TIMING OF SCHOOL ENTRY FOR AFRICAN AMERICAN BOYS

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Eric Washington, M.B.A.

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Eric Washington, M.B.A.

Thesis Advisor: Donna R. Morrison, Ph.D.

ABSTRACT

Disparate educational outcomes for African American boys remains a serious challenge. Opportunity gaps derived from disproportionate socioeconomic factors appear to influence school readiness and ultimately create gaps in academic achievement when comparing African American boys to all other children. The matter potentially exacerbates African American boys being overrepresented in the criminal justice system and further contributes to cyclical poverty, health, income, and wealth gaps that persist for African Americans in general. This study takes a closer look at the effect of school entry timing on academic achievement for African American boys. There is a bounty of research that suggest entering school later produces short- and long-term benefits, especially for at-risk children. The additional year is thought to allow children greater time to mature and develop emotional, social, and cognitive skills. Using data from the Early Childhood Longitudinal Study, Kindergarten Class of 2010-11 (ECLS-K:2011) and logistic regression predicting whether a child is performing at or above grade level on three subjects (reading, math, and science), I find no evidence of a salutary effect of delayed school entry by the fifth grade in my multivariate models. Inputs to academic achievement included in my models include socioeconomic variables, school readiness factors such as a child's physical health, lack of emotional difficulty, social confidence and cognitive ability, and support and supplemental education variables, including parent health, parent support, early childhood education program participation, kindergarten length, and teacher gender. The results revealed

the particular importance of school readiness measures on educational outcomes as a means to optimize academic achievement and equity.

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INTRODUCTION

A child's first day in kindergarten is a heartfelt milestone documented by photograph, Instagram and Facebook posts for many families in the United States. It marks the end of cumbersome and expensive childcare, and entry into a place for 'big boys and girls' embarking on the formal start of their education. Unfortunately, educational outcomes vary by race and gender (David & Marchant, 2015). African-American boys are at significant risk for poor educational outcomes (Barbarin et al., 2016), which are often congruent to the school to prison pipeline and further contributing to disparities in safety, health, and wealth (Mallett, 2015). Researchers, policy makers, and practitioners continue to identify factors that influence disparate educational outcomes. This includes studies that show a relationship between a state's age cutoff for kindergarten entry and academic achievement. Each US State has established requisite policies and cutoff dates that are based on when a child's birthday falls in the calendar/school year. That date will determine if they may or may not enter kindergarten, making school age cutoff policies and practice of strong interest when it comes to both academic achievement and equity.

Determining school readiness and its relationship to the school age entry cutoff is equally complex as it is to the uniqueness of every child. When compounded with socioeconomics, learning environments, and other current social norms, it must be asked if the cutoff serves as a proper threshold for school entry? The school age cutoff that prevents early entry into kindergarten may adversely affect African American boys. Delayed entry by policy ruling or choice may increase maturity, but it may also decrease, at a higher rate, educational preparation opportunities, and ultimately longer-term education achievement.

Considerable existing research examines the effect of the timing of entry into formal schooling across diverse samples of children, including African American boys (Cascio & Schanzenbach, 2016; Datar, 2006; Johnson & Kuhfeld, 2020; Ruffus, 2020). Most studies that examined the advantages and disadvantages of on-time school entry and delayed school entry use academic achievement measures as the dependent variable, but results are mixed. Some studies conclude that there is no difference in academic achievement for on-time and delayed school entry (Jaekel et al., 2015; Johnson & Kuhfeld, 2020; Ruffus, 2020) Others posit advantages for delayed school entry for children of all races and across gender (Cascio & Schanzenbach, 2016; Datar, 2006; McEwan & Shapiro, 2008). Part of the disparity in results across different studies can be attributed to differences in study design. For example, some investigations do not account for mitigating factors, such as whether the child was enrolled in an early childhood education program, like Pre-Kindergarten. Similarly, not all studies consider the possibility or type of fade-out of entry timing effects and studies are not consistent in measuring achievement over the same periods.

The present study seeks to understand if it is better for the academic achievement of African American boys to begin kindergarten earlier than the state policy-prescribed age cut-off, enroll "on time," or delay entry due to their birthday falling after the cutoff. Utilization of data from National Center for Education Statistics' (NCES) Early Childhood Longitudinal Studies Program (ECLS-K:2011) kindergarten through grade five waves, this thesis will estimate academic achievement through logistic regressions to identify the odds and predicted probability of academic achievement in reading, math, and science. Models account for three domains of explanatory variables: child and socioeconomic characteristics, school readiness, and supplemental education and parental support.

The findings from this analysis will potentially reveal the isolated impact of school entry and any necessary policy updates that facilitate equitable academic achievement.

PREVIOUS LITERATURE

Academic achievement gaps in the United States ordered by race and class continue to persist with African American boys being at significant risk. According to David & Marchant (2015), African American academic achievement gaps between other races is struggling to close, as race presents itself as more significant factor than income. Additionally, African American boys were not only outpaced by nearly every race, they are outpaced by African American girls in reading and fourth-grade math (David & Marchant, 2015). These outcomes require attention. The inputs to academic achievement are equally disparate and also require attention. At the intersection of both the inputs and outcomes is school entry, an area that requires much more investigation. The body of research on this topic present diverse data and analysis methods, but they are heavily skewed toward one dimension of school entry timing -- late or delayed entry. The thinking is that an additional year of maturity puts "late" starters at a cognitive, social, and emotional advantage (Bassok & Reardon, 2013).

The most pertinent bodies of research found on school entry cutoff includes two international studies and four domestic studies. They all included analysis directly related to the examination of delayed school entry. The two international studies varied the most and did not take into account the exact same factors. Jaekel, et al (2015) applied propensity score matching of kindergarten through third-grade longitudinal data during an experimental design with a focus on standardized ratings and early childhood education. The analysis showed no evidence of a difference between children on either side of the school entry cutoff in a natural experiment. On average, delayed entry offered few months of education before standardized testing. This

examination controlled for deliberate delays and early supplemental education (Jaekel et al., 2015). The second international study is by McEwan & Shapiro (2008). They applied a number of methods and concluded marginal differences between children on either side of the school entry cutoff that consequently benefited those who delayed school entry (McEwan & Shapiro, 2008). While their conclusions were modestly different, both highlighted the weaknesses of their external validity when considering the findings applicable to the US.

Previous US-based literature is current and also utilized various statistical methods. While all came to a similar result in the short-run (K-2), it was not unanimous on the cutoffs effect on long-term academic achievement beyond the point where all supplemental education through 2nd grade (Pre-K, Title I, etc.) ends, identifying the need for more domestic research.

Relative age, expected age and absolute age served as key independent variables in the Casio & Schanzenabach's (2016) study on school entry and educational outcomes. This tactic attempted to mitigate collinearity between age and test scores. Their use of experimental data in Tennessee schools to perform OLS and two-stage least square methods found that having older student in a class, on average improved educational outcomes, and did not harm other children (Cascio & Schanzenbach, 2016).

Utilizing a fuzzy regression discontinuity method, Johnson & Kuhfeld (2020) estimated multi-level academic growth of children who delayed school entry. They found significant academic growth in kindergarten but diminishing growth rates in first and second grades for children that delayed entry. They recommended caution to adopting policies that increase school age entry due to the fade out effects observed by children who entered school later. Their analysis of kindergarten through third grade longitudinal data from the Growth Research Database specifically sought to build on the finding of Datar (2006) (Johnson & Kuhfeld, 2020).

The instrumented ordinary least squares (OLS) models of ECLS-K data from kindergarten through second grade presented by Datar (2006), is relevant to the present study given that it used a similar data set from the same source. This research utilized a well-developed model of child, family and school variables that controlled biases created by deliberate school entry and identifies school entry as a function of household utility. That is, school entry decisions that deliberately delay entry even if the child's birthday falls within the cutoff of school entry are in part made based on the resources available to the household, a function of socioeconomics. Furthermore, it thoroughly presented arguments that highlight the potential harm of and benefits of delayed entry to school. Ultimately, this study found that delayed entry provided significant benefits in educational outcomes from kindergarten to second grade, especially for all categories of at-risk children, including African American boys (Datar, 2006).

