require oral communication due to language barriers, they were instructed not to assess students on these items and instead mark *Don't Know / Not Observed* or leave those items blank.

The 24 readiness skills measured on the KOF sort into three central dimensions of kindergarten readiness that comprise the *Basic Building Blocks* of readiness: *Self-Regulation*, *Social Expression*, and *Kindergarten*

Academics. The KOF also measures foundational motor development skills. The full set of KOF items is contained in Appendix A.

The KOF also includes fields to capture students' demographic information, early care and education experiences, and health and well-being characteristics to understand who took part in the study and to examine what characteristics are associated with children's skill development (e.g., experience in curriculum-based early education settings, child age, child gender, child's presence of special needs). One set of questions on the KOF asks teachers to rate the frequency with which the child came to school hungry, tired, sick, absent, or tardy, on a four-point scale ranging from "rarely or almost never" to "just about every day".

PARENT INFORMATION FORM (PIF)

To better understand how family factors and early childhood experiences are related to children's levels of readiness, a *Parent Information Form* survey was completed by parents/caregivers. The PIF collects a wide variety of information, including: types of child care arrangements for children during the year before kindergarten entry; ways in which families and children prepared for the transition to kindergarten; engagement in family activities and daily routines; use of parenting supports and family resources; parenting social support, attitudes, and stressors; health and health care measures; and several demographic and socioeconomic measures. Care was taken to ensure that the questions could be read at a sixth-grade level. Versions of the form were offered in English, Spanish, Arabic, Tagalog, Chinese, and Vietnamese. Parents/caregivers were given a children's book (in their preferred language) as an incentive to complete the PIF. To enhance their privacy, parents/caregivers were provided with an envelope in which they sealed their completed survey prior to returning them to their child's teacher.

SCHOOL DISTRICT DATA

ASR entered into data sharing agreements with OUSD and HUSD to obtain academic outcome data for children who participated in the 2010, 2011, and 2013 KRA studies. Using unique student identification numbers, student data from the readiness assessments were matched with third through sixth grade outcome data provided by each district, including student attendance and performance on the Smarter Balanced Assessment Consortium (SBAC) tests in English Language Arts (ELA) and Math.[xiii]

SBAC scores are reported as scaled scores and as achievement levels. Scaled scores reflect a student's raw score on the test, on a scale from about 2000 to 3000, depending on grade level. Based on scaled scores, achievement levels are determined for Math and ELA, for each grade.

Scale score ranges for English Language Arts/Literacy and Mathematics, by grade level and achievement level can be found in tables in Appendix A.[xiv]

LONGITUDINAL STUDY SAMPLE

The 2010 kindergarten readiness study assessed a total of 491 kindergartners in OUSD and HUSD, while the 2011 assessed 459 kindergarteners, and the 2013 kindergarten readiness assessment included 694 kindergartners, yielding a total of 1,168 students pooled across samples to comprise the baseline readiness data. Across the three cohorts, children had attended 40 different schools in kindergarten, 16 in HUSD and 24 in OUSD (see Appendix B for list of schools).
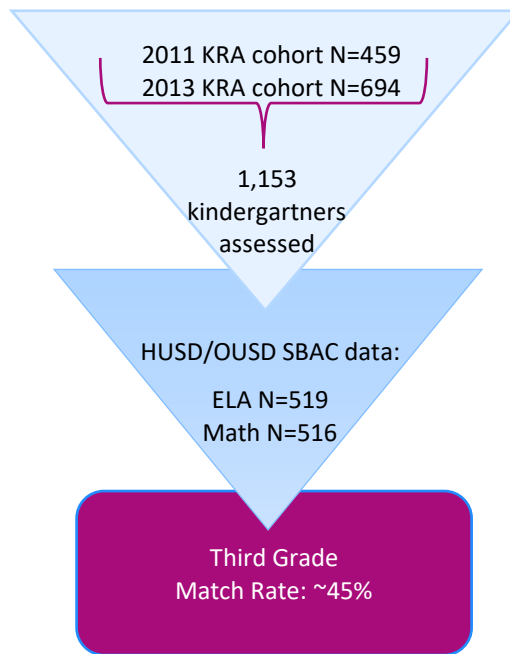
Third grade SBAC ELA and Math scores were available for the cohort of kindergarten students who participated in the 2011 and 2013 kindergarten readiness assessments (children in the 2010 kindergarten cohort were under a different standardized testing system when they were in third grade and therefore are not included in the analysis of third grade outcomes). Fourth and fifth grade data were also available for the 2011 kindergarten cohort, and data for grades four through six were analyzed for the 2010 cohort. The resulting sample sizes for each grade level, with the proportion of the school readiness sample that was able to be matched to each grade level's test scores is presented below. A total of 1,168 cases were matched across kindergarten readiness assessment data and at least one grade level's SBAC data.

Table 2. **Sample sizes**

GRADE LEVEL	TOTAL MATCHED CASES (N=1,168)	2010 K COHORT (N=491)		2011 K COHORT (N=459)		2013 K COHORT (N=694)	
		ELA	Math	ELA	Math	ELA	Math
Third	ELA N=519 Math N=516	-	-	235 (51%)	232 (50%)	284 (41%)	284 (41%)
Fourth	ELA N=453 Math N=453	203 (41%)	204 (42%)	250 (54%)	249 (54%)	-	-
Fifth	ELA N=450 Math N=451	202 (41%)	203 (41%)	248 (54%)	248 (54%)	-	-
Sixth	ELA N=203 Math N=203	203 (41%)	203 (41%)	-	-		

This report focuses on third grade outcomes, as a growing body of research has documented the importance of third grade proficiency in predicting outcomes over the life course, including high school graduation, college attendance, and future career success.[xv] In addition, the most robust matched sample size was available for this grade. As illustrated in the figure below, 45% of the children who had kindergarten readiness assessment data were able to be matched to their third grade data.

Figure 1. **The third grade sample had a 45% match rate with kindergarten readiness data**

2011 KRA cohort N=459
2013 KRA cohort N=694

1,153
kindergartners
assessed

HUSD/OUSD SBAC data:

ELA N=519
Math N=516

Third Grade
Match Rate: ~45%

A PROFILE OF THE KINDERGARTEN STUDENTS

On average, the kindergartners in the three matched cohorts were about five years and four months old when they started school. Slightly fewer males than females were in the sample (48% male and 52% female). The majority of students (70%) were Hispanic/Latino, 16% were Black/African American, 7% were Asian, 3% were White, and 6% were multiracial or another race/ethnicity. In comparison, just half of the overall population of students in Oakland and Hayward Unified School Districts in these cohorts were Hispanic/Latino (51%), 21% were Black/African American, 10% were Asian, and 9% were White.[xvi]

Figure 2. **Racial/ethnic distribution of the kindergarten sample**
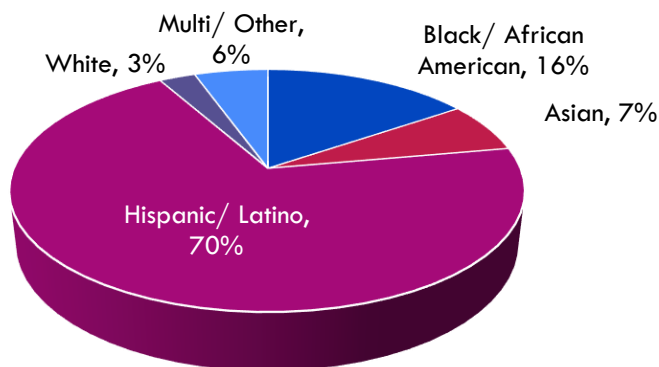
Multi/ Other, 6%
White, 3%
Black/ African American, 16%
Asian, 7%
Hispanic/ Latino, 70%

Source: 2010, 2011, 2013 Kindergarten Observation Form, Parent Information Form, HUSD/OUSD administrative data. Cases include only those matched between the KOF and at least one grade of SBAC data. N=867. Note: Race/ethnic categories were derived across datasets such that HUSD/OUSD data were used to fill in missing data from the KOF and PIF as follows: The "Asian" category includes: Asian, Asian Other, Asian Indian, Cambodian, Chinese, East Asian, Filipino, Japanese, Other Southeast Asian, South Asian, Vietnamese. The "Black/African American" category includes: African, African American, Black. The "Hispanic/Latino" category includes: Central American, Hispanic, Latino, Mexican. The "Other" category includes: Native Alaskan, Native American, Native Hawaiian/Pacific Islander, multi-racial/multi-ethnic, and Pacific Islander. The "White" category includes: White and Middle Eastern.

The primary languages spoken by the combined kindergarten cohort were predominantly Spanish and English. Figure 3. illustrates the distribution of kindergartners' primary languages.

In addition, 63% of students were identified as English Learners by their kindergarten teachers.

Figure 3.   **English and Spanish are the primary home languages spoken in kindergarten**

Multilingual, 6%

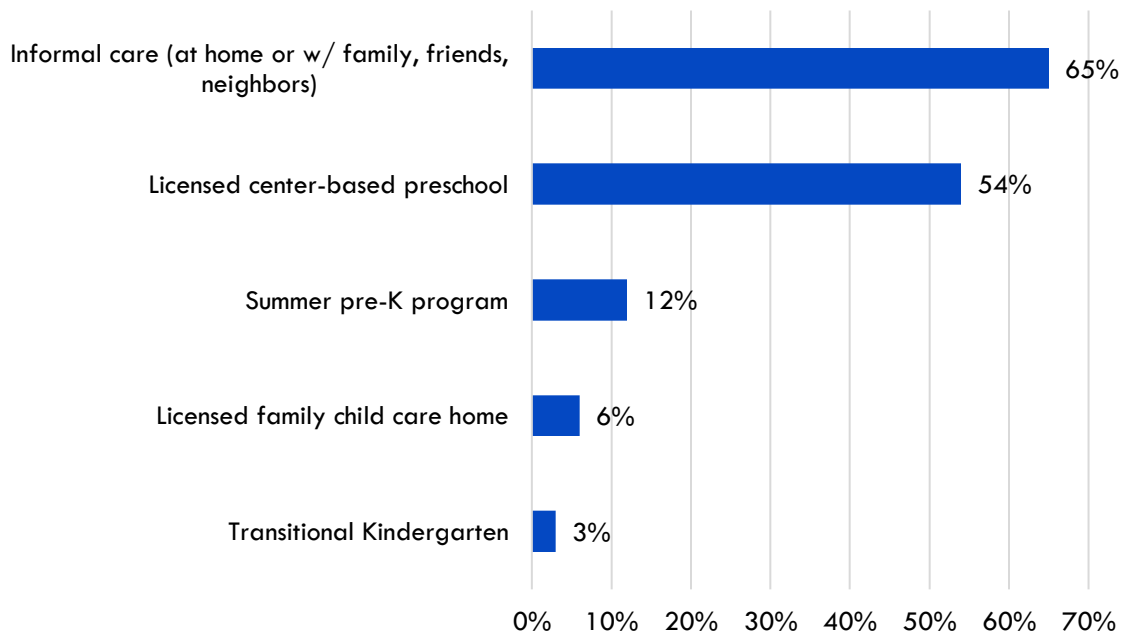| Spanish, 51% | English, 37% | | |

Other, 7%
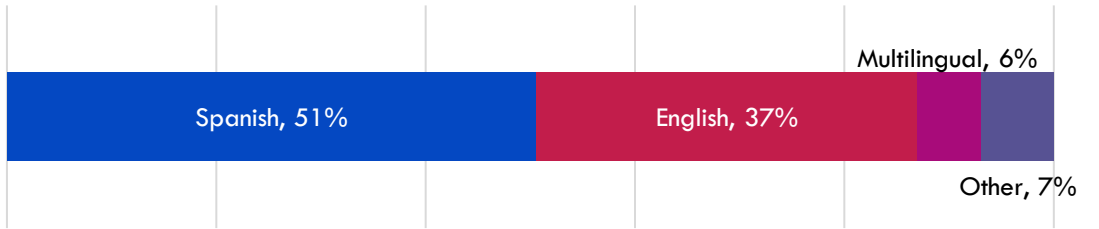
Source: 2010, 2011, 2013 Kindergarten Observation Form. N=1,090.

Approximately 9% of students had an Individualized Educational Plan (IEP) or was identified by their parent or their teacher as having a diagnosed special need.

In the year prior to entering kindergarten, just over half of the students had attended preschool at a licensed center, and 65% were in an informal care setting.

Figure 4.   **Over half of children were in licensed care in the year prior to starting kindergarten**
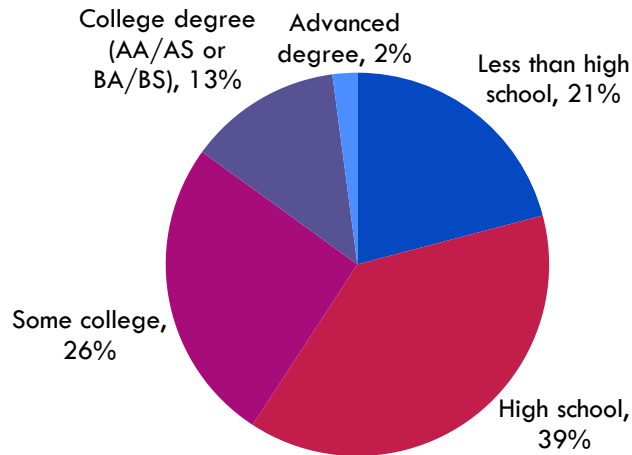

Informal care (at home or w/ family, friends, neighbors)	65%
Licensed center-based preschool	54%
Summer pre-K program	12%
Licensed family child care home	6%
Transitional Kindergarten	3%

0% 10% 20% 30% 40% 50% 60% 70%

Source: 2010, 2011, and 2013 Kindergarten Observation Form; Parent Information Form data. N=1,133.
Note: Transitional Kindergarten was established in 2012, and would only apply to students from the 2013 cohort. Percentages may not add to 100, as children may have had more than one pre-kindergarten experience in the year prior to kindergarten entry.

As illustrated in the figure below, roughly one in five students had a mother who had not graduated from high school. Only 15% of students had a mother with a college degree.

Figure 5. **One in five students' mothers had less than a high school education**

College degree (AA/AS or BA/BS), 13%
Advanced degree, 2%
Less than high school, 21%
Some college, 26%
High school, 39%

Source: 2010, 2011, 2013 Parent Information Form. N=965.

Eighty-six percent of students in the sample came from a family that was earning less than $50,000 annually at the time of the child's entry to kindergarten.

Figure 6. **The majority of students' households earned less than $50k annually**

- $0-$14,999
- $15,000-$34,999
- $35,000-$49,999
- $50,000-$74,999
- $75,000-$99,999
- $100,000+
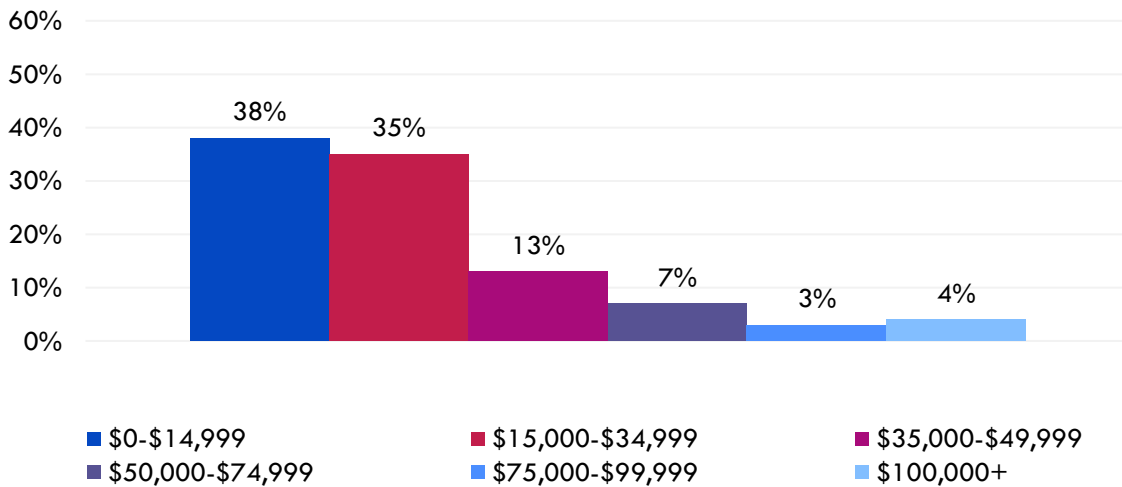
Source: 2010, 2011, 2013 Parent Information Form. N=927.

School Readiness at Kindergarten Entry

Pooling assessment scores from the 2010, 2011, and 2013 administrations of the Kindergarten Observation Forms, the figure below shows mean scores across the three *Basic Building Blocks of Readiness*. All items on the KOF are scored from 1 to 4 based on the kindergarten teacher's observations and assessments of each student's progress on the skills, using the following categories: 1=Not yet ready; 2=Beginning; 3=In Progress; and 4=Proficient. The domain scores shown below were calculated by taking the average of all items in that domain. The Overall Readiness score is the average of all 24 items on the KOF.

As illustrated in the figure below, students were rated as between *In Progress* and *Proficient* in their mastery of skills across domains. Children's scores were highest in *Social Expression* and lowest in *Kindergarten Academics*.

