Summer 8-2011

Delayed Beginnings, Jump Start? The Combined Effects on Early Literacy of Age at Entry into Kindergarten with Experiences Prior to Entry

Kathryn A. Wilson
University of Nebraska-Lincoln, Katie.a.c.wilson@gmail.com

DELAYED BEGINNINGS, JUMP START? THE COMBINED EFFECTS ON EARLY LITERACY OF AGE AT ENTRY INTO KINDERGARTEN WITH EXPERIENCES PRIOR TO ENTRY

by

Kathryn A C Wilson

A THESIS

Presented to the Faculty of
The Graduate College at the University of Nebraska
In Partial Fulfillment of Requirements
For the Degree of Master of Arts

Major: Teaching, Learning & Teacher Education

Under the Supervision of Professor Guy Trainin

Lincoln, Nebraska

August, 2011

DELAYED BEGINNINGS, JUMP START? THE COMBINED EFFECTS ON EARLY LITERACY OF AGE AT ENTRY INTO KINDERGARTEN WITH EXPERIENCES PRIOR TO ENTRY

Kathryn A C Wilson, M.A.

University of Nebraska, 2009

Adviser: Guy Trainin

As the first compulsory grade in the elementary school program, kindergarten is designed to prepare students for the numbered grades. Students are eligible for entrance into kindergarten if they turn five before a state-determined cut-off date. These dates range from the June before the start of school until the January after. Because some states do not require that children attend kindergarten until 6, 7, or even 8 years old, some parents are delaying their child's entry into the program on the assumption that their child will benefit from an extra year to grow cognitively, physically, and emotionally. The result is a large age spread for kindergarten students nationwide as well as an increased average age.

In this paper, I survey research done into the practice of delayed entry into kindergarten. For my research, I intend to address the deficiency in current research concerning the experiences of students prior to their entry into kindergarten. Which is the best scenario for students to increase their academic achievement in kindergarten: on time entry with no formal preschool experience, on time entry with preschool experience, delayed entry with no formal preschool experience, or delayed entry with formal preschool experience. Using the National Education for Statistics Kindergarten cohort, I will compare the achievement of students across theses categories. Specifically,

I will focus on literacy achievement including placing students along a hierarchical line of literacy ability

Acknowledgements

I would like to thank my advisor, Professor Guy Trainin, for helping me through this arduous (though rewarding) experience, encouraging me to try something new, and reassuring me in moments of neuroses. Also, my committee for providing me invaluable input and time. Also, all of my professors who provided me with a stimulating (if extended) graduate school experience.

I would like to thank my mother for listening to me read the work in its entirety (multiple times, without understanding roughly 1/3rd of it) and offering grammatical and syntactical suggestions, as well as for asking me to work in the word "informs" as much as possible. Also, my father for encouraging me at every turn and giving me a positive attitude ("Every day a holiday, every meal a banquet.") Also my brother, for racing to the master's degree finish line with grace (you won!)

Thank you to all of my friends who listened intently as I waxed rhapsodic on the benefits and detractions of delayed entry and center-based care. You probably never want to hear those words again, and, barring my return as a PhD student, you may never have to.

Finally, thank you to my husband, Dr. Mark Alan Wilson, who supported me throughout my graduate school experience and beyond, who explained many a complex statistical term for me, who encourages and challenges me every day, who zigs when I zag, and without whom I might have given up long ago.

Table of Contents

List of Tables

List of Figures

CHAPTER 1 – Literature Review

Kindergarten, as the entry grade in the public school system, provides a transitional environment from home or center-based care to the world of formal education. Though not universally mandated, 36 states require local districts to offer kindergarten and the grade is only compulsory in 14 of those states (Education Commission of the States, 2005).The National Center for Education Statistics cited in 2000 that 98% of public school first graders attended kindergarten (U.S. Department of Education). Kindergarten teachers are expected to prepare their students, regardless of age at entry, for subsequent grades in terms of both content (language, reading, mathematics) and socialization.

Transition into kindergarten has been an active area of education research because of its importance. What we know less about is the combined effect of delayed entry into kindergarten and the effects of center-based care on kindergarten achievement. I intend to address this deficiency by analyzing data from the Early Childhood Longitudinal Study – kindergarten cohort collected by the National Center for Educational Statistics. The data will allow me to examine whether and how kindergarten literacy achievement is mediated by a combination of a student's entry status and his or her experiences prior to kindergarten as they pertain to care.

Kindergarten Entry

Children are eligible to enter into kindergarten in a given year if their fifth birthday falls on or before a specified cut-off date. If a child's birthday falls after the cut-off date then he or she must wait until the following year to enter kindergarten. There is no national cut-off date for entry into kindergarten and dates range from the June before

the school year to the January during the school year. This variability results in a natural range of kindergartener ages both nationally and within individual classes. For example, in a state with a July 1 cut-off, all students entering school in the fall will be at least five but some may be as old as six and two months, while a school with a January 1 cut-off, students could be as young as four years and six months (see table 1).

This natural age range means that kindergarten teachers must address students at social, cognitive, and maturity levels that can be quite significantly different. It also represents a challenge for a potential national curriculum; what may be appropriate for a 4 year and 9 month old may not be appropriate for a 6 year and 2 month old. A curriculum designed to capture all of these students might rely on the notion that all students enter kindergarten ready to learn the same things because kindergarten is the first formal grade in the national public school system. This is a problematic assumption, particularly given a growing trend: delayed entry or "redshirting"[1].

Delayed entry into kindergarten is possible due to the compulsory attendance variability from state to state. In seven states, children must be enrolled in kindergarten while they are 5. In most other states, the age of compulsory attendance is 6 or 7 (regardless of whether the child attends kindergarten.) In Washington, an extreme case, children do not have to be enrolled in school until they are 8 (National Center for Education Statistics, 2004). Parents can therefore choose to legally delay a child's entry into kindergarten until the year after they are eligible. This practice exacerbates the age discrepancy in kindergarten. For example, in a school district with a January 1st cutoff,

[1] Redshirting as a synonym for delayed entry into kindergarten comes from a related practice in college sports. Though collect students are only allowed to play for a school for four years, coaches will sometimes train freshmen with the team without allowing them to play during games. Such freshmen are considered "redshirted". This allows the students to stay for five years, playing for the last four.

though some students will be 4 years and 6 months at entry, others may be as old as 6 years and 6 months. In a district with a July cut off, some students entering kindergarten may be as old as 7 (see figure 2). This practice can lead to generally older kindergarten classes in which some students may be more ready for academics leading to more rigorous kindergarten programs.

There are many reasons that parents cite for delaying their child's schooling, ranging from specific concerns about the child's individual development to perceptions of what will give children an academic advantage in the school system. It is not clear, however, whether delaying a child's entry into kindergarten is academically beneficial to the child, as current research offers mixed evidence for the outcomes of the practice.

Incidence of Delayed Entry into Kindergarten

Estimates of the prevalence of delayed entry vary throughout the country. West, Meek, and Hurst (2000) drew data from the National Household Educational Survey to find the frequency delayed entry during the 1993 and 1995 school years. They found that roughly 9% of parents reported taking advantage of the discrepancy between the age of eligibility and age of compulsory attendance in their state and decide to keep their child at home or in a center-based program for an extra year.

Brent, May, and Kundert's cross-sectional study (1996) found a range of estimates ranging from 6 to 16 percent. Incidence of delayed entry was looked at in three periods: remote past (grades 9-12), recent past (grades 5-8), and immediate past (grades 1-4). Despite variability within the grades there was a noticeable increase in delayed students over time. That is, the more recent the enrollment, the higher the percentage of delayed entry, indicating that the practice may have been growing in popularity.

Grau and DiPerna (2000) conducted a similar study analyzing a sample of more than 8,000 Wisconsin third graders in 47 representational school districts and discovered that overall roughly 7% of the students had been redshirted, but that the proportions within districts ranged from 3% to as much as 94%. They also found that birthday quartile (seasonal) was the greatest predictor of delay: when compared to students with fall birthdays, students with winter birthdays were 2.19 times more likely to be delayed, with spring birthdays, 3.43 more likely and with summer, 13.32 more likely.

Barua and Lang (2009) caution that state laws can affect the percentage of students delayed. In mining census data from 1960, they found that states with a cut-off near the beginning of the school year, nearly 45% of student entered *early*. In states with a late cut-off allowing children born in the fourth quarter of the year to enter, roughly 25% *delayed* entry.

The previous studies suggest that the practice of delaying entry is increasing, especially for students with birthdays close to the start of kindergarten. More research is therefore warranted to discover to whom the practice is academically beneficial and under what circumstances.

Why Parents Wait

As much as the incidence of delayed entry varies, so too do the reasons behind the decision. Noel and Newman (2003) interviewed group of mothers from the Hudson Valley area of New York who had decided to delay their child's entry into kindergarten. Their study describes these parents as falling into two categories. Parents in the first category decided to delay their child's entry into kindergarten based on the observed unique needs of their child. These parents made their decisions relatively late, usually

within the year before eligibility. Noel and Newman referred to the intervening year as a "tentative period" during which these parents sought the counsel of school psychologists, preschool teachers, and other professionals.

Parents in the second category decided to delay their child's entry based on preconceived notions of schooling regardless of the individual child's developmental progress. Many times, these parents reported making the decision before child's third birthday. During the years leading up to the year of eligibility, these parents were more likely to seek confirmation rather than advice during what Noel and Newman coined a "confirmatory period."

Though Noel and Newman's study focused on the decision process, they also noticed that parents cited their children's lack of eagerness to learn, sleep schedules, parents' profession, nursery school experiences, and atypical characteristics or traits as reasons for delaying school entry. Interestingly, this seems to be the only study available that explicitly mentions the effect that a child's pre-school experience, whether center-based or at home, has on the decision to delay a child's entry into kindergarten. The study was very narrow in focus, however, and did not address the child's experience in kindergarten as a result of the decision to delay or not, leaving questions about achievement based on pre-school experiences and delayed entry unanswered.

Aside from Noel and Newman's article, I found little qualitative or quantitative research done exclusively into the various reasons for delaying school entry. That is not to say that other researchers do not touch upon the potential motives in their reporting. Overall, it is assumed that parents who delay kindergarten entry for their children want to give them the "gift of time" (Grau & DiPerna, 2000). Few researchers are specific, but

they seem to assume that parents feel the extra time will allow the child to mature cognitively, socially, and physically. They think parents listen to "folk wisdom" and fear that their five year old may not be able to handle the demands of a kindergarten curriculum (Brent, May, Kundert, 1996; Grau & DiPerna, 2000; Lincove & Painter, 1996). Researchers speculate that parents want their Kindergartners to be competitive in a class with students who may be older, more mature, and better prepared for kindergarten (Brent et. al., 1996, Grau & DiPerna, 2000).

As more families delay children's entry to kindergarten, the older the mean age of kindergarteners becomes, potentially resulting in more sophisticated demands on students. As the academic demands of the curriculum in kindergarten increase, more parents may keep their children out of school an extra year with the hope that they might be better equipped to handle these advanced demands and experience early success; the cycle can be self-perpetuating (Brent et. al., 1996).