One of the most comprehensive pieces of literature found was Ruffus' (2020) *Cutting Off Kindergarten*. This examination of school entry included several hypotheses that accounted for both delayed and early child entry into school. The assessment appeared to be one of the few that highlighted the interaction of gender and school entry on academic achievement. It did not include results by race and was limited in its external validity. Ultimately, the findings identified statistically significant benefits to initial (kindergarten) literacy performance, but those effects do not persist over time. As for gender, Ruffus found no statistically significant interaction for the difference between boys and girls (Ruffus, 2020).

In summary, the body of research appears limited beyond second grade and does not reveal other exogenous factors related to school entry cutoff and academic achievement following the dissipation of early childhood education benefits which begins to occur at or about the fourth grade (Duncan & Magnuson, 2013). The current body of research available on this

topic possess findings that are diverse in such a way that makes evaluation of school entry cutoff one-sided, unfortified, and inconclusive, particularly when using it as the key determinate measure of school readiness and predictor to academic achievement. Lastly, while achievement and opportunity gaps are well documented, there does not appear to be research that evaluates the relationship of academic achievement and school entry for African American boys specifically.

The focus on the effects of delayed school entry follows the increasing trend whereby children are deliberately held back from entering kindergarten until the following year. Bassok and Reardon (2013) describe it as "academic redshirting." This behavior is potentially influencing cohort composition, curricula and public policy (Bassok & Reardon, 2013). Bedard and Dhuey (2012) not only account for the movement in school entry dates from January to September for hypothetical academic benefits, but they discuss the economic benefit to the state, creating a potential bias. Though increasingly practiced, academic redshirting may not offer academic benefits and is actually cautioned against (Schanzenbach, & Larson, 2017). The make-up of who is redshirting is telling. According to Greenburg and Winsler (2020), white affluent families of boys appear to be the most likely to exercise this behavior that is thought to offer increase school readiness and academic achievement. The examination utilized a maximum likelihood method that accounted for a racially and ethnically diverse set of children, including African American boys (Greenburg & Winsler, 2020). In addition to influencing cohort composition, and curricula, it appears to be influencing public policy. Overall, there is suitable literature available that aligns the one-sided delay of school entry (academic redshirting) by probable white affluent families of boys and school entry cutoff policies. Nonetheless, school

entry makes itself one of several other variables that effect academic achievement, and their disproportion among varying socioeconomic groups.

Differing educational outcomes by socioeconomic categories are well documented, especially for African American boys. Research provides credible qualitative and quantitative assessments of implicit and explicit factors that codify academic achievement gaps for African American boys within a broad historical context (Barbarin et al., 2016; Fantuzzo et al., 2012; Prager, 2011; Stinson, 2011). Additionally, research is readily available that identifies potential responses to a plethora of academic and socioeconomic factors that contribute to disparate educational outcomes. These disparate outcomes are highly correlated to second and third order effects that contribute to the intergenerational propagation of disparate health and wealth outcomes for African American boys (David & Marchant, 2015; Kitchens & Brodnax, 2021; Mallett, 2015; Webster-Stratton et al., 2008). The research on achievement gaps by race and income proves compelling and comprehensive enough to posit a national imperative to solve. Bowman et al., explains the ties between academic achievement, poverty and prison is not only harmful to African American boys. It hinders the entire U.S. population and economy (Bowman et al., 2018) .

Overwhelmingly available is research on school readiness, including research that targets African American boys. In all of research available school readiness serves as a significant predictor of academic achievement. School readiness is well documented though empirical research, but capturing the measure of school readiness and responding to school readiness disparities appear complex. Literature produced by Janus and Offord (2007) provides a comprehensive definition of the five domains that make up school readiness. The domains are physical health, social competence, emotional maturity, language, and cognitive ability (Janus &

Offord, 2007). The available literature goes on to describe batteries of test that capture these measures through teacher assessed writing and communication tests, motor skill evaluation, social observation and questions, and math tests. In Janus and Duku's (2007) work, it also captures the essence of all available research by identifying the major components of school readiness to include child health (social and emotional) and literacy development. Through a series of logistics regressions, Janus and Duku (2007) conclude school readiness as a prevailing factor in academic achievement. More importantly, gaps in academic achievement can be created before school entry stemming from socioeconomic status, family structure, parent health, and parent involvement (Janus & Duku, 2007). Puccioni et al. (2021), go on to make associations of pre-school entry activity such as parents' school readiness beliefs, and home-based involvement on school readiness and its moderating effect on academic achievement utilizing ECLS-K: 2011 data. Moreover, these links vary by racial and ethnic background (Puccioni et al., 2021). Throughout the literature found, school readiness is understood as the measure of academic stimulus that occurs prior to school entry, and serves as a significant predictor of academic achievement. This concept later referred to as the "opportunity gap" serves as pre-school entry determinant of academic achievement and is currently presented a greater impetus to solving gaps in achievement. This also highlights a relevant point when evaluating school cutoff's effect on academic achievement that will be discussed below. These components presume school readiness development takes place prior to approaching school entry, links school readiness to socioeconomic factors, but more importantly makes early childhood education, through parent literacy development or developmental participation a key contributor to school readiness (Bierman et al., 2008).

The emphasis on early childhood education prior to school entry and beyond is firmly substantiated by research. Nearly all research available unanimously and by various analysis methods that include OLS and regression discontinuity (RD) indicated the positive contribution of early childhood education (pre-kindergarten and Head Start programs) to school readiness and short-term academic achievement, from age 3 (pre-kindergarten) to age 8 (3rd grade) (Duncan & Magnuson, 2013; Gormley & Gayer, 2005). Beyond 3rd grade is where research also unanimously conclude the diminishing impact of early childhood education over a longer term (McCormick et al., 2019). One additional piece of literature by Lee & Loeb (1995) highlights the effects of fading benefits of head-start, a program designed to target low-income families of which African American boys are overrepresented. The initial positive impact Head Start attendance may produce is equally undermined by systemic variations and disparities in school structure and quality in terms of kindergarten length, social composition and relations, academic rigor, safety, and funding (Lee & Loeb, 1995). The research of early childhood education is consistent. While the obvious advantages are immediate and clear, sustainment of those benefits require further research.

Efforts to improve equity appear to be spawning an increasing amount of literature on variables that influence academic achievement for African American boys in addition to socioeconomic and school readiness research. The array of research relevant to this study include difference in kindergarten program lengths, teacher gender and other social influences on African American boys' academic achievement. Lau & Li (2018) suggest whole day kindergarten programs show significant effects on academic achievement. This being most true for families with limited childcare resources and limited academically focused alternatives (Lau & Li, 2018). Available research, by Underwood (2019) suggests diversifying the workforce with

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the addition or African American male teachers produce favorite educational outcomes for all students, with specific benefits for African American boys. African American boys with an African American male teacher showed lower dropout rates, fewer disciplinary issues, increased school pride and academic achievement (Underwood, 2019). This research also pointed to other research on implicit biases and systemic criminalization of African American youth starting prior to school entry. Research performed by Gilliam et al. (2016) found that some early childhood educators carried stronger biases toward African American boys when expecting challenging behavior. The research also found that discipline was more severe when the teacher student race did not match (Gilliam et al., 2016). Kitchens & Broadnax (2021) further concluded that school structure and social tone influences academic achievement, while highlighting the disparity in disciplinary action taken on African American boys. Consequently, they also conclude this disparity is reduced with improved educational settings (Kitchens & Brodnax, 2021). The criminalization of African American boys is also increasingly researched in an effort to not only close academic achievement gaps, but also to stem the heavily skewed incarceration rates of African American boys. Current literature by Henning (2021) correspond with previous literature of implicit and explicit biases applied by socioeconomic status put African American boys at significant risk for poor academic achievement and increased vilification (Henning, 2021). Collectively, the amassing body of research on variables that influence academic achievement for African American boys in addition to socioeconomic status and school readiness is widespread. While the collection or literature summarizes the need for improved teacher recruiting and training, it also speaks to cultural norms that are significantly harder to address and describe the unique academic experience for African American boys.

Previous literature has inconclusively begun to tie the relationship of school entry cutoff and academic achievement, but it has not done so in a way that distinguishes it as a clear factor effecting long-term outcomes needed to balance resources and prioritize solutions. The lack of clarity supports unsubstantiated academic redshirting and the growing trend of states making the school entry cutoff earlier, creating new students that are older (Datar, 2006). Delayed entry by ruling or choice may increase maturity, but it may also decrease, at a higher rate, educational preparation, and ultimately longer-term education achievement, especially when socioeconomics, environment and other current social norms are accounted for. Ultimately, the school age cutoff that prevents entry into kindergarten may contribute to disparate educational outcomes for African American boys. Additional research is required to examine the intermediate and long-term effects while controlling for race, gender, and supplemental education, that ends in and around 2nd grade.