Figure 7.   **HUSD and OUSD kindergartners were rated strongest in Social Expression**
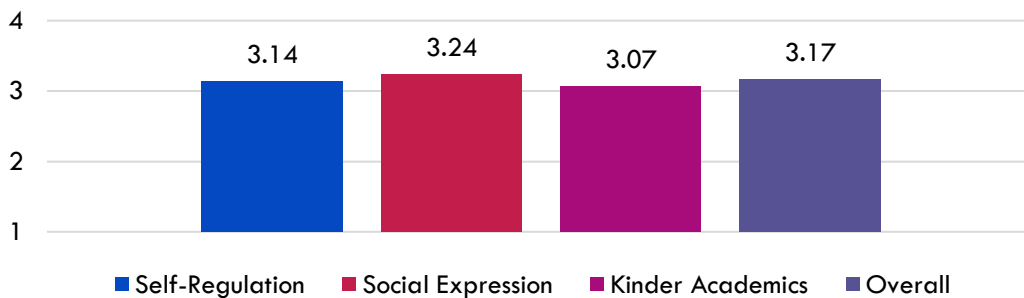
Source: 2010, 2011, and 2013 Kindergarten Observation Form. N=1,070-1,168.

Later Student Attendance and Achievement

The data obtained from Hayward and Oakland Unified School Districts allow us to examine third, fourth, fifth, and sixth grade outcomes. This section describes attendance patterns and achievement outcomes observed at third grade. Attendance and achievement data for fourth through sixth grade can be found in the Appendix.

CHRONIC ABSENTEEISM

According to the California Department of Education, students are determined to be *chronically* absent if they were absent for 10% or more of the days they were enrolled. For most students who enrolled at the beginning of the school year, 180 days of instruction is expected. Therefore, chronic absenteeism is defined as being absent 18 or more days.

As illustrated in the figure below, while 6% of third graders in the sample were chronically absent, the absenteeism rate for overall population of early elementary school children in Hayward and Oakland Unified School Districts was twice that (12%). The chronic absenteeism rate for Alameda County and the state overall (8%) was just above that of the study sample.

Figure 8.　**Chronic absenteeism rate in the sample was half the rate in OUSD and HUSD overall**
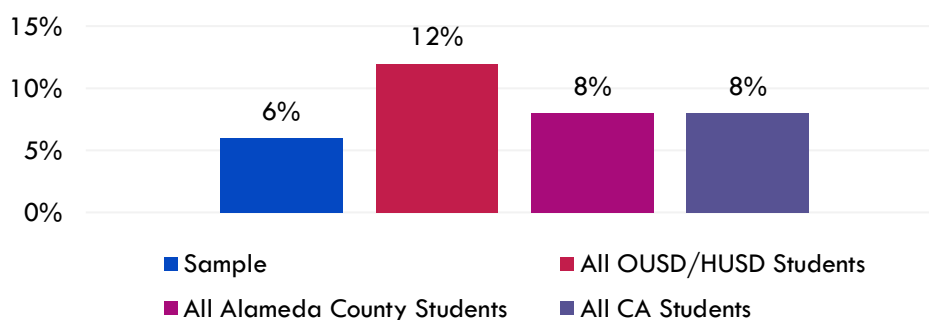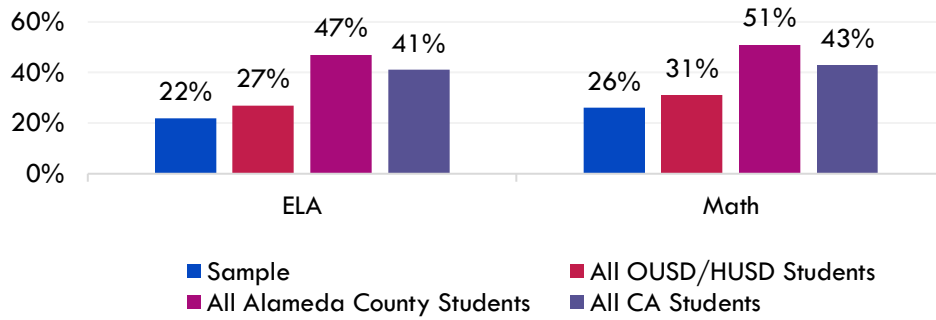

Source: HUSD and OUSD data; CDE DataQuest. Note: Figures for overall population in OUSD/HUSD, Alameda County, and CA for grades 1-3 in 2016-17 (data by grade and for prior years unavailable). Sample N=521.

ACADEMIC ACHIEVEMENT

Next, we examined academic achievement among third graders in the sample. The figure below shows the percentage of students achieving each level of proficiency in English Language Arts (ELA), as measured by SBAC scores. The schools that the children in the sample attended during kindergarten were lower-performing relative to the two districts overall and the county as a whole. As might be expected, compared to the general student population in OUSD and HUSD, the sample of children had somewhat lower achievement scores in third grade. Approximately 22% of the sample met ELA standards, and 26% of the sample met Math standards in third grade, whereas 27% of all third grade students in OUSD and HUSD in the same cohorts met ELA standards, and 31% met the standards in Math. Third grade students in OUSD and

HUSD, in turn, were less likely to be proficient in both subjects than students in Alameda County and the state overall.

Figure 9.   **The study sample was less likely to be proficient in ELA and Math than the general student population**

Source: HUSD/OUSD District Data; CDE DataQuest. Note: Data reflect percent of third graders in 2015 and 2017 who met or exceeded standards. Sample N=516-519.

Longitudinal Study Findings: Kindergarten Readiness and Third Grade Outcomes

This section reports on findings from investigations into the primary research questions posed:

- What is the relationship between kindergarten readiness and later achievement in elementary school? What academic paths were taken by the most- and least-ready kindergarteners?

- What child, family, and kindergarten readiness factors predict later academic outcomes? Are there cumulative effects of protective factors?

The most robust sample size was available for examining third grade outcomes. Moreover, researchers have documented that proficiency in third grade is strongly predictive of high school graduation, college attendance, and future career success.[xvii] Particularly with respect to reading skills, third grade marks the last year in which reading is taught, after which reading skills must be relied upon to learn other concepts. Consequently, third grade is often understood as a pivotal point in a child's academic trajectory. As such, this report focuses on the factors associated with third grade outcomes, with results for fourth, fifth, and sixth grade outcomes in the Appendix.

It is important to note that many of the factors that affect academic achievement in elementary school are beyond the scope of this study. For example, no measures are available to account for teacher effectiveness, curricula, school climate, family stressors experienced between kindergarten and third grade, parent engagement at the school, or any of a number of other variables that likely impact student learning and performance. Rather, the predictor variables examined in the analyses that follow include a core set of child and family background variables that may play a role in shaping third grade outcomes.[xviii]

RESEARCH QUESTION 1: WHAT ACADEMIC PATHS WERE TAKEN BY THE MOST- AND LEAST-READY KINDERGARTNERS?

This section more closely examines the third grade outcomes for students who did and did not enter kindergarten ready to learn across all three *Basic Building Blocks of Readiness*.

Students whose mean scores were greater than or equal to 3.25 across all domains (indicating they were *Proficient* or nearly so across readiness skills) were categorized as *Fully Ready*. Those whose mean scores were less than 3.25 across domains were categorized as *Not Ready*, and those who met the 3.25 benchmark on some but not all domains were considered *Partially Ready.* The figure that follows shows the readiness distribution of the sample of students assessed in 2010, 2011, and 2013, whose readiness data were matched to scores on one or more SBAC assessments. The sample was distributed approximately into thirds, with 33% *Fully Ready*, 29% *Not Ready*, and 38% *Partially Ready.*

**Figure 10.** **Kindergarten readiness is distributed roughly in thirds**
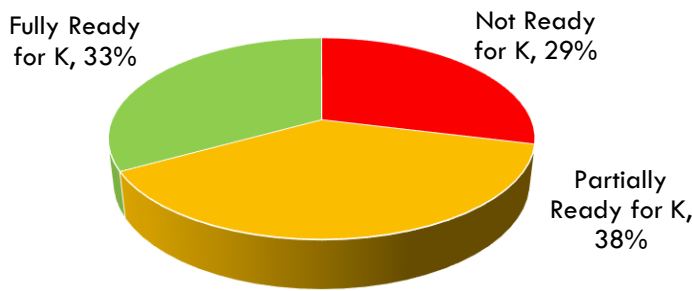
Source: Kindergarten Observation Form, Ns = Not Ready: 308; Partially Ready: 354; Fully Ready: 406.

Next, we examine the proportion of students in each of these readiness categories who were meeting proficiency standards in third grade. As illustrated in the next figure, of the students who entered kindergarten *Fully Ready*, 30% went on to meet or exceed ELA standards in third grade, as compared to only 13% of those who were *Not Ready* upon kindergarten entry. Similarly, 31% of children who were *Fully Ready* met standards in Math in third grade, compared to 17% of those who were *Not Ready* who met standards in third grade.

We also examined the proportion of students in each readiness category who were meeting standards in either Math or ELA or both, and those who were meeting standards in neither subject. Thirty-seven percent of the students who were *Fully Ready* at the beginning of kindergarten achieved proficiency in either Math or ELA in third grade, while 21% of the students who started kindergarten *Not Ready* were proficient in at least one subject. Thus, **the more ready students were in kindergarten, the better poised they were to succeed in third grade**.
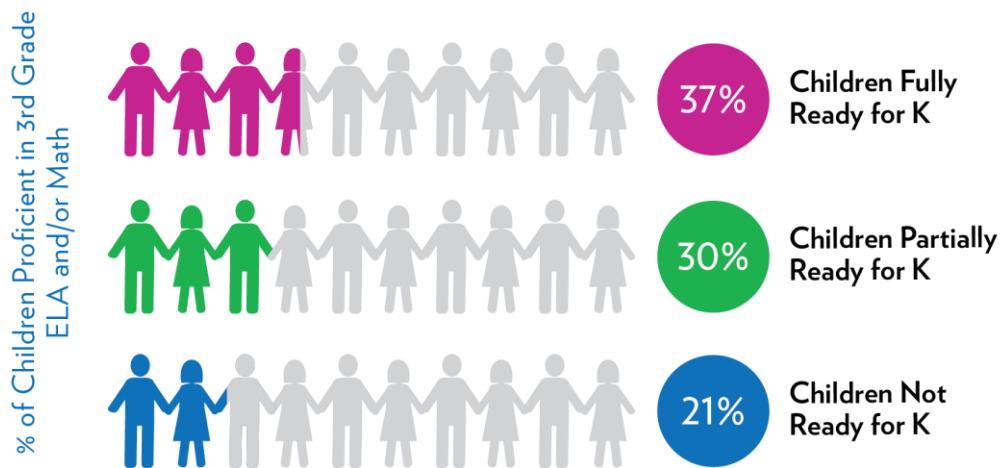
Source: Kindergarten Observation Form, HUSD/OUSD data. N=479-480.

RESEARCH QUESTION 1A: DID THE ACHIEVEMENT GAPS OBSERVED AT KINDERGARTEN NARROW OR WIDEN LATER IN ELEMENTARY SCHOOL?

This section further explores the kindergarten-to-third-grade trajectories of groups of students who, across various studies of readiness, have consistently demonstrated lower levels of readiness than their peers at kindergarten entry. The analyses that follow look at whether, relative to their more prepared peers, students who started school with lower readiness levels were able to "close the achievement gap" by third grade.

To assess the relative sizes of gaps between groups of students at kindergarten versus third grade, scores on the KOF and the SBAC ELA and Math tests were converted into a z-score format that allowed them to be compared to each other, even though they were initially measured using different scales. Creating these z-scores standardizes the data (both readiness and SBAC scores) on a single, comparable scale. This comparability is necessary for examining the size of the gaps between different groups of students, to determine whether that gap is increasing, decreasing, or staying the same.

In transforming each set of scores into z-scores, the average becomes 0. Positive scores represent scores that are above the average, whereas negative scores represent scores that are below the average. **Please note that in the figures that follow, the key information of interest is the size of the gap between the two groups being compared at the two different time points – and whether the gaps are increasing or decreasing over time.**

The z-scores for students' overall readiness scores and third grade SBAC ELA and Math proficiency levels are compared for the following groups of students:

- **Child well-being:** Students with and without optimal well-being, as indicated by teacher reports of the child coming to school hungry, tired, or sick

- **Race/ethnicity:** Hispanic/Latino or Black/African American students (these students were grouped due to similarities in their kindergarten readiness and third grade achievement outcomes) and students of other racial/ethnic backgrounds

- **Income:** Students whose families earned less than $50,000 per year at kindergarten entry and students with higher family incomes

- **Language:** English Learners and students proficient in English at kindergarten entry

- **Gender:** Girls and boys, including gender differences among Hispanic/Latino and Black/African American students

CHILD WELL-BEING

Most kindergarten students never or only rarely appeared tired, hungry, or sick according to their teachers, but some students were noted as having issues in one or more of these areas. These students with well-being concerns had much lower overall readiness levels than their peers at the beginning of kindergarten, resulting in a 0.57-point achievement gap. These achievements gaps persisted into third grade, with the two groups showing a 0.48-point gap for ELA and 0.64 point gap for Math.

Figure 11. **Achievement gaps persisted in both ELA and Math between students who had optimal well-being in kindergarten and those who did not**

ELA

Math

Well-being concerns — Optimal well-being
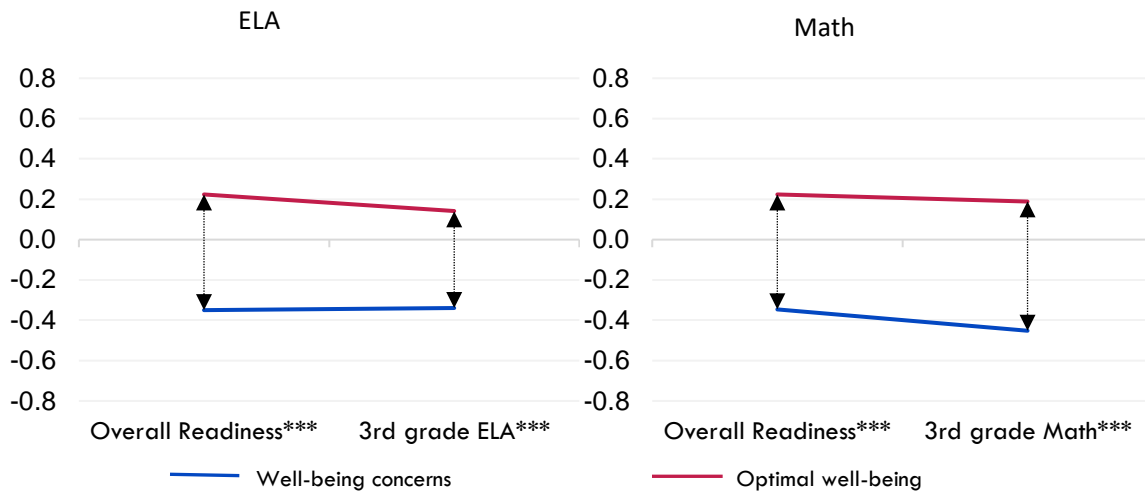
*Source: Kindergarten Observation Form and HUSD/OUSD Data. N=361-365 for students who had optimal well-being (rarely/never came to kindergarten hungry, sick, or tired) and 154 for other students. Statistical significance levels are designated as follows: * p < .05, ** p < .01, *** p < .001.*

RACE/ETHNICITY

Two racial/ethnic groups were compared: (1) Hispanic/Latino and Black/African American students; and (2) White, Asian, and Multi-racial students. Hispanic/Latino and Black/African American students started kindergarten with significantly lower readiness levels than their peers, and by third grade, the gap between the groups had grown from a 0.18-standardized-point difference in overall readiness in kindergarten to 0.54-point gap in ELA and 0.55-point gap in Math (but only the gap for ELA was statistically significant).

Figure 12. **Kindergarten achievement gap between Black/African American or Hispanic/Latino students and students of other races/ethnicities widened by third grade**

ELA

Math

Black/Latino — Asian/White/Other
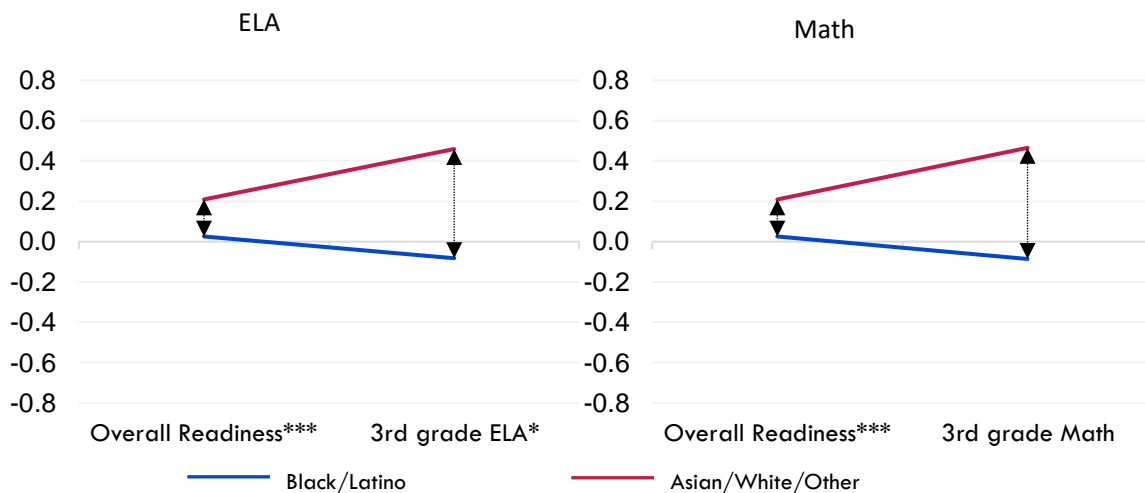
*Source: Kindergarten Observation Form and HUSD/OUSD Data. N=436-440 for Black/African American or Hispanic students and 78 for other students. Statistical significance levels are designated as follows: * p < .05, ** p < .01, *** p < .001.*

INCOME

A significant achievement gap is present at kindergarten entry between students whose families were earning less than $50,000 per year relative to their peers who came from higher-income families. This gap doubled from a 0.38-point gap in kindergarten to a 0.77-point gap in third grade for ELA. The gap in third grade Math proficiency widened to 0.56 points.