Parents often believe that an extra year before school may be preferable to being held back later in school (Grau & DiPerna, 2000). This argument is supported by evidence since students whose entry has been delayed are half as likely to be held back in kindergarten or first grade (West, Meek & Hurst, 2000). However, as I will discuss later in this proposal, the reason for the decline in retention may be more likely due to a teachers' (and parents') reluctance to hold back a student who is already older than his or her peers as retention would magnify the difference in age.

Some researchers have noticed that decision making about age of entry may be moderated by socio-economic factors. For example, it has been suggested that families of low socio-economic status can't afford *not* to send children to school as soon as they are

eligible, and that therefore the practice of delayed entry may be more common in affluent communities (May, 1998), a trend confirmed by the research of Grau & DiPerna (2000). Other researchers have proposed that delaying kindergarten entry used to be more common among families of low socio-economic status in the 70s and 80s, especially for children whose parents did not expect them to attend college (Lincove & Painter, 2006).

Theoretical Underpinnings of Delayed Entry

Proponents of delayed entry argue that children become ready on their own terms and in their own time, independent of chronological age. These assumptions mirror theories put forward by the Swiss epistemologist, Jean Piaget. Piagetian theorists assume that children reach qualitatively unique stages before which certain learning can not take place (Grau & DiPerna, 2000). According to Piagetian theory, delayed entry allows students extra time to reach a developmental stage at which they would be ready to be academically successful in kindergarten. As Grau and DiPerna suggested, readiness cannot be forced, but rather is something that requires patience. Their hypothesis concerning development is that "…readiness is amenable only to the passage of time" (2000, p. 511).

Contrary to Piagetians, opponents of the practice of delayed entry feel that children require interaction to grow. This is in keeping with theories proposed by the Russian developmental psychologist Lev Vygotsky. Teachers and caregivers must interact with students, presenting them with increasingly advanced concepts in order for those students to develop cognitively. Simply delaying a child's entry into entry into kindergarten would, from this perspective, be counterproductive (Grau & DiPerna, 2000).

Allowing children to enter kindergarten at the age of eligibility gives them the opportunity to develop more rapidly and potentially catch up with their classmates.

Readiness

Between the two philosophical camps, the point of contention is the concept of readiness and whether children acquire it on their own. Caregivers might wish to delay their child's entry into kindergarten to *ensure* readiness, but readiness itself is not easily defined or tested construct.

Defining readiness. Readiness, or the quality of being ready, as the National Association for the Education of Young Children (NAEYC) (2004) defines it, does not happen in a vacuum, but is influenced by the children themselves, their families, early environments, schools, and communities. It is broadly defined and is flexible in nature. The NAEYC maintains that children mature at different rates in all areas of development including social, emotional, physical, and intellectual, and that all areas must considered when determining readiness.

Dockett and Perry (2002) define readiness more specifically. They list eight components of readiness: knowledge, social adjustment, skills, disposition, rules, physical attributes, family issues, and educational environment. These eight aspects parallel the NAEYC's four areas of children's development: intellectual, social, emotional, and physical (see table 2). Though Dockett and Perry's list provides a more holistic view of readiness, an investigation into all eight components and the combined effects of delayed entry and center-based care on their outcomes is beyond the scope of this thesis, and I have therefore chosen to narrow my focus. The increased emphasis on testing in schools, particularly in relation to reading, has motivated me to confine my investigation to a small but crucial part of the "knowledge" on Dockett and Perry's list:

literacy. The purpose of my thesis will be to determine whether literacy in kindergarten is mediated by entry status and/or the nature of early care.

Emergent literacy is defined as "the reading and writing behaviors that precede and develop into conventional literacy" (Sulzby, 1989) and is therefore a good indicator of literacy “readiness”. Emergent literacy is difficult to measure; what exactly are pre-reading skills and when do children transition to “conventional” literacy? The measure of emergent literacy can be inferred from literacy instruction in kindergarten which in turn is theoretically designed to address students at an appropriate level of development; therefore, emergent literacy can be measured by student achievement in kindergarten curriculum components.

Curriculum and school readiness are informed by each other: curriculum design is predicated on an assumed level of readiness, and readiness is measured in part by a student’s success within a curriculum. Readiness is moderated by many factors including parental attitudes towards schooling, parental involvement, and exposure to academic socialization (Hill, 2001). Students enter kindergarten having been exposed to different knowledge and skill sets; the extent of this exposure and its alignment with school demands can play a large role in predicting a child’s success. In as much as the level of readiness is largely out of the control of curriculum designers, some assumptions must be made that attempt to address all students.

These assumptions change over time. As an example, Grau and DiPerna (2000) note that based on their observation of kindergarten curricula, modern kindergarten students are expected to recognize letters and numbers upon entry, whereas they were once introduced for the first time in kindergarten curriculum. Literacy skills that students are expected to master by the end of kindergarten today include concepts of print (for

example, that English is read from left to right and top to bottom), upper and lower case letter recognition, sound/letter associations, rhyme, phoneme blending, and the meaning of many words and phrases (Snow et. al., 1998). The National Early Literacy Panel (NELP) further defines six areas of emergent literacy that correspond well with conventional literacy development: alphabet knowledge, the understanding of the names and sounds of letters; phonological awareness, the understanding of auditory aspects of language including detecting syllables and sound segments; rapid automatic naming, being able to name a sequence of numbers or letters; rapid automatic naming of colors and objects; writing letters in isolation upon request or writing name; and phonological memory, the ability to remember auditory information for a short time (National Institute for Literacy, 2008). In keeping with increased preparedness expectations, studies conducted into delayed entry outcomes focus now on these updated benchmarks.

Readiness and the law. The National Association for the Education of Young Children (NAEYC) argues that readiness is necessary in order to ensure success, but it can not dictate kindergarten eligibility (NAEYC, 2004). Age is the only objective measure by which students can be admitted. Siegel and Hanson's 1991 investigation into kindergarten entrance policies found that tests claiming to measure readiness lack reliability and should be used for instructional planning only. They discovered in their correspondence with the Director of Publications at the Center for Law and Education in Massachusetts that any test which could label a child "not ready" or recommend a delay of kindergarten entry would be in violation of state and federal laws including "equal protection and due process under the U.S. and New York constitutions, and their rights under Section 504 of the Rehabilitation act of 1973, (and) the Education of All Handicapped Children Act of 1975…" (p. 13). The result of this finding is that no student

who turns 5 before the cutoff date can be denied entry into school. The NAEYC argues that it is the school's responsibility to help students learn regardless of a students "readiness".

Studies into the Academic Outcomes of Delayed Entry

The strict cut-off date policy for entry complicates delayed entry data analysis, since students born a few days on either side of the cut-off date would be considered in different categories if they enter in the same year (Datar, 2006). For example, a student born on September 2nd in a state with a September 1st cutoff would be considered a normally entered student for the following year, but a student born on August 31st would be considered "redshirted" (see table 3). Additionally, researchers that focus solely on delayed entry may erroneously imply that the data represents a uniform population: students across the country entering on the same first day of school after the same cutoff date at the same age (Barua & Lang, 2009). The variation in cut-off and kindergarten start dates, however, means that a student of 5.5 years old may be delayed in one state but normally entered in another. Many studies focus, therefore, on the relationship of age, rather than entry status, to achievement. Although these studies are explicitly based on age, the implicit connection between age and delay cannot be ignored; delayed students are older students. It follows that delayed entry outcomes can be inferred from age-based results.

For a better idea of the outcome of these studies, refer table 4 for a summary of study name, researchers, year, and results.

Short term studies. McNamara's 2004 study focused on the relationship of age to pre-reading skills including phonemic awareness and letter knowledge in kindergarten. A group of 625 Canadian kindergarten students were tested on skills including rhyming,

blending, and lower/upper case letter naming. McNamara concluded that age does not have a significant effect on pre-reading measures; only a .03 to .13 correlation on each tested variable: age, phoneme identities, rhyming, blending, upper/lower case IDs, and letter sounds (2004). According to McNamara's study, letter recognition, not age, was the better predictor for phonological awareness. Younger students demonstrated less letter-sound understanding, and therefore less phonological awareness, but the relationship was correlational not causal. McNamara noted that any advantage older students have in terms of letter recognition may be due to exposure over a longer period of time (2004). The study did not recognize any specific experiences prior to kindergarten as a predictor for pre-reading achievement.

Warder's PhD thesis (1999) investigated whether a student's age at the time of kindergarten entry has an effect on literacy in kindergarten, first, and second grade. By examining the results of the Early Childhood Literacy Assessment System, the literacy assessment given to all New York City public school students, Warder was able to gather students' scores on alphabet knowledge, sight vocabulary, phonemic awareness, reading, and writing mechanics. Scores from six classes of kindergarteners, first, and second graders were organized by date of birth and gender (there were 18 classes overall.) The scores were then grouped to see if there were any differences by birth date, gender, or both.

Students in Warder's study were divided into three age-based groups. She found that children who are born between January and April perform better in kindergarten than children born between May and August, while both of these groups perform better than children born between September and December. Across the board, the older students

performed better overall except for phonemic awareness and writing in the first grade. Twenty seven percent of students born between January and April were at or above reading grade level compared to 20% of students born between May and August and 11% of students born between September and December, indicating that older students in general performed better. Though Warder did not focus on redshirted students, it can be inferred from her study that the older the student at entry, the better the literacy outcomes. By the second grade, ability did not correlate well with birth month.

There may be other factors that account for the academic differences between students born at different times of the year. Offenberg and Holden (1998) performed multiple regression analyses to discern what factors influence a students' being at grade level, but found that age explains less than 3% of variance in grade level performance in kindergarten. They focused on students who were enrolled in the same Philadelphia school district during the falls of 1989 and 1997, examining the school records to find the students' ages and grades. They reported that redshirted students earned lower marks than their peers did, and that students who entered at 67 months performed best, while students who are either older or younger at entry performed worse. This means that children mature and become better prepared for school as they age, but only up to a point.

Datar's 2006 study did not agree with Offenberg and Holden's; she found that delayed entry may in fact benefit students. In her study of the National Center for Educational Statistics' Early Childhood Longitudinal Study kindergarten cohort, Datar found that kindergarteners whose parents decided to delay their entry into school generally scored higher in math and reading by 6 and 5.2 points respectively. The effect size was between .6 and .8 standard deviations and test score gains represented .7 - 1.0

standard deviations in both math and reading. These benefits continued into the first grade with increased test scores by a half a point in math and a whole point in reading. Test score increases were largest for poor, disabled, and male students, especially in reading. This study is perhaps most important to my research as it focuses on the same data set as I intend to and is nationally representative. I will elaborate upon these findings, examining the impact of experience before school entry.