This thesis seeks to reconcile the benefits of early education against the school cutoff while controlling for race, gender, and other factors to determine if school age cutoff effect educational outcomes for African American Boys. This is necessary in order to improve school entry policies to improve academic achievement and equity.

CONCEPTUAL MODEL

The varying inputs of the preschool environment called the opportunity gap can produce disparate academic achievements (Carter & Welner, 2013b). The inputs to academic achievement are used to support the conceptual model guiding the modeling of the relationship between the timing of school entry and academic achievement. These broad domains of inputs include socioeconomic status, school readiness measures, and support and supplemental educations. The following conceptual model in Figure 1 was designed to control for key

variables and will attempt to isolate the impact of the timing of school entry in three subjects: reading, math and science.
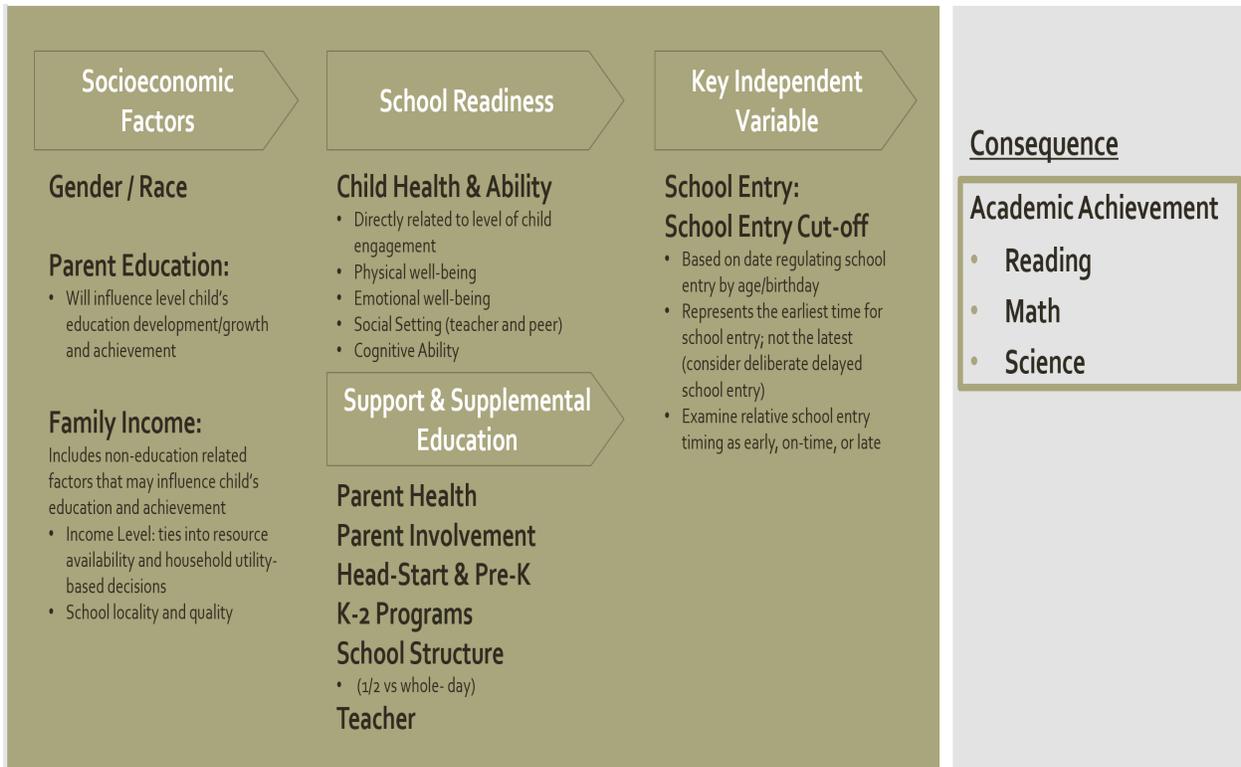
Figure 1: Conceptual Model for Academic Achievement

DATA AND METHODS

Data and Analysis Sample

The Early Childhood Longitudinal Study – Kindergarten Class of 2010-2011 (ECLS-K: 2011) provides the data used for this analysis. ECLS-K: 2011 provides descriptive longitudinal information on children's kindergarten entry and progress in school through fifth grade. The study is sponsored by the National Center for Education Statistics (NCES), a component of the Department of Education's Institute of Education Sciences (IES). The study includes a wide range of information gathered from children, their families, teachers, schools, and care providers

twice each school year. ECLS-K: 2011 allows the analysis of hundreds of variables that capture a child's cognitive, social, emotional, and physical development in relation to academic achievement between 2011 and 2016. The longitudinal study contains information on 18,174 children across the US, serving as a nationally representative sample for this analysis. The following includes the variables taken from the wide range of data that will be used in this analysis, along with their brief descriptions.

Variables

Dependent Variable

This thesis examines three dependent variables. The key dependent variables are academic achievement in reading, math and science. Academic achievement comes from the teacher component of the survey. The survey collects answers to: Overall, how would you rate this child's academic skills in each of the following areas, based on curriculum standards for his/her current grade level? Teacher rated achievement for each of these subjects are categorized as being below grade level, at grade level, or above grade level. For the purposes of performing logistic regressions with predicted binary outcomes, below grade level serves as one nominal category and being at or above grade level serves as the other. The analysis further distinguishes results for African American Boys compared to all other races/gender.

Key Independent Variable

The key independent variable is the timing of child's school entry relative to their local and state policy. Children were classified as entered early, on-time in accordance with the current policy, or entered later, beyond the birthday cut-off date for kindergarten enrollment. No variable transformations were necessary beyond accounting for missing responses, adding to the validity of our analysis. This variable allows me to identify trends specific to the target population of

African American Boys, the survey population, and associations with independent and control variables.

Other Explanatory/Control Variables

This analysis accounts for a number of other independent and control variables that are assumed to be correlated with academic achievement and school entry. Each align with the aforementioned conceptual model and falls within the following domains: socioeconomic variables, school readiness, and supplemental support and education. The survey accounts for measures of each variable on nine occasions between kindergarten and fifth grade, some up to twice per school year. While some variables have up to nine nominal, categorical and continuous responses there are number of variables that are fixed across time, like child's sex and race. A series of dummies were created for each categorical variable.

Child Sex/Gender was nominally identified as male or female.

Child Race was collected on both the parent and teacher components of the survey. Six categories were established that include African American, Asian Pacific Islander, Multiracial/Hispanic, Native American/Alaska Native, and White.

Parent Education accounts for the highest level of achievement of parents measured on each survey occurrence. It was categorized as 'Did not complete High School (HS),' 'HS Graduate,' 'Some College or Associate Degree, 'and 'Bachelor's Degree or Higher. '

Family Income was originally measured in eighteen categories. This analysis transformed this variable to a continuous variable by coding to the midpoint of each income category.

Child Physical Health is the first in the school readiness set of measures. It is a categorical variable identifying health as Excellent/Very Good, Good, and Fair/Poor.

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Child Emotional Health is a nominal variable that captures parental response to whether the child had emotional difficulties during the survey period.

Child Social Confidence is measured by two categorical variables designed to identify social standing and ability as part of school readiness. 'Fitting In' is the first variable that measures child responses to: This school year, how often did you…feel like you fit in at your school? Answers were organized into three answers, Never, Sometimes and Often/Always. 'Making Friends' is the second variable. It asks the children how true the following statement is: I make friends easily. Answers were organized into three categories, Not True, Little Bit True and Mostly/Very True.

The final school readiness measure centers on cognitive ability in reading, math and science, congruent to my dependent variable. These three variables are continuous variables of Item Response Theory (IRT)-Based scores taken on each survey occasion.

Parent Health is the first of the Supplemental Support and Educational set of variables. Parent Health is a categorical variable identifying health as Excellent/Very Good Good, and Fair/Poor.

Parent Attendance at Parent-Teacher Conferences is a nominal variable that identifies if parents did nor did not participate.

Helps with Homework is a categorical variable that identifies how often a parent helps with homework. Answers were organized in the following five categories: Never, Less than once a week, 1-2 times per week, 3-4 times per week, and 5 more times per week.