Figure 13. **Achievement gaps increased in both ELA and Math between lower- and higher-income households**
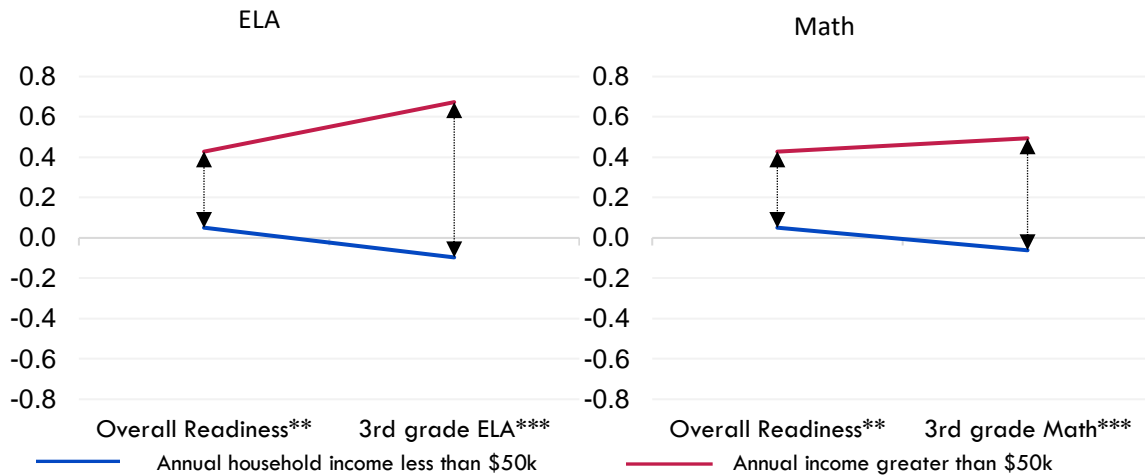
Source: Kindergarten Observation Form and HUSD/OUSD Data. N=364-366 for students whose households earn less than $50k annually and 55 for other students. Statistical significance levels are designated as follows: * p < .05, ** p < .01, *** p < .001.

LANGUAGE

Students who were identified in kindergarten as being English Learners had only slightly lower readiness scores than students who were proficient in English. This gap increased to statistical significance by third grade for ELA. For Math, although the gap between English Learners and others widened somewhat by third grade, this gap was not statistically significant.

Figure 14. **Insignificant kinder readiness gap widened to significance for English Learners in third grade ELA**
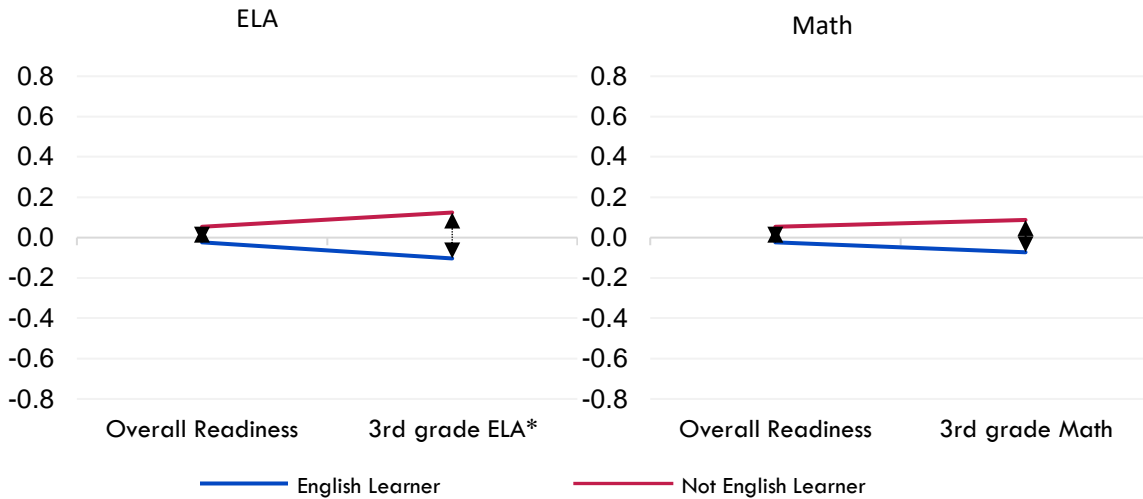
Source: Kindergarten Observation Form and HUSD/OUSD Data. N=294-298 for EL students and 141 for other students. Statistical significance levels are designated as follows: * p < .05, ** p < .01, *** p < .001.

GENDER

A significant gender gap in achievement was present at kindergarten entry such that girls outperformed boys in their overall readiness scores by 0.22 points. By third grade, this gap closed to non-significance (0.12) in ELA, and in Math proficiency, the pattern flipped, such that boys outperformed girls by 0.14 points, though this difference was not statistically significant.

Figure 15. **Achievement gaps closed between boys and girls**
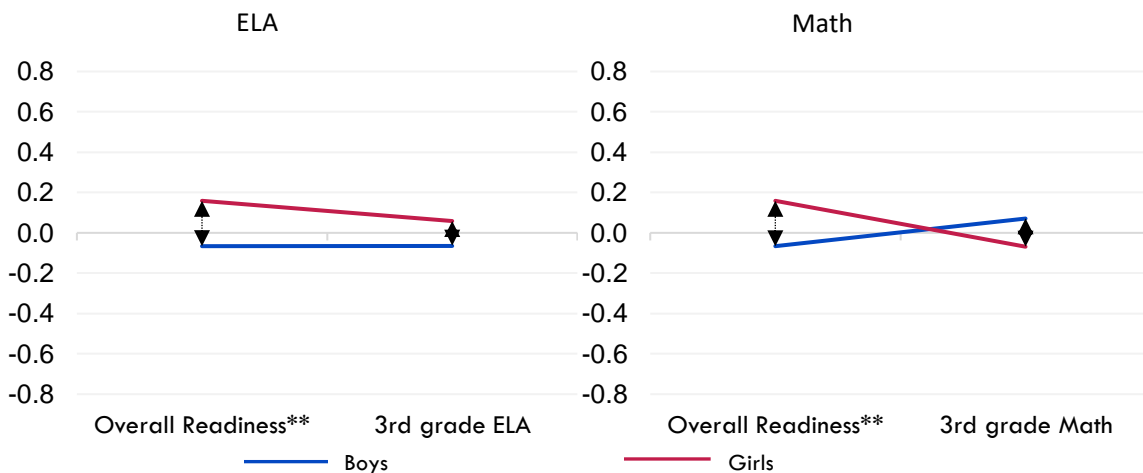
Source: Kindergarten Observation Form and HUSD/OUSD Data. N=243-245 for boys; 272-274 for girls. Statistical significance levels are designated as follows: * p < .05, ** p < .01, *** p < .001.

GENDER & RACE/ETHNICITY

Among Hispanic/Latino and Black/African American students, a gender achievement gap favoring girls persisted from kindergarten into third grade in ELA. However, as with the overall sample, boys ended up surpassing girls in third grade Math, though this gap was not statistically significant.

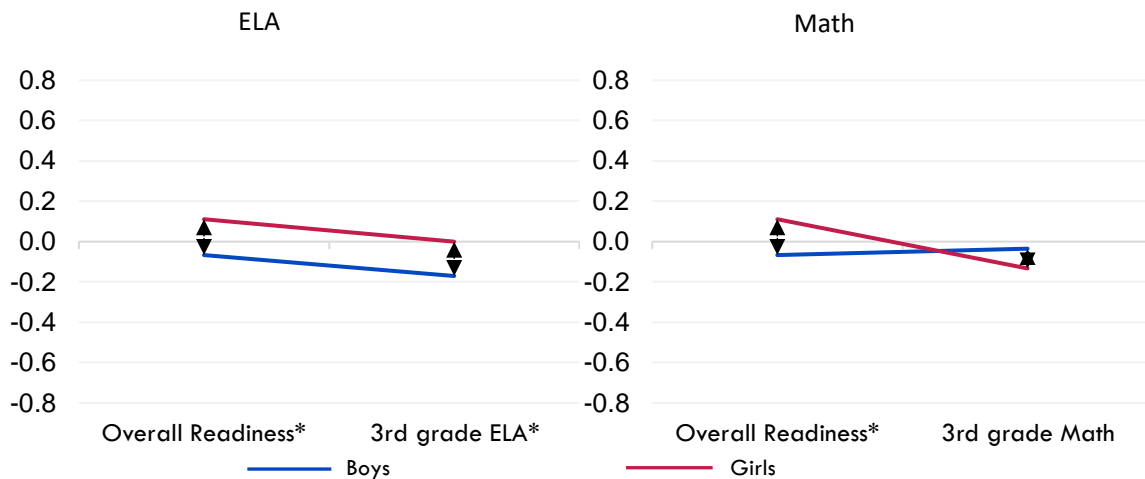**Figure 16.** **Among Hispanic/Latino and African American/Black boys and girls, achievement gaps persisted in ELA but closed in Math**

*Source: Kindergarten Observation Form and HUSD/OUSD Data. N=210-212 for boys; 226-228 for girls. Statistical significance levels are designated as follows: * p < .05.*

These analyses indicated whether the students who start out kindergarten with skill deficits were likely to gain any ground during their first few years of school. The analyses also tell us which groups fall even further behind their peers in their early elementary years. The achievement trajectories show that:

- Students who came to school tired, sick, or hungry, started out with much lower kindergarten readiness levels than their healthy peers, an achievement gap that remained large and statistically significant in both subjects in third grade.

- Black/African American and Hispanic/Latino students have a significant achievement gap at kindergarten relative to their peers, and this gap more than doubled by third grade for both ELA and math.

- Relative to their peers from higher-income households, students from households earning less than $50,000 annually had lower kindergarten readiness, and the achievement gap widened by third grade, particularly in ELA.

- Initially non-significant gaps between English language learners and their peers at kindergarten increased by third grade: The achievement gap increased to statistical significance in ELA, but not in Math.

- ■ Although girls significantly outperform boys in kindergarten, this achievement gap narrows to non-significance at third grade for the overall sample. However, the gender gap favoring girls persisted for ELA among Black/African American and Hispanic/Latino students.

Establishing the cause of persistent achievement gaps was beyond the scope of this study, but other research offers potential explanations. For example, the achievement gap between Black/African American and Hispanic/Latino children and their peers has been attributed to economic inequality,[xix] school and neighborhood segregation (which results in different schooling experiences for children of different races/ethnicities),[xx] the assignment of less experienced teachers to classrooms and schools with high concentrations of low income students and students of color,[xxi] and structural racism and implicit bias leading to differential treatment in the classroom according to the child's race/ethnicity (e.g., differences in teaching and discipline practices).[xxii]

Similarly, other research suggests the achievement gaps between children from low-income households and their more affluent peers can be partly explained by differences in exposure to high-quality early care settings and access to well-resourced schools and neighborhoods,[xxiii] the effects of poverty on children's brain development (particularly in areas of the brain associated with memory, executive functioning, and language processing),[xxiv] and differences in exposure to stressors and toxins in the environment.[xxv]

It is also well documented that children who are healthy, food secure, and well-rested have significantly higher levels of academic achievement,[xxvi] likely because improved health and well-being leads to better cognitive performance, particularly in memory and the ability to focus, as well as consistent school attendance.[xxvii] In fact, when we analyzed the relationship of health and well-being to absenteeism in the study sample, we found a significant, positive correlation between well-being concerns in kindergarten and absences in third grade. Among children who never or rarely came to kindergarten hungry, sick, or tired, only 5% were chronically absent in third grade. Of those children who had well-being concerns, the chronic absenteeism rate in third grade doubled to 10%. This suggests that health and well-being concerns observed in kindergarten likely persisted through early elementary school, affecting children's attendance. Absenteeism, in turn, strongly predicted third grade performance, as will be described in the next section of the report.

Finally, the gender differences in readiness we observed at kindergarten entry may be attributable to the slower pace of development among boys in certain skill areas, including self-regulation.[xxviii] By third grade, however, girls tend to outperform boys in reading, while boys tend to outperform girls in math,[xxix] a pattern also observed in the current study, but that was not statistically significant. Our results are also similar to those of other studies that have found girls of color achieve higher levels of reading proficiency than boys of color.[xxx] As with racial disparities, this achievement gap may be due to implicit bias or a cultural mismatch between male students of color and their predominately white and female teachers that results in disproportionate rates of disciplinary action, lower teacher expectations, or poorer student-teacher relationships, all of which can have implications for academic performance.[xxxi] Some research similarly suggests the underrepresentation of male teachers and teachers of color may contribute to the achievement gaps between boys of color and their peers.[xxxii] The fact that the gender gap among children of color in our study was only observed for ELA may be because stereotypes about boys' relative advantage in math skills, which have been shown to contribute to higher levels of math confidence and interest among boys, served as a buffer, leading to improved math performance for boys of color.[xxxiii]

Although the disparities in kindergarten readiness and third grade performance described in this section are consistent with those found in other research, the data presented above are somewhat limited in that they look at the achievement gap based on individual student characteristics in isolation from other factors that may be the true drivers of academic outcomes. Therefore, later in this report, we present results from analyses that identify the factors that have the strongest associations with school success, when all other influences are simultaneously take into consideration.

RESEARCH QUESTION 1B: BY THIRD GRADE, SOME STUDENTS "BEAT THE ODDS" BY DEMONSTRATING PROFICIENCY IN THIRD GRADE WHEN THEY WERE NOT READY IN KINDERGARTEN, AND SOME "FELL BEHIND" IN THIRD GRADE EVEN THOUGH THEY WERE FULLY READY IN KINDERGARTEN. HOW WERE THESE CHILDREN DIFFERENT FROM THEIR PEERS?

Why do some students poised to succeed at kindergarten falter by third grade, while other students who do not seem equipped at kindergarten entry thrive by third grade? To systematically compare students with different kindergarten-to-third-grade trajectories, we first categorized children who were either *Not Ready* or *Ready* in kindergarten into the following, mutually exclusive groups depending on their K-to-3rd grade trajectories:

- *Not Ready* in kindergarten and *not meeting* SBAC standards in *either* Math or ELA in third grade (38% of the sub-sample)

- *Not Ready* in kindergarten and *meeting or exceeding* SBAC standards in Math and/or ELA in third grade (10%)

- *Ready* in kindergarten and *not meeting* SBAC standards in *either* Math or ELA in third grade (33%)

- *Ready* in kindergarten and *meeting or exceeding* SBAC standards in Math and/or ELA in third grade (20%)

We then examined the relationship between membership in these categories and a set of key variables: demographic and other child characteristics, socioeconomic and family factors at kindergarten, enrichment experiences at kindergarten, and third grade absenteeism, as listed in Appendix Table 7. A multinomial logistic regression model was developed to understand the factors associated with students' trajectories. The focus of this analysis was on 1) children who were *Fully Ready* in kindergarten, but failed to demonstrate proficiency in third grade, and 2) children who were *Not Ready* in kindergarten, but went on to achieve proficiency in third grade. The children in these two categories were compared to children who had third grade outcomes consistent with their kindergarten readiness levels (i.e., *Not Ready* students who were not proficient in third grade and *Fully Ready* students who were proficient in third grade).

Results from the analysis indicate that children who were *Fully Ready* in kindergarten, but did not meet third grade standards in Math or ELA were somewhat more likely to be boys, English Learners, and from families with an annual household income of less than $50,000 at kindergarten entry.

Compared to other students who were *Not Ready* for kindergarten and who were also not meeting SBAC standards by third grade, *Not Ready* students who were able to "beat the odds" and meet one or both SBAC standards in third grade were somewhat older, and their families accessed a slightly greater number of local community resources when they were kindergartners. Ironically, these students were read to slightly less frequently in kindergarten as compared to those students who were not prepared for kindergarten and also not meeting standards in third grade.

The results of the above analyses should be interpreted with caution, however, as the relationships described were only marginally significant (p<0.10), and the sample size for some of the categories was very small. Furthermore, there are many other potential factors contributing to children's trajectories that were not measured in the current study, including parent engagement at school, curricula, and classroom teaching quality.

We then explored whether there was a relationship between school characteristics and children's trajectories. To do this, we grouped the schools in our sample according to the proportion of students attending who "beat the odds" in the proportion who "fell behind" between kindergarten and third grade. Schools that had a higher than average percentage of children who improved in their academic performance from kindergarten to third grade were categorized as "beating the odds" schools (7 of the 23 schools[xxxiii]). Conversely, those with a higher than average percentage of children who declined in their performance from kindergarten to third grade were labeled "falling behind" schools (8 schools). The remaining eight schools were categorized as "stable". These groups of schools were then compared on four characteristics:

- The percent of students who were enrolled in the free or reduced price lunch program

- The percent of students who were English Learners

- The percent of students who were Black/African American or Hispanic/Latino (as these children tended to have lower third grade achievement scores than their white and Asian peers)

- Average ELA and Math scores

- The location of the school

As shown in the chart below, the "beating the odds" schools were more socioeconomically advantaged than schools where children were "falling behind" or "stable" in their trajectories. At "beating the odds" schools, 71% of children were receiving free or reduced price lunch, compared to 89% of children at "falling behind" schools and 84% of children at "stable" schools.