The preceding studies present mixed evidence regarding the effect that age of entry has on actual academic achievement. Its effect on perceptions of students' academic success may be another matter entirely. Parents of children who had experienced delayed entry into kindergarten received less negative feedback about their children as compared to parents whose children entered immediately upon eligibility (West, Meek, & Hurst, 2000). Feedback included information on activity in the classroom, perceived maturity level, and effort allocated to class work. Based on this feedback, parents of delayed entry students may be led to believe that their children are doing better academically than their peers regardless of their actual achievement. Parents might then recommend others to do the same (Brent et al., 1996).

Long term studies. Studies on short term outcomes have provided some evidence that students may benefit during their kindergarten year as a result of delayed entry. Parents might hope then, that these students would subsequently perform better in subsequent grades, however, the impact that delayed entry into kindergarten has on academic performance in later grades is less clear.

Many studies indicate that while there may be some immediate benefits to being older in kindergarten, these differences start to disappear by the third grade (May, 1998;

Grau & DiPerna, 2000; Stipek, 2002). May (1998) found that there were no significant differences in reading achievement between redshirted students and normally entered students by the third grade, and that younger students surpass older students in math achievement by the fourth grade. Grau & DiPerna (2000) confirm that by the third grade, the two groups have comparable test scores in reading achievement. Stipek (2002) found that while older students perform better in math and reading in kindergarten and first grade, the differences even out by the third grade. Lincove and Painter (2006) found that students who are young for their grade in the tenth and twelfth grades achieve higher test scores. Interestingly, students who are old for their grade, whether they were delayed or retained later, are less likely to go on to college and earn bachelor degrees (Lincove & Painter, 2006). Academically, the benefit of being older seems to lessen proportionately with the time elapsed since kindergarten, eventually becoming a potential liability. It is important that it isn't known whether Lincove and Painter took into account the delayed students that also qualified for special education services, which would certainly affect their argument.

Other Long-Term Side Effects

The effects of delayed entry are not limited to academic outcomes. Long-term differences between the delayed and control populations exist in special education placement, gifted program placement, and retention.

Special Education. Students whose entry into kindergarten was delayed are almost three times as likely to be placed in a special education program (Offenberg & Holden, 1998). The cause-effect relationship in this case is difficult to prove. Parents who notice a developmental delay might decide to delay their child's entry into kindergarten

hoping that they will simply outgrow the delay (Datar, 2006). It is possible that parents who decide to delay their child's entry might have noticed developmental delay but not reported it to the school district, which will eventually result in students being identified as needing special education after kindergarten (May & Kundert, 1995). Grau and DiPerna (2000) argue that additionally, parents might mistake developmental delays for immaturity, causing them to delay their child's entry rather than seek educational counseling. In all three cases, whether developmental delay is understood by the parents or not, these students will need to be placed in special education programs regardless of the age at which they entered school. It is additionally possible that delayed students are placed in special education programs more often because teachers may make more allowances for the perceived immaturity of younger students but not for older ones.

Gifted programs. In addition to higher rates of special education placement, students whose entry into kindergarten has been delayed are less likely to be placed in gifted programs (Offenberg & Holden, 1998). This is surprising because older students are more likely to be *referred* to the programs (DeMeis & Sterns, 1992). Teachers may assume that older students are more mature and consequently able to handle more academically than their younger classmates. When tested by specialists, however, many of these students seem to be at best on the level of their peers who entered kindergarten "normally" (DeMeis & Stearns, 1992).

Retention. The outcomes of redshirting are not all negative; students whose entry into kindergarten was delayed are less likely to be retained (required to repeat a year of school). May and Kundert (1995) reported that 6% of students who experienced delayed entry into kindergarten were subsequently retained, almost half of the national rate

(12.8%). Lincove (2006) reported similar results, and speculated that younger students may be retained because of a perceived lack of independence and maturity rather than because of academic performance whereas older students may seem more independent regardless of academic achievement.

The lower rate of retention among delayed students may also be explained by teachers' reluctance to hold back students who are already older than their classmates in order to avoid further amplifying the age difference. If retained, delayed students could be as much as 2-3 years older than their peers, and by graduation, they could be 19 or 20. The lower rate of retention may be detrimental to delayed students who received social promotion, but may have benefited academically from retention. The redshirted population's lower graduation rate, lower college attendance rate, and lower job placement rate may be evidence of this risk (Lincove & Painter, 2006).

It is important to note that these studies on retention, gifted placement, and retention did not mention whether their population disaggregated the special-education population from their analyses.

Differences among Populations

In addition to studying the effects of delayed entry combined with center-based experiences on the general population, I intend to look into its effects on several sub-populations in order to determine whether the outcomes are moderated by gender, socio-economic status, and race and ethnicity. By looking into current research on each of these groups, I hope to better demonstrate whether each group experiences different outcomes and why.

Differences by gender. Overwhelmingly, researchers report that boys are more likely to be delayed than girls are (Grau & Di Perna 2000; Lincove & Painter, 2000; May & Kundert, 1995; West, Meek & Hurst, 2000). West, Meek, and Hurst (2000) found that 10% of boys were delayed as compared to 7% of girls in 1993. Grau & DiPerna (2000) found that boys were 1.91 times more likely to be delayed while May and Kundert (1995) found that boys may be as much 2.3 times as likely to experience a delayed entry. As Grau & DiPerna (2000) said, "…boys born close to the kindergarten entrance cutoff were seen as good candidates for waiting a year because they were believed to mature more slowly" (p. 510-11).

The discrepancy in incidence of redshirting between genders could also be due to caregivers' desire to give boys a chance to grow physically. Smith and Niemi (2007) studied a group of almost 11,000 boys in the national Early Childhood Longitudinal Survey – kindergarten cohort (ECLS-K). They compared each boy's height to data collected on the teacher's evaluation of each student's reading, math, and general knowledge *independent* of the students test scores. They discovered that teachers consistently perceived smaller boys (as compared to both the national and individual classroom's averages) as being less capable than their taller or larger counterparts. Because of this, caregivers may believe that by giving their boys an extra year to grow physically, they are actually helping them academically.

In addition to frequency of delay, outcomes of delayed entry seem to be moderated by gender. Academically, Datar (2004) found that boys benefit from an extra year before kindergarten in terms of reading while girls seem to benefit from the extra year in math. She noted that boys and girls have similar reading scores upon entering

kindergarten, but that girls experience a higher gain in reading abilities, whereas the scores of both genders continue to improve similarly in math over the course of the year.

Of the entire redshirted population, boys are retained more often than girls (82% vs. 18%) (May & Kundert, 1995; Brent et al., 1996). Other forces may be at work, however, since Warder (1998) noted that girls achieve higher grades than boys regardless of their age. Boys are also more likely to be identified as having a learning problem (Brent et al., 1996).

Differences by race and socio-economic status. While it is easy to achieve a mix of boys and girls in studies, researchers seem to focus most often on the middle class white population in order to select a large, homogeneous group. Some researchers have made efforts to include students from different races and socio-economic status, often combining the two variables.

Race and socio-economic status are implicated in reasons for delaying entry into kindergarten as well as in determining individual success of redshirted students. Grau and DiPerna (2000) found that, contrary to popular belief, in their sample well-off families did not delay their children's entry into kindergarten more frequently. Rather, children of color and lower socio-economic status are overrepresented in the redshirted population. Specifically, they found that Hispanic children are 1.78 times more likely to be redshirted than Caucasian children. Lincove & Painter (2006) also found that redshirted students more likely to be Latino or Asian, and to be born outside of US. West, Meek, and Hurst (2000) found, however, in studying the 1995 National Household Education Survey, that the rate of Hispanic children being delayed was comparable to the white, non-Hispanic

children that white, and that non-Hispanic children were twice as likely as black, non-Hispanic children to have been delayed.

Offenberg and Holden (1998) noted that socio-economic background makes less difference than a student's age upon entering kindergarten when considering academic achievement except for students who enter kindergarten fairly young (though they did not specify how young). This argument is supported by Datar (2006) who found that age older students perform better in both reading and math in kindergarten, regardless of socio-economic status. Grau & DiPerna (2000) found, however, that students of low socio-economic status were more likely to benefit from the practice of redshirting in kindergarten in terms of both math and reading. It is important to note that minority students and low socio-economic status performed lower in all categories when compared to Caucasian middle-class students in this study. The differences studied concerned the relative benefits of redshirting within each group.

While there seems to be some evidence that redshirting results in, at best, increases in academic achievement, and at worse academically neutral outcomes, the practice must also be weight by its association with potentially negative side effects. The argument for or against delayed entry, however, is not complete

Center-Based Care and Literacy Readiness

Researchers have looked into the impact of practice of delayed entry on several outcomes including social, emotional, physical, and intellectual. Race, ethnicity, poverty, special education status, and gender have all been considered as variables affecting the success rate of students who enter school a year later than eligible. There is one omission

in the research done into the outcomes of redshirting: the impact of student experiences before they enter school.

Researchers have investigated the effect of early education center-based programs on achievement extensively. These pre-school programs go by many names depending on the organizing body: Head Start, preschool, early childhood education/development centers, while some just call it day care, though they provide much more than a babysitting service. In the interest of simplicity, I will refer to all of the services that offer an educational experience before kindergarten as "center-based care."

These programs are supported by proponents on either side of the theoretical developmental argument; Piagetian camp vs. Vygotskian camp. On one hand, in accordance with Piaget's philosophy, an extra year in a formal program allows parents and teachers to observe a child progressing over time. On the other hand, the student will remain in an environment that can potentially assist in his or her development, facilitating cognitive growth as desired by the Vygotskian philosophy. Overwhelmingly, researchers report that formal center-based care can provide positive starting points for students, especially with respect to literacy (Justice, L. M., et al., 2008; Manning, M., 1988; Mohler, G. M., et al., 2009; National Institute for Literacy, 2009; Yifat, R., & Zadunaisky-Ehrlich, S., 2008).

Laura Justice and her colleagues found in studying expressive language in pre-school aged children that it is the language stimulation in language focused center-based classrooms that children receive in preschool that accounts for their literacy growth (2008). The effect was strong enough that regular attendance was associated with higher gains and also compensated for family risk factors (Justice et. al., 2008). It is important to

note that the type of curriculum implemented in the preschool program was integral to Justice's finding, and could be an important variable to consider in my own research.

While Justice's study focused on preschool language stimulation in general, Rachel Yifat and Sara Zadunaisky-Ehrlich were more specific in their research. They studied the role of "revoicing" (the teacher's elaborating, expanding, and prompting of children's discussion contributions) during circle time in an Israeli preschool (2008). Types of "revoicing" ranged from acknowledging a child's statement to questioning and comparing children's contributions, but in all cases served to motivate students to participate, hold their attention, and encourage them to think more about the topic at hand. They determined that in these group discussions teachers facilitate and reinforce their students' linguistic development.

