THE INFLUENCE OF ELEMENTARY SCHOOL QUALITY ON DIFFERENTIAL EFFECTS OF PRESCHOOL PROGRAMS IN THIRD GRADE

by

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A Thesis
Submitted to the
Graduate Faculty
of
George Mason University
in Partial Fulfillment of
The Requirements for the Degree
of
Master of Arts
Psychology

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Date: _____ Spring Semester 2017
George Mason University
Fairfax, VA

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Bachelor of Science
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DEDICATION

This is dedicated to my loving parents, Robin and Jeff Mumma, and to my advisor, Dr. Adam Winsler. Thank you all for everything you have done and continue to do for me every day.

ACKNOWLEDGEMENTS

I would like to thank my parents, friends, relatives, and supporters who have made this possible. To the members of my committee - Dr. Winsler, Dr. Curby, and Dr. Rowe – thank you so much for your flexibility and input throughout this process. Finally, I would like to give special thanks to the members of the Winslab and to the Drafate and Stetz families – I can't believe I'm lucky enough to have all of you wonderful people in my life!

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

THE INFLUENCE OF ELEMENTARY SCHOOL QUALITY ON DIFFERENTIAL EFFECTS OF PRESCHOOL PROGRAMS IN THIRD GRADE

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The phenomenon known as "preschool fadeout" suggests that differences between children that do and do not attend preschool, and between children who attend different types of preschool often disappear around the third grade. Elementary school quality may moderate preschool fadeout, but so far findings are mixed. Results from ANOVA and ANCOVA analyses on longitudinal data from the Miami School Readiness Project (MSRP) (N = 27,814) found that children who attended family childcare (FCC) go on to attend schools of worse quality than children who attended center-based care (CBC) or public school pre-K (pre-K). Further analyses show that sustained effects from preschool are present in third grade, with pre-K students performing the best academically in third grade, followed by CBC students, and lastly by FCC students. Elementary school quality moderated the degree of fadeout between groups. CBC students significantly outperform FCC students at the lowest quality schools, but these gaps decrease as school quality

increases – indicating sustained effects at low-quality schools, but full fadeout/convergence at the highest-quality schools. When comparing pre-K students to CBC students, sustained effects are present across all levels of school quality, but increase as school quality increases. I also found several significant three-way interaction effects: school quality-by-preschool type-by-ethnicity of particular interest. Hispanic students out-performed Black students at all but the lowest quality schools, and for Hispanic students, the pre-K advantage is most evident at schools of the lowest quality. The pre-K advantage is smaller for Hispanic students at average or better schools, and remains constant as quality increases. For Black students, the pre-K advantage is the least evident at lowest-quality schools, slightly larger at average or better schools, and remains stable as quality increases. Policy implications will be discussed.

INTRODUCTION

Research on early childhood education (ECE) programs has grown exponentially within the past twenty years (Barnett, 1995; Lee & Loeb, 1995; Currie & Thomas, 2000; Magnuson, Meyers, Ruhm, & Waldfogel, 2004; Winsler et al., 2008; Yoshikawa et al., 2013; Zhai, Brooks-Gunn, & Waldfogel, 2011). There are several different types of ECE programs: pre-kindergarten, center-based care, family child care, federally funded programs such as Head Start, and what are known as "boutique" programs, such as the Abecedarian Project and Perry Preschool (Ramey et al., 1976; Schweinhart et al., 1985). There is substantial evidence that shows ECE programs can greatly benefit children's cognitive abilities and help close the "achievement gap" by increasing a child's school readiness (Crosnoe, 2007). The achievement gap can be defined as the difference in performance between ethnic groups and white students, or between those in poverty and those with adequate financial resources (National Assessment of Educational Progress, 2015). Currie and Thomas (1996) discovered that on average, Head Start attendance closed at least 25% of the gap in test scores between Hispanic children and non-Hispanic White children. It has also been found that making preschool enrollment universal for 3- and 4-year-old children in poverty and increasing the quality of care could close up to 20% of the Black-White school readiness gap and up to 36% of the Hispanic-White gap (Magnuson & Waldfogel, 2005).

Despite the gains that can be made from ECE programs, a concept known as the preschool fadeout effect casts doubt on the longevity of these benefits. The preschool "fadeout" effect refers to a phenomenon sometimes seen when studies follow children who did and did not attend various ECE programs into their elementary school years. Around the third grade, differences in cognitive and other performance outcomes that were initially seen between students who attended ECE programs and those who did not often disappear (Yoshikawa et al., 2013; Zhai, Brooks-Gunn, & Waldfogel, 2011). There are multiple theoretical frameworks that could explain this phenomenon; "fadeout" may be a less accurate term than "convergence." "Fadeout" insinuates that children who were enrolled in early intervention programs decline in academic achievement outcomes by third grade. Instead of the effects of attending a preschool program diminishing by third grade, the situation is more typically that those who did not attend preschool programs, or attended certain types of preschool programs, "catch up" and "converge", achieving levels of academic success similar to their preschool-attending peers.

In a way, convergence could be seen as beneficial, since it would signify that teachers are helping lower-performing children. Then again, policymakers often argue that children who were enrolled in an early intervention program should maintain their advantage throughout elementary school and even further. This may not be advantageous to students, though, since this would mean that children in lower-quality preschool programs or children that did not attend preschool at all would always continue to struggle in school compared to those who went to high-quality pre-K programs. Also, attending certain high-quality preschool programs is not always an option for some

families; they can be very expensive. Ansari and Winsler (2012) point out that especially for families in poverty, parent education campaigns would be helpful so that they could learn about the different types of programs available, along with advantages and disadvantages of each. Similarly, higher-quality preschool programs may not be as accessible in areas with few economic resources. This would lead the most disadvantaged students to continue to be disadvantaged academically in elementary school – an issue that many preschool programs try to eliminate. Nevertheless, the topic of convergence is still important to researchers and policy makers.

The current study investigated the extent to which the quality of the subsequent elementary school attended by children affects the amount of convergence or fade-out in academic outcomes that is observed in third grade for children attending different types of ECE. Using elementary school quality as a moderator could provide insight on the complex and numerous different possibilities for the shape of preschool convergence effects. The present study used longitudinal data from the Miami School Readiness Project (MSRP) (Winsler et al., 2008), which included children who attended public school pre-kindergarten programs and children who attended center-based care or family childcare with childcare subsidies, to elucidate the effects of elementary school quality on the long-term effects of preschool.

The Achievement Gap

Ethnic minorities and children in poverty often lag behind their ethnic majority and more affluent peers in school. For instance, results from the Early Childhood Longitudinal Study, Kindergarten Cohort (ECLS-K) showed that Black and Hispanic

children performed less successfully on tests of early reading and math skills than their White peers (Magnuson & Duncan, 2005). Relatedly, young children of Mexican and Central American/Spanish Caribbean parents consistently perform worse in early academic subjects than other immigrant subgroups and native-born White children (Votruba-Drzal & Koury, 2014). It is important to note that in the United States, the achievement gap can be largely accounted for by socio-economic status (SES), which is linked with race and ethnicity.

Families with more disposable income may be able to purchase more books for their children, spend more educational time with their children, and enroll their children in more expensive and typically, higher-quality preschool programs. Indeed, many times, children of ethnic minority status/low SES do not attend ECE programs and therefore have lower levels of school readiness than their majority/higher SES peers upon entering kindergarten (Lopez, 1999; Magnuson & Waldfogel, 2005). However, studies show that ECE programs can especially help impoverished and/or children of color (Currie & Thomas, 1996; De Feyter & Winsler, 2009; Dearing, McCartney, & Taylor, 2009; Dobbie & Fryer, 2011; Magnuson et al., 2006; Magnuson, Lahaie, & Waldfogel, 2006; Magnuson & Shager, 2010).

Early Childhood Education Programs

ECE programs are one way to reduce the achievement gap. There is a prolific literature base that concludes that early childhood education programs can help promote school readiness and higher academic achievement later in life (Bauchmüller, Gørtz, & Rasmussen, 2014; Borman, 2003; Herman-Smith, 2012; Magnuson, Ruhm, & Waldfogel,

2007; Zhai, Brooks-Gunn, & Waldfogel, 2011). School readiness refers to the culmination of skills related to language, mathematics, science, and social, emotional, and physical health that a child has upon entering kindergarten (Snow, 2007). By attending ECE programs, children can increase their school readiness and thus decrease the achievement gap, at least early on. Additionally, ECE programs can help to ensure that all children are better prepared for kindergarten and elementary school.

In one of the first literature reviews of its kind, Barnett (1995) evaluated 36 studies investigating the long-term effects of various early education programs. This extensive review concluded that many, but not all, preschool programs (which he defined as Head Start, child care, or home visiting programs) can produce large, short-term benefits for children's development. The largest short-term benefit was seen on an increase of intelligent quotient (IQ) scores, and for school achievement, grade retention, placement in special education, and social adjustment; moderately sizeable effects emerged (Barnett, 1995). In ten of the studies reviewed, effects on IQ ranged from a gain of 4-11 IQ points. In another study, children's program participation resulted in a gain of 25 points (Garber, 1988), while still another reported no effect (Lally, 1988). IQ gains were reported during or after children's program participation and sustained at least until age 5. Although this is early in the lifespan, Barnett considered these to be long-term effects, since program interventions took place at least one year prior to the age 5 assessments. The types of programs explored in Barnett's literature review vary significantly; I will elaborate on each type below.

Head Start

Head Start is a publicly-funded federal early childhood education program that provides preschool education, medical, dental, and mental health care, and nutrition services (Office of Planning, Research, & Evaluation, 2012). Every student that comes from a family that makes 200% of the federal poverty line or less is eligible to attend Head Start free of charge. Many studies have been conducted on the efficacy of Head Start to determine if the government expenditure on this program is worth the money spent. One study found that children who attended Head Start have higher reading and vocabulary scores, fewer behavioral problems, and are less likely to have ever been retained at any point from ages 10-15 compared to students who did not attend Head Start (Currie & Neidell, 2007). Currie and Neidell (2007) also found that children who attended Head Start programs with higher expenditure rates and presumably were of higher quality were more likely to have higher reading and vocabulary scores across various ages compared to children who attended Head Starts with lower funding.

However, long-lasting effects of Head Start have recently been called into question. For instance, a follow-up to the Head Start Impact Study (HSIS), examined a nationally representative sample of approximately 5,000 children who were followed from their entrance into a Head Start program at age 3 or 4 through the spring of their third-grade year (Puma, Bell, et al., 2012). This particular study was a randomized-control design, with 4,667 3- and 4-year old children being randomly assigned to either a Head Start classroom that had access to Head Start program services or a control group that did not have access to Head Start (but could, and did enroll in other ECE programs if their parents so desired). This study found that while children were in Head Start, impacts

on children's language and literacy development and social-emotional development were found, although most of these effects dissipated relative to the control group by the end of their third grade year, showing evidence for the fadeout idea (Puma et al., 2012).

The fadeout/convergence notion has also been confirmed by a cost-benefit analysis that examined multiple studies that assessed the level of success of Head Start programs (Ludwig & Phillips, 2007). In this paper, the authors state that it costs approximately $7,000 per child per year to pay for the services for a child enrolled in Head Start. After completing a meta-analysis, the authors conclude that Head Start does "pass" a cost-benefit analysis. Though policy makers may desire to see larger effect sizes, the authors argue that they do not know whether changing the curriculum of the program would actually increase the effect sizes seen or have any benefit to children at all; leading funders to believe that it may not be worthwhile to risk billions of dollars to make such a change for little to no pay-off. It is also important to consider that effect sizes could be increasing or decreasing based *not* on the quality of the Head Start program, but instead, on the quality of schools that the children are attending *after* they went to Head Start. For example, if researchers are determining the quality of a Head Start program based on a child's later academic outcomes, it is entirely possible that the scores on these measures may be more telling of the quality of the elementary school that he was enrolled in at the time of the exam, rather than the quality of the Head Start program attended a number of years ago. Studies which assess later elementary school quality post-intervention will be addressed in a separate section.

Boutique Programs

Programs like the Abecedarian Project, the Chicago Longitudinal Study, and the Perry Preschool Project have been classified as "boutique" programs; or programs that generally have small samples, were from well-funded research projects, and conducted up to 40 years ago, and therefore may not be generalizable to the current population. In spite of this critique, large effect sizes have been reported for several studies analyzing the efficacy of such programs. For instance, both the Carolina Abecedarian Project and the Chicago Longitudinal Study report that as adults (aged 30 and 22, respectively), subjects who participated in their respective programs reached higher levels of education than did children who did not participate in their respective interventions (Ou & Reynolds, 2009; Ou, Reynolds, & Topitzes, 2004).

The Carolina Abecedarian Project was one of the first randomized trials to investigate the effects of a longitudinal intervention program on cognitive and social development (Ramey et al., 1976). Beginning from infancy, 111 predominantly Black children from low-income families from Orange County, North Carolina, enrolled in the treatment program. The treatment group was exposed to high-quality child care, which they called the Abecedarian Project, five days a week from age six weeks to 5 years. The "Abecedarian Approach" was designed to support age-appropriate development across the infant, toddler, and preschool years geared toward language, cognition, social, emotional, and physical development. In the preschool treatment, participants were given nutritional supplements, family support social services, pediatric care and referrals, individualized learning experiences in natural preschool atmosphere, promotion and

support for parent involvement, and daily transportation. The control group received only nutritional supplements, family support social services, and pediatric care and referrals. The Abecedarian Project is unique in that it also performed a school-age intervention for half of the preschool control group and half of the preschool intervention group. This follow-up intervention shows evidence of the extent to which gains from the intervention program might be maintained in elementary school if there was an additional program compared to if the child was to be enrolled in a normal education program.

The school-age intervention program consisted of master-level teachers (known as home/school resource teachers) providing parents supplemental educational activities and social and emotional support to parents and school teachers (Ramey & Campbell, 1991). During this intervention, the home/school resource teacher visited the parents every other week to introduce new activities and report on the child's classroom behavior. Further, parents were provided with assistance with finding better housing, employment opportunities, and social services. The school-age intervention program continued into the summer months, with day camps, tutoring, and field trips all organized by the home/school resource teacher.

Results from multiple analyses of variance performed as part of this study demonstrated that third grade IQ scores, math, and reading scores of children who were part of the preschool and school-age intervention groups outperformed children who were in the preschool and school-age control groups (Ramey & Campbell, 1991). This finding is particularly encouraging because it alludes to the importance of later school quality and how it can affect the results of a preschool intervention program. This is especially true

since children who were involved in only the preschool intervention groups did not demonstrate any significantly different cognitive outcomes in third grade compared to their peers who were in the preschool control group (Ramey & Campbell, 1991).

Also contributing to the longitudinal effects of preschool programs, the Chicago Longitudinal Study (CLS) followed children involved in a preschool – third grade intervention program through age 22. Although this study conducted an intervention project within Head Start classrooms, it was funded by a university, which is why I am classifying it as a Boutique program. This study found that preschool participation was significantly correlated with higher educational attainment and lower rates of juvenile arrest (Ou & Reynolds, 2006; Ou, Reynolds, & Topitzes, 2004). The CLS originally included a sample of 1,539 low-income, mostly Black children (93% Black, 7% Hispanic) from Title-I-eligible neighborhoods who graduated from kindergarten in 1985-1986. Data were collected from youth, parents, teachers, and administrative records.

The children in the intervention group were enrolled in the CPC Program, a center-based early intervention for impoverished 3- and 4- year old children that lasted through third grade. As this was a quasi-experimental study, the children were not randomly placed into the intervention group, although there was a comparison group in which the participants received a kindergarten intervention without the CPC preschool experience. The CPC Program focused on increasing students' school readiness and academic achievement with services such as free breakfasts, lunches and health screenings, coordinated adult supervision, reduced class size, and emphasis on reading instruction, and parental attendance at the program for at least one half-day a week. These

services were provided to children in the intervention group from preschool to early elementary school. In order to have been eligible for the intervention group, children were required to have residency in school neighborhoods that received Title I funds, to attend the program at least one half-day per week, and were not permitted to have been enrolled in any other intervention program. Children in the control group were enrolled in other programs.

To investigate the effects of the program two years post-completion, Reynolds (1994) conducted ANOVAs and multiple regression to determine if the effects of the intervention were stable (N = 1,106) When assessed in the fifth grade year, children who were involved in the intervention program for their entire preschool through third grade experience had signifcantly higher reading and math test scores, notably more positive teacher-ratings, higher parental involvement in the school, and less grade retention and special education placement compared to the control group (Reynolds, 1994). Children who did not attend the follow-up intervention, but attended just the preschool intervention, did, however, show evidence of fadeout, with their third grade reading and math scores not being significantly higher than their peers in the control group (Reynolds, 1994).

This program has also demonstrated effects possibly lasting through high school. Children in the CPC program had significantly higher rates of high school graduation when compared to the control group. Effect sizes reported were relatively small, with .30 for high school completion, .23 for highest grade completed, and .18 for college attendance; although the authors warn that effect sizes should be interpreted with caution

due to the social and economic significance of outcomes varying dramatically. Instead, percent improvement over the comparison group provides more insight into how the CPC program influenced participants. Although the effect size is only .18 for college attendance, the CPC preschool group attendees were 28.5% more likely to attend college than the comparison group (Ou & Reynolds, 2006).

One of the oldest studies evaluating the effects of preschool was the Perry Preschool Program (Schweinhart et al., 1985). Beginning in 1962, the Perry Preschool study included 123 black children spread amongst five cohorts, each separated into an experimental group and a control group. Children in the study were selected by identifying them on a Perry Elementary School census, referrals from neighborhood groups, and by door-to-door canvasing. Formation of the experimental group and the control group was done by creating pairs of children with similar pretest IQs and randomly assigning one child from each pair to one of the two groups.

Children in the experimental groups were enrolled in the Perry preschool program for 2.5 hours, 5 days a week, for one or two school years. Children in the control group did not attend preschool. Preschool through fourth grade data were collected annually from the Stanford-Binet Intelligence scale, the Peabody Picture Vocabulary test (PPVT), and home observations. Attending the Perry preschool program was positively associated with IQ scores, academic achievement, and teacher ratings of social-emotional skills. While differences between the experimental and control groups increased over time for academic achievement (with children who attended the program performing increasingly better as time went on, indicating no convergence on this measure), differences between

the groups on IQ scores *decreased* over time (indicating convergence) (Weikart et al., 1978). Since this study was extremely well-funded, data were collected on the participants of the study up through age 40, showing especially promising results post-high school. For instance, subjects in the experimental group graduated from high school at a rate of 67%, while their control group counterparts graduated at a rate of 49%. Subjects in the preschool group attended college at a rate of 38%, while the control group attended at a rate of 21% (Schweinhart et al., 2005).

Results from the Perry Preschool program point out that improvements on social skills for former participants of the program may manifest later in life (such as when they were measured in this particular follow-up study, at age 19). This may suggest that if participants of more recent studies, whose cognitive effects may fade out by third grade, were to be studied longitudinally for more years, they may also have sustained social effects, and researchers may then find results similar to the Perry Preschool Program. This illuminates yet another rationale for studying convergence; if policymakers had canceled programs that had shown fade out in third grade, then researchers would not be able to see possible even longer-term effects that may emerge in adulthood.

Prekindergarten

Prekindergarten programs have also been explored as a source for early intervention, though similar to other types of preschool programs, it seems as though benefits only persist if the program is of high quality. Significant improvements on children's mathematics, language, and literacy were found in children who attended the Boston pre-kindergarten program compared to their counterparts who did not attend any

type of preschool (Weiland & Yoshikawa, 2013). Indeed, some of these improvements were even more profound when assessing certain subgroups, such as children who received free or reduced lunch (FRL) (Weiland & Yoshikawa, 2013). Consistent with prior research on the achievement gap and ECE programs, this again may signify that certain types of programs are even more beneficial to "at-risk" students. Furthermore, a multitude of studies have examined the quality of preschool programs in relation to a variety of outcome variables. The level of preschool quality has been shown to predict later educational outcomes like second grade reading and math test scores (Ladd, Muschkin, & Dodge, 2013; Sylva, 2011). Using a sample from ECLS-K, researchers found that children who attended pre-kindergarten programs showed the greatest achievement on reading and math scores in kindergarten when compared to students who attended a different type of childcare or preschool program (Gormley et al., 2005). However, other studies produce mixed results.