In contrast, there were no significant differences between the groups of schools in the percent of students who were English Learners and the percent of children who were Black/African American or Hispanic/Latino.

Figure 17. **The percent of students receiving free or reduced price lunch is lower in schools where children were beating the odds**
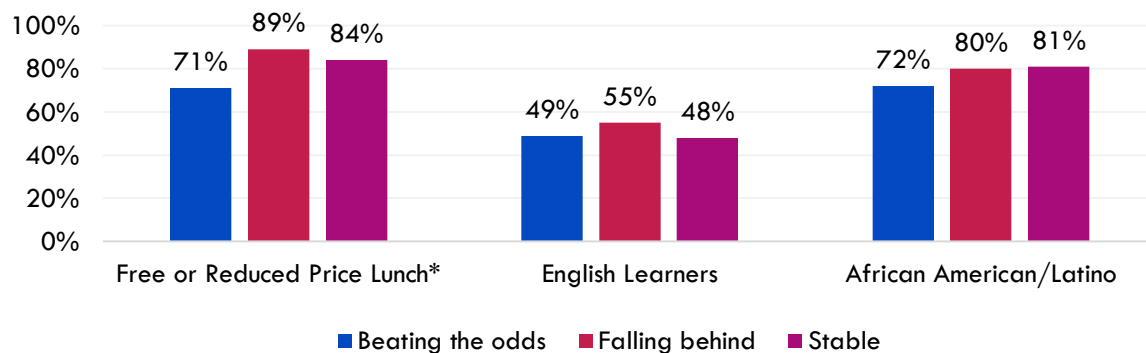
*Source: Kindergarten Observation Form, HUSD/OUSD administrative data. N=22. * p < .05.*

Schools where children were "beating the odds" were significantly higher performing on average in Math and somewhat higher performing in ELA, but the ELA score differences between the three groups of schools were only marginally significant. In both subjects, the "falling behind" schools had the lowest average scores, the "beating the odds" schools had the highest average scores, and average scores for the "stable" schools fell in between.

Figure 18.   **Schools where children were beating the odds had higher SBAC scores overall**
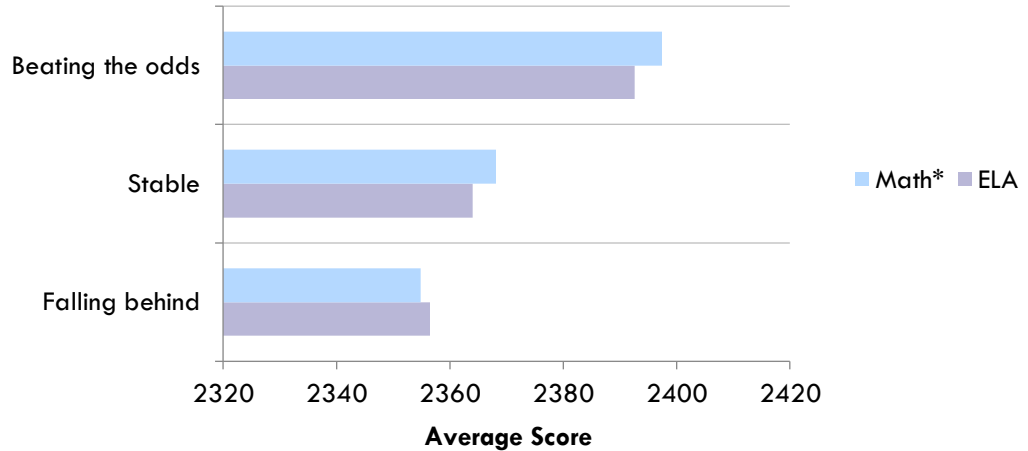
*Source: Kindergarten Observation Form, Parent Information Form; HUSD, OUSD administrative data. N=22. * p < .05.*

This school level analysis of the 2018 Alameda County Longitudinal Study data revealed that schools where children were more likely to "beat the odds" and improve in their academic performance from kindergarten to third grade tended to be socioeconomically more advantaged, as measured by the proportion of students enrolled in the free or reduced lunch program, and they were higher performing in math, as measured by average scores on the SBAC assessments. However, there were no differences between schools where children were "beating the odds" and those where children were "falling behind" or "stable" in their kindergarten to third grade trajectories based on the proportion of English Learners at the schools, their racial/ethnic makeup, or where they were located. This analysis was limited by the lack of data for a variety of potentially significant school characteristics (e.g., the background of teachers at the school, the curricula used, school climate, academic expectations, and average classroom size). Nevertheless, it suggests that children who enter kindergarten with lower readiness levels benefit from attending schools where students have access to greater economic resources and are higher performing academically. Future research might explore additional school qualities and resources that help children overcome early academic challenges.

RESEARCH QUESTION 2: WHAT CHILD, FAMILY, AND KINDERGARTEN READINESS FACTORS PREDICT LATER ACADEMIC OUTCOMES? ARE THERE CUMULATIVE EFFECTS OF PROTECTIVE FACTORS?

This section examines whether and how child, family, and kindergarten readiness factors are associated with students' later academic outcomes in Math and English Language Arts, as measured by performance on the SBAC.

FACTORS ASSOCIATED WITH MEETING THIRD GRADE STANDARDS

Kindergarten Readiness

First, we examine the relationship between kindergarten readiness, as measured by Kindergarten Observation Form, and third grade SBAC achievement. SBAC achievement is collapsed into two categories: students who either nearly met or did not meet the SBAC standard and students who either met or exceeded the SBAC standard.

The figure below shows that students who met the third grade standards had significantly higher mean kindergarten readiness scores than students who did not meet the standards. In particular, children who went on to demonstrate proficiency in third grade came to school with higher *Kindergarten Academics* and *Self-Regulation* scores. This finding highlights the importance of kindergarten readiness for longer-term academic achievement.

Figure 19. **Higher kindergarten readiness scores are associated with third grade SBAC achievement**
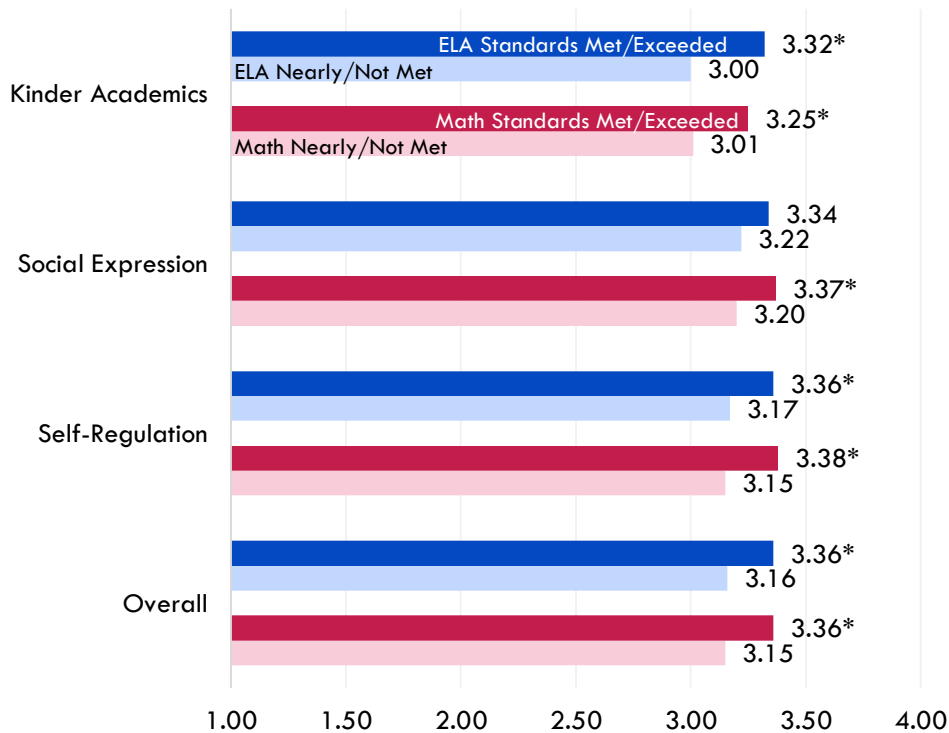
*Source: KOF, PIF, HUSD and OUSD administrative data. Note: * Indicates statistically significant differences in KOF domain scores between students who met/exceeded and those who nearly/did not meet standards, at the p<0.05 level.*

Examining the Importance of Kindergarten Academics and Self-Regulation

As shown in the previous section, students who demonstrated greater mastery at kindergarten entry, particularly in *Self-Regulation* and *Kindergarten Academics*, generally went on to achieve proficiency on SBAC standards in Math and ELA in third grade. Prior studies by ASR in other California counties have found that these two domains of kindergarten readiness, *Kindergarten Academics* and *Self-Regulation*, most strongly predicted performance on ELA and Math standardized tests taken 3 ½ years later.[xxxiv] To take a closer look at student trajectories in Alameda County, we examined the third grade outcomes of students who were "ready" in these two domains (i.e., their scores indicated they were proficient or nearly proficient across skills in the domains).[xxxv] As shown below, students who were ready in *Kindergarten Academics* alone or in both *Kindergarten Academics* and *Self-Regulation* in kindergarten tended to out-perform their peers in third grade in both ELA and math standards.

Figure 20.   **Students with strengths in *Kindergarten Academics* and *Self-Regulation* in kindergarten out-perform their peers in third grade SBAC ELA and Math**
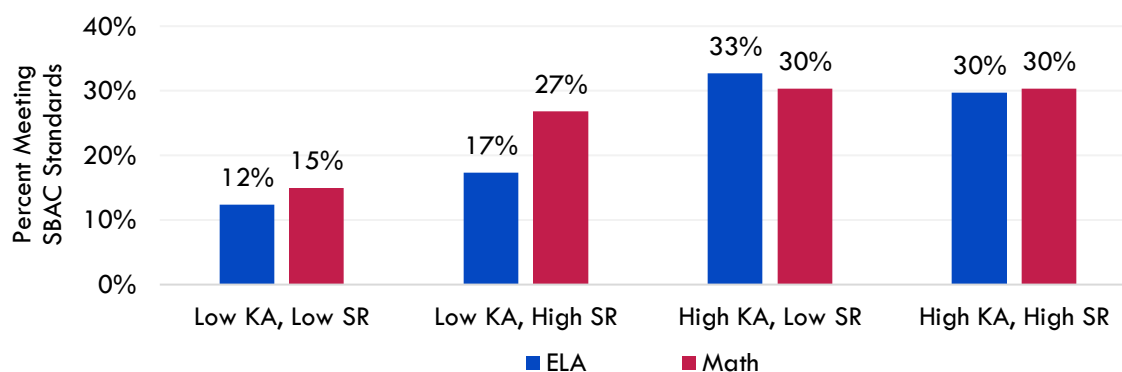
Source: Kindergarten Observation Form, Parent Information Form, HUSD/OUSD administrative data. N=481-482. ANOVA tests of statistical significance indicate significant differences at the p<0.05 level between low/low and all other combinations of Kindergarten Academics and Self-Regulation skills in ELA and Math.

Factors Predicting Third Grade Outcomes

We then examined the characteristics of children who met or exceeded SBAC standards in Math and English Language Arts. Appendix Table 4. contains the full descriptive statistics of the sample, by third grade proficiency levels. Bivariate correlations between kindergarten factors and third grade SBAC raw scores were also examined. The correlations table is contained in Appendix Table 6. and demonstrates that many of the factors that are associated with performance in English Language Arts are the same as those associated with Math performance.

Next, linear regression models were developed to estimate the effect of multiple predictors on third grade performance, as measured by SBAC ELA and Math scores. An initial model was tested, which included all of the predictor variables listed in Appendix Table 4. Models also included measures for race/ethnicity, overall kindergarten readiness scores, and a measure of total third grade absences.[xxxvi] In addition, measures for mother's education and household income were collapsed into a single dichotomous measure identifying cases whose mothers had less than a high school education OR whose household incomes were less than $50,000 at kindergarten entry. Interactions between characteristics were also tested in preliminary models

and were ultimately excluded, as no significant interactions were found. Based on those results, the decision was made to drop the variables that were not significantly associated with SBAC outcomes to arrive at a more parsimonious model. These steps preserved cases that would otherwise be lost to missing values, preserved the degrees of freedom in the model, provided for a simpler model for interpretation, and ultimately had no meaningful impact on the statistically significant findings presented next.

The following figure identifies the statistically significant factors affecting either ELA or Math scores, which were able to account for about 25% of the variance in SBAC scores.[xxxvii] As illustrated below, child well-being at kindergarten, as measured by the frequency with which children came to their kindergarten class hungry, tired, or sick, was strongly associated with both SBAC Math and ELA achievement. This finding indicates that the more frequently a child demonstrated well-being concerns in kindergarten, the lower he or she scored on the SBAC (a one-unit increase in a teacher's rating of a child's frequency of coming to school tired, sick, or hungry was associated with a 50-point drop in ELA scores and a 41-point decrease in Math scores on the SBAC). Being an English Learner at kindergarten entry was also negatively associated with SBAC ELA and Math achievement, as was absenteeism in third grade. These effects were statistically significant. Low socioeconomic status was also found to be a statistically significant predictor of lower SBAC ELA scores, but not of Math achievement.

Figure 21. **Child well-being in kindergarten is the strongest predictor of third grade outcomes in multivariate modeling of ELA and Math SBAC scores**
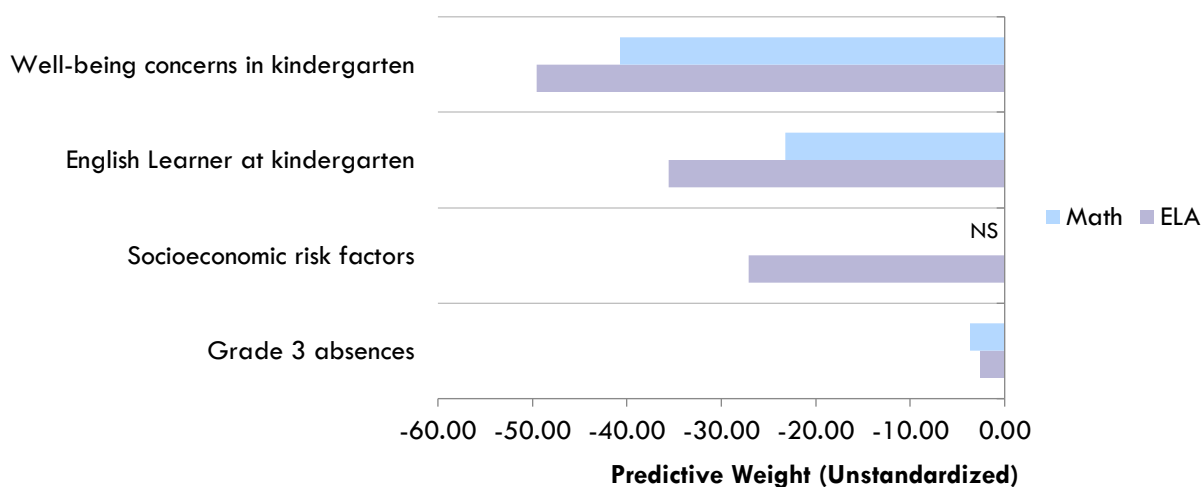
Source: Kindergarten Observation Form, Parent Information Form; HUSD, OUSD administrative data. ELA N=212; Math N=211. Notes: The results shown are unstandardized coefficients, and provide information about the unit-change in the outcome variable given a one-unit change in the predictor. The overall regression model explains 24% of the variance in 3rd grade ELA and 25% of the variance in 3rd grade Math scores. All shown results were statistically significant at the p<0.05 level. NS=not significant.

The preceding analyses isolated the factors that had a significant, independent association with third grade outcomes, after controlling for other child and family characteristics. In addition to third grade absenteeism, well-being concerns, socioeconomic risk factors, and being an English Learner emerged as the strongest predictors of third grade outcomes. These factors are also significantly associated with kindergarten readiness, but one of the strongest predictors of kindergarten readiness, preschool attendance, was not predictive of third grade outcomes in the study. There are several possible reasons for this result. First, we

did not have a measure of preschool quality in our study, and the quality of the early childhood education experience (e.g., high quality teacher-child interactions and classrooms with space, furnishings, and materials that are conducive to learning) impacts children's academic achievement.[xxxviii] It should also be noted that California's statewide effort to improve preschool quality, the Quality Rating and Improvement System, was still in development at the time children in our study attended preschool (in the years 2009-2012). Likewise, we did not have data on whether children attended preschool full-day or part-day, which also has a significant association with children's skill development, with full-day preschool producing better outcomes for children than part-day.[xxxix] Finally, some research suggests that the effects of preschool persist long-term for non-cognitive outcomes, even if its effects on cognitive skills are not lasting. The positive impact of quality preschool on participants' social-emotional skills has been shown to improve health, economic, and employment outcomes in adulthood.[xl] Thus, performance on third grade achievement tests may not capture the lasting benefits of early childhood education.

ARE THERE CUMULATIVE EFFECTS OF PROTECTIVE FACTORS ON THE LIKELIHOOD OF THIRD GRADE SUCCESS?

This section examines whether there are cumulative effects of having multiple advantages across individual, family, and/or environmental domains on the likelihood of third grade success. In particular, we examine the degree to which factors that are protective and malleable (i.e., those that might be responsive to interventions) impact third grade achievement.