Perhaps most the most convincing data on the beneficial effects of center-based care on literacy comes from the meta-analysis from the National Institute for Literacy's Early Literacy Panel (NELP) of scientific research on literacy in children ages 0-5. They found that formal center-based experience has a random effect size of 1.22 on "readiness", which they define as a combination of alphabet knowledge, concepts of print, vocabulary, memory, and phonemic awareness (2009). The NELP reported additional significant effect sizes on reading (fixed ES of 2.05, random ES of .75) and writing (fixed ES .72, random ES .67). The NELP also studied the effect size of parent and home programs designed to promote literacy in young children and found an ES of .05 on readiness, .28 on reading, and .52 on writing (2009); these are a staggering discrepancies.

CHAPTER 2 - Proposal

I set forth to determine whether students who enter kindergarten a year late and have attended center-based care perform better than students who enter on time and have not attended center-based care. Though in this study I focus on what I believe to be the seminal articles on delayed entry in my literature review, in reading over 70 articles in the process, not once did I see an inquiry into the combined effects of formal programming before kindergarten (or lack thereof) in conjunction with time of entry. I investigated whether there is a difference in the achievement of students across four categories: on-time kindergarten entry with center-based care experience, on-time kindergarten entry without center-based care experience, delayed kindergarten entry with center-based care experience, and delayed entry without center-based care experience (see table 5).

How does entry status and center based care impact literacy achievement in kindergarten and first grade? I hypothesized that students who enter on time with no center-based experience will achieve the least while the delayed students who experienced center-based care will achieve the most. I had no provisional model for the academic achievement of the other two groups of students; delayed entry with no center-based care or normal entry with center-based care. Might the extra year before school approximate the experience that comes with center-based care?

In addition to looking at these four types of students, I looked at the differences in outcomes in each category among students of different ethnicities, socio-economic status, and gender. As I mentioned in my literature review, researchers have found that different sub-populations benefit differently from delayed entry. The ECLS-K includes information about each student's race, parental income, and other socio-economic factors

such as family income, parents' professions, and highest degree achieved by the parents. I was curious as to what difference these factors make. How do demographic factors, including gender, socio-economic status, linguistic status, disabilities, and race/ethnicity, moderate the impact of entry status and center-based care on literacy achievement in kindergarten and first grade?

Though the ECLS-K has been mined by researchers to answer questions about delayed entry, my approach introduces the novel variable of pre-school experiences. Center-based care is extremely popular; nearly 8,000 students in the ECLS-K study were reported as having some sort of center-based care prior to entering kindergarten as compared to roughly 1,300 who reported none at all. The popularity of center-based care brings a whole new perspective to the self-reinforcing cycle of kindergarten advancement due to delayed entry, but there is no definitive evidence that this is a positive trend. By synthesizing new information about the effect that center-based education can have on students of different entry statuses with existing research done into redshirting, I seek to provide a more precise answer to the question: who benefits from delayed entry, if anyone?

Method

Participants. The National Center for Education Statistics' Early Childhood Longitudinal Study, Kindergarten Cohort (ECLS-K) followed a nationally selected cohort of students beginning their kindergarten year in 1998 through high school. More than 21,000 students participated in the study. Of those students, 51.2% were boys and 48.8% girls. In terms of race, 56.3% were white, 14.2% African American, 17.4% Hispanic, and 6.3% Asian (see table 6). Roughly 14% of the students were reported as having a

disability. Socio-economic status was reported in quintiles; 6,000 students were reported as being in the lowest two.

Age at Kindergarten Entry. Parents were asked: "did you [or {CHILD}'s parents] enroll {CHILD} in kindergarten when {he/she} was old enough based on {his/her} birth date, or did you [or {CHILD}'s parents] wait until {he/she} was older?" Of the complete sample, 10,766 students entered school on time while only 804 entered late; roughly 7.5%. This percentage is consistent with the averages in other studies (Brent, et. al., 1996; Grau & DiPerna, 2000; Offenberg & Holden, 2000). Of the delayed students, 65.6% were boys and 34.4% were girls. In terms of race, 76.41% of delayed students were white, 8.18% were African American, and 8.45% were Hispanic. Of the normally entered students, 87% experienced center-based care during the year prior to kindergarten as compared to 81% of delayed students.[2]

And Another Thing…It seems that some parents may not have understood the question regarding entry status. Many parents with children who entered kindergarten at the age of five during the year of their eligibility reported that their child's entry was delayed, while several others with children too old to have entered on time were reported as having done so (see figure 3.)

To correct for this curious anomaly, I created a new variable that I labeled "composite redshirt". Given the earliest and latest cutoff dates nationally, I was able to determine based on the age (in months) of kindergarten entry which students definitely entered kindergarten early, which definitely entered kindergarten on time, which may

[2] For more information about the data set, refer to the ECLS-K Users manual, available online at http://nces.ed.gov/pubs2006/2006032.pdf.

have entered kindergarten on time, and which definitely entered late. (See appendix for formula)

Center-Based Care. Due to the nature of the NCES ECLS-K survey, I had to create a new composite variable for Center-Based Care based on the answers to two items from the parent questionnaire. All parents were asked whether their child had ever attended center-based care; parents who answered "yes" were subsequently asked whether their child attended center-based care during the year prior to kindergarten. For the purposes of my study, any student whose parent answered "no" to the first question was also coded as "no" for center-based care before kindergarten, as well as the children of any parent who answered "yes" to the first and "no" to the second question. Only children who were coded as "yes" for both questions were considered to have been in center-based care the year before kindergarten. I ignored students who were coded as having had center-based care at some point but whose parents responded to the question regarding the year before kindergarten as "not-applicable", as that particular answer was intended for parents who had answered "no" to the previous question.

For the complete ECLS-K sample, the proportions of students within each center-care/entry status category was telling; the most popular scenario was to enter on time after attending center-based care (61.3% of the complete sample) while the least popular was to enter kindergarten late having had no center-based care (2.6% of the complete sample). This small percentage makes analyzing results by further dividing the sample very difficult; any results are likely to be hard to interpret.

Instruments. This study uses the National Center for Educational Statistics Early Childhood Longitudinal Study, kindergarten Cohort study (ECLS-K). The ECLS-K has

collected data from a national cohort of students beginning at their first year of kindergarten in 1998. Their data includes information on the child's environment and development as well as several measures of literacy knowledge. The study examines the relationship between a child's achievement in literacy in kindergarten with their experiences prior to their entry into kindergarten and their entry status.

The ECLS –K made use of several methods of testing to complete an academic profile of each student. Assessments were divided into direct and indirect cognitive assessments. Direct assessments measured the child through testing while indirect assessments relied on teacher report. In this study I made use of the direct assessments. The direct assessments of cognitive ability are divided into five categories: raw score, IRT score, T-score, item cluster score, and proficiency levels. Each component provides partial information about the academic achievement of each student. Of the five, I use on IRT scores and proficiency levels.

The Item Response Theory Scale or IRT scale is based on a pattern of right and wrong answers, as well as omitted responses, to a selection of questions administered in increasing difficulty and declining "guess-ability" to place students along a continuous scale (Tourangeau, et. al., 2006). This means that it is unlikely that a low-achieving student would be able to perform highly on the test because he or she was able to guess at the answers. The score represents the probability that the student would have answered all items correctly had all the questions been asked. Although the forms are different for each grade, the nature of this assessment allows for longitudinal comparison. The IRT score is useful as a criterion-referenced measure for correlational analysis as well as for

gains over time. The theta-based reliability of the IRT test for the kindergarten round of testing according to the NCES is .93.

The Level of Proficiency score places a student along a continuum of hierarchical skills. The proficiency level is also divided into two scores: the highest level mastered score (1-9) and an IRT-based probability score for each level. The reading proficiency levels most likely pertinent to kindergarten literacy are as follows:

> Level 1: Letter recognition – the ability to recognize upper and lower case letters by name
> Level 2: Beginning sounds – the ability to associate sounds with the first letter of a word
> Level 3: Ending sounds – the ability to associate sound with letters at the end of a word
> Level 4: Sight words – the ability to recognize common words
> Level 5: Comprehension of words in context – the ability to read words in context

Levels 6-9, literal inference, extrapolation, evaluation, and evaluating non-fiction, are more advanced and less likely to apply to kindergarteners.

While the IRT scores place students along a scale, the level of proficiency provides a more specific report of which reading skills a student has mastered, reflecting in part the pre-reading measures taught in kindergarten. The highest level of proficiency score had no standard measure of reliability based on theta; instead, the reliability estimate measures the likelihood that that a same-level score would be obtained under difference circumstances. These scores ranged from .83 to .60 depending on the proficiency level.

Analytic Plan for Complete ECLS-K Sample. Both research questions can be answered with an analysis of variance. Entry status is a parent reported variable with possible replies of “early”, “when old enough”, and “waited”. Children’s experiences prior to school were also parent-reported; there is no parallel data to make use of as there

is with entry status. Parents were asked if their child attended a day care center, nursery school, preschool, or prekindergarten program on a regular basis the year before kindergarten. Any positive answer was coded as "yes" for center-based care. For this study, I conducted ANOVA with entry status, center-based care status, and both IRT and HLP test scores as variables for the complete sample, only IRT for sub-samples owing to the lack of variability in the HLP scores.

In addition to analyzing the complete sample, in order to work towards more valid results, I made use of both the ECLS-K's disability status composite variable and special education variable. Special Education status was based on Field Management System and first reported in the spring of kindergarten. To determine a child's disability status, data were first taken from the parent interviews. The interview included questions about "the child's ability to pay attention and learn, overall activity level, overall behavior and relations to adults, overall emotional behavior such as anxiety or depression, ability to communicate, difficulty in hearing and understanding speech, and eyesight" (NCES, 2006). Any positive response was followed with a question about whether a professional diagnosis had been obtained as well as questions about therapies and support program participation. If any source question was coded "yes", and the follow up diagnosis and therapy questions was also coded "yes", then the composite variable was coded "yes"[3]. Students coded as "yes" were left out of the disaggregated sample.

Analytic Plan for At Risk Categories. My second question concerning the moderation effect that demographic factors have on literacy outcomes relies on more

[3] That is, except for the case of visual impairment corrected with lenses, in which case the composite was coded as "no", even though the source question and therapy were both coded as "yes" (NCES, 2006).

variables. To determine literacy outcomes for specific at-risk populations, I continued to work with the disaggregated sample that ignored students with identified disabilities. Because of the limited variability in HLP scores, I decided to continue with only IRT scores as a measure of literacy achievement. I also focused solely on the beginning of kindergarten and end of first grade time periods, as the beginning of first grade was a very small sub sample, and I felt that two distinctly separated points would suffice in determining whether effects as determined by ANOVA as well as effect sizes (*d*) are persistent.