Indeed, Hill, Gormley, and Adelstein (2015) found persisting effects in third-grade math and reading assessment scores for pre-K enrollment. Hill et al.'s study focused on pre-K programs in Tulsa, Oklahoma, a state which has implemented universal public pre-K since 1998. Data were obtained from administrative records and parent surveys. Each cohort was composed of a treatment group and a control group. Children in treatment groups were enrolled in the Tulsa preschool (TPS) pre-K program or they were enrolled in another program, such as Head Start, a different preschool program, or cared for at home, which the authors state was "the potential comparison group." (Hill et al., 2015)

Parent surveys in both cohorts were distributed in both English and Spanish. All children were administered the Oklahoma Core Curriculum Test (OCCT), designed to fulfill No Child Left Behind and state mandates for testing in third grade for math and reading. Analyses were conducted, using both regression discontinuity and propensity score matching methods.

For the early cohort, there were no significant differences in third-grade test scores between children who attended the TPS pre-K and children in the comparison group. However, significant differences were found in the later cohort for math test scores, but not reading. Pre-K attendees scored nearly 18 points higher on third-grade standardized math tests compared to their peers who did not attend the pre-K program. This resulted in an effect size of 0.18.

Program maturation, innovation, or an overall shift toward greater accountability are reasons the authors cite for the differences in effects between the early and late cohorts. New curricula embraced in the later cohort may have encouraged higher math scores for the experimental group in third grade. The findings of the Tulsa pre-K study show evidence of both persistence of preschool effects *and* convergence; considering that the only significant difference reported was math test scores of one cohort, but not reading scores, and no significant differences between groups for any test scores for the first cohort. The results of this study encourage increased research on why findings have been mixed, starting with the evaluation of educational quality.

Recently, Tulsa researchers have also published results showing differences between races in academic achievement in eighth grade (Phillips, Gormley, & Anderson,

2016). In this study, OLS and logistic regressions were conducted, revealing that being enrolled in Tulsa's CAPS Head Start intervention programs was associated with more positive math achievement scores, and lower retention and absenteeism rates in eighth grade compared to attending a non-Head Start program (and not public school pre-K). Notably, there were no significant differences between groups on eighth-grade GPA, gifted status, honors class enrollment, special education status, or suspension rates. Most of these results persist when comparing subgroups of interest as well. For instance, Hispanic and White Head Start students, FRL-status students, and girls who went to the CAPS HS program all had significantly higher math achievement test scores than their comparison groups. However, Black students, students who were ineligible for FRL, and boys still benefited from the program, but they did not have as strong of effects. These findings encourage more empirical research on subgroups in order to investigate if convergence effects are persistent or changing depending on the gender, race, ethnicity, and/or SES of the child in question.

Center-based Childcare versus Family Childcare

Another relevant comparison that has had less attention is center-based childcare (CBC) versus family childcare (FCC). Compared to children who did not attend any type of preschool, children in center-based programs experience more cognitive stimulation, more frequent language interactions with adults, and less television viewing (Dowsett, Huston, Imes, & Gennetian, 2007; Keys, Farkas, Burchinal, & Duncan, 2013). Forry, Davis, and Welti (2013) examined 6,772 children from low-income families who had received a child care subsidy in the year prior to entering kindergarten, and either family

child care or other informal care, pre-kindergarten, or Head Start. Using administrative data from Maryland, the authors used multivariate methods to estimate the probability that a child would be ready for school based upon personal and social development, language and literacy, and mathematical skills. Compared to children in subsidized family child care or informal care, children in subsidized center care were more likely to be deemed as "fully ready for school" prior to the kindergarten year. Three recent studies conducted by Ansari and Winsler (2012, 2013, 2014) use the Miami School Readiness Project (MSRP) to evaluate school readiness differences between family childcare and center-based care over the prekindergarten year, the kindergarten year, and in third grade. Children attended three different types of childcare at age 4; subsidized center-based care (CBC), subsidized family childcare (FCC), and public-school pre-kindergarten (pre-K).

The first study (2012) showed that attending center-based care may be beneficial to Latino children in terms of school readiness skills such as cognitive, motor, and language development. Participants were 6,929 low-income Latino children who had received childcare subsidies to attend either center-based care or family childcare between 2002 and 2007. Using a mixed ANOVA design, results showed that while children in CBC improved in cognitive, language, and social skills, children in FCC barely maintained skills or even "lost ground" in the same areas (Ansari & Winsler, 2012).

The second study conducted by Ansari and Winsler (2013) investigated the kindergarten readiness of children in the MSRP (N = 16,176) who attended public school pre-K, CBC, or FCC. Kindergarten readiness was measured by the Dynamic Indicators of

Basic Early Literacy Skills (DIBELS) (Kaminski & Good, 1996), Early Screening Inventory – Kindergarten (ESI-K) (Meisels, Marsden, Wiske, & Henderson, 1993), Early Childhood Observation System (ECHOS) (Harcourt Assessment, 2006), Work Sampling System (WSS) (Meisels, Liaw, Dorfman, & Nelson, 1995), and kindergarten grades. Children who were enrolled in public school pre-K received higher year-end grades than their peers who attended CBC programs (ES = 10% of a standard deviation), even controlling for demographic variables and cognitive skills at preschool entry. Also, children who were enrolled in public school pre-K performed better than their peers who attended FCC (ES = 17% of a standard deviation). Similarly, children who were enrolled in center-based care achieved higher scores on kindergarten readiness assessments compared to their peers who attended family childcare. These results were found even when controlling for cultural and language background. Thus, this study showed no fadeout/convergence by the end of kindergarten.

The most recent work by Ansari and colleagues, a follow-up examining differences of third-grade outcomes of Latino MSRP children (N = 11,902) provides evidence that there are sustained effects of pre-K through third grade; or in other words, there is little convergence between Latinos who attended pre-K programs compared to Latinos who attended center-based care Ansari et al., 2016). Results from regression and propensity score analyses found that children who were enrolled in public school pre-K outperformed children who attended CBC on standardized assessments of math and reading, and also earned a higher GPA, showing a lack of convergence, since comparisons of academic outcomes were still significantly different between the two

groups of children (Ansari et al., 2016). However, this study did not address the unique comparison of children who attended CBC to children who attended FCC; nor did it address children of different ethnicities. This thesis provides information about these unique contrasts.

Quality of Later Education

Still, it is clear that convergence may happen over time, and thus it is necessary to review studies which have examined the quality of education attended after intervention programs to determine if this convergence is due to A) children who attended a certain type of preschool program "fading out" (academic skills decreasing relative to their peers') when they attend lower-quality elementary schools, B) children who did not attend a certain preschool program "catching up" when they attend higher-quality elementary schools, or C) some third possibility which has yet to be explored. The hope is that interventions from ECE programs result in benefits to the children regardless of the quality of the elementary school later attended, but we may see that this is not the case. In 2007, Magnuson, Ruhm, and Waldfogel conducted a study using ECLS-K data. Variables assessed included school, class size, teacher quality, time spent on literature instruction, and individual reading and math assessment scores. Class size was defined as "large" (above 20.5 students), or "small" (below 20.5 students). Teacher quality was determined by the level of education that the teacher had acquired. The authors divided the time spent on literature instruction into four levels – 1-30 minutes, 31-60 minutes, 61-90 minutes, and more than 90 minutes of reading instruction per day. Children's math and reading skills were assessed at three time points – the fall of their kindergarten year,

spring of first grade, and spring of third grade. Multivariate Ordinary Least Squares (OLS) regressions were conducted on a sample of children who attended the intervention program and a control sample of children who did not receive consistent non-parental care. During the fall of kindergarten, parents of the children assessed were interviewed. Parents reported if their child had attended center-based child care, relative care, non-relative care, or Head Start.

Their results showed that consistent, non-parental preschool attendance was linked to an increase in third grade math and reading scores by 4.12 and 4.02 points, respectively. This was equivalent to effect sizes of .41 and .40, respectively. When the authors adjusted their model for subsequent classroom experiences (i.e., large versus small class sizes and high versus low reading instruction), differences in math and reading scores for children who were enrolled in consistent, non-parental care compared to those who received only parental care disappeared, especially for children who experienced small class sizes and high levels of reading instruction. For children who experienced large classes or low reading instruction and previously attended consistent non-parental care, third grade math and reading test scores were both .37 standard deviations higher than those of children who attended only parental care.Importantly, effect sizes were .003 in first grade and .12 in third grade, which the authors considered evidence of "sleeper" effects. These results would indicate that students who did not attend preschool but later attended schools of high quality "catch up" to their peers who did attend preschool (ie., no fadeout for students who attended high-quality elementary schools)

The authors also wanted to investigate if there were differences within children who attended consistent non-parental childcare previous to kindergarten, but attended various types of programs. The authors determined that third grade math and reading scores did not differ in children who had previously attended non-parental care or Head Start compared to those who attended prekindergarten or other center-based care.

The authors of this study note that quality of subsequent classroom experiences, in terms of small class size and high reading instruction, may be helping children who did not attend any type of preschool to catch up to their peers who did attend preschool. Similarly, the authors suggest that children who did not attend preschool and subsequently attended large classrooms or classrooms with low reading instruction had difficulty catching up to their peers. Although no evidence was provided for this, the authors offered the following possible explanation; "Teachers in the early grades [may] focus on ensuring that all students have a basic set of skills, and that the advantages resulting from preschool are not fully realized until later grades, when more advanced material is introduced." (Magnuson et al., 2007, pp. 28) These results again show evidence of a "catching-up" or convergence effect; where children who only received parental care are improving at a rate where they achieve similar levels of academic success compared to their peers who received more formal early childhood education, as long as they attended high-quality elementary schools.

Another pertinent study, conducted by Zhai, Raver, and Jones (2012), utilized data from the Chicago School Readiness Project, an intervention that took place within enhanced Head Start programs. They found that children who attended Head Starts with

the intervention program had higher levels of cognitive and social abilities and reduced attention problems after their kindergarten year compared to their peers who were enrolled in control group classrooms (Zhai et al., 2012). The CSRP used a clustered randomized controlled trial design and a pairwise matching procedure, so that nine pairs of matched sites were identified and randomly assigned to either the intervention or control group. The researchers evaluated children from the most economically disadvantaged neighborhoods in Chicago, with about 66% of the subjects identifying as non-Hispanic Black, 26% as Hispanic, and 8% from other racial or ethnic groups. The authors of this study investigated whether exposure to the CSRP had differential effects on children's language, literacy, and math skills, as well as both internalizing and externalizing behavior problems in kindergarten if children attended either high- or low-performing schools after the intervention program. CSRP participants included students and teachers of 18 Head Start sites. The intervention provided four services – a 30-hour teacher training focusing on behavior management strategies, the placement of mental health consultants in intervention classrooms, stress-reduction workshops for teachers, specialized curricula that implemented behavior management strategies, and individual mental health consultation services for 3-4 children per classroom that experienced high emotional and behavioral problems. Classrooms assigned to the control group were provided with a teacher's assistant.

The children were randomly assigned to attend the Head Start program with the intervention. Later school quality was obtained from school records and defined by school-wide scores attained on the Illinois standardized tests (ISAT), which was

conducted at the end of the third grade. A school deemed "high-performing" had a percentage of students that either met or exceeded state math and reading standards beyond .5 standard deviations above the mean. On the other hand, "low-performing" schools' percentage of students meeting or exceeding state standards in math or reading was .5 standard deviations below the mean. The authors only compared "high-performing" and "low-performing" schools according to these standards; schools that met standards between these two extremes were not evaluated. Students' academic skills and behavioral problems were measured by teacher-reports, which were completed in the fall and spring of the Head Start year.

The authors conclude that when children are assessed in the kindergarten year, children in the CSRP intervention group who later attended high-performing schools in kindergarten had scores .58 points higher in language and literacy scores than the children in the matched control group who did not receive the intervention. Multiple regression analyses resulted in an effect size of .53. Interestingly, when assessed in their kindergarten year, children who attended low-performing elementary schools did not show any significant difference from their peers who were not assigned to the CSRP intervention program. Thus, the CSRP intervention showed significant effects on children who subsequently attended high-performing schools (no fadeout) but not on children who subsequently attended low-performing schools (fadeout). One explanation the authors provide is that due to the new social and academic demands of kindergarten compared to preschool, children may need higher quality kindergarten experiences in order to maintain the benefits from an intervention program like the CSRP (Zhai et al., 2012).

These findings do not necessarily support "fadeout." Instead, the results show that when children are enrolled in a high quality school environment, benefits from their early childhood education programs persist. These results are in contrast to the Magnuson et al. study (2006) mentioned previously; where children enrolled in a high-quality school environment who did not attend a preschool program "caught up" to their peers (convergence), while differences persist for children who experienced lower-quality elementary school programs. It is unclear why these studies would produce different results, but I may hypothesize that it could be due to the type of instruction given to the children involved in each intervention program. For instance, the post-preschool programs in Magnuson and colleagues' studies focused especially on reading instruction. It is possible that this emphasis on reading instruction in the high-quality classrooms helped the children who did not attend the preschool intervention improve to their peers' achievement level. It could also be that the Magnuson and Zhai studies used different "counterfactuals" in their research. For example, the ECLS-K data compared children who went to center-based care or pre-kindergarten programs to an amalgamation of children who were either cared for by their parents or went to Head Start or a different non-parental childcare (Magnuson et al., 2007). On the other hand, the CLS data compared children who went to Head Start programs with an intervention to children who went to a typical Head Start (Zhai et al., 2012). The degree to which convergence exists could depend on which contrast is being made (i.e., children who went to Head Start versus not, or children who went to CLS versus family childcare, et cetera) – a question which is explored in the present study.

In addition to the above studies, Lee and Loeb (1995) and Currie and Thomas (2000) concluded that the lower quality of middle schools that Head Start alumni attend can partially explain why Head Start effects fade over time. In contrast to the previous studies that focused on outcomes in elementary school, Lee and Loeb instead focused on identifying the type of schools Head Start attendees were likely to attend as eighth graders. A major strength of this study is that it used data from the National Education Longitudinal Study of 1988 (NELS-88). The NELS-88 collected educational information from a nationally representative sample of students through student and parent surveys and achievement tests. A composite school quality variable included measures of the school's average SES, average academic achievement, perceived safety, and teacher-student relation scores (Lee & Loeb, 1995). Students' preschool experience was the independent variable, with levels being Head Start, other preschool, or no preschool. Data were collected from student surveys, achievement tests in math, science, reading, and social studies, parent surveys, and teacher surveys. Analyses compared children who attended Head Start to children who attended other preschool programs, and children who attended Head Start to children who did not attend any preschool. Analyses of variance (ANOVA) determined that former Head Start students attended middle schools of significantly lower SES, lower average achievement, lower quality, and schools that are perceived to be less safe compared to students that did not attend Head Start, but attended a different preschool program (Lee & Loeb, 1995). To summarize, this would mean that students who attended Head Start are later attending worse schools than their peers who attended different early education programs, and could partially explain why former Head

Start participants' benefits fade out over time. Similarly, Currie and Thomas (2000) also used the NELS-88 as their sample, and concluded that Black children who attended Head Start also attend schools of lower quality in eighth grade compared to Black children who attended other types of preschool programs. Despite the fact that these studies analyzed middle school quality instead of elementary school quality, these results suggest that later education quality may indeed have an impact on the lasting effects of preschool.

Gaps in the Literature

Although the previously summarized literature provides a sound foundation, there are important aspects of the early childhood education research that need to be addressed. For instance, although the Perry Preschool Project and Chicago Longitudinal Study report results that indicate lasting effects from preschool, the Tulsa study and analyses conducted by Magnuson and colleagues found that results may not be so clear. It is especially important to consider that part of these mixed findings may be due to the studies evaluating separate outcomes. That is, educational achievement, generally measured by the number of years attending a school, does not measure the same thing as academic achievement, generally operationalized as higher standardized scores and GPAs. Furthermore, even as many studies have shown that preschool and pre-K programs have positive lasting effects, only several studies show school quality as a moderating factor on extending these benefits (Magnuson et al., 2007; Lee & Loeb, 2005). The current study will also expand upon previous MSRP research (Ansari et al., 2016a), determining whether there are sustained effects of preschool for all children, or if sustained effects are only present for Latinos.

As previously mentioned, there are several possibilities that may explain the mixed results of the degree to which preschool effects do or do not fade out. For example, students who are enrolled at higher-quality schools may be exposed to higher-quality teachers, leading to less or no convergence. These higher quality teachers may do a better job of improving the skills of children at all levels. On the other hand, students who are enrolled at lower-quality schools may be exposed to lower-quality teachers who instead focus on creating a baseline level of education. This idea would consequently align with the "catch-up" theory mentioned earlier; leading to more evidence of convergence. Alternatively, catch-up may be a process which appears in all American schools regardless of the level of quality. There is some evidence for this, since the current literature has found both increased and decreased convergence for high-quality schools. A final possibility is that the mixed findings from the current literature may be a result of different types of comparisons being made across studies. Most studies mentioned have mainly compared children enrolled in one type of preschool to children who did not attend any preschool. But, there are other important contrasts like pre-K versus CBC, and CBC vs. FCC. This is a strength of my study, since I examine children who attended family childcare, center-based care, and public school pre-kindergarten, and compare preschool effects across the three groups. This will answer questions that the current literature has not yet explored; namely, which children are attending schools of what quality (across all levels of quality, rather than just the upper and lower extremes), and if convergence changes as a result of the comparison being made. I use data from the Miami School Readiness Project and specifically address the influence of elementary

school quality on different types of potential preschool convergence effects in the context of the Miami-Dade County in Miami, Florida.

The Present Study

The Miami School Readiness Project (MSRP) is an ongoing longitudinal study which takes place in Miami-Dade County in Miami, Florida. Essentially the entire county population of children receiving subsidies to attend childcare and those attending public school pre-K programs were assessed for school readiness at age 4 and followed into school. This dataset is particularly ideal to expound upon the current literature on the educational needs of ethnically and economically diverse children in early childhood programs (Winsler et al., 2008). For instance, Miami-Dade has a diverse population, which is reflected in the MSRP dataset (58% Hispanic/Latino, 33% Black/African American, and 9% Caucasian/other). Additionally, a large number of children in poverty inhabit Miami-Dade County, with 29.6% of children under the age of 18 living below the federal poverty level as of 2012 (Miami-Dade County Department of Regulatory and Economic Resources, 2013). Finally, with the recent implementation of a universal voluntary pre-K program in Florida (Florida House of Representatives, 2004) in addition to local taxpayer support for early childhood programs (statue 125.901, F.S.; Florida Senate, 1988), the MSRP makes for a necessary area to study from a policy perspective.

The current study expounds upon the current literature by assessing the type of preschool the child attended in addition to the quality of elementary school later attended. I compare students who attended public school pre-K, CBC, and non-relative FCC. Much of the current literature has data from samples of majority White and Black students. An

advantage to my study is that I am able to compare children who attended different types of childcare within a majority Hispanic/Latino population, an understudied yet growing part of the United States population (Crosnoe, 2007), yet still evaluate the academic performances of Hispanic, Black, and White students and even make comparisons between the groups; an aspect of the MSRP dataset which is currently unexplored.

The following research questions were addressed in this study: 1) Do children who attend FCC, CBC or public school pre-K at age 4 go on to attend elementary schools of the same quality? 2) How are children who went to CBC, FCC, or public school pre-K programs performing academically in third grade? Are group differences previously found to favor those who attended public school pre-K still present in 3rd grade (i.e., are there sustained effects of pre-K or is there fade out)? 3) Do the differences (if any) between the 3rd grade academic performance of children who attended CBC, FCC, or public-school pre-K change as a function of elementary school quality? 4) Is there differential "fadeout", depending on the quality of elementary school, for males versus females or for Blacks or Latinos?

METHOD

The current investigation uses a subset of the MSRP (N = 27, 814; 59.8% Hispanic; 32.7% Black, 7.5% White/Other; 51.1% male; 79.5% FRL) to examine whether effect sizes contrasting the academic performance of third graders who attended pre-K (n = 18,010), center-based care (n = 9,538), and family childcare (n = 266) vary as a function of the quality of the school attended in third grade. As described in Ansari and Winsler (2012), the sample of the present study examines children whose family received subsidies for the child to attended either FCC or CBC in the community as well as children who were enrolled in public school pre-K. In order to have received a subsidy, family income was capped at 150% of the federal poverty line. The centers within the MSRP included licensed and license-exempt for-profit and non-profit childcare centers, local/individual and national chains, faith-based church preschools, nurseries, and daycares. The public school pre-K programs of this sample employed certified teachers with a child-adult ratio of 20:2 or less, while CBC programs in the sample were of average quality, with fewer than 10% being accredited.