Pre-Kindergarten Attendance, and *Head-Start Attendance* are both nominal control variables incorporated to account for any academic achievement difference between children

who participated in these programs and those who did not, particularly since a child's attendance in pre-kindergarten and the Head Start program are not shared by all surveyed.

Kindergarten Length is also a control variable that accounts for schools that offer whole-day classes over half-day class. It is a nominal variable where 1 equals whole-day Kindergarten class.

Teacher Gender is also a nominal variable included to identify the effect of African American Boys having a male teacher.

Table 1 offers descriptive statistics for variables used in this analysis.

Data Limitations

Data limitations for this analysis include a lack of access to non-public information. In order to guard against the unwanted release of sensitive or protected data, some of the information collected in the ECLS-K: 2011was not made public. Teacher education and race were two variables that may have added to the valid specification of my models. Unfortunately, these measures were suppressed from public use. In addition, other items such as child participation in state or federal supplemental education programs after kindergarten entry were not available.

The unit of measure for family income was collected in salary ranges (categories) and was not continuous. I transformed family income into a continuous based on the average of each categorical salary range. Additionally, I transformed the dependent variable from a categorical variable to a nominal variable because ordered probit/logit models are not supported in Stata fixed effects analyses (StataCorp, 2021).

Methodology

This analysis will include bivariate examinations that compare socioeconomic characteristics with the timing of kindergarten entry, and school readiness, and support and supplemental education measures to academic achievement. Additionally, multivariate regressions will be used to estimate the odds and marginal effect of being at/above grade level in reading, math and science for African American Boys who enter school before the school entry cutoff, those that enter on-time and those whose entry is delayed due to their birthday falling after the cutoff as well as those with delayed entry. Additionally, this method will estimate the relationship and marginal effect of each independent variable with their statistical significance within the limits of the available data.

Empirical Model and Estimation Strategy

I begin with a bivariate examination whereby I cross-classify children into three groups: began school early, began school within the time-frame directed by state policy, and began school after the cut-off date (later entry) and examine differences in child characteristics and socioeconomic status, including gender, race, family income, and parent's education. Next, I cross-classify children according to whether they were below, or at/above grade-level in reading, math, and science and compare difference in the domains of school readiness and supplemental support and education variables.

Next, I estimate a series of logistic regression models to identify the odds and marginal effect of being at/above grade level in reading, math and science for children who enter kindergarten before the school entry cutoff and those whose entry is delayed due to their birthday falling after the cutoff as well as those with delayed entry in comparison to children who enter during the policy prescribed period. To account for whether the effect of the timing of entry into

kindergarten differs for African American boys, I also include measures for the main effect of being an African American boy and its interaction with timing of school entry. The models incrementally control for three domains of variables: child and socioeconomic characteristics, school readiness, and support and supplemental education variables (including participation in early education) according to the specifications outlined in Table 2.

To maximize the data available/collected at each survey occasion (up to twice per school year), I reshaped the longitudinal data into a long format. This accounts for time-varying covariates throughout the entire study. This approach was chosen to improve estimation accuracy over selection of kindergarten entry statistics and their effect on the singular predicted outcome at fifth grade, with no other use of all of the information collected in each grade during the survey.

Due to the fact that the ECLS-K: 2011 was collected using a complex survey sampling design, it is necessary to estimate models that use proper weighting techniques. I made use of the *svy* suite of commands in Stata and employed the primary sampling unit of W9C29P_9T29PSU, the W9C29P_9T290 variable as the weight, and W9C29P_9T29STR as the stratum (StataCorp, 2021).

Study Limitations

Among the study limitations, omitted variable bias remains a possible factor that limits this analysis. Aside from data not made publicly available, there may be one or more variables that are related to academic achievement and school entry that is not included in this analysis. Variables not included in the study included variables on discipline (social setting), teacher education and race, and kindergarten through second-grade participation in supplemental education programs. While I attempted to gather as many of those variables available through the

ECLS-K: 2011 dataset, there may be variables unaccounted for. The use of the svy command prevented me from estimating robust standard errors, which may affect tests of statistical significance.

RESULTS

Bivariate Analysis Findings

The bivariate analysis shows interesting results for African American boys' academic achievement and school entry. In the course of the bivariate examination, I asked several key questions. Does school entry vary by socioeconomic factors? Does academic achievement vary by a child's school readiness, and support and supplemental education? How does academic achievement by fifth-grade vary by school entry for all children? In order to address the study's hypothesis, one must ask how does school entry for African American boys effect their academic achievement by fifth-grade?

School Entry

Table 3 allows us to compare child and socioeconomic characteristics across the three categories of the timing of kindergarten entry – before the age-cutoff (early), during the policy prescribed entry interval (on time) and equal after the cutoff (later). While white males tend to enter school later, African Americans, Asian Pacific Islanders, and Native/Alaska Native children whose parents appear to have higher average income and lower education tend to enter early. Some research indicates children from high income families have better academic achievement on average than those from lower income families (Reardon, 2013). Consequently, our analysis showed the highest average family income were among children who entered school early. Of all of the children that entered school early the parents that did not complete high school, were twice as likely to send their children to school early. Those parents that attained a

bachelor's degree or higher tended to send their children to school later. From the statistics gathered, 60% boys enter later though they are only 51% of the sample population. Of all of the children who enter school later whites are overrepresented at 64%, despite them being only 41% of the population sample. Now that it is understood who enters school early, on-time or later, and to what degree, a subsequent analysis of how well entrants performed will cross-examined against school readiness, and support and supplemental education variables.

Academic Achievement

Tables 4, 5 and 6 allow us to examine differentials in school readiness, and support and supplemental education measures across children who are performing below grade level versus at or above grade level in reading, math, and science, respectively. Common trends emerge across the three academic subjects. Tables 4 - 6 show excellent child health, lack of emotional difficulties, and favorable social confidence (fitting in and making friends) all favor being at/above grade level by the fifth-grade, at 88%, 95% and 82/66%, respectively. These school readiness indicators suggest these variables having a direct relationship to academic achievement. Among all school readiness variables, cognitive abilities show the strongest correlation to academic achievement, very closely followed by family income. Specifically, kindergarten cognitive ability for reading shows a 0.553 correlation with reading academic achievement, 0.435 with math achievement, and 0.386 with science achievement. Similar statistics are revealed for cognitive ability for math and science. Additionally, cognitive ability in each of the subjects (reading, math and science) have strong correlation between them. This suggests children that are school ready or not ready in one area is ready or not ready in the others.

In terms of measures of support and supplemental education, good to excellent health of the child's parent favors them being at/above grade level by the fifth-grade by 6.88 percentage points. Parent's attendance at parent teacher conference show very little difference (1.9 percentage points) between children below grade level and those at/above grade level. Surprisingly, the bivariate analysis shows children who were helped by their parents with homework more often were more were more likely to be below grade level. This suggests that parents spend more time helping their child with homework is the child is struggling. A child's attendance in pre-kindergarten program was associated with being at/above grade level. A child's attendance in Head Start did not. Bivariate statistics show no difference in academic achievement based on the teacher's gender.

The most compelling bivariate analysis tied directly to the question regarding schools' entry's impact on African American boys are detailed on Table 7 and Table 8. An examination of all children that enter school early, on-time or late, 70 to 81% are at/above grade level by fifth-grade among all three subjects. There are modest differences that favor entering school later when considering all children. However, when examining African American boys specifically, 100% of them that enter early are at/above grade level. When African American boys enter on-time or late they suffer measurably. For reading, 46 to 55% end up below grade level when entering on-time or late. For math, 39 to 44% end up below grade level when entering on-time or late. For science, 37 to 50% end up below grade level when entering on-time or late. It will be important to see if these patterns remain net of mitigating factors in my multivariate analyses.

Altogether, school entry does vary by socioeconomic factors and school readiness, and support and supplemental education present more diverse relationship on academic achievement. What is clear within our bivariate study is that African American boys perform better when

entering school early. One must now ask how all endogenous and exogenous factors interact with one another to offer a predicted probability for African American boys' academic achievement based on the timing of their school entry. For that I turn to the results of my multivariate analysis.

Multivariate Analysis Findings

I estimated four multivariate models for each academic subject – reading, math, and science detailed in Table 9, Table 10, and Table 11, respectively.

Model 1: Socioeconomics

Model 1 allows us to examine the effect of being an African Boy on academic achievement, net of socioeconomic characteristics. Being an African American Boy adversely effects achievement in two out of three of the academic subjects examined. On average, African American boys are 36% less likely to be at/above grade level than all other children for reading and math. There is no evidence of a statistically significant effect of being an African American boy on academic achievement in science.