Race and ethnicity. Race and ethnicity are treated as one composite variable in the ECLS-K, and were taken from parent interview data. Parents reported their child's race, and were asked specifically about ethnicity only in terms of whether their child was Hispanic. This resulted in a composite variable with the possible responses of White, non-Hispanic; Black or African American, non-Hispanic; Hispanic, race specified; Hispanic, no race specified; Asian; Native Hawaiian or other Pacific Islander; American Indian or Alaska Native; and more than one race specified, non-Hispanic (see table 6). One of the difficulties surrounding analyzing literacy outcomes for students of racial or ethnic minority status, like linguistic minority, is sample size. For the ECLS-K, in order to have minority sample sizes comparable to the white majority sample, all subgroups had to be lumped together into one minority group. Of the white student population, 8.5% delayed entry while 6.2% of racial/ethnic minority students delayed entry into kindergarten. I use the original terminology of the ECLS-K in describing race/ethnicity categories in my discussion.

Socio-economic status. Socio-economic status is also treated as a composite variable and includes formation on the father/male guardian's occupation, mother/female guardian's occupation, father/male guardian's education, mother/female guardian's education, and household income. To include parent occupation in the composite variable, each parent's reported occupation was given a prestige score[4], but this was only included if the parent was in the job force at the time (regardless if the parent reported an occupation). For the education component, parents were asked their highest grade completed. If a parent reported not having graduated from high school, they were asked if they had completed a GED. Income was reported in two ways: whether the family earned above or below $25,000, and the income range of the family in one of 13 categories ranging from $5,000 a year to $200,000 + in 5-10,000 dollar intervals. The socio-economic status composite variable uses the midpoint of the income range reported, and is then weighted for number of children in the household. Socio-economic status is reported by quintile. As there were so few students in each of the center/delay categories when divided into socioeconomic quintiles that I created a new variable for socioeconomic status that sorted students into two categories; one for the lowest 40% (low) and one for the upper 60% (med-high) (see table 1.)

Table 1: Socio-Economic Status frequency by category

	Frequency
Low	6242
Mid-High	11320

a. low = 1st and 2nd quintiles; med-high = 3rd-5th quintiles

Gender. Since

[4] In accordance with 1989 General Social Survey prestige scores (NCES, 2006)

researchers seem to agree that boys might benefit from delay (Grau & Di Perna 2000; Lincove & Painter, 2000; May & Kundert, 1995; West, Meek & Hurst, 2000), I have chosen to address gender as a potential risk factor. Interestingly, gender is also reported as a composite variable. The reported gender of a student is taken from the parent interview, child report, and the Field Management System. In the event of a discrepancy, the most frequently reported gender is used.

Linguistic Minority. The English Language Learner composite variable calculated by whether the child received either in class or pull out services; represented 8.4% of sample; not enough to produce valid results (only 20 out of ~1460 students delayed entry) Therefore, In order to determine whether a student qualifies as a linguistic minority, I used the ECLS-K variable C1SCREEN which asked parents if the language of the household is English or non-English. Students of non-English speaking homes were coded as linguistic minorities.

Special Education and Disabilities. In addition to disaggregating the disabled portion from the complete sample in answering my first research question, I treated students with disabilities as an at risk category using the same parameters. Interestingly, about 12% of the disabled population experienced delayed entry into kindergarten as compared to 7% of the rest of the population.

CHAPTER 3 -Results

To contextualize effect sizes (*d*) in literacy outcomes, my first step was to calculate the effect size (*d*) of literacy growth in kindergarten by comparing literacy achievement (IRT score) at the beginning of kindergarten with achievement at the end of kindergarten. After one academic year (9 months of school), average literacy growth represented an effect size (*d*) of .97 (see table 1). For reference, when considering the combinations of Center-Based Care and delayed entry, an effect size (*d*) of .1 will represent about a one months' advantage. In keeping with Cohen's benchmarks (1992), .2 represents a minimum effect, .5 a medium effect, and .8 or greater a large effect. I considered effect sizes rounding to the nearest tenth to determine significance.

Table 2: Descriptive Statistics of Literacy measures as described by IRT scores

	Mean	SD	N
Beginning of kindergarten	29.66	10.09	14385
End of kindergarten	41.30	13.79	14385

a. Cases selected to represent students present for both evaluations

Center-Based Care. By comparing the means between the new compound center-care variable and the students' IRT scores at the beginning of kindergarten for the complete sample, I found that center-base care has a small effect size (d) on early literacy achievement of about .4, representing just under a four month head start.

Table 3: IRT scores by Center-Based Care, beginning K, complete sample

	Mean	SD	N
Center Care	31.75	10.89	8301
No Center-Based Care	27.57	8.72	4175

Delayed Entry. Delayed entry by itself had almost no significant effect on early literacy achievement, d=.12, or just about one month head start.

Table 4: IRT scores by delay status at the beginning of kindergarten for the, complete ECLS-K sample

	Mean	SD	N
On Time	30.07	10.19	10766
Delayed	31.34	11.43	804

Center-Based Care and Delayed Entry. ANOVA revealed no significant interaction between center-based care and entry status for the complete sample, but significant main effects from each on IRT literacy scores (Center-Based Care: $F(1,12215)$= 125.278, p<.001,at the beginning of kindergarten; $F(1,12390)$= 86.176, p<.001 at the end of first grade. Entry status: $F(1,12215)$=12.38, p<.001 at the beginning of kindergarten) and Highest Level Proficiency scores (Center-Based Care: $F(1, 8149)$= 23.476, p,.001 at the beginning of kindergarten, $F(1, 11568)$= 74.156, p<.001 at the end of first grade. Entry status: $F(1, 8149)$ = 12.04, p=.001 at the beginning of kindergarten.) The only main effect that was persistently significant into the first grade was center-based care.

I then calculated effect *sizes* (*d*) in for four scenarios; the effect of delaying if attending Center-Based Care, the effect of delaying if not attending Center-Based Care, the effect of attending Center-Based Care if entering on time, and the effect of attending Center-Based Care if delaying. In this model, Center-Based Care and delayed entry are treated as possible mediators on literacy outcomes. In the first two cases, the emphasis is on delaying; that is, how beneficial is it for a student to be withheld from kindergarten for a year of he or she will spend the extra year in a center-based care program versus spending that year at home? Conversely, as in the latter two cases, how beneficial is attending center-based care if the student is entering kindergarten on time versus entering kindergarten a year later? For further clarification, it is helpful to think of delaying as the moderator of literacy outcomes and nature of care as the mediator in the first scenario, while in the second, Center-Based Care acts as the moderator and entry status the mediator.

The only meaningful effect size came directly from center-based care. The effect size (*d*) of Center-Based Care if the child is entering kindergarten on time (as opposed to no Center-Based Care and entering on time) is .41 at the beginning of kindergarten and .34 at the end of first grade, while the effect size (*d*) of Center-Based Care if the child is delaying (as opposed to no Center-Based Care if the child is delaying) is .33 at the beginning of kindergarten and .30 at the end of first grade.

Table 5: Descriptive statistics of IRT scores for the complete ECLS-K sample

	Center-Based Care				No Center-Based Care			
	On Time		*Delay*		*On Time*		*Delay*	
All Students	Mean (SD)	N	Mean (SD)	N	Mean (SD)	N	Mean (SD)	N
Beginning K	*31.68 (10.77)*	*7494*	*32.90 (12.32)*	*626*	*27.51 (8.49)*	*3781*	*28.87 (11.25)*	*318*
End of K	*43.56 (14.55)*	*7609*	*44.14 (15.38)*	*631*	*38.86 (12.21)*	*3942*	*39.48 (14.17)*	*332*
End of 1st	*76.11 (22.4)*	*7468*	*76.86 (23.48)*	*613*	*68.53 (21.29)*	*3978*	*69.92 (22.00)*	*335*

Table 6: Descriptive statistics of Highest Level Proficiency scores for the complete ECLS-K sample

	Center-Based Care				No Center-Based Care			
	On Time		*Delay*		*On Time*		*Delay*	
All Students	Mean (SD)	N	Mean (SD)	N	Mean (SD)	N	Mean (SD)	N
Beginning K	*1.86 (1.00)*	*5424*	*1.98 (1.10)*	*450*	*1.61 (.88)*	*2099*	*1.80 (1.1)*	*180*
End of K	*2.71 (1.1)*	*6885*	*2.75 (1.13)*	*569*	*2.42 (1.05)*	*3319*	*2.45 (1.07)*	*277*
End of 1st	*4.59 (1.14)*	*7042*	*4.60 (1.19)*	*575*	*4.21 (1.19)*	*3643*	*4.25 (1.18)*	*312*

Disaggregation. Next, I disaggregated the complete ECLS-K sample to ignore students with identified disabilities. This removed just over 1,800 cases from the sample.

ANOA revealed that the effect of care and entry status on literacy outcomes for the non-disabled sample were the same as for the complete sample; while Center-Based Care had a small effect on literacy outcomes, entry status only had a significant effect in kindergarten. (Center-Based Care: $F(1, 10517)=115.56$, $p<.001$ at the beginning of kindergarten, $F(1, 10707)=88.22$, $p<.001$ at the end of first grade. Entry status: $F(1, 10517)=7.49$, $p=.006$ at the beginning of kindergarten.) There were no significant interactions.

As with the complete sample, the only significant effect came from attending Center-Based Care if entering on time ($d=.41$ at the beginning of kindergarten, $d=.35$ at the end of first grade) and Center-Based Care if delaying ($d=.4$ at the beginning of kindergarten, $d=.37$ at the end of first grade. At each interval, the students that achieved the most had all experienced center-based care, but delaying made little to no difference. The effect size (d) of center-based care alone (regardless of delayed entry) was about .4 at the beginning of kindergarten , while delaying only added about .1 over students who did not attend Center-Based Care nor delay, consistent with the results for the complete ECLS-K sample.

Table 7: Descriptive statistics of Item Response Theory scores for the ECLS-K non-disabled sample

	Center-Based Care				No Center-Based Care			
	On Time		*Delay*		*On Time*		*Delay*	
All Students	Mean (SD)	N	Mean (SD)	N	Mean (SD)	N	Mean (SD)	N
Beginning K	*32.04 (10.90)*	*6483*	*33.34 (11.61)*	*489*	*27.78 (8.61)*	*3295*	*28.74 (11.07)*	*254*
End of K	*44.11 (14.67)*	*6569*	*45.10 (14.99)*	*488*	*39.35 (12.24)*	*3443*	*39.24 (13.59)*	*270*
End of 1st	*77.14 (22.35)*	*6468*	*78.51 (23.32)*	*479*	*6* *9.38 (21.05)*	*3491*	*70.04 (21.10)*	*273*

Table 8: Descriptive statistics of Highest Level Proficiency scores for the ECLS-K non-disabled sample

	Center-Based Care				No Center-Based Care			
	On Time		*Delay*		*On Time*		*Delay*	
All Students	Mean (SD)	N	Mean (SD)	N	Mean (SD)	N	Mean (SD)	N
Beginning K	*1.88 (1.01)*	*4790*	*2.01 (1.06)*	*365*	*1.62 (.89)*	*1882*	*1.79 (1.09)*	*141*
End of K	*2.75 (1.00)*	*5963*	*2.84 (1.11)*	*446*	*2.46 (1.04)*	*2922*	*2.41 (1.04)*	*225*
End of 1st	*4.63 (1.12)*	*6136*	*4.67 (1.68)*	*454*	*4.26 (1.16)*	*3210*	*4.26 (1.14)*	*256*

Gender. ANOVA revealed main effects by gender on Item Response Theory scores for Center-Based Care in kindergarten and first grade ($F(1, 10523)= 118.338$, $p<.001$ and $F(1, 10703)=85.80$, $p<.001$ respectively), for entry status at the beginning of kindergarten ($F(1, 10523)=8.32$, $p=.004$) and for gender at the end of first grade ($F(1.10703)=14.38$, $p<.001$). There were no significant interactions between any effects.