Sample

The overall dataset of the MSRP encompasses nearly all children in Miami-Dade County who were receiving child-care subsidies or attending public school pre-K in 5 cohorts covering the years 2002-2006. They were subsequently followed and we

currently have data up to grade 11 for our earliest cohort. Most public school pre-K children were from Title-I schools, meaning that the children and families of this dataset are of low SES. Indeed, in order to receive a childcare subsidy in Miami-Dade County, a family must have been making 150% or less of the poverty line (Winsler et al., 2008). The sample of the current study consists of 27,814 children (59.8% Hispanic; 32.7% Black, 7.5% White/Other; 51.1% male; 79.5% FRL) who attended either CBC, FCC, or public-school pre-K at age 3-4, and had third grade outcome data for at least one outcome. For primary inferential analyses, the sample was limited to those children who had age-4, school entry LAP-D cognitive skill data (an important covariate) (n = 20,254). To include all children, including those who might have repeated a grade once or twice (and therefore were a year or two behind by the time they got to 3rd grade), I created an aggregate variable that included on-time third graders as well as late or previously retained third-graders, (n = 4,550) and third graders that previously skipped a grade (n = 9). For students who were retained in third grade, I used their academic performance data corresponding to the first time they attempted the third grade.

There was a small amount of missing data in this sample (n = 1,436; 5.13%). Data were considered missing if a child had data on school-entry cognitive scores, but did not have any data on third-grade academic outcomes. Due to the small percentage of missing data, imputation methods were not utilized.

Procedure

Obtaining Records. All post-kindergarten data were received from Miami-Date County public school administrative records. Students were each given identification

numbers by their respective schools. Participants' information was then de-identified by creating individual identification numbers which differed from their school identification number. With the help of the school district, we then matched the students' original school identification with the new identification numbers so that we could obtain longitudinal follow-up data.

LAP-D. LAP-D assessments were administered at the beginning and end of the pre-school year. End-of-year data were used when available. If the student did not have end-of-year assessment data, beginning-of-year data were used instead.

Measures

Preschool Type. A three-level preschool type categorical variable distinguishes children who went to different types of preschool. The majority of the current sample attended public school pre-kindergarten (N = 18,010; 64.8%), though many attended center-based care (N = 9,538; 34.3%) and family childcare (N = 266; 1%).

Gender. For my study, I dichotomously code the gender of the students of my sample. Gender was coded as male = 1 and female =2.

Race/Ethnicity. The three races/ethnicities included in the three-level variable were Hispanic, African American, and White/Other. For higher-level models, due to small cell sizes, ethnicity had to be turned into a dichotomous variable including only Black and Latino students (excluding the White/other group).

Poverty Status. Poverty status was an additional covariate/control variable in my equations. For this variable, I used the child's Free and Reduced Lunch (FRL) status

in third grade to indicate if the student is in poverty. In order to obtain FRL status, a student's family income must be no higher than 150% of the federal poverty line.

School-entry Cognitive Skills. According to previous literature, school-entry cognitive skills control for most other selection effects involved in sorting into CBC, FCC, and pre-K programs. These other potential selection effects (like parental education and cognitive stimulation at home) are expected to have already influenced child cognitive skills by age 5, meaning that including LAP-D scores in my models will help me make more causal conclusions from my results (Ansari & Winsler, 2012, 2013). To control for school-entry cognitive skills, my study uses the child's Learning Accomplishment Profile Diagnostic (LAP-D; Nehring et al., 1992) scores. The LAP-D is strongly correlated with similar exams such as the Woodcock Johnson (Woodcock, McGrew, & Mather, 2001) and the Peabody Picture Vocabulary Test (Dunn & Dunn, 1997). At the beginning of the preschool year, children were individually assessed by pre-K teachers or by outside, well trained bilingual assessors. The LAP-D was administered in the child's strongest language (determined by teacher reports and the bilingual assess after a rapport period).

School quality. Similar to previous work (Zhai et al., 2012)**,** publically available school quality data (the school's "grade" – A, B, C, D, F - given to the elementary school by the school district based on average student performance and how much the school improved on high-stakes standardized FCAT scores) was used for school-level quality. I used the value given to the child's elementary school the year the student was in 3rd grade.

Third grade academic outcomes. Florida Comprehensive Assessment Test **(**FCAT; Human Resources Research Organization & Harcourt Assessment, 2007) math and reading scores and 3rd grade GPA were used as the dependent variables. The FCAT is a high-stakes standardized test, with scores ranging from 100-500, that all Florida public school children are required to take for the first time in third grade. Although local school boards establish their own policies on the retention of students, Florida state statutes specifically mention that students who do not score as "proficient" on third grade FCAT reading assessments must be retained. This makes third-grade standardized test scores of particular interest. Furthermore, previous studies looking at preschool fadeout also often select third grade standardized test scores as an outcome variable (Currie & Neidel, 2007; Ramey & Campbell, 1991; Reynolds, 2000).

I used third grade GPA (A = 5, B = 4, C = 3, D = 2, F = 1) as a dependent variable, since it shows the students' performance in the classroom over the course of a year. Cumulative third grade GPA gives an accurate estimate of the students' overall skills in reading, writing, language arts, math, science, social studies, art, music, and physical education over the time period of one academic school year.

RESULTS

Q1. Do children who attend FCC, CBC or public school pre-K at age 4 go on to attend elementary schools of the same quality?

For my first research question, I conducted an ANCOVA with the four-level ordinal school quality variable (A=5; B; C; D and F=1) as the dependent variable and the three-level preschool type (pre-K, CBC, FCC) variable as my independent variable, with Free and Reduced Lunch (FRL) status as a covariate to control for children from impoverished families perhaps enrolling in schools of lower quality. On average, children who attended CBC in preschool later go on to attend elementary schools of significantly higher quality (M = 4.33, SE= 0.01) compared to children who previously attended pre-K (M = 4.22, SE = 0.01) or FCC (M = 4.18, SE = 0.07), who attend schools with very similar average school quality grades. Preschool type had a significant main effect on school quality ($F(2, 26{,}006) = 28.16$, $p < .01$).

Q2. How are children who went to CBC, FCC, or public school pre-K programs performing academically in third grade?

For my second research question, I conducted both ANOVA and ANCOVA analyses to determine whether controlling for poverty status and school-entry cognitive scores changes the degree of difference observed between each of the preschool groups. First, I conducted an ANOVA analysis for each third grade academic outcome (FCAT math scores, FCAT reading scores, and third grade GPA), with the 3-level preschool type variable as the independent variable. Table 1 presents unadjusted means, standard

deviations, and Cohen's *d* values of FCAT math, FCAT reading, and third grade GPA scores of children who attended pre-K, CBC, or FCC. As seen from the table, students who previously attended pre-K perform the best across all outcomes, followed closely by students who previously attended CBC, and finally by students who previously attended FCC. Mean FCAT scores are presented in Figure 1. This graph again shows that children who attended pre-K prior to elementary school are performing the best on standardized tests in third grade, children who attended CBC prior to elementary school perform nearly as well as students who previously went to pre-K, and children who attended FCC prior to elementary school perform the worst on standardized tests in third grade. Predictably, preschool type is a significant main effect of unadjusted third grade FCAT math ($F(2, 27{,}551) = 147.54$, $p < .01$) and FCAT reading scores ($F(2, 27{,}550) = 145.88$, $p < .01$). This pattern is identical for mean unadjusted third grade GPA. In Table 1 and Figure 2, we can see that again, students who previously attended pre-K are obtaining the best GPAs in third grade, followed by children who previously attended CBC, and finally by children who previously attended FCC. Once again, preschool type has a significant main effect on third grade GPA ($F(2, 27{,}813) = 245.47$, $p < .01$).

However, it was important to also conduct post-hoc analyses to determine if the differences between pre-K and CBC and the differences between CBC and FCC were also significant. For all unadjusted outcomes, there were significant differences between children who attended pre-K and children who attended CBC. These results indicate that without controlling for poverty status or school-entry cognitive skills, there are sustained effects of preschool in third grade for Miami-Dade students who previously attended pre-

K. I also conducted post-hoc analyses for the CBC to FCC comparison. There were only significant differences between these groups for unadjusted GPA scores.

Since there is a significant difference in the performances between children who attended pre-K, CBC, and FCC for unadjusted GPA scores, this would mean that there is no evidence of fadeout for that outcome. Of course, it is necessary to control for poverty status and school-entry cognitive skills when possible, which was the next step of this study. I then added in the covariates of FRL status and school-entry cognitive skills and conducted three separate ANCOVAs, one for each third grade academic outcome variable. After adjusting for these covariates, 3rd grade FCAT math scores no longer varied as a function of preschool type ($F(2, 18{,}204) = 1.05$, $p = .35$). This means that all students are performing similarly on standardized math assessments; and that fadeout exists for this measure. But, sustained pre-K effects persisted when controlling for FRL status and school-entry cognitive scores for FCAT reading ($F(2, 18{,}205) = 4.16$, $p < .05$) and third grade GPA ($F(2, 18{,}063) = 14.67$, $p < .01$). Post-hoc analyses also show a marked difference between the the pre-K and CBC groups on FCAT reading and third grade GPA, once again indicating sustained effects of preschool and a lack of fadeout/convergence on these outcomes even when controlling for poverty and child school-entry cognitive skills. Post-hoc analyses for the CBC to FCC contrast showed that there were no significant differences between the CBC and FCC groups for FCAT reading, but there were significant differences between these groups for third grade GPA. These results make it apparent that for my sample of students, the type of preschool previously attended is an important indicator of how the student will perform in third

grade. The next step of the study was to find out if the quality of the elementary school the student enrolls in in third grade changes the differences between the three groups.

Q3. Do the differences (if any) between the 3rd grade academic performance of children who attended CBC, FCC, or public-school pre-K change as a function of elementary school quality?

To liken my results to previous studies which do not adjust for poverty status or school-entry cognitive scores, I first conducted an unadjusted 4 school quality (A, B, C, and a combined D and F level) by 3 preschool type (pre-K, CBC, or FCC) ANOVA separately for each third grade academic outcome. I chose to collapse the D- and F- level schools due to the fact that together, only 3% of schools are rated as being of D- or F- levels of quality.

Table 3 displays means, standard deviations, and Cohen's *d* values of the unadjusted FCAT math, FCAT reading, and GPA of children who attended pre-K, CBC, or FCC. As seen from this table and Figure 3, third grade academic scores of all children (regardless of preschool type) increase as school quality increases. That is, on average, students perform best academically in third grade when they attend the highest-quality schools, and on average, students perform worst academically in third grade when they attend the lowest-quality schools. Indeed, school quality had a significant main effect for FCAT math ($F(3,25,277) = 62.79$, $p < .01$), FCAT reading ($F(3,25,276) = 52.16$, $p < .01$), and GPA ($F(3,25,517) = 66.94$, $p < .01$).

It is also evident from Table 3 and Figures 3, 5, and 7 that students who attended pre-K perform the best across all outcomes, followed by children who attended CBC, and finally by children who attended FCC. In fact, there was a main effect of preschool type

on unadjusted third grade FCAT math ($F(2, 27{,}550) = 147.54$, $p < .01$), FCAT reading ($F(2, 27{,}550) = 145.88$, $p < .01$), and GPA ($F(2, 27{,}813) = 245.47$, $p < .01$), with children who attended pre-K performing the best, children who attended CBC performing second-best, and children who attended FCC performing the worst.

Of course, my main question was to determine whether elementary school quality *moderated* the performances/fadeout of children who attended the three different types of preschool. Effect sizes between the three ECE groups (i.e., "fadeout/convergence") differed depending on both elementary school quality and the type of preschool being compared (Table 3), and there was a significant preschool type-by school quality-interaction for FCAT math ($F(6, 25{,}277) = 5.50$, $p < .01$; Figure 3), FCAT reading ($F(6, 25{,}276) = 3.95$, $p < .01$; Figure 5), and third grade GPA ($F(6, 25{,}517) = 6.65$, $p < .01$; Figure 7). These patterns of fadeout/convergence are similar across all three outcomes, and can be seen clearly in Figures 3, 5, and 7.For the pre-K versus CBC contrast, the long-term benefits of pre-K increase as quality of elementary increased, such that children who attended pre-K out-perform children who attended CBC by an *increasing* margin as school quality increases. This indicates that there is the least amount of fadeout/convergence for children that attend pre-K and consequently attend the highest-quality schools in third grade.

Alternatively, fadeout/convergence is evident when comparing children who attended FCC to children who attended CBC. For the CBC versus FCC contrast, the benefits of center-based care are the most pronounced at low-quality schools (i.e., no fadeout), but as quality increases, the differences between children who attended CBC vs.

FCC decrease until there is no difference between the two groups at higher-quality schools (a "catch-up" effect). This could also mean that school quality is particularly important for FCC children. Effect sizes (Table 3) between children who attended CBC and children who attended FCC are largest at the lowest-quality schools, and that attending low-quality schools appears to be an especially maladaptive environment for children who previously attended FCC.

The next step was to determine if adjusting for FRL status and school-entry cognitive skills changed the patterns of fadeout observed between the groups. Adjusted means, standard deviations, and Cohen's *d* values are displayed in Table 4. School quality remained as a significant main effect for adjusted FCAT math (F (3, 16,589) = 37.18, p <.01, adjusted FCAT reading (F (3, 16,589) = 33.23, p <.01), and adjusted third grade GPA (F (3, 16,458) = 41.59, p <.01, such that third grade academic scores for all children, regardless of where they went to preschool, improve as school quality improves. Preschool type showed a main effect for adjusted FCAT reading (F (2, 16,589) = 4.71, p <.01), and adjusted third grade GPA (F (2, 16,458) = 2.73, p <.01), but not for adjusted FCAT math scores (F(2, 16,589) = 0.84, p = .43).

When adjusting for FRL status and school-entry cognitive scores, the preschool type-by-elementary-school-quality interaction was no longer significant for FCAT math (F(6, 16,589) = 1.39, p = .22; Figure 4) or FCAT reading (F(6, 16,589) = 0.77, p = .59 ;Figure 6), but remained significant for third grade GPA (F (6, 16,458) = 2.73, p <.05; Figure 8). Means, standard deviations, and Cohen's *d* values of adjusted FCAT math, reading, and third grade GPA scores are presented in Table 4. To summarize, elementary

school quality does *not* moderate fadeout/convergence for standardized math and reading assessments once we control for poverty status and earlier cognitive skills, but *does* moderate fadeout/convergence for third grade GPA when we control for these covariates. Although the preschool type by elementary school quality interaction is no longer significant for adjusted FCAT math and reading scores, if one compares Figure 3 to Figure 4 and Figure 5 to Figure 6, the overall shapes of the patterns between pre-K and CBC children (differences/gaps increasing as quality increases) and between CBC and FCC children (differences/gaps decreasing as quality increases) are still consistent with unadjusted FCAT math and reading scores, the gaps are just less pronounced and failed to reach statistical significance. However, after adjusting for these covariates for GPA, we continue to see that sustained differences between children who attended pre-K and children who attended CBC significantly increase as school quality increases, while we see total fadeout/convergence for the comparison of children who attended FCC to children who attended CBC (the "catch-up" effect as school quality increased).

Q4. Is there differential "fadeout", depending on the quality of elementary school, for males versus females or for Black versus Latino students?

In order to investigate how fadeout changes as a result of school quality for different subgroups, I conducted a four-way interaction GLM model [4-level school quality x 2-level preschool type (CBC vs. pre-K) x 2 level gender x 2 level ethnicity (Black vs. Latino)] for each unadjusted and adjusted third grade academic outcome. This was the highest model tenable, as cell sizes became too small for children who attended family childcare and for children who identified as White/Other. That is, the two-level

preschool type variable now just compares children who attended pre-K to children who attended CBC, and the two-level ethnicity variable now just compares Hispanic children to Black children (with Whites excluded).

MATH – unadjusted. First, I performed the 4 x 2 x 2 x 2 model on unadjusted FCAT math scores. Table 5 shows means and standard deviations of unadjusted third grade outcomes of Hispanic and Black students who previously attended pre-K or CBC. The four-way preschool type-by-school quality-by-ethnicity-by-gender interaction was significant for unadjusted FCAT math scores ($F(3, 23{,}107) = 3.49$, $p < .05$). I represented this information in Figures 9 - 12. Since this interaction effect has several complex levels, I separated the visualization into four separate figures: Figure 9 pictures Hispanic and Black males and females who attended Pre-K, and Figure 10 pictures Hispanic and Black males and females who attended CBC. Figure 9 shows that within students who attended pre-K, there are no gender differences within Hispanics, and similarly, minimal differences between Black boys and girls. There is a visible ethnicity main effect, with Hispanics who attended pre-K out-performing Blacks who attended pre-K at all levels of school quality. It also appears as though the gaps between the two ethnic groups remain mostly stable across all levels of quality, with FCAT math scores improving for all students as school quality increases. Figure 10 displays the comparisons of Hispanic and Black males and females who previously attended CBC. Differences between Hispanic males and Black males increase as school quality increases, with Hispanics out-performing Blacks at all but the lowest-quality schools. This would seem to indicate that school quality matters more for males who went to CBC than for those who went to pre-

K – that is, ethnic differences grow as a function of school quality but only for males. Also evident in Figure 10 is that at the worst quality schools, ethnicity and gender do not matter at all for those who went to center-based care at age 4 – everyone does poorly. But this is not true for those who went to pre-K – ethnic differences are observed at all levels of school quality for those who went to public school pre-K.

The effect for preschool type is more visible in Figures 11 and 12. Figure 11 displays Hispanic males and females who previously attended pre-K and CBC, while Figure 12 displays Black males and females (who previously attended pre-K and CBC). For Hispanics, males and females who attended pre-K always perform better than those who previously attended CBC – although for girls, the two groups perform nearly the same at C-level quality schools (Figure 11). On the other hand, it is apparent from Figure 12 that for Black males, there is an increasing pre-K advantage as school quality increases. There is a similar pattern for Black females, though less-pronounced. Finally, there still convergence for the pre-K to CBC contrast (regardless of gender) at the lowest-quality schools for Black students (Figure 12). The bottom line for the 4-way interaction is that school quality moderates sustained effects of pre-K more for Black males than for anyone else.

The three-way interaction for preschool type by school quality by ethnicity, was marginally significant, ($F(3, 23{,}107) = 2.27$, $p = .08$), but not interpretable given the significant 4-way interaction discussed above. Preschool type had a significant main effect ($F(1, 23{,}107) = 49.99$, $p < .01$), though since the four-way interaction is present, this main effect is no longer interpretable. There was also a main effect for ethnicity (F(1,

23,106) = 57.11, p <.01), but again this is no longer interpretable since the performance of Hispanic and Black students clearly depends on school quality, the type of preschool previously attended, and their gender. There was not a significant main effect for gender, indicating that girls and boys performed about the same on standardized math assessments. There was, however, a significant main effect for school quality on unadjusted FCAT math scores that is still interpretable, (F(3, 23,107) = 221.68, p <.01) - FCAT math scores for all children always increased as school quality increased.

MATH – adjusted. I found similar results for the inter-workings of preschool type, school quality, ethnicity, and gender for FCAT math scores when controlling for child FRL status and school-entry level cognitive skills, although the four-way preschool type by school quality by ethnicity by gender interaction became non-significant (F(3, 15,241) = 0.71, p = .55). The three-way interaction, however, for preschool-type-by-school-quality-by ethnicity (Figures 13 and 14) stayed significant for adjusted FCAT math scores (F(3, 15,241) =2.55, p < .05), in addition to the school-quality-by-ethnicity-by-gender three-way interaction (F(3, 15,241) = 5.11, p < .01; Figs. 15 and 16). Figure 13 displays adjusted FCAT math scores for Hispanics who attended pre-K and CBC. As seen from this graph, the gaps are largest between these two groups at the lowest-quality schools, then decrease at C-level schools and remain stable as school quality increases. There are little differences between pre-K and CBC students at average or better schools. Figure 14 shows a similar pattern, but for Blacks who previously attended pre-K or CBC. Again, we see that gaps are largest at the lowest-quality schools – but this time, CBC students out-perform pre-K students. This could be caused by an increased duration in

low-quality schools having a particularly negative effect on Black students. There are subsequently little differences at average or better quality schools. The school-quality-by-ethnicity-by-gender interaction is displayed in Figures 15 and 16. In Figure 15, it is clear that the gaps between males and females are largest at the lowest and highest quality schools, where Hispanic males significantly out-perform Hispanic females. There are little to no differences in the adjusted FCAT math scores at C- and B-level schools. Figure 16 shows adjusted math scores for Black males and females, where males out-perform females at all levels of school quality except for the highest quality schools. The mean adjusted FCAT math scores are always higher for Hispanics than for Blacks, and Hispanics' adjusted FCAT math scores improve more than Blacks'; indicating that school quality may be more important for Hispanics' math scores than Blacks'.