In terms of the effects of socioeconomic variables, the higher the parent education or family income, the greater the likelihood a child achieves at/above grade level outcomes. A child with a parent with a bachelor's degree or higher has a 45% greater likelihood of favorable academic performance in reading than one whose parent did complete high school. There was no statistically significant effect of parental education in the math and science models.

Model 2: School Readiness

Model 2 adds "school readiness" measures to the baseline model. Once physical health, emotional health. social confidence (making friends and fitting in among peers), and cognitive ability are accounted for, the effect of being an African American boy loses its statistical

significance. Cognitive ability in reading, math and science distinguishes themselves as strong explanatory variables for academic achievement in reading, math and science, even over family income, which was also no longer statistically significant in this model.

Cognitive ability in reading and math are statistically significant to academic achievement and shows an increased likelihood of being at/above grade level in reading. A single unit increase in cognitive ability in reading increases the likelihood of being at/above grade level in reading by 13%. A single unit increase in cognitive ability in math increases the likelihood of being at/above grade level in reading by 2%. Though cognitive ability in science is also statistically significant for academic achievement in reading, it shows a 2% decrease in the likelihood of being at/above grade level in reading.

Fitting in among their peers, as a measure of social confidence proves statistically significant to academic achievement in math. For example, a child that feels that they fit in sometimes or often/always is twice as likely to be at/above grade level in math than a child that feel like they never fit in. Cognitive ability in reading and math are statistically significant to academic achievement and shows an increased likelihood of being at/above grade level in math. A single unit increase in cognitive ability in reading increases the likelihood of being at/above grade level in math by 4%. A single unit increase in cognitive ability in math increases the likelihood of being at/above grade level in math by 8%. Cognitive ability in science is not statistically significant for academic achievement in math.

Academic achievement in science is impacted by statistically significant measures in each domain of school readiness. A child whose physical health is fair/poor is 49% less likely to be at/above grade level in science than a child whose heath is excellent, and a child with emotional difficulties is 45% less likely to be at/above grade level in science than a child without

emotional difficulty. Additionally, a child that feels that they fit in often/always is 38% more likely to be at/above grade level in science than a child that feels like they never fit in, and four times more likely when they sometimes fit in when compared to those that feel like they never fit in. Cognitive ability in reading, math and science are statistically significant to academic achievement and shows an increased likelihood of being at/above grade level in science. A single unit increase in cognitive ability in reading and math increases the likelihood of being at/above grade level in science by 7% and 2%, respectively. A single unit increase in cognitive ability in science increases the likelihood of being at/above grade level in science by 5%.

Model 3: Support and Supplemental Education

Model 3 adds variables to account for parental support and supplemental education. These include measures of parental health, whether the parent attends parent teacher conferences and helps the child with homework, pre-kindergarten attendance, enrollment in Head Start, whether kindergarten was half- or full-day, and whether the teacher is male. The effect of being an African American boy on academic achievement remains statistically insignificant with the inclusion of these variables.

When accounting for support and supplemental education in academic achievement in reading, cognitive ability in reading and math remained consistent in their statistical significance, relationship and predictability. However, cognitive ability in science is no longer statistically significant to academic achievement in reading in this model. A parent's attendance at parent teacher conferences, and kindergarten length prove statistically significant in this model for reading. Parent participation in parent-teacher conferences reveal a negative relationship to academic achievement in reading, similar to that observed in the bivariate analysis. Consequently, a child whose parent attended parent teacher conferences is 56% less likely to be

at/above grade level in reading in this multivariate model. A child that participated in whole-day kindergarten class is 37% more likely to be at/above grade level than a child that participated in half-day kindergarten class.

When accounting for support and supplemental education in academic achievement in math, fitting in among peers (social confidence) and cognitive ability in reading and math remained consistent in their statistical significance, relationship and predictability. However, cognitive ability in science is no longer statistically significant to academic achievement in math in this model. Parent health and parent attendance in parent-teacher conferences reveal a counter-intuitive relationship to academic achievement in math. A child whose parent is of fair/poor health is 58% more likely to be at/above grade level in math than a child whose parent is of excellent health. Whereas, a child whose parent(s) participated in parent-teacher conferences has a 54% less likelihood of being at/above grade level in math than those whose parent did not attend parent teacher conferences. A child's participation in a whole-day kindergarten class is statistically significant and increases the likelihood by 60% of being at/above grade level over half-day kindergarten providers for math.

Academic achievement in science is also impacted by statistically significant measures in each domain of school readiness and when accounting for support and supplemental education. A child whose physical health is fair/poor is 59% less likely to be at/above grade level in science than a child whose heath is excellent, and a child with emotional difficulties is 52% less likely to be at/above grade level in science than children without emotional difficulty. Additionally, a child that feels that they fit in often/always and sometimes are nearly four times more likely to be at/above grade level in science than a child that feel like they never fit in. Cognitive ability in reading, math and science remained consistent in their statistical significance, relationship and

predictability to academic achievement in science as in Model 2. Only parents in fair/poor health show statistical significance among support and supplemental education variables. A child whose parent is of fair/poor health is twice as more likely to be at/above grade level in science than a child whose parent is of excellent health.

Model 4: School Entry

Model 4 allows us to address the central questions of this study – whether the timing of entry into kindergarten affects academic achievement through fifth grade and if so, whether the effect differs for African American boys compared to other children.

Overall, the results for Model 4 showed that there was no main effect of the timing of school entry on any of the three academic subjects examined. This indicates that children's reading, math, and science scores are not influenced by whether they enrolled in kindergarten according to the state-policy prescribed age, or before or after that cutoff. Turning to the question of whether African American boys are particularly sensitive to the timing of school entry, there is no main effect of being an African American boy nor the timing of enrollment. While the interaction of African American boy and timing of kindergarten entry achieves statistical significance in the model for reading, the interaction term is not statistically significant for math or science scores. Given the lack of significance of the main effects of being an African American boy and the timing of school entry, we can essentially disregard the interaction term observed for reading and conclude that there is no observed difference in academic achievement based on the timing of school entry. Therefore, there is no evidence that African American boys are at a particular academic disadvantage based on the timing of their entry into kindergarten.

Turning to other explanatory variables, it is noteworthy that the school readiness variables of cognitive ability remain consistent in their statistical significance, relationship and

predictability to academic achievement as found in Model 3 for each subject. Additionally, the support and supplemental education variables also remain consistent in their statistical significance, relationship and predictability to academic achievement as found in Model 3 for each subject.

Surprisingly, there was the lack of statistical significance for teacher gender, prekindergarten attendance and Head Start attendance despite previous research findings. The current study's findings could not support the hypothesis for male teacher influence on boys or overall academic performance, nor the effects of early childhood education efforts. Ultimately, the results as to the effect of school entry on their academic achievement were inconclusive. After a review of each model results, their revealing consistencies and inconsistencies within and among the subjects will help to identify improvements for future studies of school age cutoff as well as any policy implications.

CONCLUSION

A child's first day in kindergarten is remarkable, but what is also remarkably clear is that each child enters school with varying learning opportunities. While our bivariate analysis favored African American boys entering school early, our multivariate findings were not conclusive enough to rule out nor substantiate the hypothesis that the school entry cutoff adversely affects academic achievement for African American boys. What was revealed was the key explanatory influence of school readiness, in particular cognitive ability. Cognitive ability in reading and math consistently proved statistically significant to academic achievement in reading, math, and science. A single unit increase in cognitive ability for reading increased the likelihood of being at/above grade level 13% for reading, 4 % for math and 7% for science. A single unit increase in cognitive ability for math increased the likelihood of being at/above grade

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level 2% for reading, 8 % for math and 2% for science. While cognitive ability in science was not consistently significant in all subjects, it was for academic achievement in science. A single unit increase in cognitive ability for science increased the likelihood of being at/above grade level 5% in all of the applicable regression models. Further observed in academic achievement in science was the statistical significance of factors in all school readiness domains of health, emotional health, social confidence, and cognitive ability. Overall school readiness presented itself as the prevailing influence on academic achievement and appears to be an area where investments can be made to close achievement gaps.