Analyzing the effect sizes by gender, it became clear that girls slightly outperformed boys in early literacy achievement; the advantage that girls have is equivalent to an effect size (*d*) of .13 at the beginning of kindergarten. For both groups, the students who attended Center-Based Care had better literacy outcomes than students who did not.

Interestingly, effects of combined Center-Based Care and delay status on literacy outcomes seem to be moderated by gender. The effect size (*d*) for boys of delaying and not attending Center-Based Care (as opposed to entering on time without Center-Based Care) is .25 at the beginning of kindergarten and .09 at the end of first grade, indicating that if Center-Based Care is not an option, just delaying entry could give a boy about a 2.5 month head start over a boy who enters on time without Center-Based Care, but will lose that advantage in first grade. For comparison, the effect size of delaying if not attending Center-Based Care for girls is -.05 at the beginning of kindergarten and 0.0 at the end of first grade.

On the other hand, it seems that girls benefit more than boys from an extra year if they are attending center-based care. The effect size (*d)* for girls of Center-Based Care if delaying (as opposed to no Center-Based Care if delaying) is .61 for girls at the beginning of kindergarten and .4 at the end of first grade, compared with .29 and .3 respectively for

boys. This indicated that if a girl is entering kindergarten late, attending center-based care could give her up to a 6 month head start over a girl who enters late but does not experience center-based care, whereas a boy would only gain about 3 months from the same. It should be noted, however, that delaying entry and attending Center-Based Care only gives girls 2 months over girls who attended Center-Based Care and entered on time.

Table 9: Descriptive statistics of IRT scores for the boys of the ECLS-K sample

	Center-Based Care				No Center-Based Care			
	On Time		*Delay*		*On Time*		*Delay*	
	Mean (SD)	N	Mean (SD)	N	Mean (SD)	N	Mean (SD)	N
Beginning of K								
Boys	*31.38 (11.12)*	*3115*	*32.67 (11.51)*	*310*	*26.94 (8.02)*	*1646*	*29.10 (13.11)*	*153*
Girls	*32.64 (10.65)*	*3368*	*34.49 (11.70)*	*179*	*28.61 (9.10)*	*1649*	*28.19 (6.52)*	*101*
End of First Grade								
Boys	*75.28 (22.71)*	*3130*	*77.51 (24.27)*	*307*	*67.15 (21.27)*	*1726*	*68.99 (21.27)*	*162*
Girls	*78.87 (21.86)*	*3338*	*80.29 (21.45)*	*172*	*71.56 (20.60)*	*1765*	*71.59 (20.85)*	*111*

Socio-economic status. ANOVA revealed no interaction between Center-Based Care, entry status, and socio-economic status, but main effects for each independently (Socio-Economic Status: $F(1, 10513)=135.61$, $p<.001$ at the beginning of kindergarten, $F(1, 10703)=173$, $p<.001$ at the end of first grade. Center-Based Care: $F(1, 10513)=43.12$, $p<.001$ at the beginning of kindergarten, $F(1, 10703)=23.83$, $p<.001$ at the end of first grade. Entry; $F(1,10513)=4.99$, $p=.026$). Interestingly, R squared values for this category indicated that Center-Based Care, entry status, and socio-economic status account for ~ 8-10% of the variance in IRT scores; higher than any other at-risk category

When calculating effect size (*d)*, it became clear that the outcomes for the two groups mirror results from other researchers; that is, the med-high SES group significantly outperformed the low SES group both at the beginning of kindergarten and at the end of first grade. The advantage that med-high SES students have over low SES students is equivalent to an effect size (*d)* of .62 at the beginning of kindergarten and .67 at the end of first grade. That is, students who are of higher socio-economic standing stay about 6 months ahead of lower socio-economic status students at least through first grade.

Table 10: Comparison of Means, IRT score by SES for the beginning of kindergarten

Composite SES	Mean	SD	N
Low	25.90	7.10	3832
Mid-High	32.58	10.94	7979

In both cases, Center-Based Care made a difference in literacy outcomes while delayed entry did not; however, unlike gender, socio-economic status did not seem to

moderate the combined effects of Center-Based Care and entry status on literacy outcomes. For example, the effect size (*d*) for low SES students of attending Center-Based Care if entering on time was .27 at the beginning of kindergarten and .16 at the end of first grade, while the effect sizes (*d*) for med-high SES were .34 and .26 respectively.

Table 11: Descriptive statistics of IRT scores for the disaggregated ECLS-K sample by SES

	Center-Based Care				No Center-Based Care			
	On Time		*Delay*		*On Time*		*Delay*	
	Mean (SD)	N	Mean (SD)	N	Mean (SD)	N	Mean (SD)	N
Beginning of K								
Low	*27.30 (7.52)*	*1362*	*28.80 (11.11)*	*78*	*25.30 (2.90)*	*1415*	*25.51 (6.17)*	*108*
Med-High	*33.30 (11.30)*	*5121*	*34.20 (11.51)*	*411*	*29.64 (9.29)*	*1880*	*31.12 (13.12)*	*146*
End of 1st								
Low	*66.25 (19.35)*	*1437*	*68.05 (20.63)*	*82*	*63.21 (19.53)*	*1611*	*63.77 (16.36)*	*123*
Med-High	*80.25 (22.17)*	*5031*	*80.67 (23.28)*	*397*	*74.67 (20.87)*	*1881*	*75.19 (23.96)*	*150*

Linguistic Minority. ANOVA revealed no interaction between entry status, Center-Based Care, and linguistic minority. Interestingly, at the beginning of kindergarten, the only significant main effect was from Center-Based Care ($F(1,12211)=43.01$, $p<.001$). At the end of first grade, however, both linguistic minority and Center-Based Care were significant ($F(1,12232)=16.35$, $p<.001$, $F(1,12232)=42.49$, $p<.001$ respectively)

Delaying alone had an effect size (*d*) of only .16 for non-English speakers at the beginning of kindergarten, while Center-Based Care alone had an effect size (*d*) of .49; the equivalent of almost 5 months of schooling. Delaying kindergarten entry for a linguistic minority student who has been in Center-Based Care resulted in an effect size (*d*) of .68 over a student who had experienced neither, compared to .5 for a native English speaker. Delaying kindergarten entry if a linguistic minority student had not experienced Center-Based Care had an effect size (*d*) of .08; not even a full month's advantage. By the end of first grade, the combined effect size (*d*) of Center-Based Care and delay for a linguistic minority student drops to .3, while the effect size (*d*) of delaying if the student has not experienced Center-Based Care drops to -.07. It should be noted that there are so few students in the non-English delay/no Center-Based Care category (n=46) that these effects should be viewed with care.

Table 12: Descriptive statistics of IRT scores for the non-disabled ECLS-K sample by Linguistic status

	Center-Based Care				No Center-Based Care			
	On Time		*Delay*		*On Time*		*Delay*	
	Mean (SD)	N	Mean (SD)	N	Mean (SD)	N	Mean (SD)	N
Beginning of K								
English	*31.69 (10.60)*	*7057*	*32.85 (11.83)*	*46*	*27.68 (8.46)*	*3436*	*29.04 (11.50)*	*295*
Non-English	*31.53 (12.17)*	*437*	*34.01 (21.56)*	*24*	*25.85 (8.63)*	*345*	*26.57 (6.85)*	*22*
End of 1st								
English	*77.57 (22.16)*	*5847*	*78.90 (23.20)*	*452*	*70.58 (21.12)*	*2818*	*71.57 (21.56)*	*224*
Non-English	*73.22 (23.85)*	*559*	*70.71 (22.16)*	*24*	*64.23 (19.91)*	*618*	*62.78 (17.25)*	*46*

Racial/Ethnic Minority.ANOVA revealed significant effects from racial/ethnic minority status and Center-Based Care only. There were no interactions, and entry status had no significant effect. (Racial/Ethnic Minority: F (1,10513)=49.83, p<.001 at the beginning of kindergarten, F (1, 10703)= 85.45, p<.001 at the end of first grade. Center-Based Care: F(1,10513)=87.00, p<.001 at the beginning of kindergarten, F(1,10703)=51.41, p<.001 at the end of first grade.)

The white group significantly outperformed the racial/ethnic minority group both at the beginning of kindergarten (equivalent of an effect size (d) of .31) and at the end of first grade (equivalent of an effect size (d) of .4). For the most part, race/ethnicity did not moderate the combined effect of Center-Based Care and entry status on literacy outcomes, but there were some small difference. The effect size (d) for racial/ethnic minority students of delaying and not attending Center-Based Care was -.1 at the beginning of kindergarten and .05 at the end of first, while for white students the effect sizes (d) were .24 and .09 respectively. This did represent a small difference; white students gained about 2 months from delaying if Center-Based Care was not an option, while delaying without Center-Based Care had no effect for racial/ethnic minorities.

The effect size (d) of attending Center-Based Care and entering on time was about .42 for racial/ethnic minorities at the beginning of kindergarten and .36 at the end, while for whites the effect sizes (d) were .38 and .27 respectively. Another difference between the majority/minority groups is seen in the effect of Center-Based Care if delaying is necessary: the effect size (d) for racial/ethnic minorities of Center-Based Care and delaying was .55 at the beginning of kindergarten and .33 at the end of first, while for whites the effect sizes (d) were .25 and .24 respectively.

Table 13: Descriptive statistics of IRT scores for the disaggregated ECLS-K sample by Racial/Ethnic Minority

	Center-Based Care				No Center-Based Care			
	On Time		*Delay*		*On Time*		*Delay*	
	Mean (SD)	N	Mean (SD)	N	Mean (SD)	N	Mean (SD)	N
Beginning of K								
White	*32.58 (10.51)*	*4411*	*34 (11.41)*	*384*	*28.80 (8.56)*	*1875*	*31 (13.12)*	*148*
Minority	*30.88 (11.59)*	*2072*	*30.93 (12.04)*	*105*	*26.42 (8.50)*	*2177*	*25.58 (6.06)*	*106*
End of 1st								
White	*79.09 (21.94)*	*4307*	*80.68 (23.06)*	*370*	*73.16 (20.81)*	*1801*	*75.05 (22.37)*	*145*
Minority	*73.25 (22.64)*	*2161*	*71.16 (22.64)*	*109*	*65.36 (20.56)*	*1690*	*64.38 (10.04)*	*128*

Disabled/Special Education. ANOVA for the special education sample revealed significant effects from special education services, Center-Based Care, entry status, but no significant effects from interactions. (Special Education: $F(1, 12032)=9.434$, $p=.002$ at the beginning of kindergarten, $F(1,12247)=51.2$, $p<.001$ at the end of first grade. Center-Based Care: $F(1,12032)=7.89$, $p=005$ at the beginning of kindergarten, $F(1,12247)=10.05$, $p=.001$ at the end of first grade. Entry: $F(1,12032)=12.65$, $p<.001$ at the beginning of kindergarten).