The figure that follows displays third grade academic outcomes as a function of the number of malleable advantages they started with at kindergarten, controlling for their overall kindergarten readiness score on the KOF. A measure for third grade attendance is also included as a protective factor, as listed below:

- Child characteristics
  - No special needs/IEP
  - Not an English Learner
  - Never appears hungry, tired, ill
- Family factors
  - Mother has completed high school or higher level of education
  - Family income is greater than $50,000
- Enrichment practices and experiences
  - Attended preschool
  - Was read to at home 5+ times/week
- Was not chronically absent in third grade

The number of protective factors a child had based on the above background, family and socioeconomic factors, and enrichment practices were summed and each child received a score,[xli] with higher scores indicating a greater number of advantages the child started kindergarten with. Next, their third grade SBAC outcomes were plotted according to the number of advantages they had. Measures were created to identify student achievement on SBAC Math and ELA standards as follows:

- Student meets or exceeds SBAC Math and/or ELA standards

- Student fails to meet SBAC standards in Math and ELA

As the following figure shows, protective factors are associated with achieving SBAC standards in third grade – the more protective factors a child possesses, the more likely he or she is to meet Math and/or ELA SBAC standards. For example, just 4% of children who had no more than one positive malleable factor were proficient in third grade, while 58% of children who had six to eight positive malleable factors met or exceeded standards in math and/or ELA.

As the # of positive malleable factors increase, so does the likelihood that a 3rd grader will meet or surpass Math/ELA standards
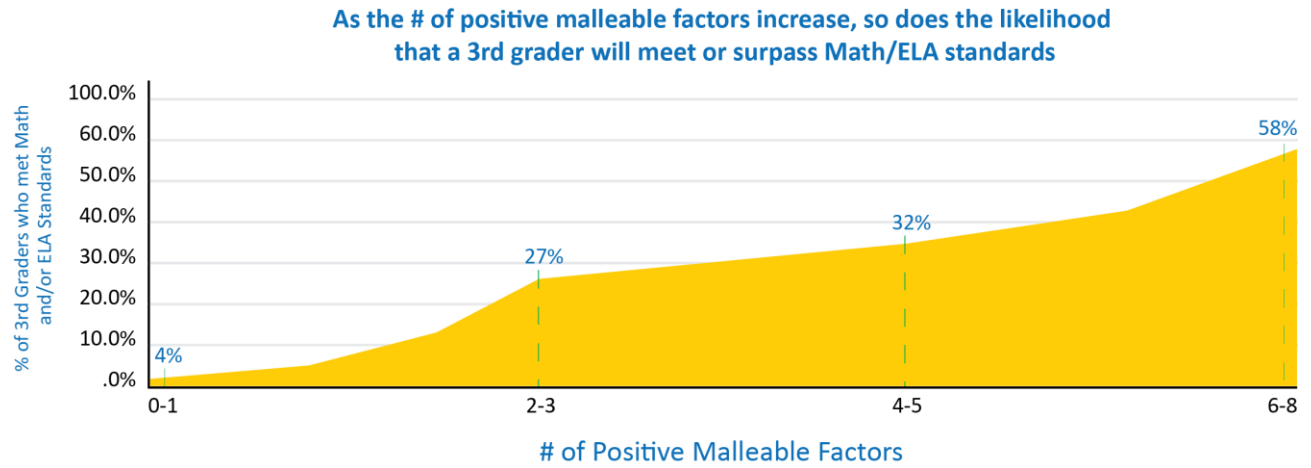
Source: Kindergarten Observation Form, Parent Information Form, HUSD/OUSD administrative data. N=514.

Summary and Recommendations

Consistent with longitudinal studies in other counties, the current study found that children's kindergarten readiness skills, particularly in *Self-Regulation* and *Kindergarten Academics*, are important drivers of later academic achievement. In general, skill gaps observed in kindergarten persisted into third grade and even widened for some children, particularly children of color (especially boys), children with well-being concerns, and children from low-income households. This study demonstrates the correlation between the socioeconomic realities of families and student achievement.

Although the study could not fully assess the causes behind the persistent achievement gaps, other research has shown that children of color and those from lower income households have less exposure to high-quality early care settings and often attend schools in neighborhoods with fewer resources and less experienced teachers, leading to a cycle of poorer school performance. In addition, lower income children of color may experience the negative effects of structural racism and implicit bias leading to differential treatment in the classroom (e.g., differences in teaching and discipline practices). Furthermore, the ill effects of poverty on children's brain development, and exposure to stressors and toxins in the environment, can contribute to poorer school performance. It is also well-documented that children who are healthy, food secure, and well-rested have significantly higher levels of academic achievement, likely because improved health and well-being leads to better cognitive performance, particularly in memory and the ability to focus, as well as regular school attendance.

The factors measured in the current study account for about a quarter of what contributes to children's third grade achievement. This is typical for social science research; it is impossible to isolate and measure all the factors that influence outcomes. Information about other factors, including children's experiences inside and outside of the classroom between kindergarten and third grade, was not available. It should also be noted that the study sample was drawn from lower-performing schools relative to the two school districts and the county as a whole. Nevertheless, the findings were consistent with what has been found in other regions of the state and nation, and point to several opportunities for programs and policies, particularly those that increase access to and utilization of basic needs supports and community resources, address inequity and childhood poverty, improve child health and well-being, promote family engagement, leadership, and community well-being, and encourage consistent school attendance. Investment should also be made in programs that strengthen children's kindergarten readiness skills, including high quality ECE and those that support parents' capacity to offer enriching early experiences at home.

Findings point to the importance of efforts to:

- Address families' basic needs

- Improve children's health and well-being

- Use policy and systems change to reduce inequities, structural racism, and implicit bias

- Encourage consistent school attendance

- Strengthen children's kindergarten readiness skills by improving access to high quality ECE and supporting parents' capacity to offer enriching early experiences at home

First 5 Alameda County makes strategic investments that recognize the interplay between equity, place, health and child well-being and is committed to implementing targeted policies and practices to sustain programs and investments with proven results for kindergarten readiness. This includes addressing inequity and childhood poverty and supporting programs and policies that promote family engagement, leadership, and community well-being. By implementing these policies, we may see an increase in the impact of positive, cumulative effects of interventions that promote the well-being of all children in our county. Considering our finding that achievement gaps generally do not close between kindergarten and the third grade, it is imperative that interventions take place early in the child's life, thereby setting them up for later success.

Appendix A. Study Measures

Appendix Table 1. **The Kindergarten Observation Form includes 24 skills items.**

Basic Building Block	Individual Skill
Self-Care & Motor Skills	Use of small manipulatives such as crayons, paintbrush, buttons, zippers, etc.
	Has general coordination on playground (kicking balls, running, climbing)
	Performs basic self-help / self-care tasks (toileting, eating, washing hands)
Self-Regulation Skills	Comforts self with adult guidance
	Stays focused during activities
	Controls impulses and self-regulates
	Follows one to two step instructions
	Negotiates with peers to resolve social conflicts with adult guidance
	Works and plays cooperatively with peers
	Participates successfully in circle time
	Handles frustration well
Social Expression Skills	Relates appropriately with other adults
	Appropriately expresses needs and wants verbally
	Expresses empathy or caring for others
	Has expressive abilities
	Expresses curiosity and eagerness for learning
	Engages in symbolic play
Kindergarten Academic Skills	Recognizes letters of alphabet
	Writes own first name
	Can recognize rhyming words
	Engages with books
	Can count 10 objects correctly
	Recognizes primary colors
	Recognizes primary shapes

Appendix Table 2. **ELA SBAC scaled score ranges by grade and achievement level**

English Language Arts/Literacy Scale Score Ranges						
Grade	Min Scale Score	Max Scale Score	Scale Score Range for Standard Not Met	Scale Score Range for Standard Nearly Met	Scale Score Range for Standard Met	Scale Score Range for Standard Exceeded
3	2114	2623	2114–2366	2367–2431	2432–2489	2490–2623
4	2131	2663	2131–2415	2416–2472	2473–2532	2533–2663
5	2201	2701	2201–2441	2442–2501	2502–2581	2582–2701
6	2210	2724	2210–2456	2457–2530	2531–2617	2618–2724

Appendix Table 3. **Math SBAC scaled score ranges by grade and achievement level**

Mathematics Scale Score Ranges						
Grade	Min Scale Score	Max Scale Score	Scale Score Range for Standard Not Met	Scale Score Range for Standard Nearly Met	Scale Score Range for Standard Met	Scale Score Range for Standard Exceeded
3	2189	2621	2189–2380	2381–2435	2436–2500	2501–2621
4	2204	2659	2204–2410	2411–2484	2485–2548	2549–2659
5	2219	2700	2219–2454	2455–2527	2528–2578	2579–2700
6	2235	2748	2235–2472	2473–2551	2552–2609	2610–2748

Appendix B. Schools Attended by Longitudinal Study Participants in Kindergarten Year

HAYWARD UNIFIED SCHOOL DISTRICT

- Bidwell/Treeview Elementary
- Bowman Elementary
- Burbank Elementary
- Cherryland Elementary
- East Avenue Elementary
- Eldridge Elementary
- Fairview Elementary
- Faith Ringgold School Of Arts And Science
- Glassbrook Elementary
- Harder Elementary
- Palma Ceia Elementary
- Park Elementary
- Ruus Elementary
- Stonebrae Elementary
- Strobridge Elementary
- Tyrrell Elementary

OAKLAND UNIFIED SCHOOL DISTRICT

- Acorn Woodland Elementary
- Allendale Elementary
- Brookfield Elementary
- Carl B. Munck Elementary
- Community United Elementary
- East Oakland Pride Elementary
- Esperanza Elementary
- Franklin Elementary
- Futures Elementary
- Garfield Elementary

- Greenleaf Elementary
- Howard Elementary
- International Community School
- Lafayette Elementary
- Lakeview Elementary
- Laurel Elementary
- Longwood Elementary
- Manzanita Community
- Markham Elementary
- New Highland Academy
- Reach Academy
- Sankofa Academy
- Sequoia Elementary
- Sobrante Park Elementary

Appendix C. Demographics and Family Background and Meeting Third Grade SBAC Standards

Appendix Table 4.   **Third grade ELA and Math achievement varied by demographics and family background**

	ELA Standards Nearly/ Not Met	ELA Standards Met/ Exceeded	Math Standards Nearly/ Not Met	Math Standards Met/ Exceeded
Totals (N=519)	402 (77%)	117 (23%)	385 (75%)	131 (25%)
Hayward Unified School District (N=167)	**119 (71%)**	**48 (29%)***	121 (73%)	45 (27%)
Oakland Unified School District (N=352)	283 (80%)	69 (20%)	264 (75%)	86 (25%)
Gender*				
Male	77%	23%	**69%**	**31%**
Female	78%	22%	**79%**	**21%**
Average age at kindergarten entry*	**5.32**	**5.42**	**5.24**	**5.34**
Received Special Education/IEP in kinder				
Child had special needs	87%	13%	87%	13%
Child had no special needs	81%	19%	**75%±**	**25%**
Child well-being in kindergarten[e] *				
Rarely/never hungry, sick, tired	**73%**	**27%**	69%	31%
Some to every day hungry, sick, tired	**87%**	**13%**	87%	13%
English language proficiency*				
English Learner	**83%**	**17%**	75%	25%
Not English Learner	**74%**	**26%**	74%	26%
Race/Ethnicity*				
Asian (N=35)	**54%**	**46%**	75%	25%
Hispanic (N=348)	**81%**	**19%**	83%	17%
African American (N=92)	**79%**	**21%**	88%	12%
White (N=14)	**43%**	**57%**	38%	63%
Other (N=29)	**69%**	**31%**	83%	17%
Birthweight*				
Child was low birthweight	**90%**	**10%**	87%	13%
Child was not low birthweight	**74%**	**26%**	72%	28%
Mother's education*				
High school or less	**81%**	**19%**	76%	24%
Greater than a high school education	**68%**	**32%**	70%	30%
Teen motherhood				
Mother was a teen when child was born	79%	21%	68%	32%

	ELA Standards Nearly/ Not Met	ELA Standards Met/ Exceeded	Math Standards Nearly/ Not Met	Math Standards Met/ Exceeded
Mother was not a teen when child was born	76%	25%	74%	26%
Household income at kindergarten entry*				
$50k or more	**48%**	**52%**	**57%**	**43%**
Less than $50k	**81%**	**19%**	**77%**	**23%**
Single parent household at kindergarten entry±				
Single parent	**82%**	**18%**	**80%**	**20%**
Not single parent	**74%**	**26%**	**72%**	**29%**
Parent lost job within the year prior to kinder entry				
Lost job	78%	22%	77%	23%
No lost job	75%	25%	73%	27%
Child moved more than twice before kinder entry				
Moved twice or less	75%	25%	75%	25%
Moved more than twice	77%	23%	72%	28%
Preschool				
Had preschool	76%	24%	73%	27%
No preschool	79%	21%	76%	24%
Number of times per week child was read aloud to as kindergartner	4.5	4.8	4.5	4.7
Average rating of parenting challenge[a]	1.45	1.39	1.45	1.41
Number of concerns at home[b]	1.63	1.59	1.62	1.65
Social support scale[c]	2.08	**2.30±**	2.11	2.18
Community resources accessed[d]	1.92	2.08	1.93	2.03
Child's bedtime at kindergarten entry				
Before 9pm	75%	25%	75%	25%
9pm or later	77%	23%	73%	27%
Screen time at kindergarten entry				
Limited to 2 hrs or less per day	74%	26%	72%	28%
Not limited	78%	22%	76%	24%

Appendix Table 5. **Proficiency on one or more third grade SBAC tests also varied by demographics and family background**

	SBAC Standards Not Met	ELA or Math (or both) Standards Met/ Exceeded
Totals (N=517)	359 (69%)	158 (31%)
Hayward Unified School District (N=166)	**106 (64%)**	**60 (36%)***
Oakland Unified School District (N=351)	253 (72%)	98 (28%)
Gender*		
Male	**66%**	**34%**
Female	**73%**	**27%**
Average age at kindergarten entry*	**5.32**	**5.39**
Received Special Education/IEP in kinder		
Child had special needs	87%	13%
Child had no special needs	81%	19%
Child well-being in kindergarten[e] *		
Rarely/never hungry, sick, tired	**64%**	**37%**
Some to every day hungry, sick, tired	**83%**	**17%**
English language proficiency		
English Learner	73%	27%
Not English Learner	66%	34%
Race/Ethnicity*		
Asian (N=36)	**39%**	**61%**
Hispanic (N=345)	**73%**	**27%**
African American (N=92)	**72%**	**28%**
White (N=14)	**43%**	**57%**
Other (N=29)	**69%**	**31%**
Mother's education*		
High school or less	**72%**	**28%**
Greater than a high school education	**62%**	**39%**
Teen motherhood		
Mother was a teen when child was born	64%	36%
Mother was not a teen when child was born	68%	32%
Household income at kindergarten entry*		
$50k or more	**38%**	**63%**
Less than $50k	**73%**	**27%**
Single parent household at kindergarten entry*		
Single parent	**75%**	**25%**
Not single parent	**65%**	**35%**
Parent lost job within the year prior to kinder entry		
Lost job	70%	30%
No lost job	67%	33%
Child moved more than twice before kinder entry		
Moved twice or less	69%	31%

	SBAC Standards Not Met	ELA or Math (or both) Standards Met/ Exceeded
Moved more than twice	66%	34%
Preschool		
Had preschool	69%	31%
No preschool	71%	29%
Number of times per week child was read aloud to as kindergartner	4.5	4.7
Screen time at kindergarten entry		
Limited to 2 hrs or less per day	66%	34%
Not limited	70%	30%
Community resources accessed[d]	1.90	2.09
Attendance in third grade		
Not chronically absent	66%	34%
Chronically absent	82%	18%

*Source: KOF, PIF, HUSD and OUSD administrative data. Notes: *indicates statistically significant difference between SBAC standards categories on that item at the p<0.05 level. ± Indicates statistically significant difference at the p<0.10 level. For example, there are statistically significant differences in mother's education between students who met none, one, or both SBAC standards. ᵃParent challenge rating is measured on a 4-point scale that asked parents to indicate how often (none, some, most, all of the time) they felt 1) That your child was much harder to care for than most children, 2) That your child does things that really bother you a lot, 3) You were giving up too much of your life to meet your child's need. Higher scores indicate greater challenges. ᵇConcerns at home are measured on a 3-point scale (not a concern, somewhat of a concern, a big concern) and averaged across 4 concerns: money/paying the bills, health/health care, work-related concerns, problems with your spouse or partner. Higher scores indicate greater concerns. ᶜSocial support is measured on a 4-point scale (definitely true, somewhat true, not very true, not at all true for me) and takes the average of 3 items:1)There is someone I can count on to watch my child if I need to run an errand, 2) There is someone I can count on to watch my child when I need a break, and 3) I can easily find someone to talk to when I need advice on how to raise my child. Higher scores indicate greater needs for social support. ᵈCommunity resources accessed counts the number of resources the parent has accessed among the following: community clinic, arts/music programs, local museums, local parks, libraries, recreational activities/camps/sports. ᵉChild well-being is a composite measure of the frequency with which a child came to school 1) hungry, 2) tired, or 3) sick, measured on a 4-point scale (rarely or almost never, on some days, on most days, just about everyday). Higher scores indicate greater well-being concerns.*

Appendix D. Bivariate Associations

The correlations below represent the strength of the association between the individual factor and the ELA or Math score. As shown in the table below, many of the factors that are associated with performance in English Language Arts are the same as those associated with Math performance. As might be expected, being an English Learner is negatively associated with third grade ELA scores, but it is not statistically associated with third grade Math performance. Interestingly, being a low birthweight baby is associated with ELA but not with Math scores, and the association of household income is stronger for ELA (r=-.26) than it is for Math (r=-.19).