In terms of other effects, the three-way preschool-type-by-school-quality-by-gender interaction still was not significant, nor was the preschool-type-by-ethnicity-by-gender three-way significant. The two-way preschool-type-by-school-quality, preschool-type-by-gender, quality-by gender, and ethnicity-by-gender interactions were non-significant. The preschool-type-by-ethnicity interaction remained significant (F(1, 15,241) = 4.98, $p < .05$,), as well as the school-quality-by-ethnicity interaction (F(3, 15,241) = 5.80, $p < .01$), but these effects are no longer interpretable with the presence of the three-way interaction Finally, all main effects remained significant except for preschool type (F(1, 15,241) = 2.28, $p = .13$). Hispanics always out-perform Blacks for adjusted Math scores, and adjusted math scores always improve as school quality

improves, but these main effects are the only significant main effects which are still interpretable.

READING – unadjusted. I next performed the same GLM analysis on unadjusted FCAT reading scores. The four-way interaction involving preschool type, school quality, ethnicity, and gender for FCAT reading was non-significant ($F(3, 23{,}106) = .80$, $p = .49$). Similarly, the three-way interaction effect for preschool-type-by-school-quality-by-gender was not significant ($F(3, 23{,}106) = .64$, $p = .59$) nor was the preschool-type-by-ethnicity-by-gender interaction ($F(1, 23{,}106) = .00$, $p = .99$).

There was, however, a significant preschool-type-by-school-quality-by-ethnicity three-way interaction ($F(3, 23{,}106) = 5.70$, $p < .01$) as can be seen in Figures 17 and 18. For Black students (Figure 18), the difference favoring pre-K over CBC was generally greater than it was for Hispanic students (Figure 17), and the pre-K effect was only seen at the higher three levels of school quality (A, B, or C schools). At the worst/poorest schools, there was no sustained pre-K effect for Black students, but for Hispanic students, that's where the pre-K effect was largest. Also for Latino students, the gap between pre-K and CBC gets bigger as schools move up in quality from the C to the A level.

The school-quality-by-ethnicity-by-gender effect was also significant ($F(3, 23{,}106) = 5.22$, $p < .01$; Figs. 19 and 20). The mean unadjusted FCAT reading scores were always higher for Hispanics than for Blacks. Within Hispanics (Figure 19), females always obtained higher FCAT reading scores than males, but the differences between the groups remain stable as quality increases. For Blacks (Figure 20), there are little

differences between males and females, and this does not change as school quality increases.

Other interpretable lower-order effects included a main effect for school quality ($F(3, 23{,}106) = 206.38$, $p < .01$) with all students' reading scores, regardless of the other variables increasing as school quality increased. There was also a main effect for gender ($F(1, 23{,}106) = 53.32$, $p < .01$), where girls generally outperformed boys, as well as a main effect for ethnicity ($F(1, 23{,}106) = 57.11$, $p < .01$), with Hispanic students outperforming Black students. There was not a significant interaction effect for preschool type by gender ($F(1, 23{,}106) = 2.08$, $p = .15$), indicating that males and females performed about the same on reading, even when they previously attended different types of preschool. There were no significant interaction effects for school quality by gender ($F(3, 23{,}106) = .88$, $p = .45$), nor for ethnicity by gender ($F(1, 23{,}106) = .84$, $p = .36$).

The remaining lower-order effects, which are not interpretable because of the presence of the significant 3-way interaction reported above, were a significant preschool type main effect ($F(1, 23{,}106) = 67.65$, $p < .01$), a non-significant preschool type-by-school quality interaction ($F(3, 23{,}106) = 1.36$, $p = .26$), a significant interaction for preschool-type and ethnicity ($F(1, 23{,}106) = 6.21$, $p < .01$), and a significant interaction effect for school quality by ethnicity ($F(3, 23{,}106) = 21.45$, $p < .01$).

READING – adjusted. When adjusting FCAT reading scores for FRL status and school-entry level cognitive skills, the significance of main effects and interaction effects remained exactly the same. For example, the four-way interaction effect was non-significant. Significant three-way interaction-effects included the preschool type by

school quality by ethnicity interaction (F(3, 15,241) = 3.93, p < .01), and school-quality-by-ethnicity-by-gender interaction (F(3, 15,241) = 6.81, p < .01). These three-ways had identical patterns to the unadjusted FCAT reading scores. The three-way interactions involving preschool type by school quality by gender and preschool type by ethnicity by gender remained non-significant. Also just as for unadjusted FCAT reading scores, the interactions for preschool type by gender, school quality by gender, and preschool type by quality were not significant. The two-way ethnicity by gender was not significant, but the preschool-type-by-ethnicity interaction, (F(1, 15,241) = 6.62, p < .01) and quality-by-ethnicity interaction (F(3, 15,241) = 7.74, p < .01) were significant, though not interpretable given the significant three-way interactions. All main effects were still significant after adjusting for FRL status and earlier cognitive skills School quality was the only significant interpretable lower-order main effect (F(3, 15,241) = 84.89, p < .01), with FCAT reading scores always increasing as school quality increased. Non-interpretable but significant lower-order effects included the gender main effect (F(1, 15,241) = 8.87, p < .01), ethnicity main effect (F(1, 15,241) = 74.70, p < .01), and the preschool-type main effect (F(1, 15,241) = 14.36, p < .01).

GPA – unadjusted. Finally, I ran the 4-way GLM model for third grade GPA The four-way interaction effect was non-significant *(*F(3, 23,312) = 1.32, p = .27). Like the unadjusted FCAT math and reading scores, there was a significant three-way interaction effect for preschool-type-by-school quality-by-ethnicity F(3, 23,312) = 2.96, p < .05; Figure 21). Sustained effects of pre-K for Hispanics were seen at schools of each quality, while there is complete convergence at failing-level schools for Black students.

Sustained effects of pre-K increased as school quality increased after that for Black students. There was also a significant three-way interaction effect for school quality-by-ethnicity-by-gender ($F(3, 23{,}312) = 2.96$, $p < .05$; Figure 22). In this graph, we can see that females always out-performed males, with differences between them, regardless of race, remaining stable as school quality increases. Gaps between Hispanic females and Black females *and* gaps between Hispanic males and Black males increase in size as school quality increases, with Hispanic females always out-performing Black females and Hispanic males always out-performing Black males. There were no significant interaction effects for preschool type-by-school quality-by-gender $F(3, 23{,}312) = .01$, $p = .99$), nor for preschool type-by-ethnicity-by-gender $F(1, 23{,}312) = .01$, $p = .92$).

Like FCAT math and reading, the preschool-type-by-school-quality interaction for unadjusted GPA was non-significant within the four-way GLM model ($F(6, 23{,}312) = 1.09$, $p = .35$). But, there was an interpretable significant interaction effect for school quality by ethnicity (Figure 23), such that the differences between Black and Hispanic students increase as school quality increases from the lowest-quality schools to B-level schools, with Hispanics always out-performing Blacks ($F(3, 23{,}312) = 6.44$, $p < .01$). The school-quality-by-gender-interaction was non-significant ($F(3, 23{,}312) = 1.73$, $p = .16$) meaning that the differences between girls and boys did not change as school quality increased. There was a trend-level effect for ethnicity by gender $F(1, 23{,}312) = 3.51$, $p = .06$). Non-interpretable effects (because of higher-order significant interactions) included the preschool-type-by-ethnicity interaction $F(1, 23{,}312) = 10.14$, $p < .01$) and preschool-type-by-gender interaction ($F(1, 23{,}312) = 1.33$, $p = .25$).

School quality was the only significant interpretable lower-order main effect $F(3, 23,312) = 208.78$, $p < .01$), signifying that children do better in third grade when they attend higher-quality schools. Other significant, but non-interpretable main effects included preschool type $F(1, 23,312) = 116.20$, $p < .01$), ethnicity $F(1, 23,312) = 199.06$, $p < .01$), and gender $F(1, 23,312) = 372.66$, $p < .01$).

GPA – adjusted. Adjusted third grade GPA scores had mostly similar results as unadjusted third grade GPA reported above. For example, the four-way interaction was still non-significant, and the school-quality-by-ethnicity-by-gender three-way interaction $F(3, 23,312) = 3.39$, $p < .05$) remained significant. The preschool type-by-school quality-by-ethnicity three-way interaction became marginally significant after adjusting for FRL status and earlier cognitive skills $F(3, 23,312) = 2.40$, $p = .07$; Figure 24). Figure 24 shows that for Hispanics, pre-K students always out-perform CBC students, but most obviously at the lowest-quality schools. Hispanics in general out-perform Blacks at all but the lowest-quality schools. There are small differences between Blacks who attended pre-K and Blacks who attended CBC, but these differences increase from the lowest-quality schools to B-level schools. At the highest-quality schools, the two groups perform about the same.

Lower-order effects for adjusted GPA also remained mostly the same. The preschool type by ethnicity interaction was non-significant. Furthermore, the preschool-type-by-school-quality interaction was not significant, nor was ethnicity by gender. However, although there was no preschool type by gender interaction for unadjusted GPA scores, it did become significant after adjusting for FRL status and school-entry

cognitive skills $F(1, 23{,}312) = 4.31$, $p < .05$; Figure 25), meaning that boys and girls perform differently when they attend CBC versus pre-K when controlling for poverty and earlier cognitive skills. In Figure 25, we can see that females always obtain higher GPAs than males, and this difference is slightly larger when the students went to CBC. All main effects remain significant, although the gender main effect and the preschool type main effect are no longer interpretable.

DISCUSSION

With the increasing demand to see lasting results from ECE programs, it is critical to study the academic trajectories of children who attend various types of preschool. Since several studies are publishing results of children who attended certain preschool programs for third, fifth, and eighth grade outcomes (Ansari et al., 2016; Hill et al., 2015; Phillips et al., 2016, Weiland & Yoshikawa, 2013), the current study is timely and provides additional insight into the field. Few studies have investigated the influence of the quality of school later attended on the academic trajectories of children who attended varying types of preschool (Magnuson et al., 2007; Zhai et al., 2012), and this thesis contributed to the current literature by examining children who attended FCC, CBC, and pre-K, the quality of the elementary school they subsequently attended, and their third grade academic outcomes.

This thesis found that elementary school quality and long-term fadeout/convergence effects for various types of ECE are related in complex ways. Children who previously attended pre-K obtained the highest academic scores on standardized math and reading assessments and GPA, both before and after adjusting for poverty and early cognitive skills. Children who previously attended CBC obtain scores nearly as high as their peers who previously attended pre-K, and children who previously attended FCC obtain scores that are lowest in comparison to these two groups. This

finding is consistent with several studies which found a lasting advantage for students who attended high-quality preschool programs (Ramey et al., 1976; Schweinhart et al., 1976; Weiland & Yoshikawa, 2013). After controlling for poverty and school-entry level cognitive skills, there were no differences between the three preschool groups for on FCAT math scores. This could mean that standardized math assessments are equally difficult for all children, regardless of the type of preschool they previously attended. Another possibility is that preschools do not emphasize mathematical skills as much as reading skills, or at least that these effects do not appear in third grade.

After I found that benefits from attending pre-K are sustained until third grade for pre-K students and appear to fade out for CBC students compared to FCC students, the central focus of my study was to discover if elementary school quality changed the way preschool effects are sustained or fade out. I found that the degree of fadeout depends on the counterfactual (the types of ECE being compared), the level of quality of elementary school later attended, and the outcome being examined. For Pre-K vs. CBC, there is never fadeout, but the degree to which pre-K students out-perform CBC students increases as school quality increases. For FCC vs. CBC, fadeout/convergence *increases* as later school quality increases, with FCC children "catching up" to their CBC peers and differences are only seen at the lowest-quality schools.

Indeed, low-income children who attend subsidized family childcare (FCC) at age 4 seem to be particularly at risk for poor performance in 3rd grade, especially if they go on to attend low-quality/low-resourced elementary schools. This group could be targeted for intervention/prevention programs. Although school quality is important for all

children, those who experience FCC appear most affected by the quality of their later elementary school, especially at poor schools. At low-quality schools, FCC kids perform much worse than other children. However, at high-quality elementary schools, they perform just as well or even better than children with other ECE experiences. The "No Child Left Behind Act" was originally geared to make these kinds of adjustments to improve schools' averages on standardized exams. Since this initiative was put into place around the time my sample was in third grade, it is possible that we are seeing some results of the law's implementation.

The results of this part of the study help explain the mixed effects found in prior research (Magnuson et al., 2007; Weiland & Yoshikawa, 2013; Zhai et al., 2012), since different comparisons were made across studies (i.e., preschool vs. none/any other), with different control variables used (often only age and SES). The current study adds to the literature by making the unique and specific contrasts of children who attended public school pre-K, CBC, and FCC and adding more rigorous selection controls (i.e., school entry cognitive skills and poverty status)., and also by comparing different racial/ethnic groups.

The last step of my study was to examine the degree to which elementary school quality moderates fadeout for the subgroups of males and females and Blacks and Hispanics. This final question of my study answers whether fadeout changes for Hispanic and Black males and females when they attend schools of various quality. A four-way interaction model for unadjusted FCAT math scores was significant, while all other unadjusted and adjusted third grade academic outcomes were not significant. The four-

way interaction for unadjusted FCAT math scores showed that there were minimal gender effects for Hispanics who attended pre-K and CBC and for Blacks who attended pre-K and CBC. This indicates that the differences between Hispanic males and females is about the same as the difference between Black males and females, regardless of preschool type. In terms of fadeout, this would mean that fadeout/lack thereof is about the same for these groups. Furthermore, ethnic differences are especially apparent for males. It might be that Hispanic males do especially well when they attend higher-quality schools compared to Black males.

Several three-way interactions within the four-way interactions also tell an interesting story. The three-way interaction of particular interest is preschool type-by-school quality-by ethnicity. It seems that pre-K may be especially beneficial for Blacks to attend compared to CBC, but only when they attend schools of average or better quality. Latinos who attend pre-K and go on to attend failing quality schools may be especially resilient, since the differences in academic scores of Latinos are largest at failing level schools. When investigating the school quality by ethnicity by gender interaction, it appears that these patterns differ upon the third grade outcome being evaluated. In general, females perform better academically in third grade compared to males, except on FCAT math scores, and Hispanics perform better academically compared to Blacks. This could be because Blacks are still a minority in our sample, which could mean that they are susceptible to unequal treatment or are more likely to be of lower SES and have fewer resources than their Latino peers. Research has also shown that Black children perform better when they have a teacher who also identifies as Black, and similarly, Latino

children perform better in school when they have a Latino teacher (Downer et al., 2016), and since Miami is largely a Latino population, this could also explain the differences between the academic performances of the two ethnicities.

One of the biggest take-aways from my study is that the level of school quality *always* increases the academic scores of *all* students, regardless of the type of preschool previously attended, the student's gender, and their ethnicity. This is a very important finding, and it calls for policy-makers to take a hard look at their current laws to do what they can to increase the quality of the public schools where children are enrolling *after* a preschool program. Although this thesis uses standardized test scores as part of the school quality variable and also as two of the three outcome variables, this work is a step in the right direction and illuminates several areas to be explored.

Limitations. This project has several limitations. As mentioned, my school quality variable is based upon standardized tests of the schools, and this may not be a good estimator of overall quality. Though I did try to combat this by assessing other variables (ie., teacher salary and number of computers in media center, etc.), the amount of data I had on these variables was too low to be able to run the desired analyses. This study would also benefit from a larger sample size of children who attended family childcare, since I was unable to compare these children to children who attended pre-K or CBC in higher-level analyses exploring gender and race effects. Similarly, I had a low population of White students, so I was unable to compare these students to Hispanic and Black students in higher-level analyses, and this would have given me more information

on how fadeout changes across a population that is usually in the majority, but in this sample would be in the minority.

Strengths. Despite these limitations, my study also has many strengths. I have information on the type of preschool that the children in this study previously attended, while other studies generally only have information on children who received the intervention compared to children who did not – and the type of preschool that the non-intervention children had is usually an anomaly. I also have more stringent control variables than most studies found in the current literature, with school-entry level cognitive skills being of particular importance. Finally, my study bridges a gap in the literature by assessing how MSRP children from different types of preschool perform academically in third grade, regardless of race. Previous work on the MSRP has only investigated the third grade academic performance of Latinos who attended different types of preschool (Ansari & Winsler, 2016).

Future Research. Future work should explore school quality in a more well-rounded sense. Perhaps using more complex quality assessments would provide an accurate measure of school quality. It is also important to consider the teacher-child racial composition, as research has shown that ethnic minority students perform better when they have a teacher which matches their racial identity (Downer et al., 2016). Other work could investigate how the racial composition of schools and teachers is related to school quality (Card & Krueger, 1992; Conway-Turner, 2016; Hanushek et al., 2009). Finally, it is critical for the field to research children who attend different types of preschool and their performances later in elementary, middle, and high school. Results from this study

suggest that it is important for children to be in a high-quality environment in elementary school in order for children to have the most benefit from their education. Preschool intervention programs are not enough to reverse the effects of poverty that many children are faced with every day, and the American education system must adjust accordingly.

Table 1 Mean Unadjusted GPA, FCAT math and reading scores and Cohen's d values for Public School Pre-K (Pre-K), Center-based Care (CBC), and Family Childcare (FCC) Children in Third Grade

G3 Outcome	Pre-K		CBC		FCC		Cohen's *d* for Pre-K vs. CBC	Cohen's *d* for CBC vs. FCC
	M	**(*SD*)**	**M**	**(*SD*)**	***M***	**(*SD*)**		
G3 GPA	4.10	(0.62)	3.93	(0.61)	3.86	(0.65)	0.26*	0.13*
FCAT Math	336.03	(66.49)	322.08	(62.46)	318.94	(67.86)	0.21*	0.05
FCAT Reading	317.05	(63.09)	303.98	(59.31)	298.39	(63.84)	0.21*	0.09

Table 2.