The significance of school readiness along with prior research on opportunity gaps' effect on academic achievement would lead one to anticipate the significance of early childhood education. However, early childhood education efforts such as prekindergarten and Head Start did not prove to have a statistically significant effect on reading, math, and science achievement in this study. Other support and supplemental education variables did find statistical significance to include parent health, and parent teacher conference attendance. They showed an unexpected relationship to academic achievement. Attending whole-day kindergarten improved reading and math academic achievement markedly for reading and math. Children who attend whole day kindergarten show an increased likelihood of achievement in reading and math of 37% and 60%, respectively.

Limitations of Current Study

The current study was limited in to the use of publicly available information. There may be one or more variables that are related to academic achievement and school entry for African American boys that is not included in this analysis, creating an omitted variable bias. Aside from omitted variable bias, the use of the svy command prevented me from estimating robust standard

errors, which may affect tests of statistical significance, thereby potentially overlooking the significance of other variables included, and limiting the accuracy of the overall analysis of the hypothesis.

The effect of school entry policies on African American boys should continue to be examined by future researchers to support equitable policies that eliminate systemic biases that cause observed gaps in academic achievement. In order to achieve equity our current policies must identify the needs of each portion of our diverse population of children. Parents, educators, and researchers understand that a one size fits all approach to childhood development is problematic. Therefore, a balance of research (early, on-time and delayed entry) that complements the previously explored examination of delayed entry is required, especially for those at significantly high risk, African American boys. On average, African American students are more likely to have limited learning opportunities and to fail an elementary grade that any other race, and are overrepresented in juvenile and criminal justice systems (Noguera, 2003). More research is needed to support activities attempting to mitigate the current achievement gap. Potential limitations in conducting future studies include capturing variables that correlate to the academic achievement in the uniquely lived experiences for varying groups of children. Therefore, it is recommended that the collection of data for public and private use is recommended. Information on school resourcing, and teacher skill and development should be included in future studies. School resourcing though property taxes makes itself a source of inequitable education (Darling-Hammond, 2019) and should be considered as a variable to academic achievement.

Some will argue that learning for African American boys is no different than any other child. What is less debated is that each child enters school under varying circumstances. School

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entry policies should take into account these varying circumstances, and consider the array of entry criteria possible.

Policy Implications and Recommendations

The examination of school entry and the findings of this study effect a wide range of policies at and beyond the intersection of early childhood education efforts and primary education structure. Statistically significant socioeconomic, and school readiness, and support and supplemental variables' relationship to academic achievement force us to look at the inputs to academic achievement and the polices tied to them. The varying opportunities across socioeconomic groups to supply social, emotional, and cognitive skills attained before entering kindergarten and the lack thereof create opportunity gaps that can contribute to academic achievement gaps (Carter & Welner, 2013a). Varying socioeconomic and school readiness should not be met with a one-size fits all school entry policy.

The National Education Policy Center recommends the expansion of high-quality early childhood education to close opportunity gaps (National Education Policy Center, n.d.). This appears to be an effective investment given the significance of school readiness. The advocacy and benefits of early childhood education are fleeting unless they are aligned to the primary education school system (McCormick et al., 2019). Given observed benefits of early childhood education (Gormley & Gayer, 2005) to child school readiness and academic achievement, one must ask why delay any education, if a child is school ready? Additionally, policies affecting school resources for whole-day kindergarten should be examined in addition to investments in early childhood education, and examination of school entry policies.

The intersection of current school entry demands more flexible policies in order to optimize academic achievement and equity. The following represent two recommendations bases on my results.

- Establish school entry based on school readiness measures and not age
- Invest in universal high-quality early childhood education to improve school readiness for all children

Table 1: Descriptive Statistics for Variables Used in Analysis of School Age Cutoff

	Mean	Standard Deviation	Proportion
Timing of School Entry [1]			
Enter School Early			1.72%
Enter School When Old Enough (On Time)			91.83%
Enter School Later			6.45%
Socioeconomic Status			
Gender (Male)			51.22%
Race			
African American			13.21%
Asian Pacific Islander			9.13%
Multiracial / Hispanic			29.89%
Native American/Alaska Native			0.93%
White			46.81%
Parent Education			
Did not complete HS			7.52%
HS Graduate			24.99%
Some College or Associate Degree			26.38%
Bachelor Degree or Higher			41.10%
Income *(2011 USD)*	$66,914.63	61,271.40	
School Readiness			
Child Physical Health *(Good or Better)*			96.99%
Child Emotional Health *(No disfunction)*			93.52%
Child Social Confidence			
Fitting In *(Often to Always)*			79.25%
Making Friends *(Mostly True)*			64.30%
Child Cognitive Ability			
Reading *(Score Range 0.0 - 120.0)*	54.07	11.50	
Math *(Score Range 0.0 - 113.0)*	35.56	11.64	
Science *(Score Range 0.0 - 64.0)*	33.48	7.38	
Support and Supplemental Education			
Parent Health (Good or Better)			89.99%
Attend Parent-Teacher Conference			90.51%
Helps with Homework (3 or more days/wk)			69.39%
Pre-K attendance			
Attended			67.56%
Head Start Attendance			
Attended			17.50%
Kindergarten 1/2 vs Whole			
Full Day			81.64%
Teacher Gender			
Male			8.60%

Source: Early Childhood Longitudinal Study – Kindergarten (ECLS-K), DoE National Educational Statistics Foundation
N = 18,174
Note(s) 1: When regulated by student location (state) the average age in months of school entry is 66.08 with a standard deviation of 4.64.

Table 2: Analysis Plan for Bivariate Analysis and Multivariate Estimation

	Model 1 Baseline - Socioeconomic Status	Model 2 Adds School Readiness	Model 3 Adds Support and Supplemental Education	Model 4 Adds Timing of School Entry
Socioeconomic Status				
Race/Gender (African American/Boys)	*	*	*	*
Parent Education	*	*	*	*
Income	*	*	*	*
School Readiness				
Child's Physical Health		*	*	*
Child's Emotional Difficulty		*	*	*
Child's Social Confidence (Fitting In and Making Friends)		*	*	*
Child's Cognitive Ability (Reading, Math and Science)		*	*	*
Support and Supplemental Education				
Parent Health			*	*
Parent School Engagement (Parent-Teacher Conferencing)			*	*
Parent Child Engagement (Helps with Homework)			*	*
Pre-K attendance			*	*
Head Start Attendance			*	*
Kindergarten Length (1/2 vs Whole Day)			*	*
Teacher Gender			*	*
School Entry				
Interactions (African American Boys * Timing of Entry)				*
Timing of Entry (Early and Late)				*

Table 3: School Entry by Socioeconomic Factors

	Early	On Time	Later
Gender (Male)	41.74%	50.99%	59.91%
Race			
African American	15.28%	13.26%	7.65%
Asian Pacific Islander	17.47%	7.04%	7.07%
Multiracial / Hispanic	28.82%	28.21%	19.93%
Native American/Alaska Native	1.75%	0.75%	1.16%
White	36.68%	50.74%	64.19%
Parent Education			
Did not complete HS	13.76%	7.12%	5.39%
HS Graduate	22.48%	25.22%	22.67%
Some College or Associate Degree	26.14%	26.51%	26.96%
Bachelor Degree or Higher	37.62%	41.16%	44.97%
Family Income *(2011 USD)*	$ 90,215.05	$ 68,817.70	$ 79,502.05

Source: Early Childhood Longitudinal Study – Kindergarten (ECLS-K), DoE National Educational Statistics Foundation

Table 4: Support and Supplemental Education Effect on Academic Achievement (Reading)

	Below Grade Level	At / Above Grade Level
Child Physical Health		
Excellent/Very Good	78.55%	88.33%
Good	14.94%	9.38%
Fair/Poor	6.51%	2.29%
Child Emotional Health		
No difficulties	90.78%	95.41%
Difficulties	9.22%	4.59%
Child Social Confidence		
Fitting In		
Never	5.28%	2.31%
Sometimes	21.56%	16.14%
Often/Always	73.16%	81.55%
Making Friends		
Not True	12.15%	6.54%
Little Bit True	27.62%	27.45%
Mostly/Very True	60.23%	66.01%
Child Cognitive Ability		
Reading *(Score Range 0.0 - 120.0)*	47.43	56.75
Math *(Score Range 0.0 - 113.0)*	27.31	39.05
Science *(Score Range 0.0 - 64.0)*	28.99	35.40
Parent Health		
Excellent/Very Good	57.09%	68.21%
Good	28.52%	24.28%
Fair/Poor	14.39%	7.51%
Attend Parent-Teacher Conference		
Attend	89.32%	91.42%
Does Not Attend	10.68%	8.58%
Helps with Homework (3 or more days/wk)		
Never	0.92%	1.51%
Less than once a week	3.43%	5.46%
1-2 times per week	20.66%	25.48%
3-4 times per week	42.57%	42.57%
5 more times per week	32.41%	24.98%
Pre-K attendance		
Attended	60.62%	71.29%
Did Not Attend	39.38%	28.71%
Head Start Attendance		
Attended	23.43%	14.29%
Did Not Attend	76.57%	85.71%
Kindergarten 1/2 vs Whole		
Full Day	83.33%	79.51%
Half Day	16.67%	20.49%
Teacher Gender		
Male	8.85%	8.31%
Female	91.15%	91.69%