Appendix Table 6.   **Third grade ELA and Math performance are associated with similar factors**

	ELA	Math
Sex (female)	.06	-.07
Child age at kindergarten entry	.05	.07
English Learner	-.11*	-.07
Race/Ethnicity		
Asian	.17*	.21*
Hispanic	-.12*	-.08
African American	-.03	-.09
White	.14*	.08
Multi/Other	-.001	.01
Child was low birthweight	-.10*	-.10
Mother completed less than a high school education	.12*	.14*
Mother was a teen when child was born	-.06	-.03
Household earned less than $50k at kinder entry	-.26*	-.19*
Had preschool	.02	.04
Number of times per week child was read aloud to as kindergartner	.06	.05
Average rating of parenting challenge	-.05	-.06
Number of concerns at home	-.06	-.03
Social support scale	.03	-.01
Community resources accessed	.09	.08
Child's kinder bedtime was 9p or later	-.01	-.02
Average daily kinder screen time (minutes)	-0.	-.04
Received Special Education/IEP in kinder	-.14*	-.18*
Child well-being in kindergarten[e] *	-.21*	-.27*
Kindergarten Readiness Scores:		
Overall	.18*	.19*
Self-Regulation	.15*	.16*
Social Expression	.10*	.09*
Kindergarten Academics	.24*	.25*

*Source: KOF, PIF, HUSD and OUSD administrative data. *Indicates statistically significant at the p<0.05 level [e]Child well-being is a composite measure of the frequency with which a child came to school 1) hungry, 2) tired, or 3) sick, measured on a 4-point scale (rarely or almost never, on some days, on most days, just about everyday). Higher scores indicate greater well-being concerns.*

Appendix E. Multinomial Logistic Regression Modeling Odds of Achievement

Appendix Table 7.   **Variables examined in comparing student trajectories from kindergarten to third grade**

Category	Variables Included	Characteristics typically associated with better kindergarten readiness outcomes
Child characteristics	Gender	Female
	Race	Asian or White
	Age	Age 5.5+ at K entry
	Special needs status	No special needs
	English Learner status	Not an English Learner
	Child well-being	Never appears hungry, tired, or ill
Family/ Socioeconomic factors	Maternal education	Mother has more than HS
	Income level	Family income more than $32K
	Single parenthood	Not a single parent household
Enrichment practices and experiences	Preschool	Attended preschool
	Reading at home	Home reading 5 + times/wk
	Use of local resources (library, parks, zoo, FRCs, museums, Raising a Reader)	Above median use of local resources
Third grade experiences	Absenteeism	Fewer than 18 days absent from school year

Appendix Table 8. **Multinomial Logistic Regression estimating odds of being *Fully Ready* in Kindergarten, but not meeting SBAC standards in third grade**

|	Parameter Estimates				
	B	Std. Error	Wald	Sig.	Exp(B)
Fully Ready in k, not meeting SBAC standards in 3rd — Intercept	6.348	6.837	.862	.353	
Child gender[a]	-1.272	.738	2.969	.085	.280
Black/African American or Hispanic/Latino	1.038	.778	1.780	.182	2.825
Child age	-1.668	1.206	1.912	.167	.189
Special education/IEP in K	16.859	3225.573	.000	.996	20987526.159
ELL in K	1.715	.662	6.717	.010	5.557
Child wellbeing in K	1.169	2.256	.268	.605	3.217
Maternal education	.851	.750	1.290	.256	2.343
Household income in K	1.462	.863	2.869	.090	4.315
Single parent family in K	-1.336	.927	2.079	.149	.263
Preschool	-.712	.689	1.065	.302	.491
Was read aloud to in K	-.071	.120	.355	.551	.931
Use of local community resources in K	.271	.261	1.079	.299	1.311
District[b]	-.340	.707	.231	.631	.712
Chronic absence in 3rd	18.202	5747.485	.000	.997	80367376.286

Note: The reference category is: Fully Ready in K, meeting Math and/or Ela in 3rd grade. Source: Kindergarten Observation Form, Parent Information Form; HUSD, OUSD administrative data. Not Ready in K, not meeting SBAC standards in third: N=47; Not Ready in K, meeting Math or ELA or both standards in third: N=13; Fully Ready in K, not meeting SBAC standards in third: N=38; Fully Ready in K, meeting Math or ELA or both in third: N=22. [a]Gender was coded as follows: 0=Male, 1=Female. [b]A variable to identify the student's school district is included as a control (0=OUSD; 1=HUSD).

Appendix Table 10.   **Multinomial Logistic Regression estimating odds of being *Not Ready* in Kindergarten, and meeting SBAC standards in third grade**

		B	Std. Error	Wald	Sig.	Exp(B)
	Parameter Estimates					
Not Ready in k, meeting Math and/or ELA standards in 3rd grade	Intercept	-29.599	8.544	12.000	.001	
	Child gender[a]	-.038	.762	.003	.960	.962
	Black/African American or Hispanic/Latino	16.969	.000	.	.	23416719.508
	Child age	2.419	1.408	2.951	.086	11.233
	Special education/IEP in K	-.407	1.097	.138	.711	.666
	ELL in K	-.139	.778	.032	.858	.870
	Child wellbeing in K	-.151	1.417	.011	.915	.860
	Maternal education	.442	.809	.299	.585	1.557
	Household income in K	.069	1.412	.002	.961	1.072
	Single parent family in K	-.161	.815	.039	.843	.851
	Preschool	-.237	.814	.085	.771	.789
	Was read aloud to in K	-.399	.214	3.477	.062	.671
	Use of local community resources in K	.558	.327	2.911	.088	1.747
	District[b]	1.303	.832	2.454	.117	.272
	Chronic absence in 3rd	-17.706	.000	.	.	2.044E-008

Note: The reference category is: Not Ready in k, not meeting SBAC standards in 3rd grade. Source: Kindergarten Observation Form, Parent Information Form; HUSD, OUSD administrative data. Not Ready in K, not meeting SBAC standards in third: N=47; Not Ready in K, meeting Math or ELA or both standards in third: N=13; Fully Ready in K, not meeting SBAC standards in third: N=38; Fully Ready in K, meeting Math or ELA or both in third: N=22. In estimating statistics for the effect of race and absenteeism, small cell sizes limited analyses and reliable statistics were not produced for the Wald test of statistical significance. [a]Gender was coded as follows: 0=Male, 1=Female. [B]A variable to identify the student's school district is included as a control (0=OUSD; 1=HUSD).

Appendix F. Student Attendance and Achievement in Grades 4 to 6

Although the focus of this longitudinal study was on third grade outcomes, we also analyzed children's attendance and achievement in fourth, fifth, and sixth grade.

The children in our sample had chronic absenteeism rates in fourth through sixth grade that were similar to the rate among all HUSD and OUSD students in grades 4-6 (approximately 10%). However, rates of absenteeism in the sample were higher than rates in Alameda County and the state overall.

Appendix Figure 1 | **Chronic absenteeism rate in the sample was similar to the rate in the overall student population in HUSD and OUSD, but higher than in the county and state overall**
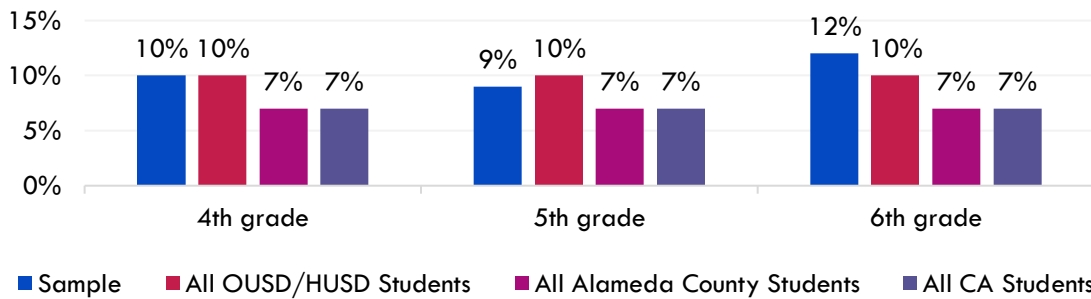
Source: HUSD/OUSD data; CDE DataQuest. Note: Figures for overall population represent all students in HUSD and OUSD in grades 4-6 in 2016-17 (data by grade and for prior years unavailable). Sample 4th grade N=463; 5th grade N=454; 6th grade N=113.

Next, we examined academic achievement among fourth, fifth, and sixth graders in our sample. The figure below shows the percentage of students achieving proficiency in English Language Arts (ELA), as measured by SBAC scores. Across grade levels, students in our sample had ELA proficiency rates that were just slightly lower than the proficiency rates among all students in OUSD and HUSD, but that were significantly lower than the proficiency rates in Alameda County and the state overall.

Appendix Figure 2 | **The study sample was less likely to be proficient in ELA than the general student population**
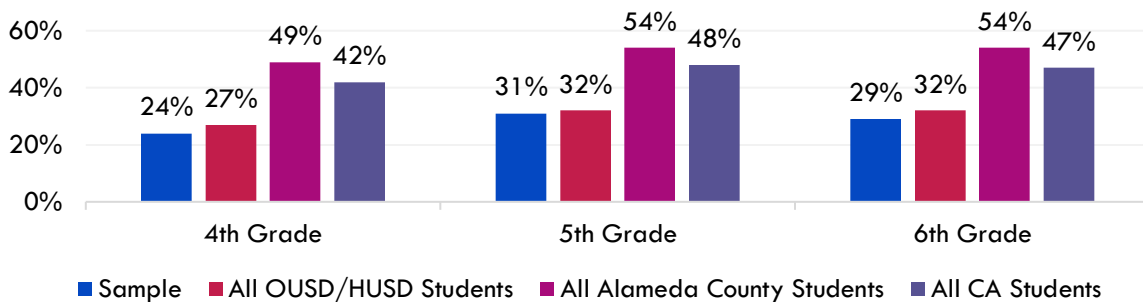

Source: HUSD/OUSD District Data; CDE DataQuest. Note: Data reflect percent of students who met or exceeded standards in 2015 and 2016 (4th graders); 2016 and 2017 (5th graders); and 2017 (6th graders). Sample 4th grade N=453; 5th grade N=450; 6th grade N=203.

Disparities in Math performance between students in the sample and all students in the two districts were more pronounced, particularly in fourth grade, with students in the sample significantly underperforming relative to their peers. Also, as with ELA, the sample had significantly lower levels of Math proficiency than other students Alameda County and the state overall, across all grade levels.

Appendix Figure 3 **The study sample was less likely to be proficient in Math than the general student population**
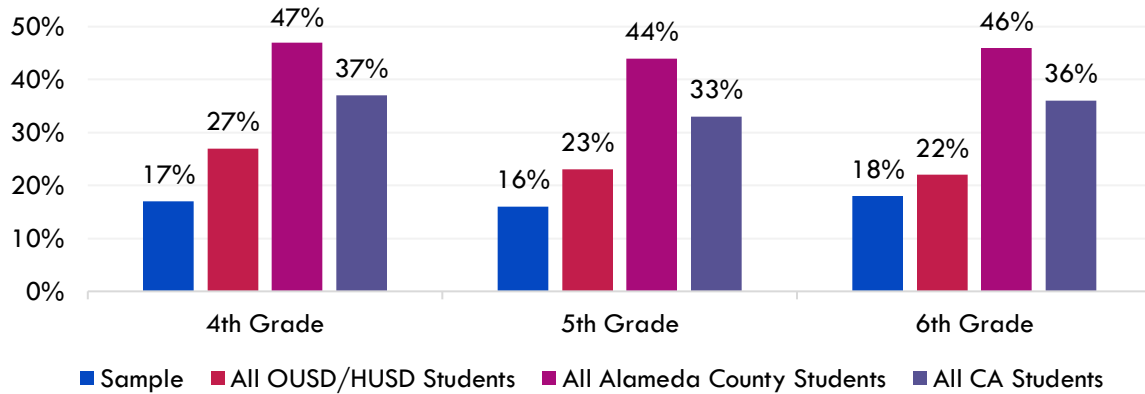
Source: HUSD/OUSD District Data; CDE DataQuest. Note: Data reflect percent of students who met or exceeded standards in 2015 and 2016 (4th graders); 2016 and 2017 (5th graders); and 2017 (6th graders). Sample 4th grade N=453; 5th grade N=450; 6th grade N=203.

Appendix G. Fourth Grade Outcomes

KINDERGARTEN READINESS AND FOURTH GRADE OUTCOMES

As illustrated by the figure below, students who did not meet fourth grade SBAC standards had lower readiness scores in each of the KOF domains. The differences in mean kindergarten readiness scores between those who met and those who failed to meet fourth grade standards were statistically significant in every domain, though differences in average scores were largest in Self-Regulation.

Appendix Figure 4 **Higher kindergarten readiness scores are associated with fourth grade SBAC achievement.**
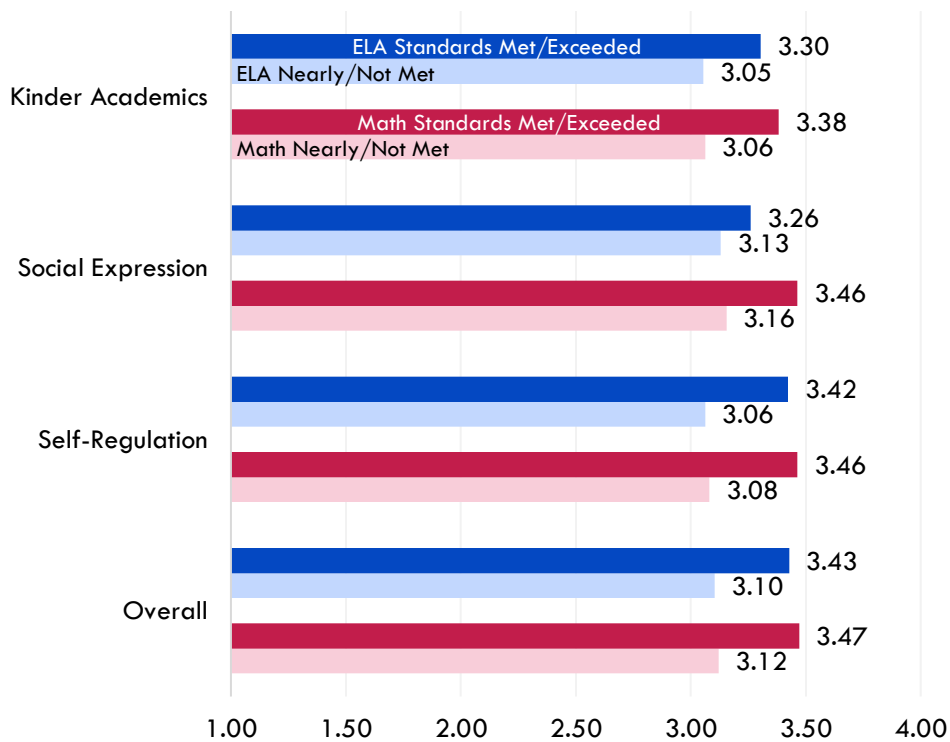
*Source: KOF, PIF, HUSD and OUSD administrative data. N=404-453. Note: * All mean comparisons are statistically significant between students who met/exceeded and those who nearly/did not meet standards, at the p<0.05 level.*

MULTIVARIATE MODELING OF FOURTH GRADE OUTCOMES

Bivariate correlations were initially examined between fourth grade SBAC ELA and Math scores and a series of independent variables that might help to explain fourth grade outcomes. A multivariate regression model was then developed that included items that had a statistically significant association with ELA or Math scores and items that have been demonstrated in past research to have significant impact on later school outcomes.

In the fourth grade, socioeconomic risk factors (i.e., mother had less than high school education or household income was less than $50,000 in kindergarten) were the strongest predictors of SBAC performance in both Math and ELA. Attendance was also a statistically significant predictor; each day of absence was associated with a 2-point decrease in both Math and ELA scores.