Mean GPA, FCAT math and reading scores and Cohen's d values for Public School Pre-K (Pre-K), Center-based Care (CBC), and Family Childcare (FCC) Children in 3rd Grade, adjusted for FRL status and school-entry level cognitive scores

G3 Outcome	Pre-K		CBC		FCC		Cohen's *d* for Pre-K vs. CBC	Cohen's *d* for CBC vs. FCC
	M	**(*SD*)**	**M**	**(*SD*)**	***M***	**(*SD*)**		
GPA	4.12	(0.62)	3.92	(0.61)	3.84	(0.65)	0.28*	0.11*
FCAT Math	337.01	(63.42)	321.03	(61.36)	318.81	(66.06)	0.21	0.02
FCAT Reading	321.64	(61.52)	305.25	(58.94)	299.23	(67.42)	0.22*	0.08

Table 3. Unadjusted Mean GPA, FCAT math and reading scores for Public School Pre-K (Pre-K), Center-based Care (CBC), and Family Childcare (FCC) Children in Third Grade, for All Levels of Quality*

Quality of School	Pre-K		CBC		FCC		Cohen's *d* for Pre-K vs.CBC	Cohen's *d* for CBC vs. FCC
	GPA		**GPA**		**GPA**		**GPA**	
	M	**(*SD*)**	**M**	**(*SD*)**	***M***	**(*SD*)**		
A	4.26	(0.56)	4.07	(0.57)	4.06	(0.53)	0.34	0.02
B	4.07	(0.59)	3.93	(0.61)	3.92	(0.61)	0.23	0.03
C	3.89	(0.61)	3.79	(0.60)	3.69	(0.67)	0.17	0.16
D/F	3.72	(0.66)	3.66	(0.64)	3.22	(0.66)	0.09	0.68
	FCAT Math		**FCAT Math**		**FCAT Math**		**FCAT Math**	
	M	**(*SD*)**	***M***	**(*SD*)**	***M***	**(*SD*)**		
A	353.26	(61.24)	337.32	(58.22)	341.01	(58.11)	0.28	-0.06
B	327.97	(63.67)	315.53	(59.04)	317.14	(66.54)	0.20	-0.02
C	316.75	(61.99)	309.32	(59.90)	305.95	(70.60)	0.12	0.05
D/F	295.55	(64.02)	294.80	(61.83)	263.44	(57.55)	0.01	0.53
	FCAT Reading		**FCAT Reading**		**FCAT Reading**		**FCAT Reading**	
	M	**(*SD*)**	***M***	**(*SD*)**	***M***	**(*SD*)**		
A	332.61	(58.58)	317.20	(55.09)	318.81	(58.77)	0.27	-0.03
B	312.11	(59.87)	302.81	(57.73)	298.55	(49.68)	0.16	0.08
C	297.89	(59.40)	289.72	(56.98)	287.95	(64.94)	0.14	0.03
D/F	284.30	(61.48)	279.38	(62.14)	257.63	(46.80)	0.08	0.40

*Note: Overall 4-level quality by 3-level preschool type interaction significant at $p < .01$ for all outcomes

Table 4. Mean GPA, FCAT math and reading scores and Cohen's d values for Public School Pre-K (Pre-K), Center-based Care (CBC), and Family Childcare (FCC) Children in 3rd Grade, adjusted for FRL status and school-entry cognitive skills

Quality of School	Pre-K		CBC		FCC		Cohen's *d* for Pre-K vs. CBC	Cohen's *d* for CBC vs. FCC
	GPA		**GPA**		**GPA**		**GPA**	
	M	**(*SD*)**	**M**	**(*SD*)**	***M***	**(*SD*)**		
A	4.28	(0.55)	4.05	(0.57)	4.07	(0.53)	0.41	-0.03
B	4.05	(0.61)	3.90	(0.62)	3.90	(0.57)	0.23	0.02
C	3.91	(0.61)	3.78	(0.60)	3.62	(0.67)	0.17	0.25
D/F	3.74	(0.66)	3.67	(0.64)	3.19	(0.69)	0.11	0.72
	FCAT Math		**FCAT Math**		**FCAT Math**		**FCAT Math**	
	M	**(*SD*)**	***M***	**(*SD*)**	***M***	**(*SD*)**		
A	353.62	(58.57)	335.50	(57.88)	342.43	(56.92)	0.31	-0.12
B	325.66	(62.30)	313.40	(59.02)	308.42	(74.43)	0.20	0.07
C	319.26	(59.71)	308.29	(59.83)	308.95	(60.15)	0.18	-0.01
D/F	296.47	(60.72)	293.62	(59.56)	271.22	(45.73)	0.05	0.42
	FCAT Reading		**FCAT Reading**		**FCAT Reading**		**FCAT Reading**	
	M	**(*SD*)**	***M***	**(*SD*)**	***M***	**(*SD*)**		
A	337.04	(57.36)	318.13	(55.08)	322.88	(61.11)	0.34	-0.08
B	315.09	(59.35)	304.02	(59.20)	296.39	(55.35)	0.19	0.13
C	303.96	(57.83)	290.88	(56.88)	288.45	(69.85)	0.23	0.04
D/F	287.31	(60.44)	279.42	(63.52)	252.67	(39.65)	0.13	0.51

Table 5 Unadjusted Mean GPA*, FCAT math* and reading* scores for Hispanic and Black Public School Pre-K (Pre-K) and Center-based Care (CBC) Children in 3rd Grade

Quality of School	Hispanic Pre-K		Hispanic CBC		Black Pre-K		Black CBC	
	GPA		**GPA**		**GPA**		**GPA**	
	M	**(*SD*)**	**M**	**(*SD*)**	***M***	***(SD)***	***M***	**(*SD*)**
A	4.27	(0.54)	4.09	(0.56)	4.02	(0.60)	3.93	(0.61)
B	4.14	(0.56)	4.03	(0.58)	3.94	(0.60)	3.81	(0.62)
C	3.98	(0.60)	3.86	(0.58)	3.84	(0.61)	3.74	(0.61)
D/F	3.88	(0.65)	3.64	(0.66)	3.68	(0.66)	3.67	(0.64)
	FCAT Math		**FCAT Math**		**FCAT Math**		**FCAT Math**	
	M	**(*SD*)**	***M***	**(*SD*)**	***M***	**(*SD*)**	***M***	**(*SD*)**
A	354.25	(59.98)	340.32	(57.62)	330.49	(61.31)	340.32	(57.62)
B	331.81	(64.17)	320.27	(58.00)	319.65	(61.21)	320.27	(58.00)
C	321.76	(64.45)	315.17	(59.15)	312.86	(59.31)	315.17	(59.15)
D/F	310.03	(62.70)	293.63	(68.14)	291.41	(63.46)	293.63	(68.14)
	FCAT Reading		**FCAT Reading**		**FCAT Reading**		**FCAT Reading**	
	M	**(*SD*)**	***M***	**(*SD*)**	***M***	**(*SD*)**	***M***	**(*SD*)**
A	332.77	(57.20)	320.12	(54.00)	312.18	(59.13)	302.25	(56.77)
B	316.18	(59.62)	308.89	(58.91)	304.33	(58.70)	295.42	(55.55)
C	298.34	(61.87)	293.28	(57.87)	297.27	(57.72)	286.96	(56.39)
D/F	294.20	(65.43)	268.95	(72.58)	281.14	(60.09)	283.33	(56.87)

Table 6

Mean GPA*, FCAT math* and reading* scores, Adjusted for FRL Status and School-Entry Cognitive Scores, for Hispanic and Black Public School Pre-K (Pre-K) and Center-based Care (CBC) Children in 3rd Grade

Quality of School	Hispanic Pre-K		Hispanic CBC		Black Pre-K		Black CBC	
	GPA		**GPA**		**GPA**		**GPA**	
	M	**(*SD*)**	**M**	**(*SD*)**	**M**	**(*SD*)**	**M**	**(*SD*)**
A	4.30	(0.53)	4.08	(0.56)	4.04	(0.59)	3.92	(0.61)
B	4.14	(0.56)	3.98	(0.59)	3.95	(0.61)	3.80	(0.63)
C	4.03	(0.60)	3.85	(0.56)	3.85	(0.60)	3.73	(0.61)
D/F	3.96	(0.52)	3.62	(0.67)	3.69	(0.68)	3.69	(0.63)
	FCAT Math		**FCAT Math**		**FCAT Math**		**FCAT Math**	
	M	**(*SD*)**	***M***	**(*SD*)**	**M**	**(*SD*)**	**M**	**(*SD*)**
A	354.87	(57.13)	337.90	(57.58)	330.37	(57.10)	322.79	(57.38)
B	328.53	(62.94)	317.31	(59.21)	320.14	(60.76)	308.30	(58.19)
C	327.58	(60.33)	314.20	(58.50)	314.46	(58.58)	304.44	(60.51)
D/F	315.40	(54.37)	287.17	(67.66)	293.11	(60.55)	295.83	(56.08)
	FCAT Reading		**FCAT Reading**		**FCAT Reading**		**FCAT Reading**	
	M	**(*SD*)**	***M***	**(*SD*)**	**M**	**(*SD*)**	**M**	**(*SD*)**
A	337.81	(55.53)	321.09	(54.26)	315.49	(57.67)	303.42	(56.69)
B	322.33	(58.23)	309.90	(61.42)	307.10	(58.29)	296.90	(55.90)
C	308.75	(59.54)	294.63	(57.43)	301.10	(56.94)	288.07	(56.53)
D/F	304.95	(60.39)	267.52	(75.66)	283.73	(59.96)	283.67	(57.58)

Table 7
Unadjusted Mean GPA, FCAT math and reading scores for Hispanic and Black Public School Male and Female Children in 3rd Grade

Quality of School	Hispanic Males		Hispanic Females		Black Males		Black Females	
	GPA		**GPA**		**GPA**		**GPA**	
	M	**(*SD*)**	**M**	**(*SD*)**	**M**	**(*SD*)**	**M**	**(*SD*)**
A	4.13	(0.58)	4.29	(0.52)	3.85	(0.63)	4.11	(0.55)
B	4.02	(0.59)	4.20	(0.53)	3.80	(0.65)	3.99	(0.56)
C	3.82	(0.62)	4.06	(0.54)	3.68	(0.62)	3.93	(0.57)
D/F	3.69	(0.68)	3.90	(0.62)	3.53	(0.67)	3.82	(0.60)
	FCAT Math		**FCAT Math**		**FCAT Math**		**FCAT Math**	
	M	**(*SD*)**	***M***	**(*SD*)**	**M**	**(*SD*)**	**M**	**(*SD*)**
A	351.37	(61.72)	347.01	(57.13)	325.08	(62.48)	329.19	(58.43)
B	326.63	(64.90)	328.25	(59.11)	317.79	(62.07)	314.29	(59.30)
C	317.74	(67.93)	321.00	(56.63)	308.98	(62.41)	311.39	(57.21)
D/F	305.55	(66.28)	301.19	(64.23)	291.34	(62.14)	293.76	(62.19)
	FCAT Reading		**FCAT Reading**		**FCAT Reading**		**FCAT Reading**	
	M	**(*SD*)**	***M***	**(*SD*)**	**M**	**(*SD*)**	**M**	**(*SD*)**
A	325.40	(58.15)	330.97	(54.42)	301.59	(59.41)	314.23	(56.86)
B	308.19	(59.50)	318.86	(58.93)	300.29	(58.60)	301.90	(56.94)
C	289.72	(63.82)	303.44	(55.99)	288.29	(59.72)	298.65	(54.92)
D/F	279.84	(70.39)	289.36	(67.98)	277.54	(60.37)	286.02	(57.54)

Table 8

Mean GPA*, FCAT math* and reading* scores, adjusted for FRL Status and school-entry cognitive skills, for Hispanic and Black Public School Male and Female Children in 3rd Grade

Quality of School	Hispanic Males		Hispanic Females		Black Males		Black Females	
	GPA		**GPA**		**GPA**		**GPA**	
	M	**(*SD*)**	**M**	**(*SD*)**	***M***	**(*SD*)**	**M**	**(*SD*)**
A	4.12	(0.58)	4.27	(0.52)	3.84	(0.62)	4.11	(0.55)
B	3.97	(0.59)	4.14	(0.57)	3.79	(0.66)	3.97	(0.58)
C	3.80	(0.62)	4.08	(0.52)	3.68	(0.63)	3.91	(0.57)
D/F	3.68	(0.63)	3.86	(0.61)	3.56	(0.70)	3.81	(0.60)
	FCAT Math		**FCAT Math**		**FCAT Math**		**FCAT Math**	
	M	**(*SD*)**	***M***	**(*SD*)**	***M***	**(*SD*)**	***M***	**(*SD*)**
A	351.15	(59.73)	343.31	(55.95)	323.31	(59.02)	330.03	(55.68)
B	324.03	(62.47)	321.63	(60.15)	318.13	(59.99)	312.72	(59.91)
C	319.17	(65.76)	323.28	(53.40)	309.55	(62.10)	311.13	(57.31)
D/F	303.79	(64.15)	294.53	(63.12)	294.12	(60.77)	294.14	(57.16)
	FCAT Reading		**FCAT Reading**		**FCAT Reading**		**FCAT Reading**	
	M	**(*SD*)**	***M***	**(*SD*)**	***M***	**(*SD*)**	***M***	**(*SD*)**
A	329.47	(57.27)	330.86	(53.92)	302.27	(58.63)	316.66	(55.72)
B	312.73	(58.02)	319.21	(62.09)	303.38	(56.55)	302.53	(58.44)
C	295.19	(62.88)	308.75	(54.09)	292.00	(60.18)	299.20	(54.20)
D/F	281.94	(72.86)	285.52	(70.90)	280.26	(62.64)	286.91	(55.37)

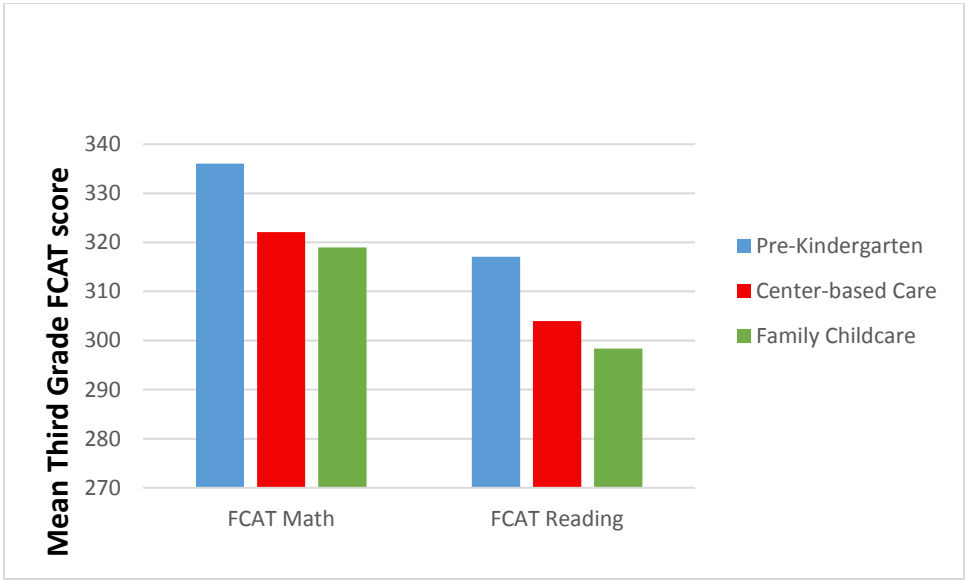

Figure 1. **Unadjusted Third Grade FCAT Math and Reading Scores for Students who Attended Pre-K, CBC, or FCC**

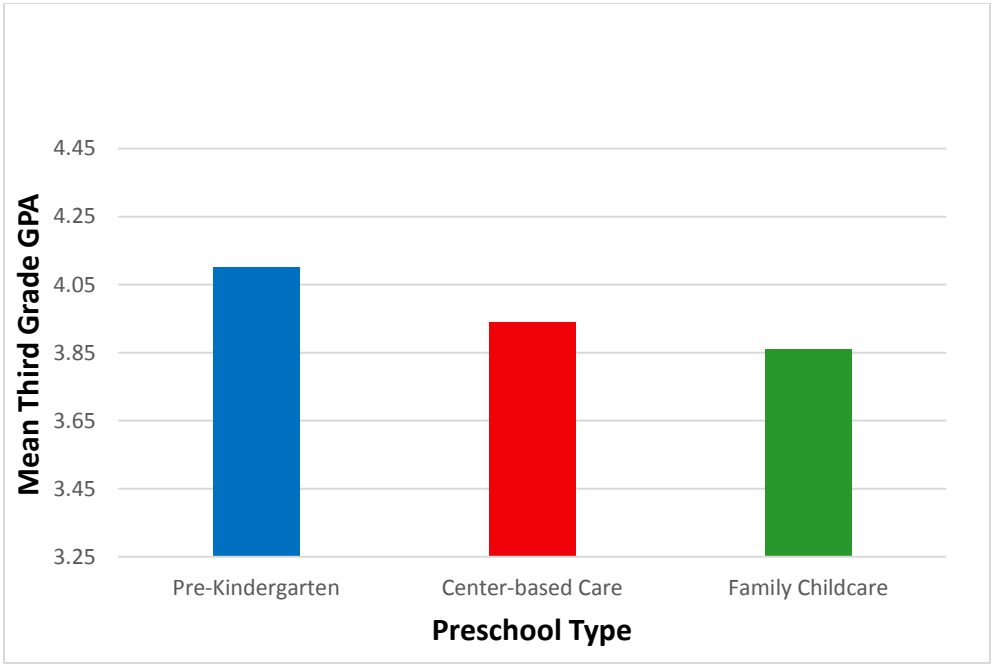

Figure 2. **Unadjusted Mean Third Grade GPA of Students who Attended Pre-K, CBC, or FCC**

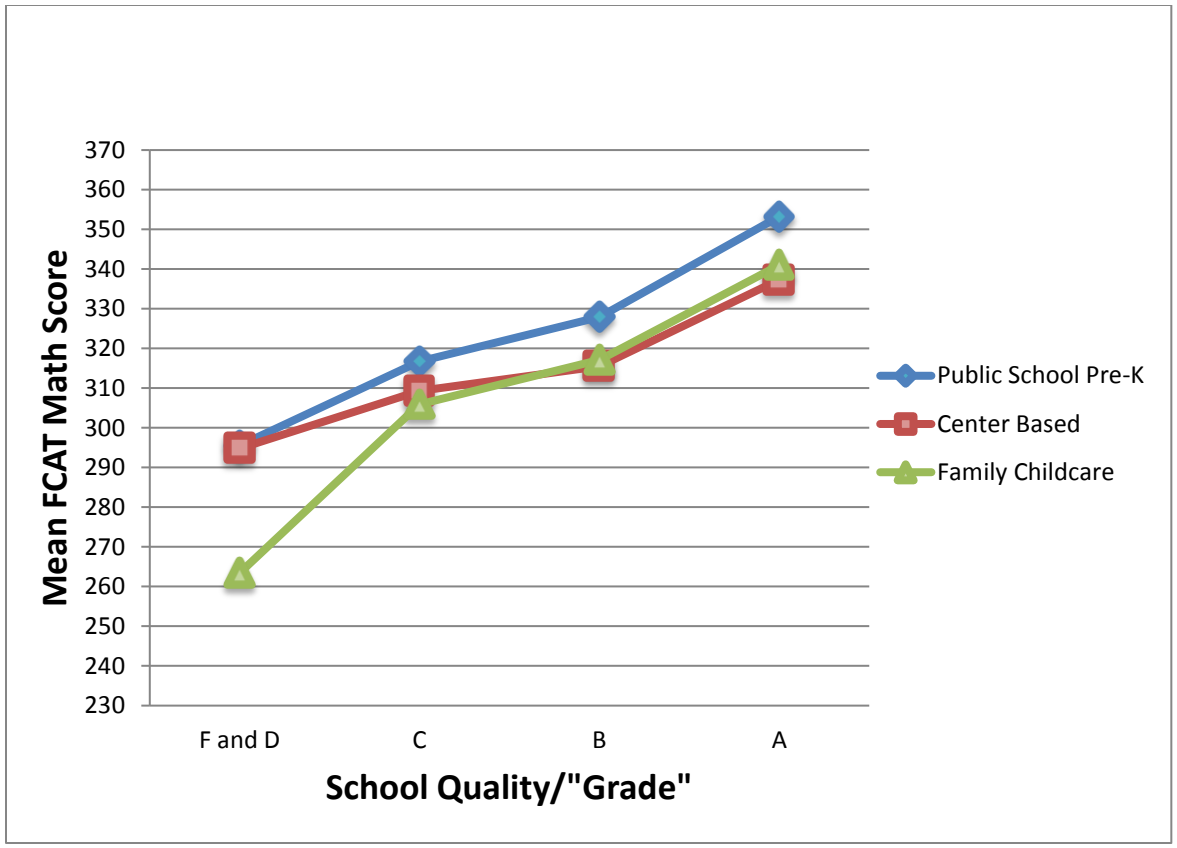

Figure 3. **Unadjusted Mean 3rd Grade FCAT Math Scores by Level of School Quality**