Source: Early Childhood Longitudinal Study – Kindergarten (ECLS-K), DoE National Educational Statistics Foundation

Table 5: Support and Supplemental Education Effect on Academic Achievement (Math)

	Below Grade Level	At / Above Grade Level
Child Physical Health		
Excellent/Very Good	80.23%	88.93%
Good	14.12%	8.46%
Fair/Poor	5.65%	2.61%
Child Emotional Health		
No difficulties	91.53%	95.29%
Difficulties	8.47%	4.71%
Child Social Confidence		
Fitting In		
Never	4.55%	1.98%
Sometimes	22.03%	15.87%
Often/Always	73.41%	82.14%
Making Friends		
Not True	10.55%	6.48%
Little Bit True	27.37%	27.73%
Mostly/Very True	62.08%	65.79%
Child Cognitive Ability		
Reading *(Score Range 0.0 - 120.0)*	47.99	56.31
Math *(Score Range 0.0 - 113.0)*	27.33	38.81
Science *(Score Range 0.0 - 64.0)*	29.51	35.13
Parent Health		
Excellent/Very Good	57.11%	69.48%
Good	26.94%	24.23%
Fair/Poor	15.95%	6.29%
Attend Parent-Teacher Conference		
Attend	89.46%	91.26%
Does Not Attend	10.54%	8.74%
Helps with Homework (3 or more days/wk)		
Never	0.71%	1.48%
Less than once a week	3.23%	5.83%
1-2 times per week	20.00%	26.00%
3-4 times per week	43.33%	42.04%
5 more times per week	32.73%	24.65%
Pre-K attendance		
Attended	57.14%	71.87%
Did Not Attend	42.86%	28.87%
Head Start Attendance		
Attended	22.35%	14.74%
Did Not Attend	77.65%	85.26%
Kindergarten 1/2 vs Whole		
Full Day	83.33%	79.83%
Half Day	16.67%	20.17%
Teacher Gender		
Male	8.30%	8.31%
Female	91.70%	91.69%

Source: Early Childhood Longitudinal Study – Kindergarten (ECLS-K), DoE National Educational Statistics

Table 6: Support and Supplemental Education Effect on Academic Achievement (Science)

	Below Grade Level	At / Above Grade Level
Child Physical Health		
Excellent/Very Good	75.23%	87.73%
Good	17.04%	10.17%
Fair/Poor	7.72%	2.10%
Child Emotional Health		
No difficulties	88.03%	95.53%
Difficulties	11.97%	4.47%
Child Social Confidence		
Fitting In		
Never	7.74%	2.51%
Sometimes	20.77%	17.17%
Often/Always	71.49%	80.36%
Making Friends		
Not True	12.31%	7.48%
Little Bit True	26.77%	27.24%
Mostly/Very True	60.92%	65.28%
Child Cognitive Ability		
Reading *(Score Range 0.0 - 120.0)*	47.05	56.30
Math *(Score Range 0.0 - 113.0)*	26.70	38.44
Science *(Score Range 0.0 - 64.0)*	28.55	35.11
Parent Health		
Excellent/Very Good	51.08%	67.71%
Good	33.20%	23.81%
Fair/Poor	15.73%	8.48%
Attend Parent-Teacher Conference		
Attend	89.35%	91.44%
Does Not Attend	10.65%	8.56%
Helps with Homework (3 or more days/wk)		
Never	1.12%	1.44%
Less than once a week	2.99%	5.25%
1-2 times per week	21.67%	24.70%
3-4 times per week	40.72%	43.16%
5 more times per week	33.50%	25.46%
Pre-K attendance		
Attended	61.70%	70.77%
Did Not Attend	38.30%	29.23%
Head Start Attendance		
Attended	25.64%	14.24%
Did Not Attend	74.36%	85.76%
Kindergarten 1/2 vs Whole		
Full Day	84.31%	79.52%
Half Day	15.69%	20.48%
Teacher Gender		
Male	8.41%	8.46%
Female	91.59%	91.54%

Source: Early Childhood Longitudinal Study – Kindergarten (ECLS-K), DoE National Educational Statistics

Table 7: Academic Achievement Direct Relationship to School Entry

	Below Grade Level	At / Above Grade Level
__Reading__		
Enter School Early	27.55%	72.45%
Enter School When Old Enough	23.97%	76.03%
Enter School Later	24.55%	75.45%
__Math__		
Enter School Early	30.23%	69.77%
Enter School When Old Enough	22.72%	77.28%
Enter School Later	24.91%	75.09%
__Science__		
	23.21%	76.79%
Enter School When Old Enough	18.79%	81.21%
Enter School Later	21.74%	78.26%

Source: Early Childhood Longitudinal Study – Kindergarten (ECLS-K), DoE National Educational Statistics Foundation

Table 8: Academic Achievement Direct Relationship to School Entry

for African American Boys

	Below Grade Level	At / Above Grade Level
__Reading__		
Enter School Early	0.00%	100.00%
Enter School When Old Enough	45.86%	54.14%
Enter School Later	54.55%	45.45%
__Math__		
Enter School Early	0.00%	100.00%
Enter School When Old Enough	38.98%	61.01%
Enter School Later	44.44%	55.56%
__Science__		
Enter School Early	0.00%	100.00%
Enter School When Old Enough	37.10%	62.90%
Enter School Later	50.00%	50.00%

Source: Early Childhood Longitudinal Study – Kindergarten (ECLS-K), DoE National Educational Statistics Foundation

Table 9: Estimated Odds Ratios and Marginal Effects for Models Predicting Being At/Above Grade Level in Reading

	Model 1 Baseline - Socioeconomic Status		Model 2 Adds School Readiness		Model 3 Adds Support and Supplemental Education		Model 4 Adds Timing of School Entry	
	Odds Ratio	Marginal Effect	Odds Ratio	Marginal Effect	Odds Ratio	Marginal Effect	Odds Ratio	Marginal Effect
Socioeconomic Status								
African American Boys (Race / Gender)	0.641	-0.072*	0.708	-0.035	0.734	-0.031	0.812	-0.021
Parent Education								
HS Graduate	1.286	0.044	1.141	0.013	1.120	0.011	1.148	0.014
Some College or Associate Degree	1.201	0.032	1.053	0.005	1.078	0.007	1.083	0.008
Bachelor Degree or Higher	1.446	0.062**	1.068	0.007	1.091	0.009	1.092	0.009
Family Income	1.000	0.000***	0.999	0.000	1.000	0.000	1.000	0.000
School Readiness								
Child Physical Health								
Good			0.803	-0.023	0.757	-0.028	0.751	-0.029
Fair/Poor			0.733	-0.032	0.645	-0.046	0.608	-0.052
Child Emotional Health								
Emotional Difficulties			0.825	-0.019	0.807	-0.021	0.836	-0.018
Child Social Confidence								
Fitting In								
Sometimes			0.918	-0.009	0.888	-0.012	0.876	-0.013
Often/Always			0.952	-0.005	0.942	-0.006	0.935	-0.006
Making Friends								
Little Bit True			1.300	0.026	1.285	0.025	1.285	0.025
Mostly/Very True			1.105	0.01	1.088	0.009	1.093	0.009
Child Cognitive Ability								
Reading			1.126	0.012***	1.125	0.012***	1.126	0.012***
Math			1.017	0.002***	1.016	0.002***	1.016	0.002***
Science			0.985	-0.002*	0.987	-0.001	0.986	-0.001
Support and Supplemental Education								
Parent Health								
Good					1.021	0.002	1.027	0.003
Fair/Poor					1.283	0.024	1.269	0.023
Attend Parent-Teacher Conference								
Attend					0.436	-0.082***	0.444	-0.080***
Helps with Homework (3 or more days/wk)								
Less than once a week					1.478	0.035	1.486	0.036
1-2 times per week					1.152	0.013	1.169	0.015
3-4 times per week					0.904	-0.01	0.925	-0.008
5 more times per week					0.724	-0.033	0.728	-0.032
Pre-K attendance								
Attended					1.044	0.004	1.050	0.005
Head Start Attendance								
Attended					1.012	0.001	1.009	0.001
Kindergarten 1/2 vs Whole								
Full Day					1.368	0.031*	1.361	0.03*
Teacher Gender								
Male					1.099	0.009	1.075	0.007
Dependent Variable								
Interactions								
African American Boys Entering Early							0.170	-0.174**
African American Boys Entering Later							0.418	-0.086
Entering Early							1.743	0.049
Entering Later							0.765	-0.027
Predicted Probability	0.797		0.791		0.790		0.790	