Appendix Figure 5   **Absenteeism and socioeconomic risk factors predict fourth grade outcomes in ELA and Math SBAC scores**
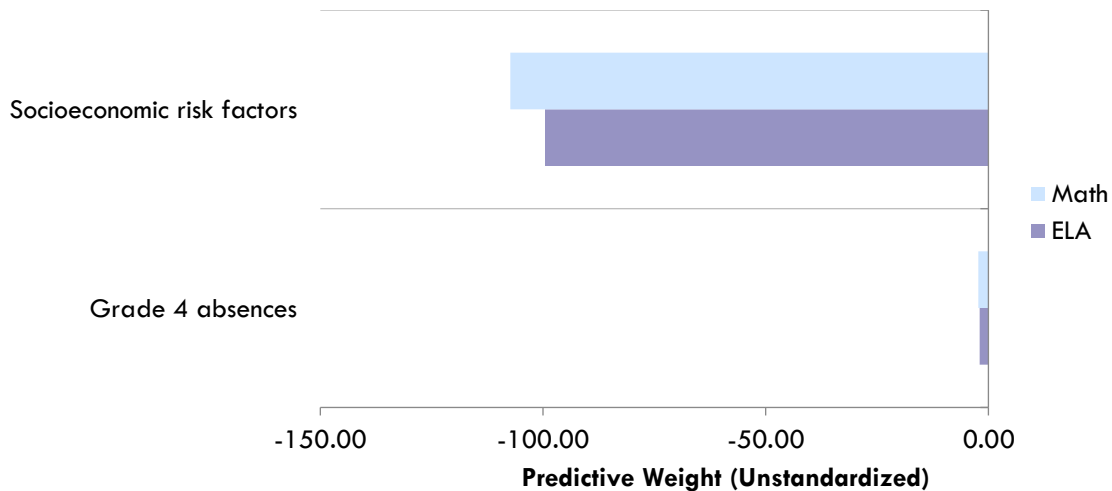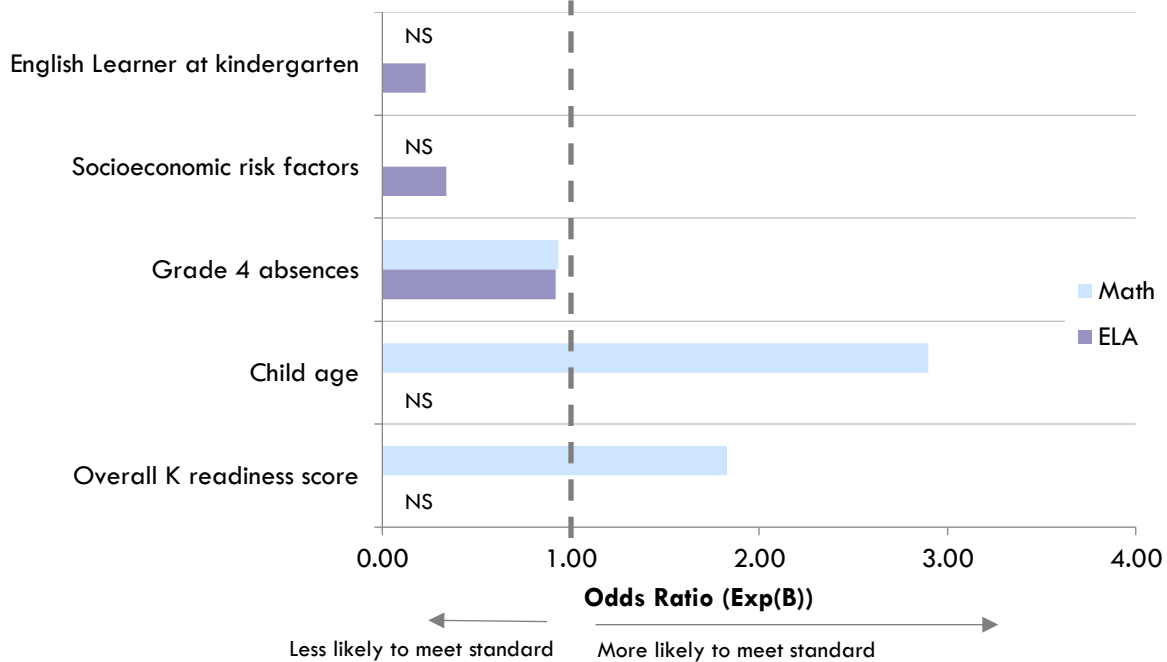

Source: Kindergarten Observation Form, Parent Information Form; HUSD, OUSD administrative data. ELA N=316; Math N=316. Notes: The results shown are unstandardized coefficients, and provide information about the unit-change in the outcome variable given a one-unit change in the predictor. The overall regression model explains 12% of the variance in 4th grade ELA and 13% of the variance in 4th grade Math scores. All shown results were statistically significant at the p<0.05 level.

Multivariate logistic regression analyses were also conducted to estimate the effects of each predictor on the likelihood of achieving fourth grade Math and ELA standards. Odds ratios greater than 1 indicate an increased likelihood of the outcome event (e.g., meeting Math standards or meeting ELA standards), whereas values of less than 1 indicate a decreased likelihood of the event.

As shown in the next figure, absenteeism was a statistically significant predictor of both ELA and Math outcomes, reducing the odds that a student met the fourth grade SBAC standards by roughly 8% with each day of school missed. Having been an English Learner in kindergarten also significantly decreased the odds of a student meeting SBAC ELA standards in fourth grade by 77%. Socioeconomic risk factors, as measured in kindergarten, were associated with a two-thirds decline in the odds of ELA success in fourth grade.

In examining the predictors of meeting SBAC Math standards, other predictors that rose to statistical significance were child age and Overall kindergarten readiness. Every year of age tripled the odds of meeting the Math standards, and every one-point increase in Overall readiness scores on the KOF nearly doubled the odds of success in Math in fourth grade.

Appendix Figure 6   **Absenteeism significantly predicts the likelihood of meeting ELA and Math standards in fourth grade**

Source: Kindergarten Observation Form, Parent Information Form; HUSD, OUSD administrative data. ELA N=328; Math N=328. Notes: The results shown below are the exponentiated coefficients, and provide information about the change in odds of meeting the SBAC standard given a one-unit change in the predictor. All shown results were statistically significant at the p<0.05 level. NS=not significant.

FOURTH GRADE OUTCOMES SUMMARY

Although there are many unmeasured factors that the study could not account for, higher performance on fourth grade standardized assessments was associated with the following:

- Higher kindergarten readiness scores
- Higher socioeconomic status in kindergarten
- Better attendance
- Not an English Learner
- Being older

Appendix H: Fifth Grade Outcomes

KINDERGARTEN READINESS AND FIFTH GRADE OUTCOMES

As illustrated by the figure below, kindergarten readiness scores in each of the KOF domains continues to significantly differentiate students' fifth grade outcomes: Those who did not meet fifth grade SBAC standards had lower scores in each of the KOF domains. The differences in mean kindergarten readiness scores between those who met and those who failed to meet fifth grade standards was statistically significant in every domain, with the largest differences in Self-Regulation and Kindergarten Academics.

Appendix Figure 7   **Higher kindergarten readiness scores are associated with fifth grade SBAC achievement.**
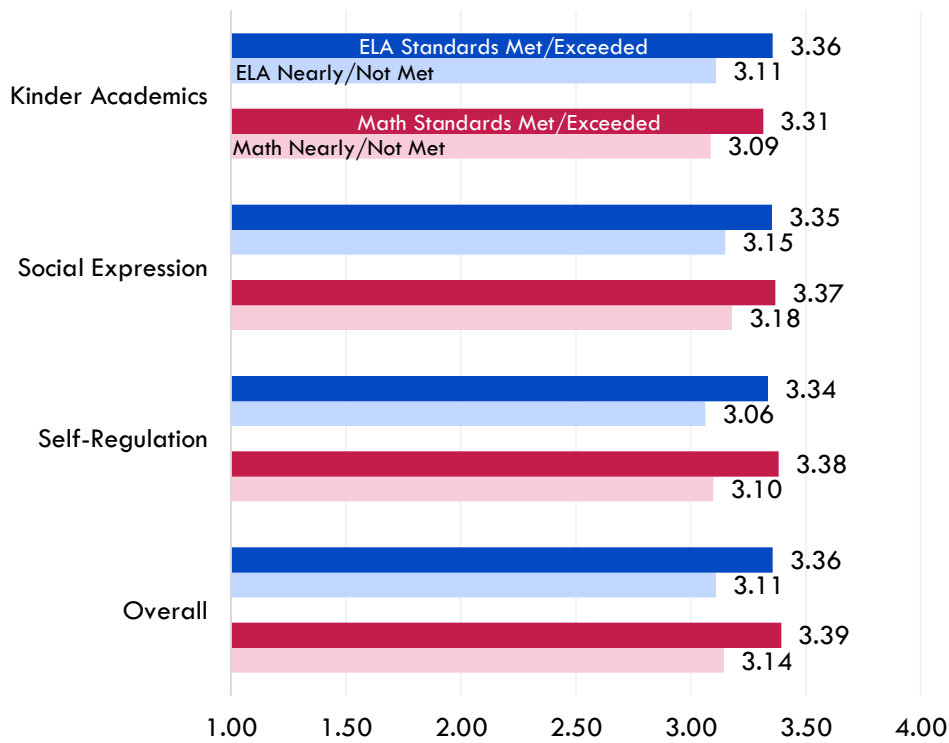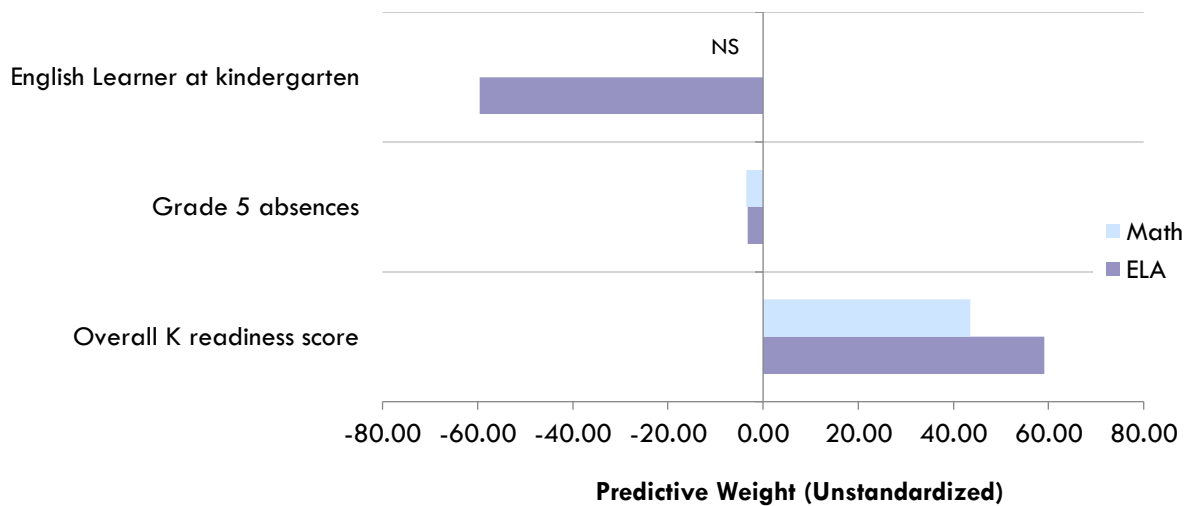

*Source: KOF, PIF, HUSD and OUSD administrative data. N=402-451. Note: * All mean comparisons are statistically significant between students who met/exceeded and those who nearly/did not meet standards, at the p<0.05 level.*

MULTIVARIATE MODELING OF FIFTH GRADE OUTCOMES

Again, bivariate correlations were initially examined between SBAC ELA and Math scores and a series of independent variables that might help to explain fifth grade outcomes. The multivariate regression model that was tested included items that had a statistically significant association with ELA or Math scores and items that have been demonstrated in past research to have significant impact on later school outcomes.

Overall kindergarten readiness was the strongest statistically significant predictor of fifth grade SBAC performance in both ELA and Math: A one-point increase in overall readiness in kindergarten was associated with a 43-point boost in fifth grade Math and a 59-point increase in ELA scores. In addition, being an English Learner in kindergarten was associated with a 59-point decrease in ELA SBAC scores in the fifth grade. Absenteeism in fifth grade was also significantly and negatively associated with both Math and ELA scores.

Appendix Figure 8   **Overall kindergarten readiness scores are among the strongest predictor of fifth grade ELA and Math SBAC scores**
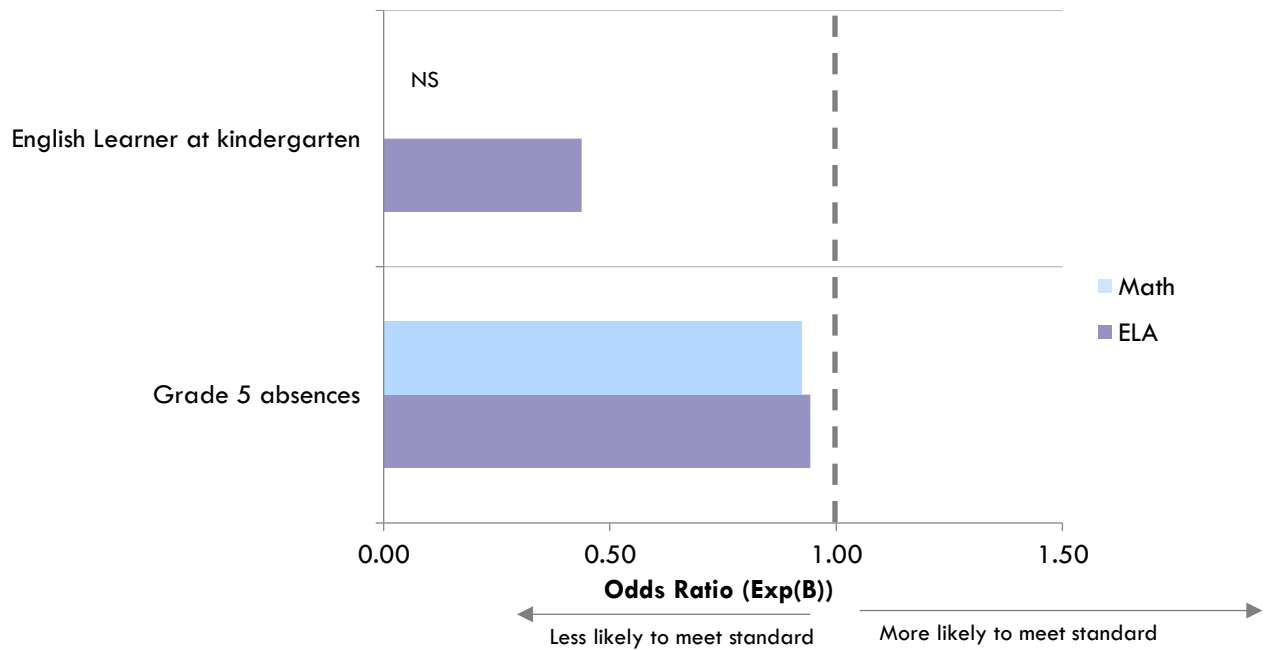

Source: Kindergarten Observation Form, Parent Information Form; HUSD, OUSD administrative data. ELA N=326; Math N=326. Notes: The results shown are unstandardized coefficients, and provide information about the unit-change in the outcome variable given a one-unit change in the predictor. All shown results were statistically significant at the p<0.05 level. NS=not significant.

As above, multivariate logistic regression analyses were conducted to estimate the effects of each predictor on the likelihood of achieving fifth grade Math and ELA standards. Odds ratios greater than 1 indicate an increased likelihood of the outcome event (e.g., meeting Math standards or meeting ELA standards), whereas values of less than 1 indicate a decreased likelihood of the event.

Absenteeism again plays a significant role in SBAC outcomes, as every day of absence in fifth grade was associated with a 7% decrease in the odds of meeting standards in Math and a 6% decrease in the odds of meeting standards in ELA.

Additionally, being an English Learner in kindergarten decreased the odds of a student meeting SBAC ELA standards in fifth grade by 50%.

Appendix Figure 9   **Absenteeism has a significant impact on fifth grade SBAC performance**

Source: Kindergarten Observation Form, Parent Information Form; HUSD, OUSD administrative data. ELA N=327; Math N=328. Notes: The results shown below are the exponentiated coefficients, and provide information about the change in odds of meeting the SBAC standard given a one-unit change in the predictor. All shown results were statistically significant at the p<0.05 level. NS=not significant.

FIFTH GRADE OUTCOMES SUMMARY

Although there are many unmeasured factors that the study could not account for, higher performance on fifth grade standardized assessments was associated with the following:

- Higher kindergarten readiness scores
- Better attendance
- Not an English Learner

Appendix I: Sixth Grade Outcomes

KINDERGARTEN READINESS AND SIXTH GRADE OUTCOMES

As illustrated below, the association between kindergarten readiness and SBAC outcomes had diminished by the sixth grade, such that there were no longer statistically significant associations between any of the kindergarten readiness domain and Math SBAC outcomes. However, with the exception of Social Expression, readiness scores did have a statistically significant association with ELA achievement in the sixth grade. Students who met SBAC standards in sixth grade tended to also be better prepared for kindergarten.