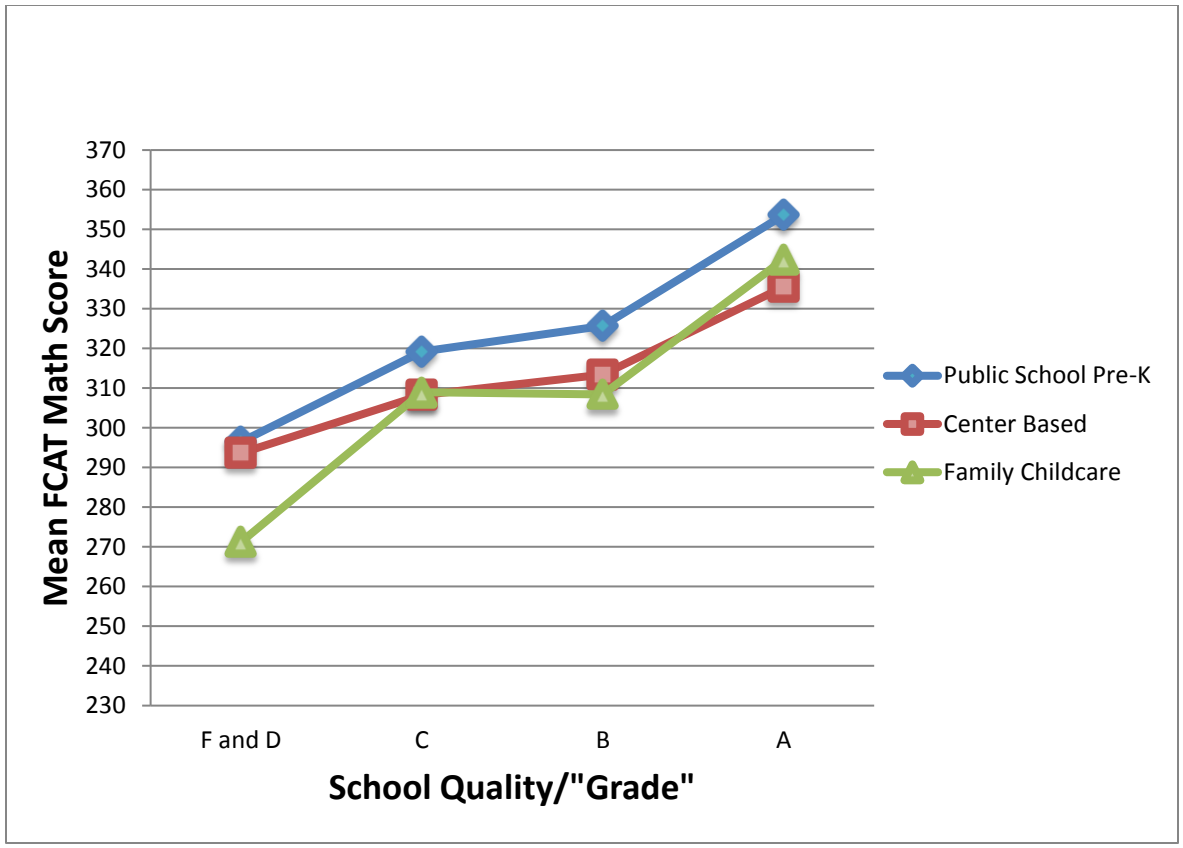

Figure 4. **Mean 3rd Grade FCAT Math Scores by Level of School Quality, Adjusted for FRL Status and School-Entry Level Cognitive Skills**

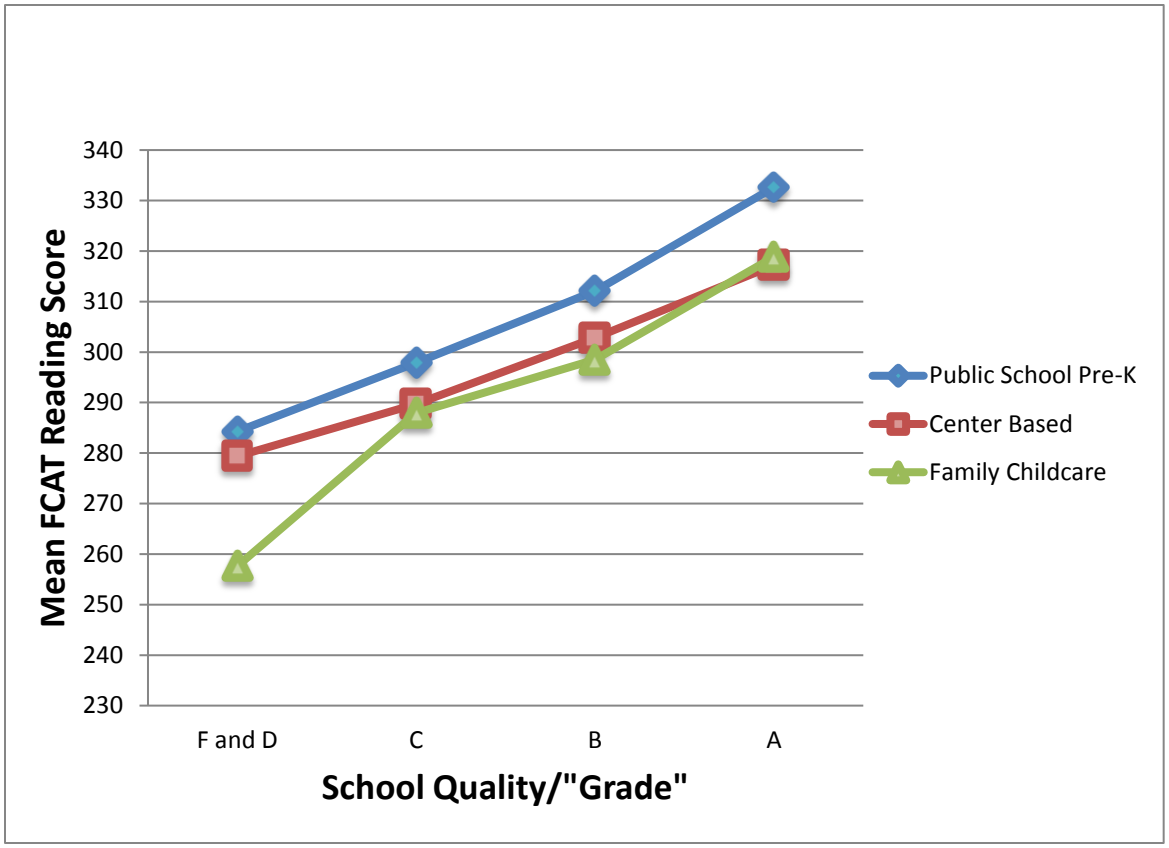

Figure 5. **Unadjusted Mean 3rd Grade FCAT Reading Scores by Level of School Quality**

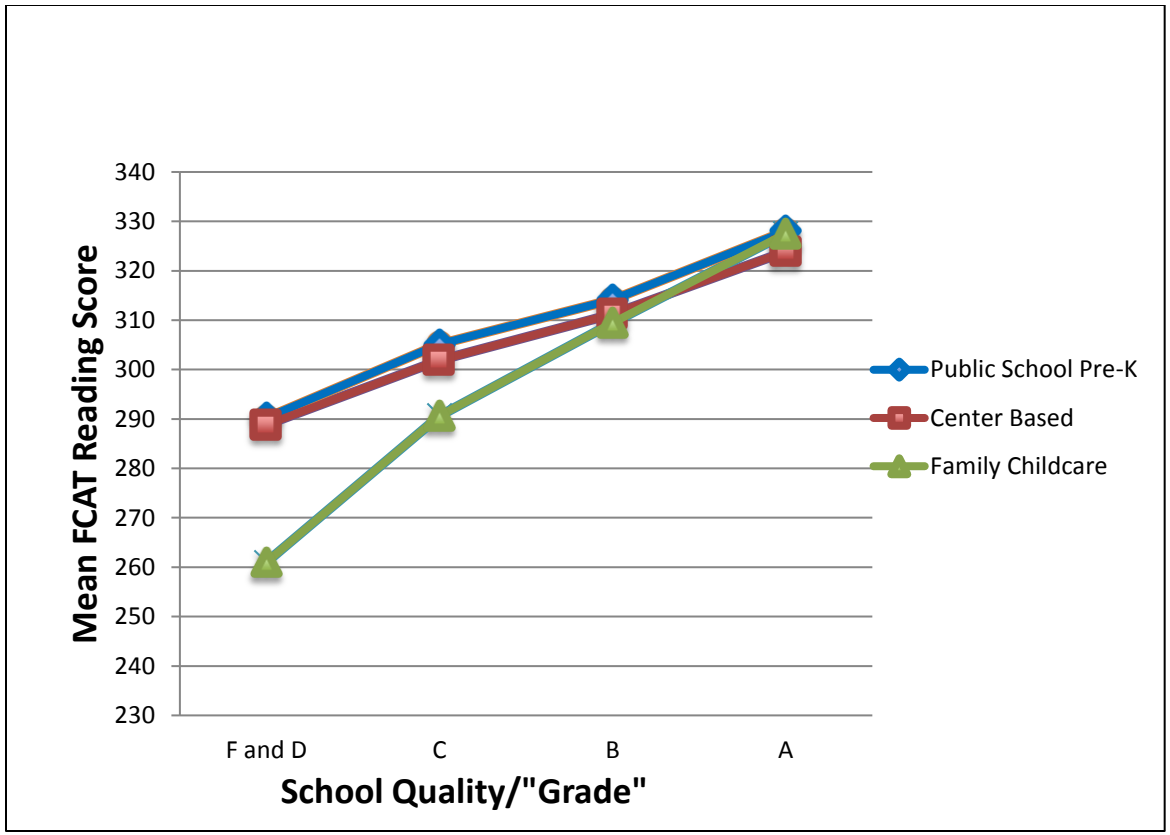

Figure 6. **Mean Third Grade FCAT Reading Scores by Level of School Quality, Adjusted for FRL Status and School-Entry Cognitive Scores**

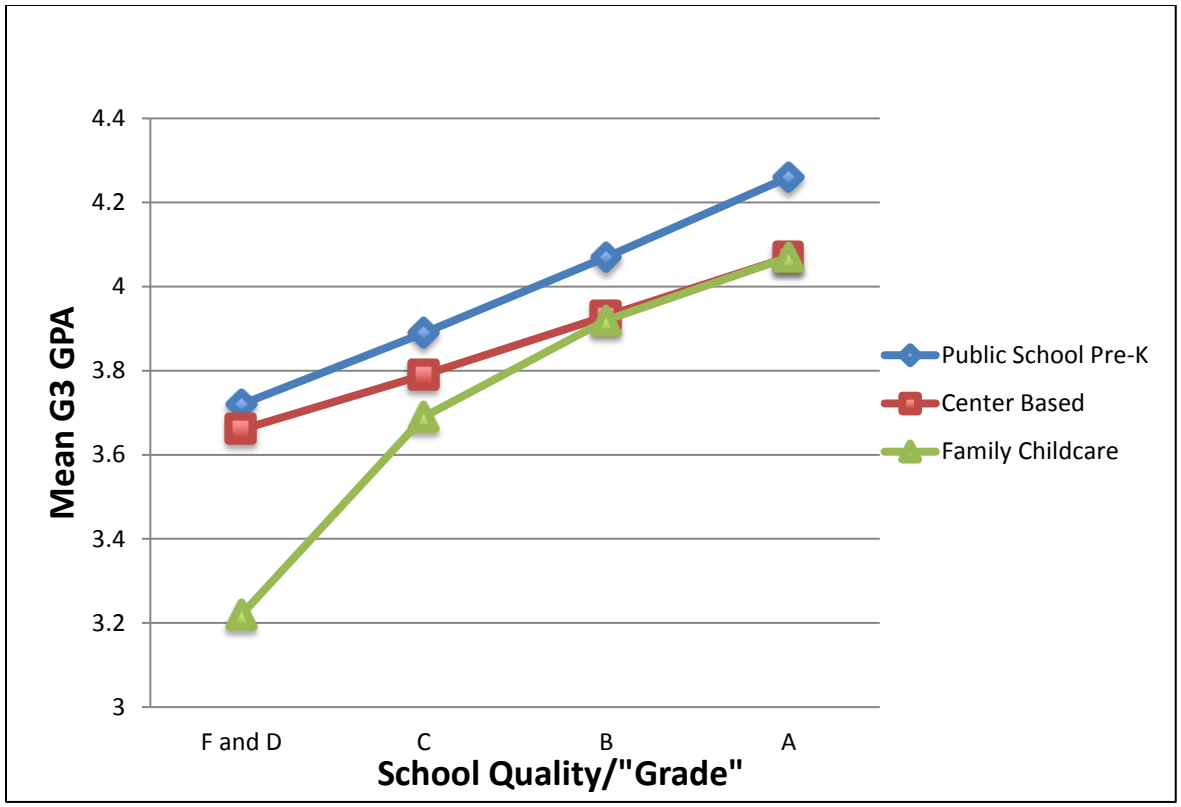

Figure 7. **Unadjusted Mean 3rd Grade GPA by Level of School Quality**

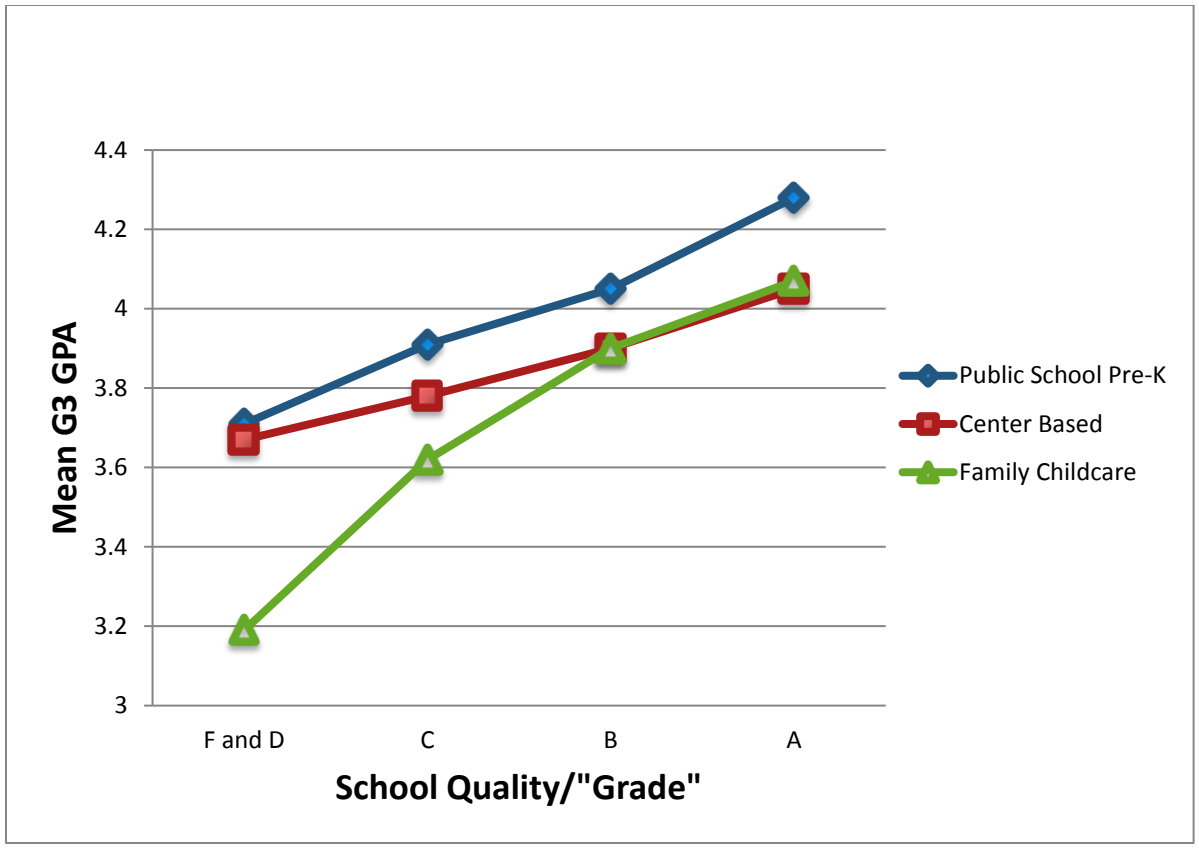

Figure 8. **Mean 3rd Grade GPA by Level of School Quality, Adjusted for FRL Status and School-Entry Level Cognitive Skills**

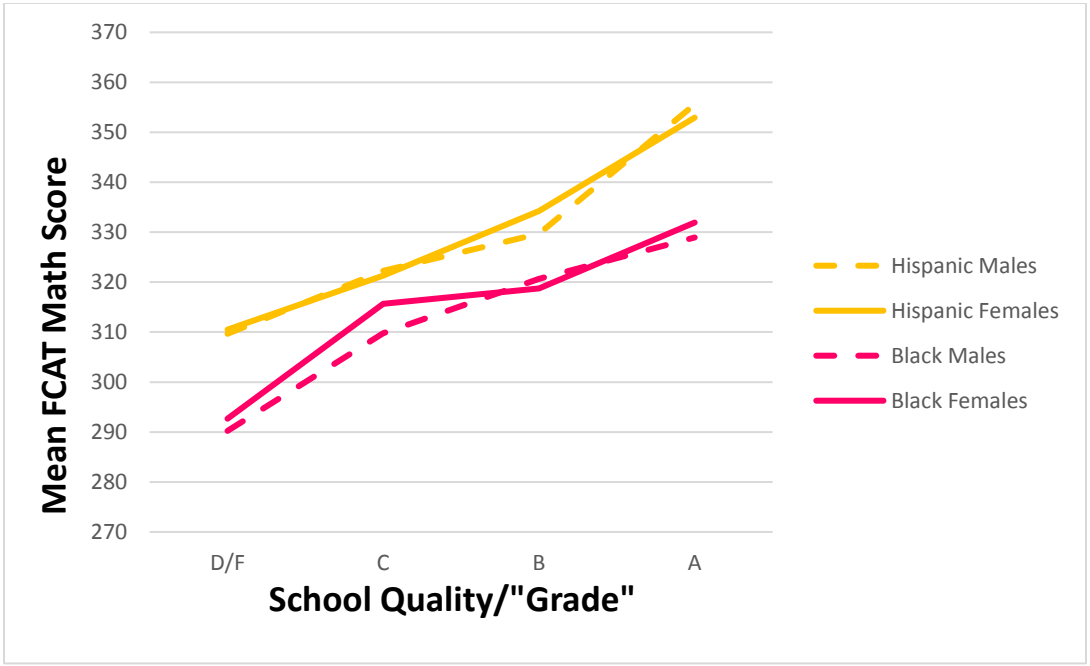

Figure 9. **Unadjusted FCAT Math Scores for Hispanic and Black Males and Females who Attended Pre-K**

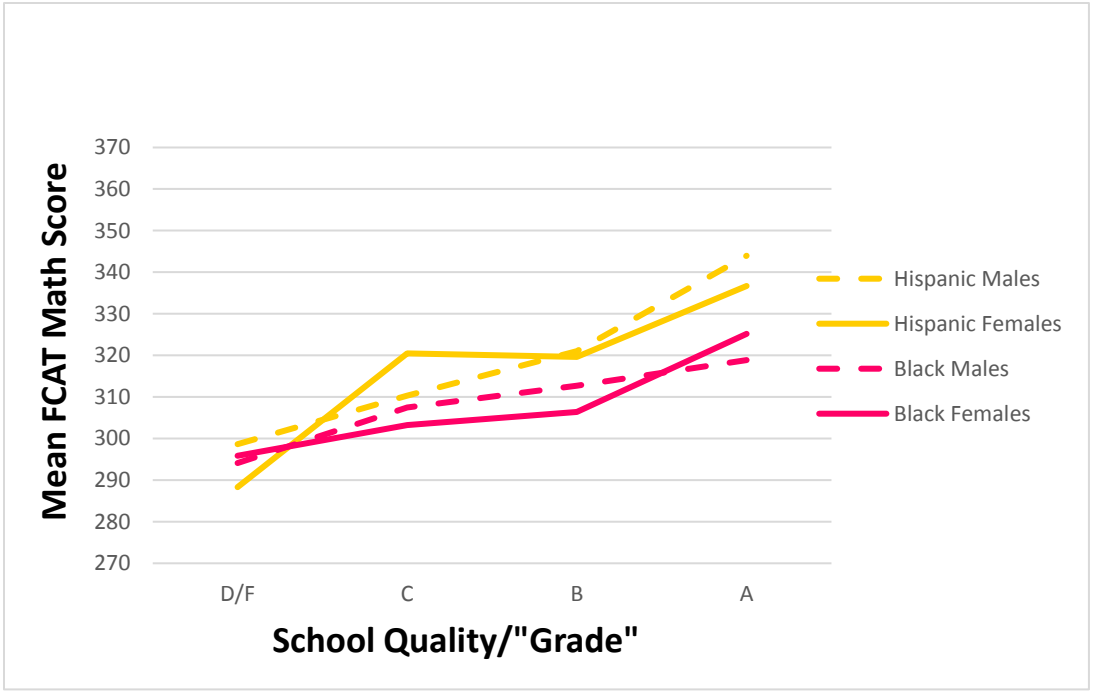

Figure 10. **Unadjusted FCAT Math Scores for Hispanic and Black Males and Females who Attended CBC**