There seem to be effects for students receiving special education services if delaying if attending Center-Based Care ($d=.38$), delaying and not attending Center-Based Care ($d = .66$), attending Center-Based Care if entering on time ($d = .23$), however, the effect of attending Center-Based Care and delaying was negligible. By the end of first grade, some effects were persistent: delaying and Center-Based Care had an effect size *(d)* of .21, and delaying and entering on time had an effect size (*d)* of .68, however, so few students received special education services that these results cannot be considered significant

Table 14: Descriptive statistics of IRT scores for the special education ECLS-K sample

	Center-Based Care				No Center-Based Care			
	On Time		*Delay*		*On Time*		*Delay*	
Received Special Education Services in Kindergarten	Mean (SD)	N	Mean (SD)	N	Mean (SD)	N	Mean (SD)	N
Beginning K	*26.43 (8.82)*	*186*	*29.67 (7.52)*	*28*	*24.52 (7.73)*	*151*	*30.71 (17.05)*	*19*
End of 1st	*60.61 (20.71)*	*187*	*64.91 (22.32)*	*27*	*55.25 (18.91)*	*152*	*61.07 (28.11)*	*18*
Did Not Receive Special Education Services in Kindergarten	*Mean (SD)*	*N*	*Mean (SD)*	*N*	*Mean (SD)*	*N*	*Mean (SD)*	*N*
Beginning K	*31.83 (10.75)*	*7227*	*33.12 (12.51)*	*589*	*27.72 (8.53)*	*3524*	*28.78 (10.86)*	*295*
End of 1st	*76.58 (22.29)*	*7214*	*77.52 (23.32)*	*581*	*69.26 (21.18)*	*3761*	*70.49 (21.58)*	*315*

ANOVA revealed significant effects for Center-Based Care, entry status, and disability status in kindergarten that persisted through first grade (Disability status: $F(1, 12206)= 10.71$, $p=.001$ at the beginning of kindergarten, $F(1, 12381)=32.84$, $p< .001$ at the end of first grade, Center-Based Care: $F(1, 12206)= 62.32$, $p< .001$ at the beginning

of kindergarten, $F(1.\ 12381)=38.78$, $p<.001$ at the end of first grade, entry status: $F(1, 12206)=18.47$, $p<.001$ at the beginning of kindergarten, $F(1, 12381)=6.97$, $p=.008$ at the end of first grade) ANOVA revealed no significant interactions between these variables.

Though the results for delaying if a disabled student that has experienced center based care is negligible, the effect size (*d*) of delaying if the student has not attended Center-Based Care is .46 at the beginning of kindergarten and .3 at the end of first grade. This result is significantly different from the complete ECLS-K sample; delaying a disabled student who will not experience center-based care gives them a 5 month head start once in school. The effect size (*d*) for delaying *and* center based care (as opposed to on time entry without Center-Based Care) for disabled students is .57 at the beginning of kindergarten and .38 at the end of first grade. For comparison, the effect size (*d*) of just Center-Based Care, without including entry status, is .35.

Table 15: Descriptive statistics of IRT scores for the disabled ECLS-K sample

	Center-Based Care				No Center-Based Care			
	On Time		*Delay*		*On Time*		*Delay*	
Disabled students	Mean (SD)	N	Mean (SD)	N	Mean (SD)	N	Mean (SD)	N
Beginning K	*29.39 (9.63)*	*1006*	*31.35 (14.52)*	*137*	*25.73 (7.33)*	*486*	*29.40 (12.00)*	*64*
End of 1st	*69.46 (21.60)*	*995*	*70.95 (23.20)*	*134*	*62.44 (22.06)*	*487*	*69.41 (25.74)*	*62*

Composite Redshirt (Definitely Redshirted.) Given the earliest and latest cutoff dates nationally, I isolated the samples of students who were definitely delayed based on age at entry[i]. For this sample, delaying entry if attending Center-Based Care (based on "definitely redshirted" and "definitely on time") results in an effect size (*d*) of .28 at the beginning of kindergarten; delaying if *not* attending center based care had an effect size (*d)* of .77, or the equivalent just over 7 months of growth over students who entered on time and didn't attend Center-Based Care. This represents a very different view of the combined effects of Center-Based Care and entry status. Unfortunately there are too few students in the "definitely redshirted" category (n=19) who had not attended center-based care for these results to be significant.

Table 16: Descriptive statistics for complete ECLS-K sample by composite entry status, literacy achievement based on IRT at the beginning of kindergarten

Center-Based Care?	Redshirt Composite	Mean	SD	N
YES	Early	28.96	9.86	60
	Definitely on Time	30.00	9.53	1983
	Maybe on time	32.32	11.22	6113
	Definitely redshirted	33.02	12.17	145
	Total	31.75	10.89	8301
NO	Early	29.90	7.15	11
	Definitely on Time	25.75	6.80	297
	Maybe on time	28.59	9.43	896
	Definitely redshirted	32.64	13.54	19
	Total	27.97	9.02	1223

Table 17: Summary of effect sizes (d) at the beginning of kindergarten by sample – those rounding to notable effect sizes (medium to large) are bolded.

Sample	**Delay if Center-Based Care**	**Delay if no Center-Based Care**	**Center-Based Care if on time**	**Center-Based Care if delay**
Complete	.11	.15	.41	.33
Disaggregated	.12	.11	.41	.4
Disabled	.16	**.46**	**.57**	.15
Boys	.12	.25	.43	.29
Girls	.17	-.05	.39	**.61**
Racial/Ethnic minority	.01	-.1	.42	**.55**
White	.13	.24	.38	.33
Linguistic Minority	.18	.08	**.49**	**.47**
English speakers	.10	.15	.40	.39
Low SES	.19	.03	.27	.38
Med-High SES	.08	.15	.34	.25
Composite Redshirt	.28	**.77**	**.78**	.03

CHAPTER 4 - Discussion

The purpose of this study was to determine what the combined effects are of entry status and the nature of care prior to kindergarten on early literacy outcomes for both the general and specific at-risk populations, and what combination of entry and care results in the highest literacy achievement. The results of the study do not support the idea that delaying entry into kindergarten, whether the extra time is spent at home or in a center-based care environment, results in significant gains in literacy achievement. This is true for both for the general population and for most at-risk populations. In looking though the academic outcomes of students in the ECLS-K longitudinal study, it is not clear whether the advantage of students whose entry into kindergarten has been delayed is large enough to merit the promotion of the practice.

In most cases, the literacy achievement of students who delayed entry into kindergarten, attended center-based care, or both, is comparable to 2-7 months worth of literacy growth over their normally entered, peers who did not experience center-based care. It is clear, however, that the majority of the advantage is due to center-based care attendance. In the complete sample, for example, the effect size (*d)* of delaying, regardless of the nature of care, was around .1 while the effect size (*d*) of Center-Based Care, regardless of entry status, was about .35. These results show that the experiences that students have prior to entering kindergarten, regardless of entry status, do moderate literacy academic outcomes; specifically, that attending center-based care promotes higher literacy achievement.

These differences are magnified in at-risk populations, who seem to benefit the most from center-based care. Students of racial/ethnic minority status gained about 5

months of literacy growth from attending Center-Based Care, while delaying had almost no effect. Linguistic minority students showed similar growth from Center-Based Care, but also gained about 2 months of literacy growth from delaying if they were attending a center-based care program. Boys gained about 2.5 months of growth from delaying (if not attending center based care) while girls gained 6 months from attending Center-Based Care if they were delaying. There was very little difference in literacy achievement gains made by students of low and medium-high socio-economic status. Disabled students benefited the most from delaying if not attending Center-Based Care (about 5 months worth of literacy growth), and about 6 months of growth from attending center based care if not delaying. These were the only results that were significant through first grade.

Unfortunately, the data shows that for most other populations, any advantage due to delay disappears as early as the end of first grade. That brief advantage in kindergarten costs delayed students at least 12 months before entering kindergarten and costs the parents either an additional year of Center-Based Care or of staying at home with the child. Ultimately, it seems that the effect of Center-Based Care on early literacy achievement is large enough to make attendance desirable for all students, while the addition of delaying entry must be considered on a case by case basis given the individual needs of the child.

Delayed entry may result in more than just differences in literacy achievement and, when considering delaying their child, parents must also take other associated outcomes into consideration. The social and emotional ramifications of delayed entry are mixed. It seems that students who experienced delayed entry into kindergarten are aware of their status, and are more likely to assume that they had failed in some capacity (Grau

& DiPerna, 2000). Other researchers found that students who are older (and usually bigger) are admired by their peers (Moore as cited in Grau & DiPerna 2000). It may be that the interpretation of these outcomes, failure or reverence, may be highly individualized. Depending on their personality, a student could experience either.

One potentially positive side effect of delay may stem from a child's physical development; extra time generally means extra growing. Smith and Niemi (2007) looked into the question of size and reputation, specifically for boys. They found that there was a significant correlation between the size of a boy and the teacher's perception of his abilities. The smaller the boy, the less the teachers thought him capable. It may also be that parents feel a larger student, particularly a boy, will be selected for an athletic team over his younger (and smaller) classmates. Just as a redshirted college freshman is given an extra year to grow, so too are these students.

Though many researchers have chosen to focus on short and long-term benefits in terms of elementary school grades, there seem to be ramifications of the practice into secondary school and beyond. One of the effects of delaying entry into kindergarten may have less to do with academics and more to do with timing; because redshirted students are older, they are eligible to drop out of school at an earlier grade than their chronological peers who entered "normally." This means that students who are redshirted and drop out at the same age as their normally entered peers experience less schooling overall. This news is particularly disturbing in light of Lincove and Painter's 2006 study that found that older students seem to be twice as likely to drop out, more likely to be arrested, and more likely to have behavioral problems than their peers. Delayed students

are also less likely to attend college, graduate, and they are expected to earn lower salaries in the workforce.

Limitations. While the ECLS-K sample was extremely large and far reaching, and every effort was made on the part of the National Center for Educational Studies to include a diverse sample representative of the larger population, some samples were too small to further divide into entry and care categories that would produce significant results. For example, only 20 English Language Learners in the whole sample experienced delayed entry.

Additionally, the high variability in ages among students whose parents reported them as having entered early, on time, and late, indicates that some parents may not have understood the question as intended. Perhaps they understood the question to be asking them whether they thought their child entered kindergarten too early for their liking, too late, or that they entered when was right for them. When corrected for age, there are too few students in the sample who could be said to have definitely been delayed based latest cutoff date nationally, as demonstrated by the composite redshirt variable. There was no information in this data set to indicate the state in which each child attended school; even if there were, cutoff dates can vary from district to district, limiting the ability of any researcher to determine each student's entry status. A more precise measurement of entry status would be desirable.