Appendix Figure 10 **Higher kindergarten readiness scores are associated with sixth grade ELA SBAC achievement.**
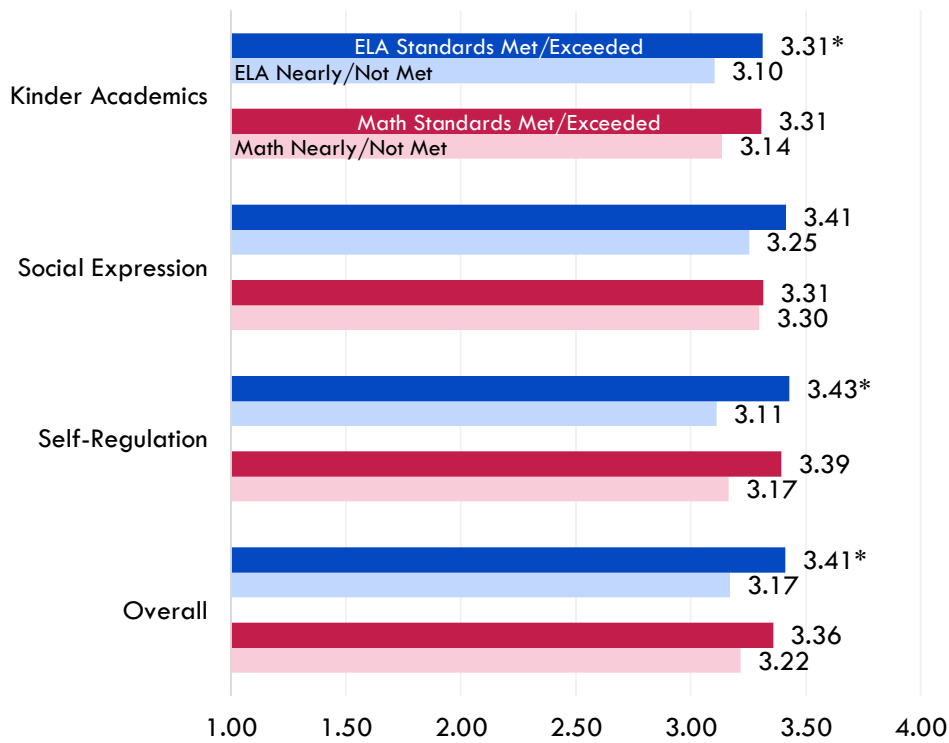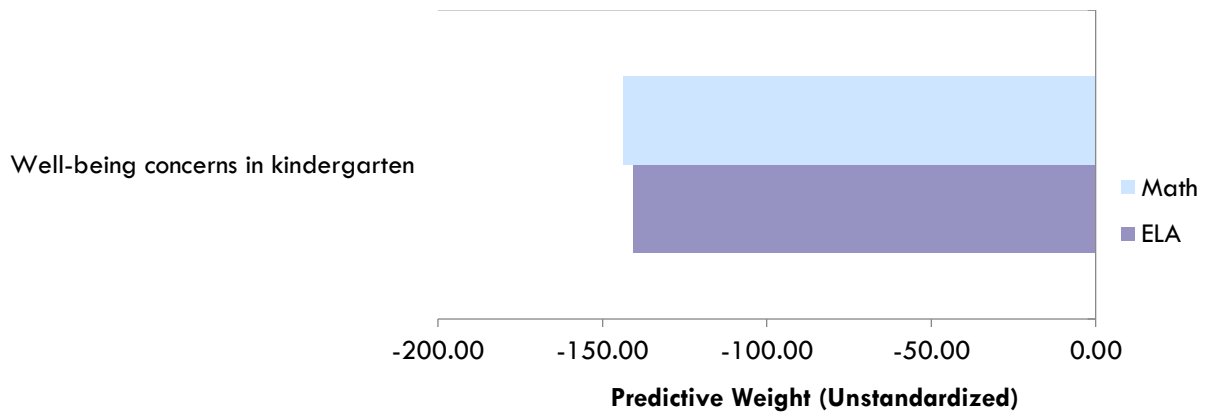

*Source: KOF, PIF, HUSD and OUSD administrative data. N=186-203. Note: * Indicates statistically significant difference in mean scores between students who met/exceeded and those who nearly/did not meet standards, at the $p<0.05$ level.*

MULTIVARIATE MODELING OF SIXTH GRADE OUTCOMES

As with the analysis of fourth and fifth grade outcomes, bivariate correlations were initially examined between SBAC ELA and Math scores and a series of independent variables that might help to explain sixth grade outcomes. The multivariate regression model that was developed included items that had a statistically significant association with ELA or Math scores and items that have been demonstrated in past research to have significant impact on later school outcomes.

In the sixth grade, child well-being in kindergarten was the only statistically significant predictor of SBAC performance in either Math or ELA. Children who demonstrated well-being concerns in kindergarten (i.e., they were tired, sick, or hungry, according to their teacher) had significantly lower Math and ELA scores in sixth grade.

Appendix Figure 11   **Child well-being in kindergarten is the strongest predictor of sixth grade ELA and Math SBAC scores**
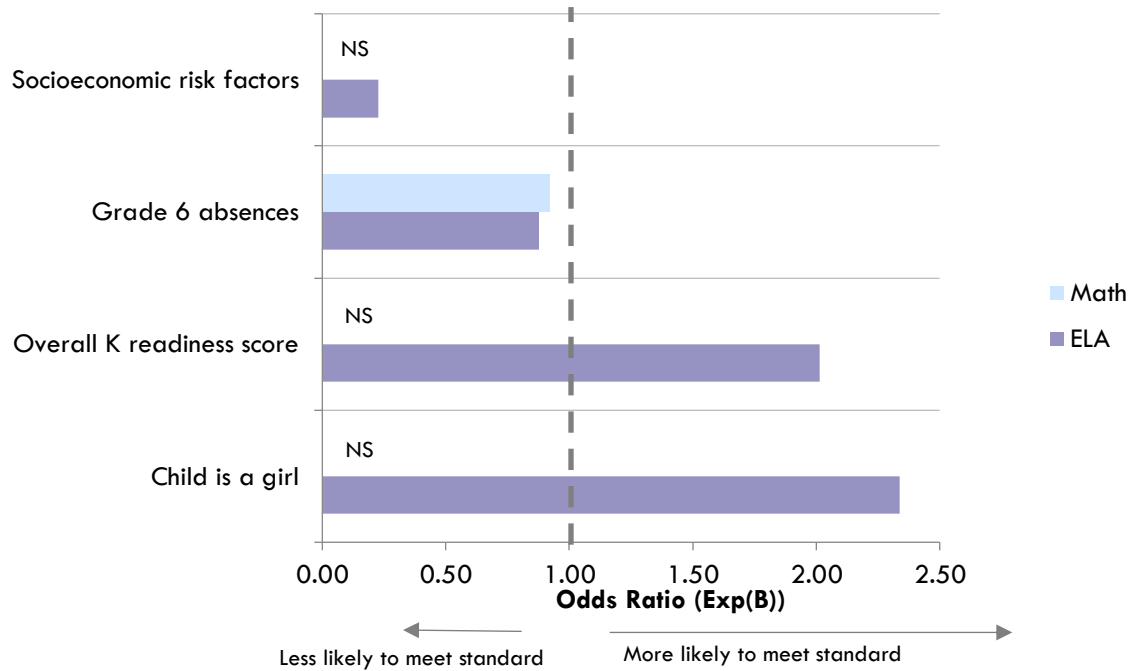

Source: Kindergarten Observation Form, Parent Information Form; HUSD, OUSD administrative data. ELA N=162; Math N=162. Notes: The results shown are unstandardized coefficients, and provide information about the unit-change in the outcome variable given a one-unit change in the predictor. The overall regression model explains 16% of the variance in 6th grade ELA and 16% of the variance in 6th grade Math scores. All shown results were statistically significant at the p<0.05 level.

Again, logistic regression analyses were conducted to estimate the effects of each predictor on the likelihood of achieving sixth grade Math and ELA standards. Odds ratios greater than 1 indicate an increased likelihood of the outcome event (e.g., meeting Math standards or meeting ELA standards), whereas values of less than 1 indicate a decreased likelihood of the event.

As shown in the next figure, absenteeism was the only statistically significant predictor of meeting Math standards on the sixth grade SBAC, and was associated with an 8% decrease in odds of Math success. Absenteeism was also associated with a 12% decrease in the odds of ELA success in the sixth grade.

Being a girl more than doubled the odds of meeting ELA standards in sixth grade. Likewise, every one-point increase in Overall kindergarten readiness scores doubled the odds of meeting sixth grade ELA standards. Conversely, having a mother with less than a high school education or living in a household earning less than $50,000 annually in kindergarten depressed the odds of success in ELA in the sixth grade by one-third.

Appendix Figure 12   **Absenteeism significantly predicts the likelihood of meeting ELA and Math standards in sixth grade**

Source: Kindergarten Observation Form, Parent Information Form; HUSD, OUSD administrative data. ELA N=165; Math N=163. Notes: The results shown below are the exponentiated coefficients, and provide information about the change in odds of meeting the SBAC standard given a one-unit change in the predictor. All shown results were statistically significant at the p<0.05 level. NS=not significant.

SIXTH GRADE OUTCOMES SUMMARY

Although there are many unmeasured factors that the study could not account for, higher performance on sixth grade standardized assessments was associated with the following:

- Higher kindergarten readiness scores
- Better attendance
- Healthy, well-fed, and well-rested in kindergarten
- Being a girl
- Higher socioeconomic status in kindergarten

[i] Fiester, L. (2010). *Early warning! Why reading by the end of third grade matters. KIDS COUNT Special report*. Baltimore, MD: Annie E. Casey Foundation; Lesnick, J., Goerge, R. M., & Smithgall, C. (2010). *Reading on grade level in third grade: How is it related to high school performance and college enrollment?* Chicago, IL: Chapin Hall at the University of Chicago.

[ii] Applied Survey Research. (2010). *School readiness and student achievement: A longitudinal analysis of Santa Clara and San Mateo County students*; Applied Survey Resarch. (2017). *San Francisco school readiness longitudinal study 2017.*

[iii] Fryer, R. G., & Levitt, S. D. (2005). *The black-white test score gap through third grade* (Working paper No. w11049). Cambridge, MA: National Bureau of Economic Research; Rothstein, J., & Wozny, N. (2013). Permanent income and the black-white test score gap. *The Journal of Human Resources, 48*(3), 509-544.

[iv] Kalogrides, D., Loeb, S., & Beteille, T. (2013). Systematic sorting teacher characteristics and class assignments. *Sociology of Education, 86*(2), 103-123.

[v] Casteel, C. A. (1998). Teacher-student interactions and race and integrated classrooms. *Journal of Educational Research, 92*, 115-120; Gregory, A., Skiba, R. J., & Noguera, P. A. (2010). The achievement gap and the discipline gap: Two sides of the same coin?. *Educational Researcher, 39*(1), 59-68.

[vi] Duncan, G. J., & Murnane, R. J. (2016). Rising inequality in family incomes and children's educational outcomes. *RSF Journal of the Social Sciences, 2*(2), 142-158.

[vii] Noble, K. G., Houston, S. M., Brito, N. H., Bartsch, H., Kan, E., Kuperman, J. M., ... & Schork, N. J. (2015). Family income, parental education and brain structure in children and adolescents. *Nature Neuroscience*, *18*(5), 773.

[viii] Evans, G. W., Brooks-Gunn, J., & Klebanov, P. K. (2011). Stressing out the poor. *Pathways*, 22-27.

[ix] Ickovics, J. R., Carroll-Scott, A., Peters, S. M., Schwartz, M., Gilstad-Hayden, K., & McCaslin, C. (2014). Health and academic achievement: cumulative effects of health assets on standardized test scores among urban youth in the United States. *Journal of School Health*, *84*(1), 40-48.

[x] Alaimo, K., Olson, C. M., & Frongillo, E. A. (2001). Food insufficiency and American school-aged children's cognitive, academic, and psychosocial development, Pediatrics, 108(1), 44–53; Curcio, G., Ferrara, M., & De Gennaro, L. (2006). Sleep loss, learning capacity and academic performance. Sleep Medicine Reviews, 10(5), 323-337; Kleinman, R. E., Hall, S., Green, H., Korzec-Ramirez, D., Patton, K., Pagano, M. E., & Murphy, J. M. (2002). Diet, breakfast, and academic performance in children. Annals of Nutrition & Metabolism, 46(suppl 1), 24–30; Taras, H. (2005). Nutrition and student performance at school. Journal of School Health, 75(6), 199–213.

[xi] Applied Survey Research, 2010.

[xii] Hair, E., Halle, T., Terry-Humen, E., Lavelle, B., & Calkins, J. (2006). Children's school readiness in the ECLS-K: Predictions to academic, health, and social outcomes in first grade. *Early Childhood Research Quarterly, 21*(4), 431-454; Sabol, T. J., & Pianta, R. C. (2012). Patterns of school readiness forecast achievement and socioemotional development at the end of elementary school. *Child Development, 83*(1), 282-299.

[xiii] On January 1, 2014, the California Assessment of Student Performance and Progress (CAASPP) was established. In the 2014-15 school year, the state transitioned to the Common Core State Standards and the Smarter Balanced Assessment Consortium (SBAC) system for measuring achievement of the Standards. As such, the decision was made to examine outcomes on standardized tests as of 2014 and beyond.

[xiv] See https://caaspp.cde.ca.gov/sb2017/ScaleScoreRanges and http://www.smarterbalanced.org/assessments/scores/ for additional details on the SBAC and its scoring.

[xv] Fiester, L. (2010). *Early warning! Why reading by the end of third grade matters. KIDS COUNT Special report*. Baltimore, MD: Annie E. Casey Foundation; Lesnick, J., Goerge, R. M., & Smithgall, C. (2010). *Reading on grade level in third grade: How is it related to high school performance and college enrollment?* Chicago, IL: Chapin Hall at the University of Chicago.

[xvi] California Department of Education, 2017.

[xvii] Fiester, 2010; Lesnick, Goerge, & Smithgall, 2010.

[xviii] The factors included in our analyses were able to account for approximately 25% of the variance in third grade Math and ELA scores.

[xix] Fryer & Levitt, 2005; Rothstein & Wozny, 2013.

[xx] Reardon, 2016.

[xxi] Kalogrides, Loeb, & Beteille, 2013.

[xxii] Casteel, 1998; Gregory, Skiba, & Noguera, 2010.

[xxiii] Duncan & Murnane, 2016.

[xxiv] Noble et al., 2015.

[xxv] Evans, Brooks-Gunn, & Klebanov, 2011.

[xxvi] Ickovics et al., 2014.

[xxvii] Alaimo, Olson, & Frongillo, 2001; Curcio, Ferrara, & De Gennaro, 2006; Kleinman et al., 2002; Taras, 2005.

[xxviii] Matthews, J. S., Ponitz, C. C., & Morrison, F. J. (2009). Early gender differences in self-regulation and academic achievement. *Journal of Educational Psychology, 101*(3), 689.

In the longitudinal study sample, girls significantly outperformed boys in *Self-Regulation* and *Kindergarten Academics*. Approximately 58% of girls in the longitudinal study sample were proficient or nearly proficient in *Self-Regulation*, compared to 47% of boys (a statistically significant difference, p<.001). Similarly, 52% of girls were proficient or nearly proficient in *Kindergarten Academics*, compared to 43% of boys (also statistically significant, p<.01). Gender differences in *Social Expression* scores, on the other hand, were not significant.

[xxix] Robinson, J. P., & Lubienski, S. T. (2011). The development of gender achievement gaps in mathematics and reading during elementary and middle school examining direct cognitive assessments and teacher ratings. *American Educational Research Journal, 48*, 268–302.

[xxx] Matthews, J. S., Kizzie, K. T., Rowley, S. J., & Cortina, K. (2010). African Americans and boys: Understanding the literacy gap, tracing academic trajectories, and evaluating the role of learning-related skills. *Journal of Educational Psychology*, *102*(3), 757-771.

[xxxi] Ferguson, R. F. (1998). Teachers' perceptions and expectations and the black-white test score gap. In C. Jencks & M. Phillips (Eds.), *The black-white test score gap* (pp. 217-317), Washington, DC: The Brookings Institution Press; Gregory, Skiba, & Noguera, 2010.

[xxxii] Dee, T. S. (2007). Teachers and the gender gaps in student achievement. *Journal of Human Resources, 42*(3), 528-554; Ferguson, 1998; Egalite, A. J., Kisida, B., & Winters, M. A. (2015). Representation in the classroom: The effect of own-race teachers on student achievement. *Economics of Education Review, 45*, 44-52.

According to data from the California Department of Education, in the 2016-17 school year, the majority of teachers in Hayward and Oakland Unified School Districts were female (69%) and white (53%). See www.ED-data.org/Alameda

[xxxiii] Ganley, C. M., & Lubienski, S. T. (2016). Mathematics confidence, interest, and performance: Examining gender patterns and reciprocal relations. *Learning and Individual Differences*, *47*, 182-193.

[xxxiii] Schools with fewer than 10 children in the sample were excluded from the analyses and the analysis is limited to those schools that had children with KOF scores and third grade SBAC scores.

[xxxiv] Applied Survey Research, 2010; Applied Survey Research, 2017.

[xxxv] A mean score of 3.25 or higher is used as a benchmark for readiness, as it indicates the child is proficient or nearly proficient on the measured readiness skills.

[xxxvi] On average, students who met/exceeded ELA standards in third grade were absent 2.26 fewer days than students who nearly met or did not meet ELA standards. Students achieving standards in Math had 1.43 fewer days of absence than their peers who did not meet Math standards in third grade.

[xxxvii] Regression models were derived by examining bivariate correlations with predictor variables available in the kindergarten datasets and several model iterations were developed to reach the most efficient and parsimonious model for each grade level.

[xxxviii] Auger, A., Farkas, G., Burchinal, M. R., Duncan, G. J., & Vandell, D. L. (2014). Preschool center care quality effects on academic achievement: An instrumental variables analysis. *Developmental Psychology*, *50*(12), 2559-2571; Keys, T. D., Farkas, G., Burchinal, M. R., Duncan, G. J., Vandell, D. L., Li, W., ... & Howes, C. (2013). Preschool center quality and school readiness: Quality effects and variation by demographic and child characteristics. *Child Development*, *84*(4), 1171-1190.

[xxxix] Reynolds, A. J., Richardson, B. A., Hayakawa, M., Lease, E. M., Warner-Richter, M., Englund, M. M., ... & Sullivan, M. (2014). Association of a full-day vs part-day preschool intervention with school readiness, attendance, and parent involvement. *JAMA, 312*(20), 2126-2134.

[xl] Elango, S., Hojman, A., García, J. L., & Heckman J. J. (2016). Early childhood education. In Moffitt, R. (Ed.), *Means-tested transfer programs in the United States II* (pp. 235-297). Chicago: University of Chicago Press.

[xli] Possible values ranged from 0 to 8, although the highest score in the sample was 7.