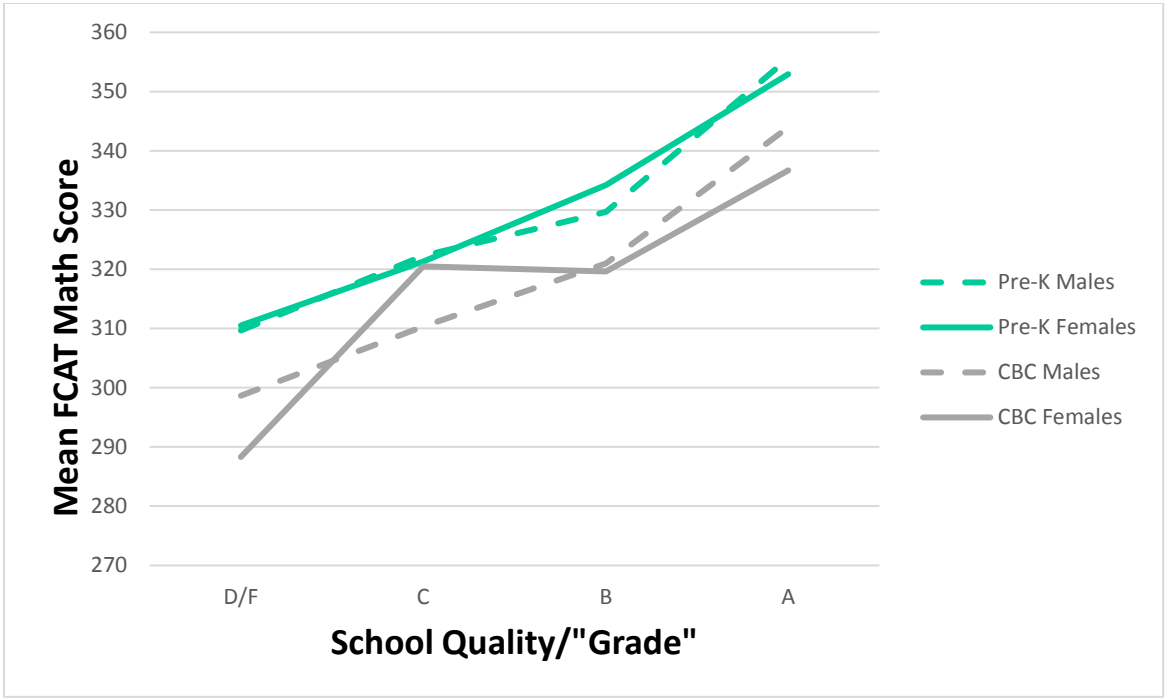

Figure 11. **Unadjusted FCAT Math Scores for Hispanic Males and Females who attended Pre-K and CBC**

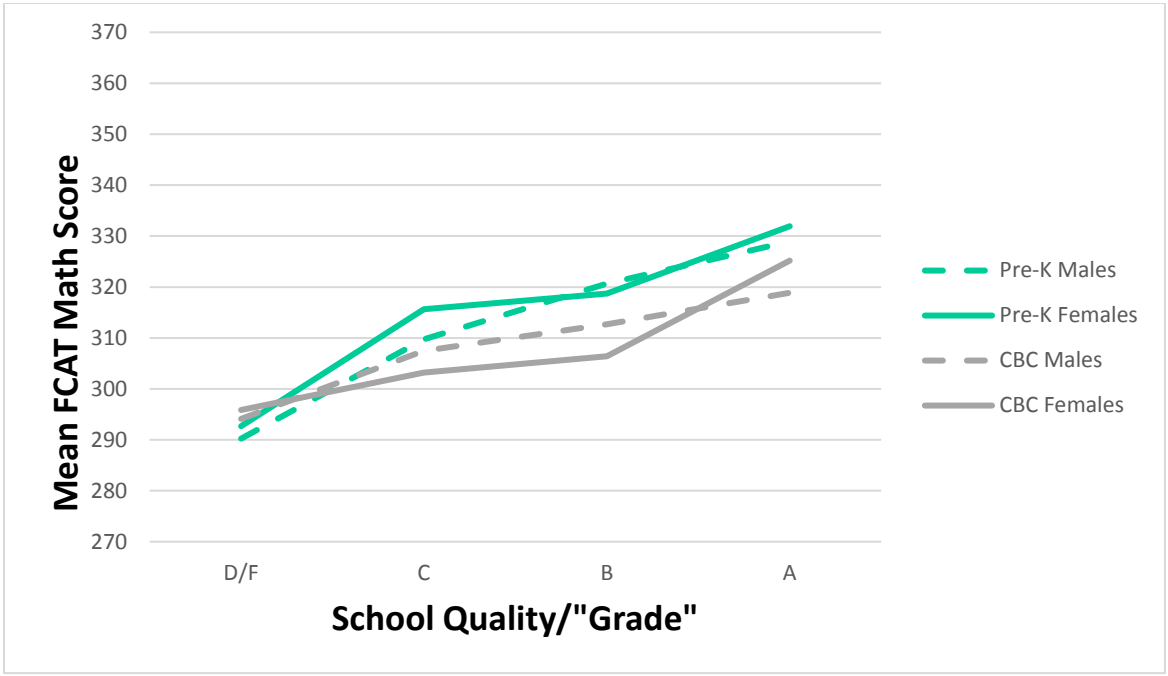

Figure 12. **Unadjusted FCAT Math Scores for Black Males and Females who attended Pre-K and CBC**

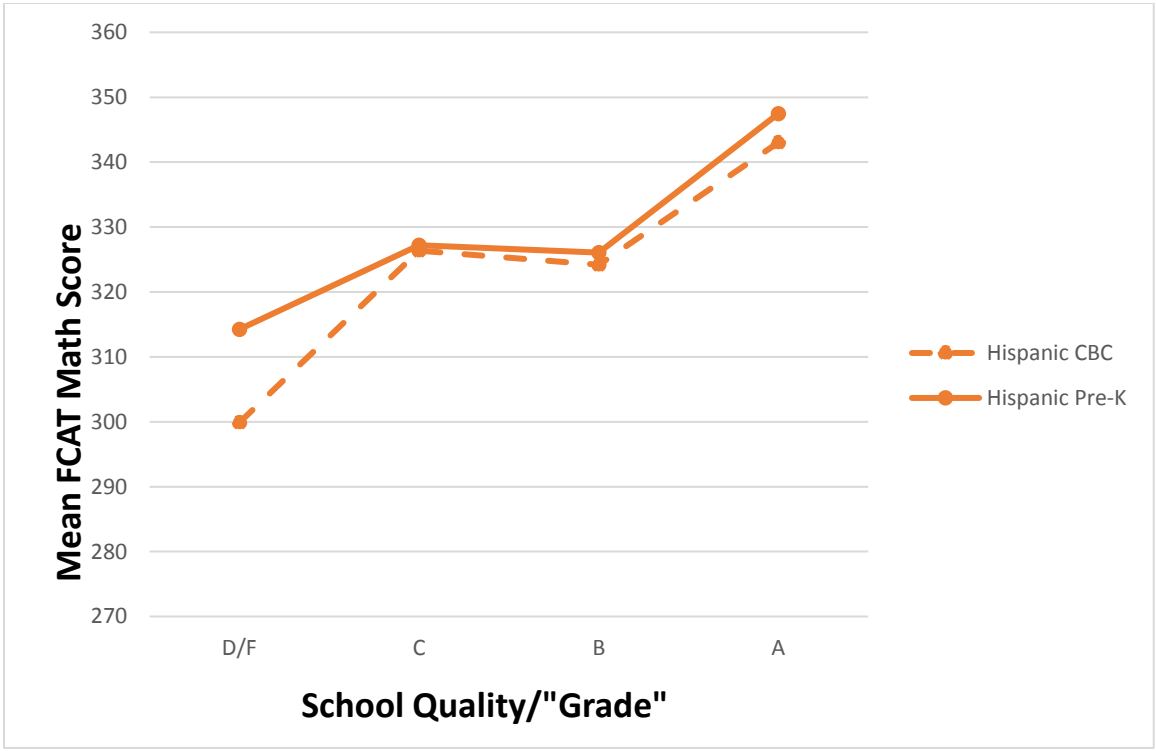

Figure 13. **Third Grade FCAT Math Scores, Adjusted for School-entry Cognitive Skills and FRL Status, of Hispanics who Attended CBC or Pre-K**

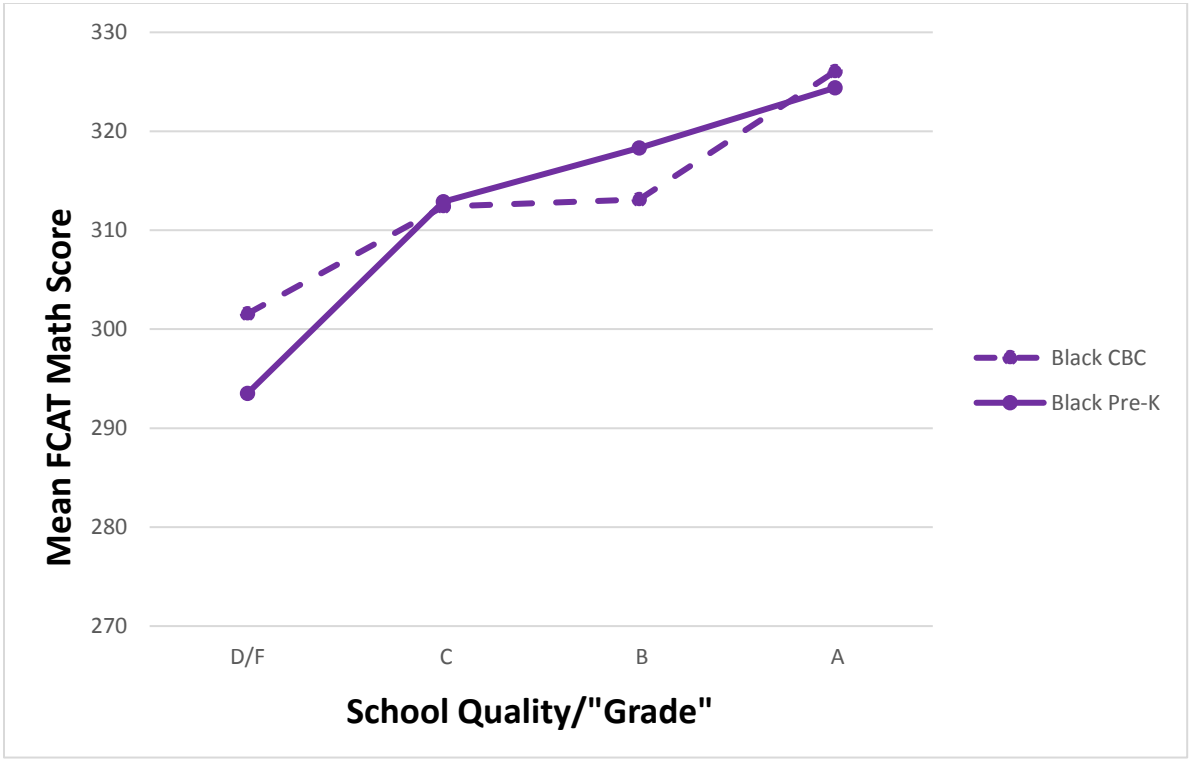

Figure 14. **Third Grade FCAT Math Scores, Adjusted for School-entry Cognitive Skills and FRL Status, of Blacks who Attended CBC or Pre-K**

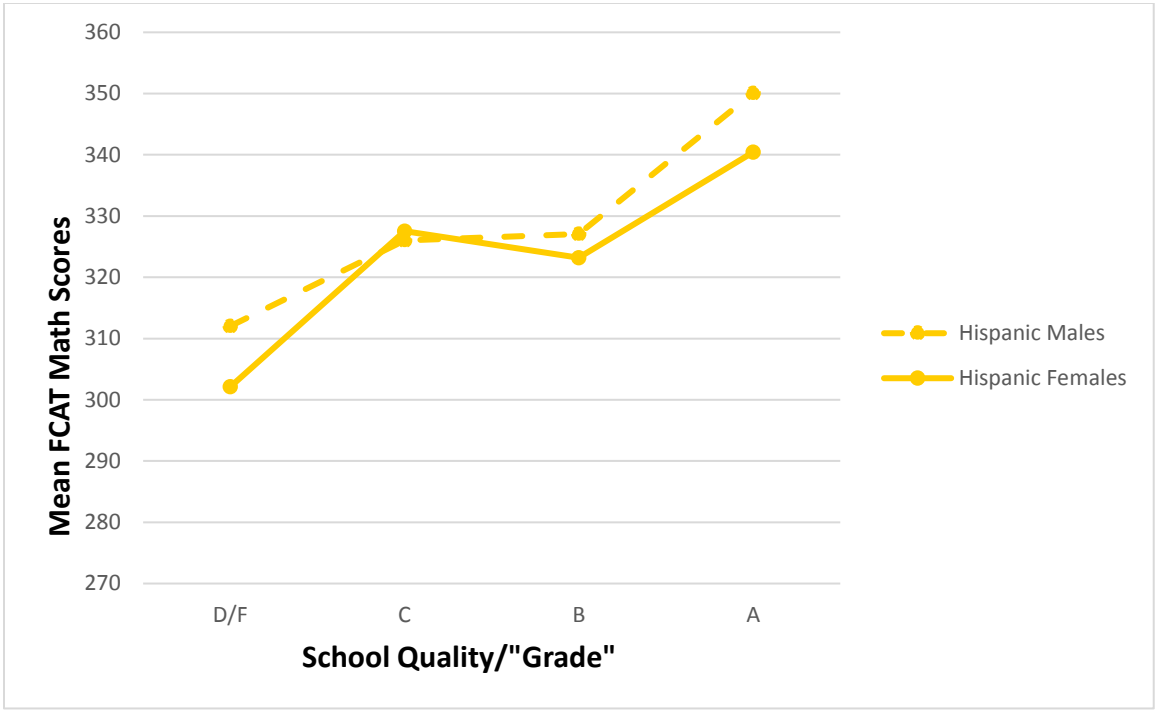

Figure 15. **Third Grade FCAT Math Scores, Adjusted for School-Entry Cognitive Skills and FRL Status, of Hispanic Males and Females**

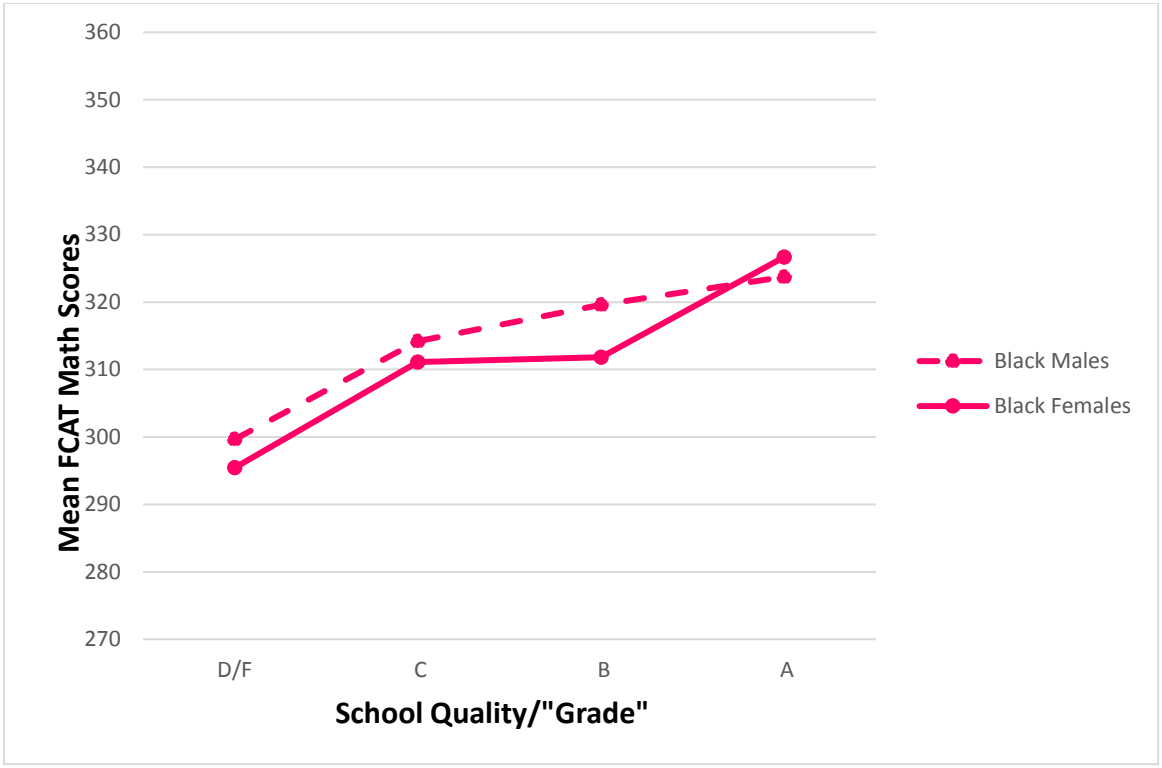

Figure 16. **Third Grade FCAT Math Scores, Adjusted for School-Entry Cognitive Skills and FRL Status, of Black Males and Females**

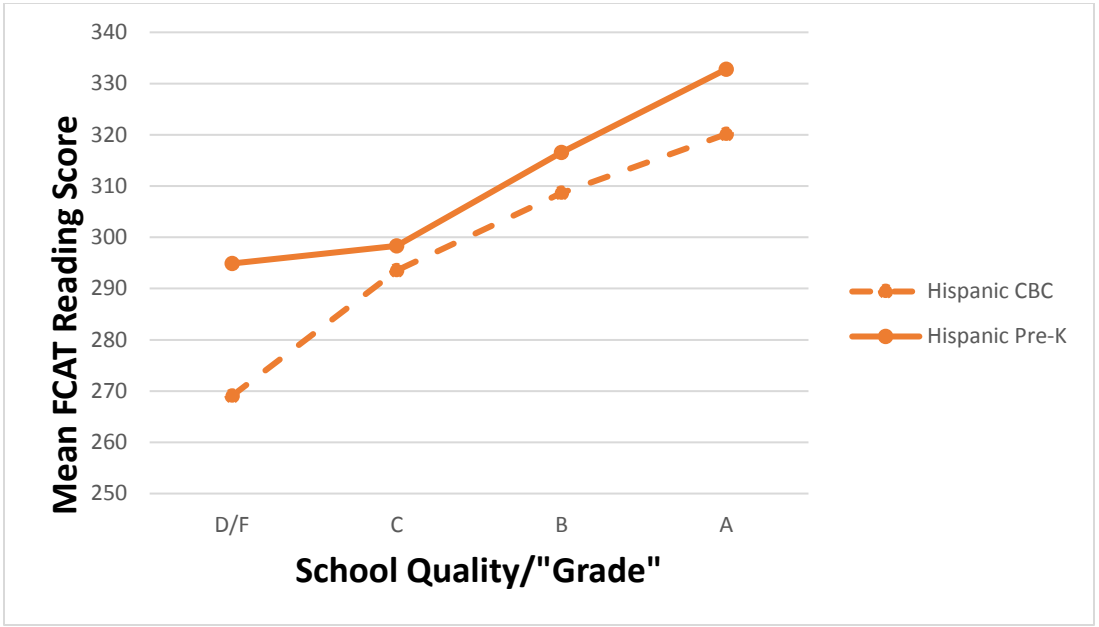

Figure 17. **Unadjusted Third Grade FCAT Reading Scores of Hispanics who Attended CBC or Pre-K**