Dependent Variable Predicted Probability of being At/Above Grade Level
Total Observations (N) = 4,435
*Measure of Statistical Significance: * = p < 0.10, ** = p < 0.05, *** = p < 0.01*
Source: Early Childhood Longitudinal Study – Kindergarten (ECLS-K), DoE National Educational Statistics Foundation

Table 10: Estimated Odds Ratios and Marginal Effects for Models Predicting Being At/Above Grade Level in Math

	Model 1 Baseline - Socioeconomic Status		Model 2 Adds School Readiness		Model 3 Adds Support and Supplemental Education		Model 4 Adds Timing of School Entry	
	Odds Ratio	**Marginal Effect**	**Odds Ratio**	**Marginal Effect**	**Odds Ratio**	**Marginal Effect**	**Odds Ratio**	**Marginal Effect**
Socioeconomic Status								
African American Boys (Race / Gender)	0.644	-0.050*	0.764	-0.022	0.813	-0.016	0.767	-0.021
Parent Education								
HS Graduate	1.181	0.021	1.165	0.013	1.126	0.010	1.108	0.008
Some College or Associate Degree	1.289	0.031	1.246	0.018	1.262	0.019	1.291	0.020
Bachelor Degree or Higher	1.353	0.037	1.103	0.008	1.109	0.009	1.114	0.009
Family Income	1.000	0.000***	1.000	0.000	1.000	0.000	1.000	0.000
School Readiness								
Child Physical Health								
Good			1.090	0.007	1.034	0.003	1.044	0.003
Fair/Poor			1.084	0.006	0.912	-0.008	0.914	-0.007
Child Emotional Health								
Emotional Difficulties			0.746	-0.024	0.726	-0.026	0.768	-0.021
Child Social Confidence								
Fitting In								
Sometimes			2.052	0.070*	2.021	0.067*	2.048	0.068*
Often/Always			2.342	0.081**	2.315	0.078**	2.320	0.078**
Making Friends								
Little Bit True			0.874	-0.012	0.876	-0.011	0.873	-0.011
Mostly/Very True			1.147	0.011	1.133	0.010	1.135	0.010
Child Cognitive Ability								
Reading			1.043	0.003***	1.042	0.003***	1.041	0.003***
Math			1.081	0.006***	1.081	0.006***	1.081	0.006***
Science			0.990	-0.001	0.993	-0.001	0.995	0.000
Support and Supplemental Education								
Parent Health								
Good					0.985	-0.001	0.968	-0.003
Fair/Poor					1.578	0.034*	1.557	0.032*
Attend Parent-Teacher Conference								
Attend					0.462	-0.062**	0.460	-0.062***
Helps with Homework (3 or more days/wk)								
Less than once a week					0.449	-0.053	0.427	-0.056
1-2 times per week					0.538	-0.039	0.515	-0.042
3-4 times per week					0.426	-0.057	0.406	-0.060
5 more times per week					0.408	-0.061	0.392	-0.063
Pre-K attendance								
Attended					1.172	0.013	1.138	0.010
Head Start Attendance								
Attended					0.934	-0.005	0.979	-0.002
Kindergarten 1/2 vs Whole								
Full Day					1.595	0.037***	1.562	0.035***
Teacher Gender								
Male					1.273	0.019	1.265	0.019
Dependent Variable								
Interactions								
African American Boys Entering Early							1.000[1]	0.000[1]
African American Boys Entering Later							0.468[1]	-0.060[1]
Entering Early							1.405	0.025
Entering Later							0.675	-0.034
Predicted Probability	0.870		0.865		0.864		0.863	

Dependent Variable Predicted Probability of being At/Above Grade Level; Total Observations (N) = 4,435
*Measure of Statistical Significance: * = p < 0.10, * *= p < 0.05, *** = p < 0.01*
Note 1: Regression of interactions ommitted standard errors for African American Boys Entering Early.
Source: Early Childhood Longitudinal Study – Kindergarten (ECLS-K), DoE National Educational Statistics Foundation

Table 11: Estimated Odds Ratios and Marginal Effects for Models Predicting Being At/Above Grade Level in Science

	Model 1 Baseline - Socioeconomic Status		Model 2 Adds School Readiness		Model 3 Adds Support and Supplemental Education		Model 4 Adds Timing of School Entry	
	Odds Ratio	Marginal Effect	Odds Ratio	Marginal Effect	Odds Ratio	Marginal Effect	Odds Ratio	Marginal Effect
Socioeconomic Status								
African American Boys (Race / Gender)	0.963	-0.002	1.170	0.006	1.157	0.006	1.115	0.004
Parent Education								
HS Graduate	1.368	0.021	1.03	0.001	1.082	0.003	1.111	0.004
Some College or Associate Degree	1.425	0.023	1.027	0.001	1.085	0.003	1.124	0.005
Bachelor Degree or Higher	1.713	0.032	1.083	0.003	1.160	0.006	1.174	0.007
Family Income	1.000	0.000***	0.999	0.000	1.000	0.000	1.000	0.000
School Readiness								
Child Physical Health								
Good			0.900	-0.004	0.855	-0.006	0.846	-0.007
Fair/Poor			0.512	-0.032*	0.407	-0.045**	0.434	-0.041*
Child Emotional Health								
Emotional Difficulties			0.553	-0.024**	0.480	-0.029***	0.502	-0.027**
Child Social Confidence								
Fitting In								
Sometimes			3.703	0.073**	3.622	0.073**	3.72	0.074**
Often/Always			1.389	0.070**	3.542	0.072**	3.580	0.072**
Making Friends								
Little Bit True			0.895	-0.004	0.911	-0.004	0.920	-0.003
Mostly/Very True			0.933	-0.003	0.906	-0.004	0.925	-0.003
Child Cognitive Ability								
Reading			1.065	0.003***	1.067	0.003***	1.066	0.003***
Math			1.020	0.001**	1.020	0.001**	1.020	0.001**
Science			1.046	0.002***	1.048	0.002***	1.050	0.002***
Support and Supplemental Education								
Parent Health								
Good					0.940	-0.003	0.911	-0.004
Fair/Poor					1.998	0.024**	1.933	0.022**
Attend Parent-Teacher Conference								
Attend					0.627	-0.019	0.641	-0.018
Helps with Homework (3 or more days/wk)								
Less than once a week					3.511	0.051	3.146	0.044
1-2 times per week					1.733	0.027	1.536	0.020
3-4 times per week					1.719	0.026	1.498	0.019
5 more times per week					2.029	0.033	1.776	0.026
Pre-K attendance								
Attended					0.952	-0.002	0.933	-0.003
Head Start Attendance								
Attended					1.333	0.011	1.379	0.013
Kindergarten 1/2 vs Whole								
Full Day					1.078	0.003	1.067	0.003
Teacher Gender								
Male					0.950	-0.002	0.943	-0.002
Dependent Variable								
Interactions								
African American Boys Entering Early							1.000[1]	0.000[1]
African American Boys Entering Later							0.483[1]	-0.029[1]
Entering Early							0.637	-0.020
Entering Later							0.654	-0.019
Predicted Probability	0.944		0.940		0.940		0.940	

Dependent Variable Predicted Probability of being At/Above Grade Level; Total Observations (N) = 4,435
*Measure of Statistical Significance: * = p < 0.10, ** = p < 0.05, *** = p < 0.01*
Note 1: Regression of interactions ommitted standard errors for African American Boys Entering Early.
Source: Early Childhood Longitudinal Study – Kindergarten (ECLS-K), DoE National Educational Statistics Foundation

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