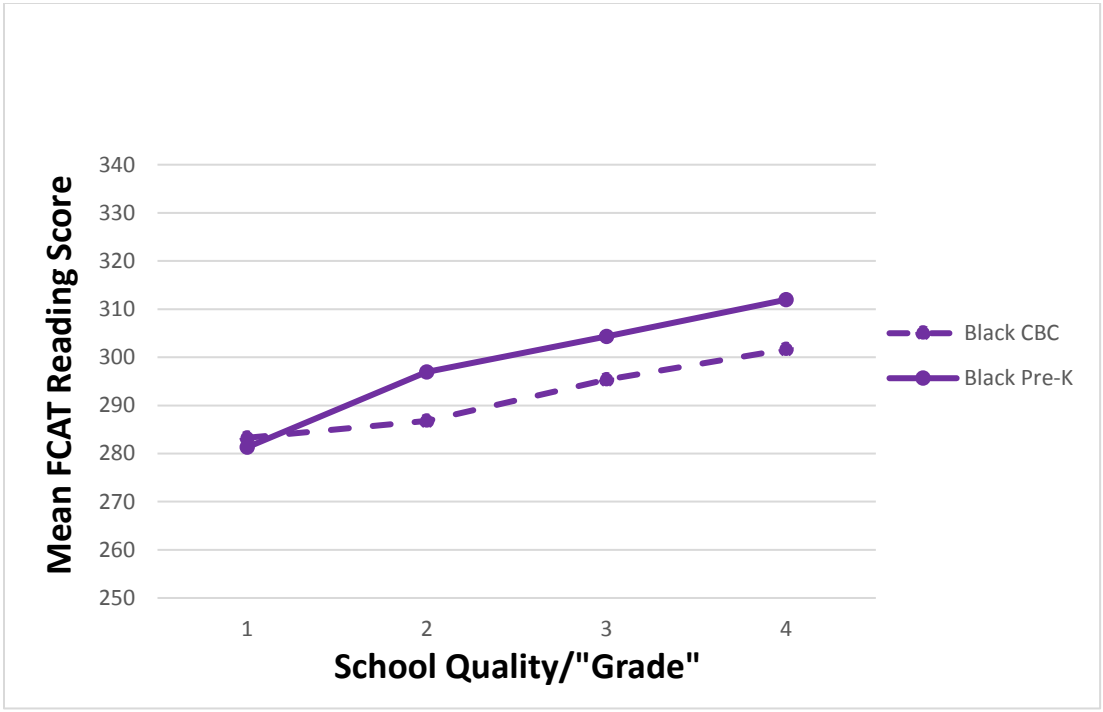

Figure 18. **Unadjusted Third Grade FCAT Reading Scores of Blacks who Attended CBC or Pre-K**

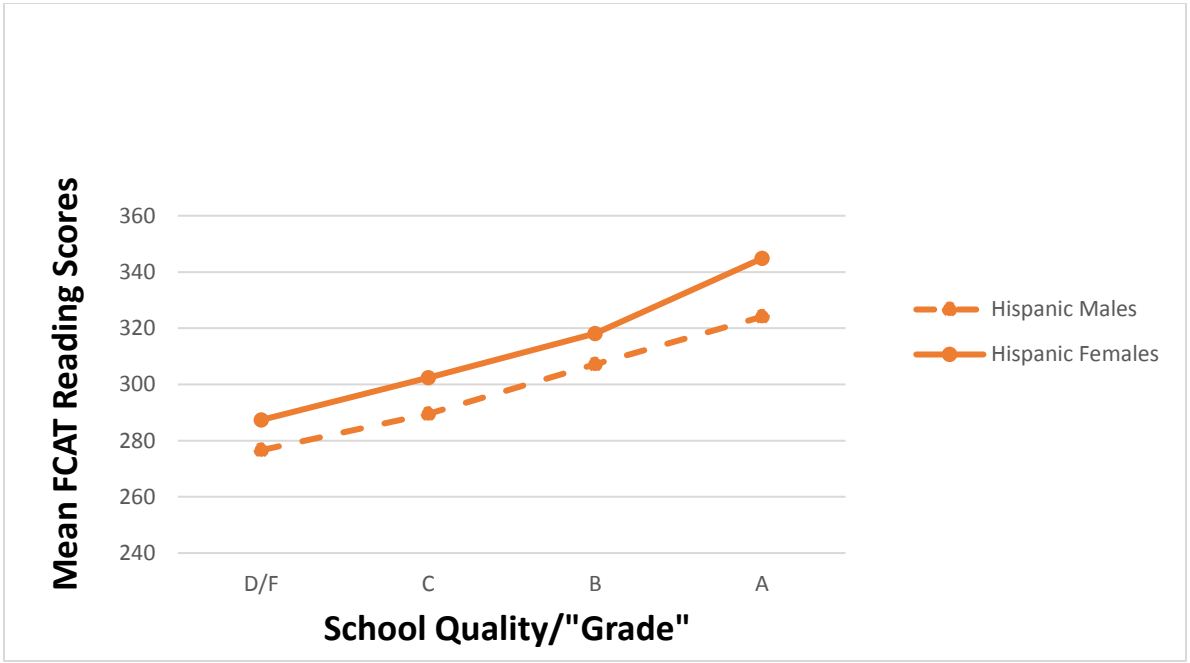

Figure 19. **Unadjusted Third Grade FCAT Reading Scores of Hispanic Males and Females**

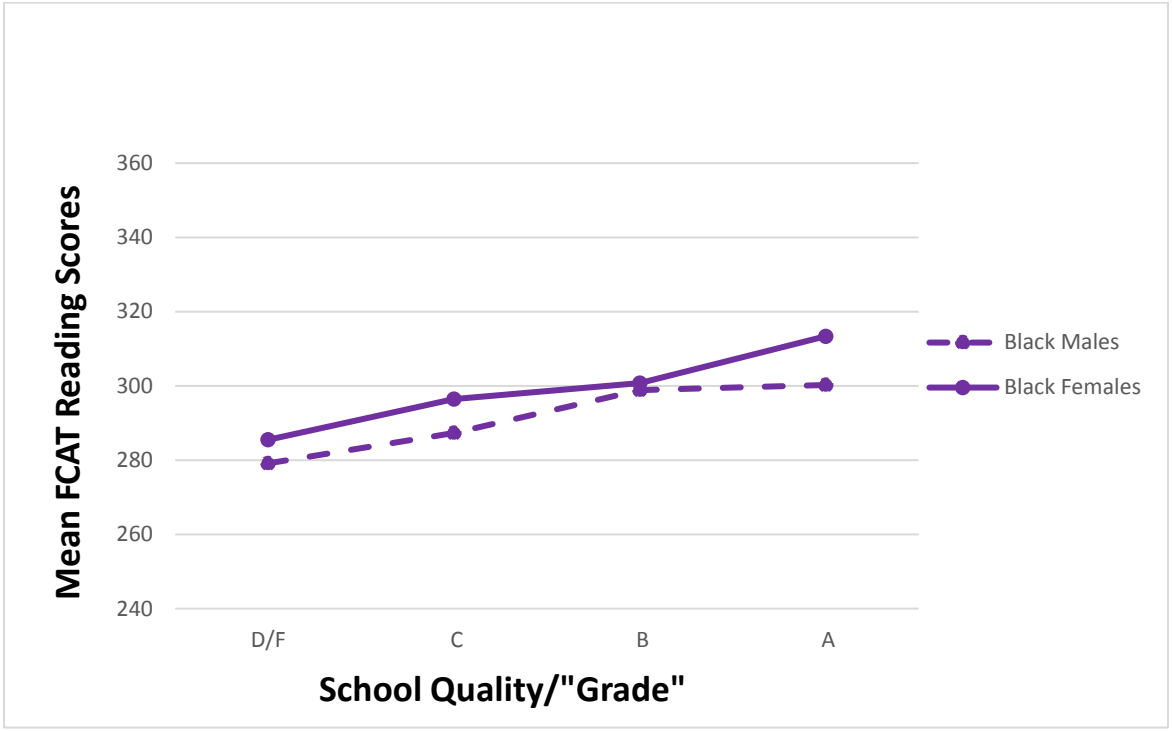

Figure 20. **Unadjusted Third Grade FCAT Reading Scores of Black Males and Females**

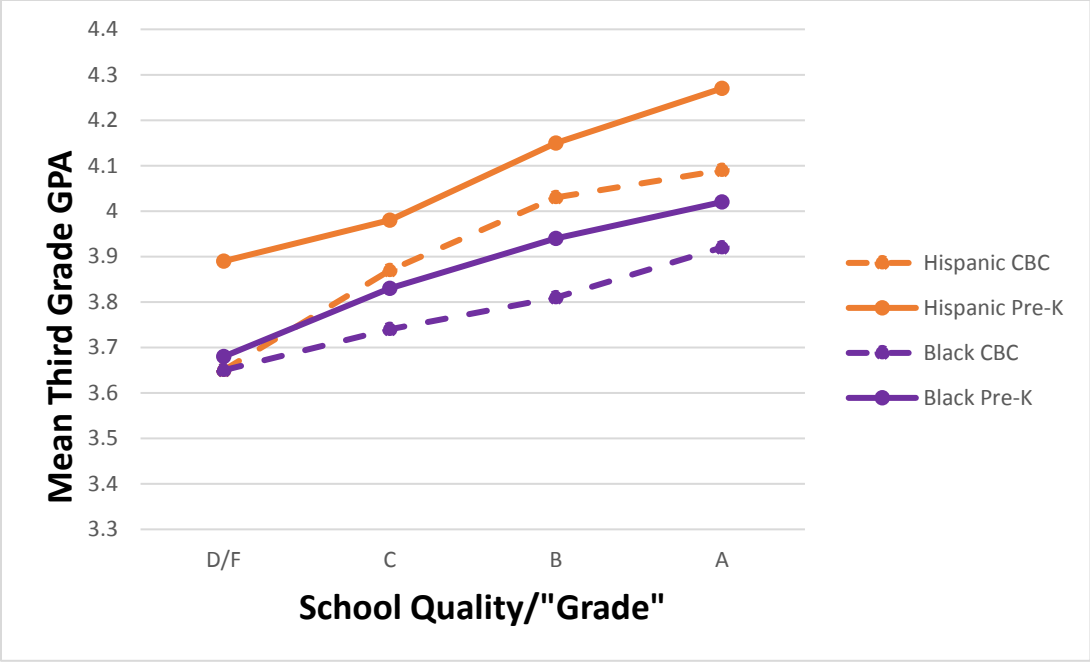

Figure 21. **Unadjusted Third Grade GPA of Hispanics and Blacks who Attended CBC or Pre-K**

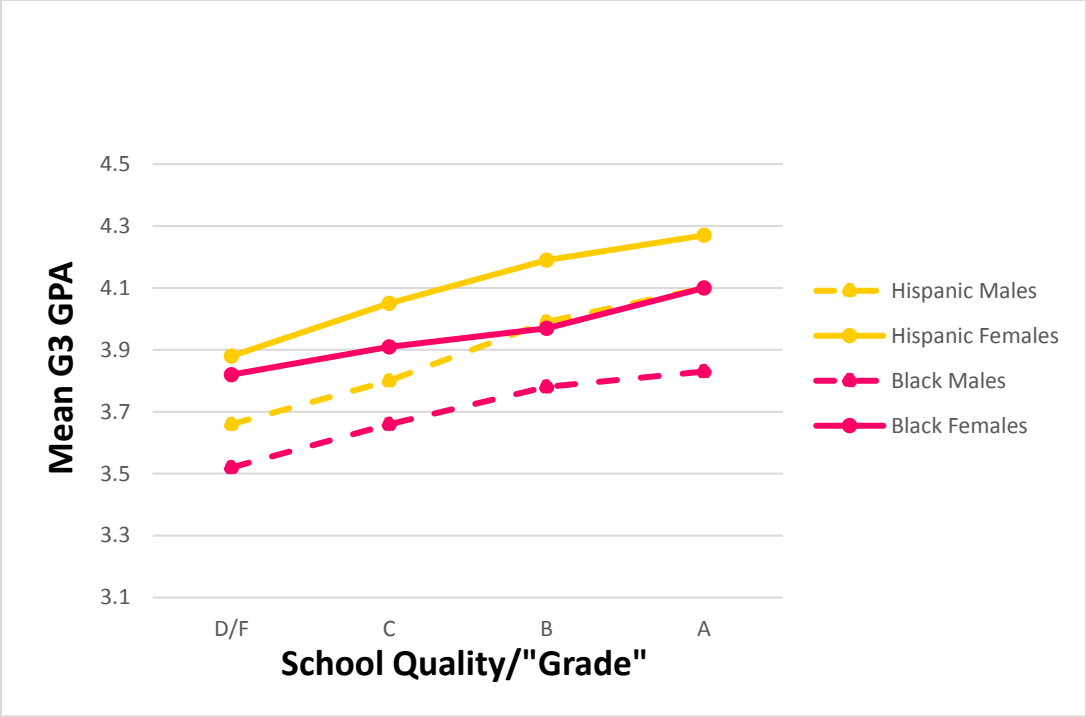

Figure 22. **Unadjusted Third Grade GPA of Hispanic and Black Males and Females**

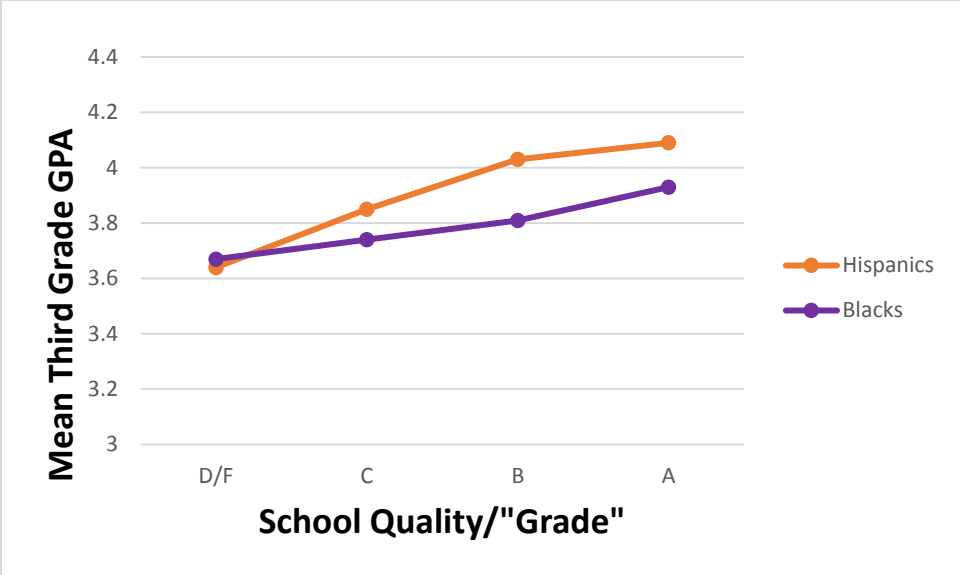

Figure 23. **Unadjusted Third Grade GPA of Hispanics and Blacks**

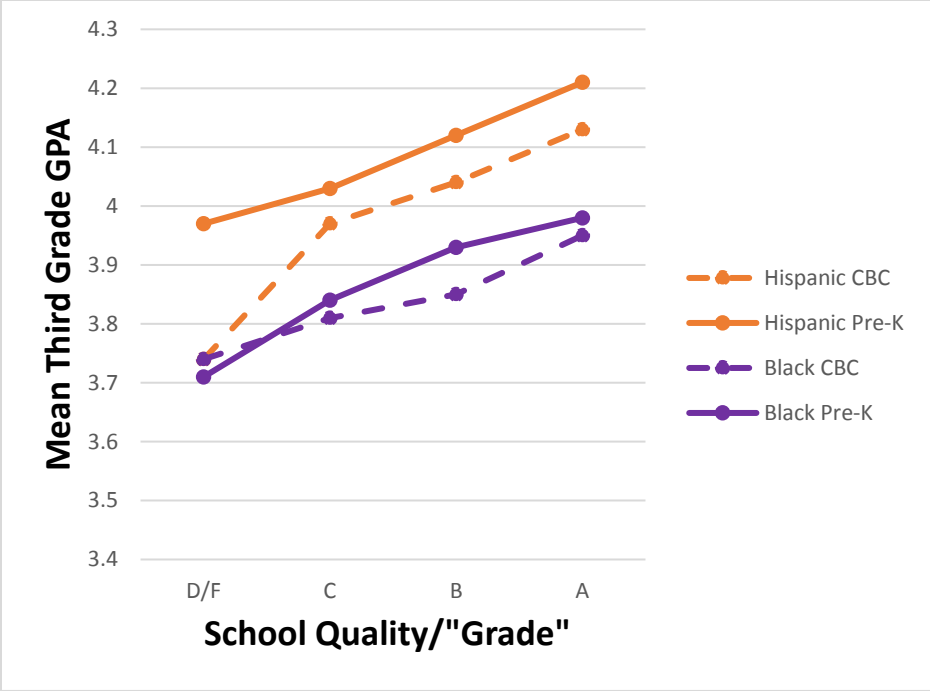

Figure 24. **Third Grade GPA, Adjusted for School-Entry Cognitive Skills and FRL status, of Hispanics and Blacks who Attended CBC or Pre-K**

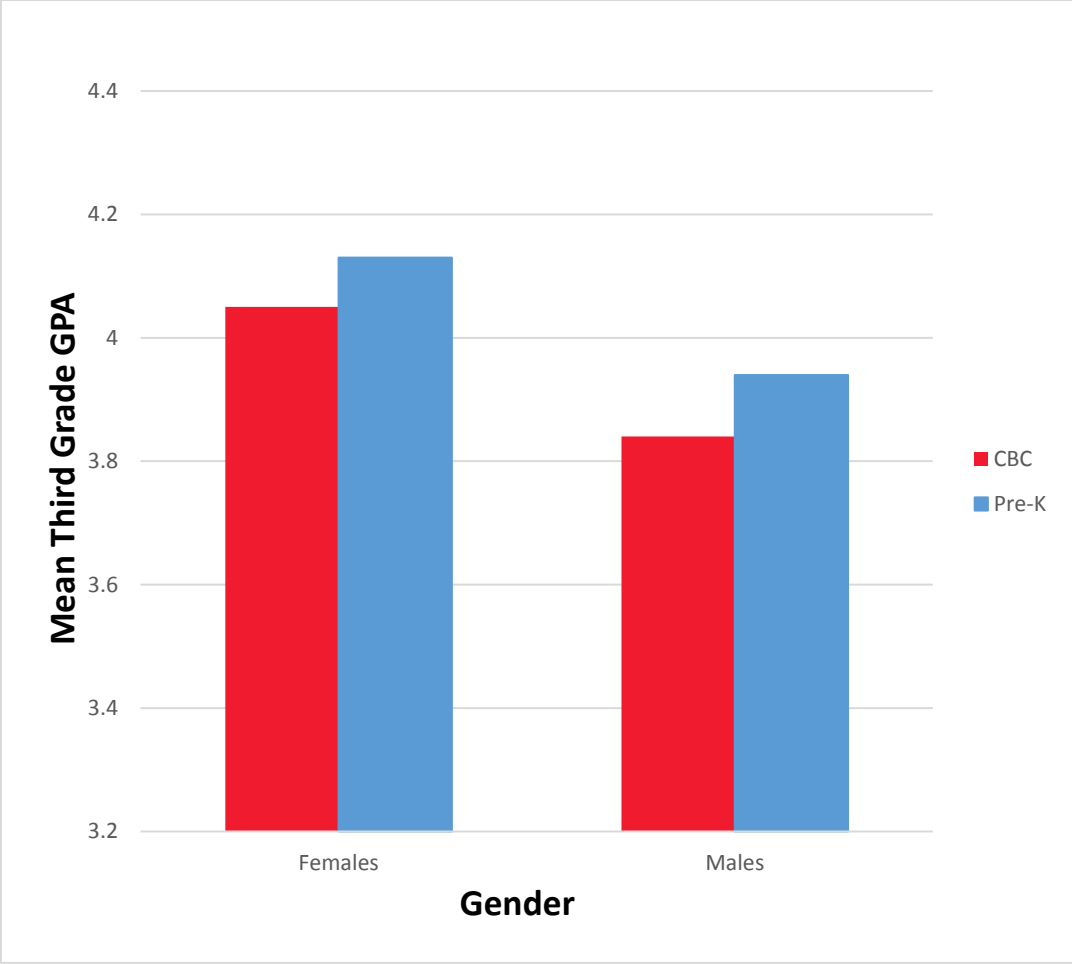

Figure 25. **Third Grade GPA, Adjusted for School-Entry Cognitive Skills and FRL status, of Males and Females who Attended CBC or Pre-K**

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