Also complicating this study is a phenomenon I referenced in my literature review section. Datar (2000) noted that two students who enter school on the same year but born one day apart could be considered in different categories concerning their entry status. One student born the day of the cut-off but entering a year later is delayed while the boy

entering the same year born one day later is entering on time. I propose that looking at instances of students' whose delay is more pronounced (i.e. more than a month difference between birth date and cut-off date) may make the analysis of differences in delay easier.

For future studies, it may be also prudent to take into account the quality of center-based care (and perhaps, of home-based care) experienced by each student. This would only be made possible by oversampling for delayed and center-based care attending students. The ECLS-K included a few measures that could serve as proxies for quality of care including the cost of care; amount of care (hours per day, days per week); the nature of the center (whether it is classified as Head Start, an Early Childhood Center, etc.); number of children in cohort; however, more precise measures would be prudent. These may be available in the ECLS-Birth Cohort, not available at the time of this study. Variables such as the qualifications for teaching staff, amount of time spent on literacy activities, and the ratio of students to teachers would all be helpful in determining the quality of care experienced by the students. In turn, this would help clarify whether it is the experiences in center-based care programs that result in higher literacy achievement, or merely the extra time.

Recommendations. Until there are more conclusive studies done with a holistic approach to delaying, including other academic, social, and emotional outcomes, and unless there is a specific developmental reason to delay entry, perhaps it would be prudent for the practice of delaying entry to be discouraged. One way to accomplish this would be by standardizing the cut-off date into kindergarten, or at least narrowing the window.

Research done by Kristin Warder (1999) suggests that students who are born in the first two thirds of the year perform better in reading and writing than students who are born in the last third (entering upon eligibility in school districts with cut-off dates ranging from October to January.) Additionally, DeMeis and Stearns (1992) conducted their research in New York (cut-off date of December 1st) and found that students who enter school before they turn five (born between October and December as in the research by Warder) may be more likely to have social and behavioral problems. These findings lend themselves to an argument for establishing an earlier cut-off date. Perhaps the cut-off date could be standardized to be September 1st nationwide (or to coincide with the start of the school year); this would eliminate any four year olds entering kindergarten, subsequently relieving the pressure on some parents to delay their children's entry.

In some school systems where the cut-off date is already September or earlier, parents still delay their children, waiting until they are six. To counter this, in addition to moving the date of eligibility, the age of compulsory attendance could be lowered nationally to five (where kindergarten is available.) Coupled with a cut-off date coinciding with the start of the school year, every child would be in kindergarten during the year of his or her eligibility at the age of five. The natural range of students nationwide (currently from approximately 4 years and 9 months to approximately 6 years and 3 months or a span of about 18 months – 30 months including delayed students) would be narrowed to the span of a year.

To make things more equitable, parents who suspect a developmental delay in their child could petition the school board for an extra year until their child enters kindergarten. The child could then be placed in a head-start class, preschool program, or

alternative kindergarten class (with financial aid available to those who qualify) and his or her progress tracked to note the need for special education programs later.

References

Barua, R., Lang, K. (2009, September). School Entry, Educational Attainment and Quarter of Birth: A Cautionary Tale of LATE. NBER Working Paper No. 15236. Retrieved October 29, 2009, from http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1437617

Brent, D., May, D., & Kundert, D. (1996). The Incidence of Delayed School Entry: A Twelve-Year Review. *Early Education and Development*. *7*(2), 121-35.

Cohen, J. (1992). "Statistics a power primer". *Psychology Bulletin* **112**: 155–159. doi:10.1037/0033-2909.112.1.155.

Datar, A. (2006). Does delaying kindergarten entrance give children a head start? *Economics of Education Review*, 43-62.

DECPS Webmaster. (2008, April 2). Early entrance to kindergarten. In *Early entrance procedures; School year 2008-2009*. Retrieved April 7, 2008, from Montgomery County Public Schools Web site: http://www.montgomeryschoolsmd.org/departments/earlychi/earlyentranceprocedures.shtm

DeMeis, J. & Stearns, E. (1992). Relationship of school entrance age to academic and social performance. *Journal of Educational Research,* 86(1), 20-27.

Diamond, K. E., Gerde, H. K., & Powell, D. R. (2008). Development in Early Literacy Skills during the Pre-kindergarten Year in Head Start: Relations between Growth in Children's Writing and Understanding of Letters. *Early Childhood Research Quarterly*. *23*(4), 467-478.

Dockett, S. & Perry, B. (2002). Who's ready for what? Young children starting school. *Contemporary Issues in Early Childhood,* 3(1), 67-89.

Education Commission of the States (Ed.). (2005, February). *StateNotes kindergarten; Access to kindergarten: Age Issues in State Statutes*. Retrieved from http://www.ecs.org/clearinghouse/58/27/5827.doc

FCPS. (2008). *kindergarten early entrance* [Pamphlet]. Retrieved April 7, 2008, from Frederick County Public Schools Web site: http://www.fcps.org/content/publications/early%20entry%20pamphlet.pdf

Graue, E. & DiPerna, J. (2000). Redshirting and early retention: Who gets the "gift of time" and what are its outcomes? *American Educational Review Journal, 37*, 509-534.

Hill, N. E. (2001). Parenting and Academic Socialization as They Relate to School Readiness: The Roles of Ethnicity and Family Income. *Journal of Educational Psychology*. *93*(4), 686-97.

Justice, L. M., Mashburn, A., Pence, K. L., & Wiggins, A. (2008). Experimental Evaluation of a Preschool Language Curriculum: Influence on Children's Expressive Language Skills. *Journal of Speech, Language, and Hearing Research*. *51*(4), 983-1001.

Lincove, J. & Painter, G. (2006). Does the age that children start kindergarten matter? Evidence of long-term educational and social outcomes. *Educational Evaluation and Policy Analysis.* 28(2) 153-179.

Manning, M. (1988). Early Phonics Instruction: Its Effect on Literacy Development. *Young Children*. *44*(1), 4-8.

May, D. & Kundert, D., (1995). Does delayed school entry reduce later grade retentions and use of special education services? *Remedial & Special Education*, 16(5).

Mohler, G. M., Yun, K. A., Carter, A., & Kasak, D. (2009). The Effect of Curriculum, Coaching, and Professional Development on Prekindergarten Children's Literacy Achievement. *Journal of Early Childhood Teacher Education*. *30*(1), 49-68.

National Association for the Education of Young Children (NAEYC). (2004). Where we stand on school readiness. Retrieved online from www.naeyc.org/about/positions/pdf/psready98.pdf.

National Center for Educational Statistics. (2004). *Digest of Education Statistics*. Retrieved April 7, 2008, from Department of Education website: http://nces.ed.gov/

National Institute for Literacy. (2008). *Developing early literacy: Report of the National Early Literacy Panel*. Retrieved October 28, 2009, from National Institute for Literacy website: http://www.nifl.gov/

Noel, A. M. & Newman, J. (2003). Why Delay kindergarten Entry? A Qualitative Study of Mothers' Decisions. *Early Education and Development*. *14*(4), 479-498.

Offenberg, R. & Holden, B. (1998, August). *kindergarten enrollment age and achievement: Overage enrollment*. 106th, San Francisco, CA: Paper presented at the Annual Convention of the American Psychological Association.

Ogbu, J. U. & Simons, H. D. (1998). Voluntary and Involuntary Minorities: A Cultural-Ecological Theory of School Performance with Some Implications for Education. *Anthropology & Education Quarterly*. *29*(2), 155-88.

Siegel, D. F. & Hanson, R. A. (1991). kindergarten Educational Policies: Separating Myth from Reality. *Early Education and Development*. *2*(1), 5-31.

Smith, J. & Niemi, N., (2007). Exploring teacher perceptions of small boys in kindergarten. *The Journal of Educational Research.* 331-335.

Snow, C.E., Burns, M.S., & Griffin, P., eds. 1998. *Preventing reading difficulties in young children*. Washington, DC: National Research Council.

Stipek, D. (2002). At what age should children enter kindergarten? A question for policy makers and parents. *Social Policy Report.* XVI(2). 3-16.

Sulzby, E. (1989). Assessment of writing and children's language while writing. In L. Morrow & J. Smith (Eds.), *The role of assessment and measurement in early literacy instruction* (pp. 83-109). Englewood Cliffs, NJ: Prentice-Hall.

Tourangeau, K., Nord, C., Lê T., Pollack, J.M., & Atkins-Burnett, S. (2006). *Early Childhood Longitudinal Study, kindergarten Class of 1998–99 (ECLS-K), Combined User's Manual for the ECLS-K Fifth-Grade Data Files and Electronic Codebooks* (NCES 2006–032). U.S. Department of Education. Washington, DC: National Center for Education Statistics.

U.S. Department of Education, National Center for Education Statistics, *Entering kindergarten: A Portrait of American Children When They Begin School: Findings from The Condition of Education 2000,* Nicholas Zill and Jerry West, NCES 2001–035, Washington, DC: U.S. Government Printing Office, 2001.

Warder, K. (1999, December). *Born in December: Ready for school?*

West, J., Meek, A. & Hurst, D., (2000). Children who enter kindergarten late or repeat kindergarten: Their characteristics and later school performance. *National Center for Education Statistics.* 3-5.

Yifat, R. & Zadunaisky-Ehrlich, S. (2008). Teachers' Talk in Preschools during Circle Time: The Case of Revoicing. *Journal of Research in Childhood Education*. *23*(2), 211.

Appendix

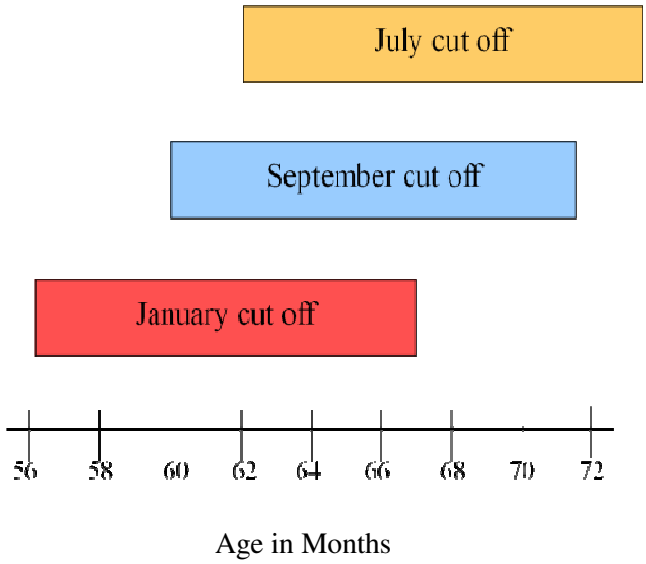

Figure 1. Age spread of students entering kindergarten based on cut-off dates

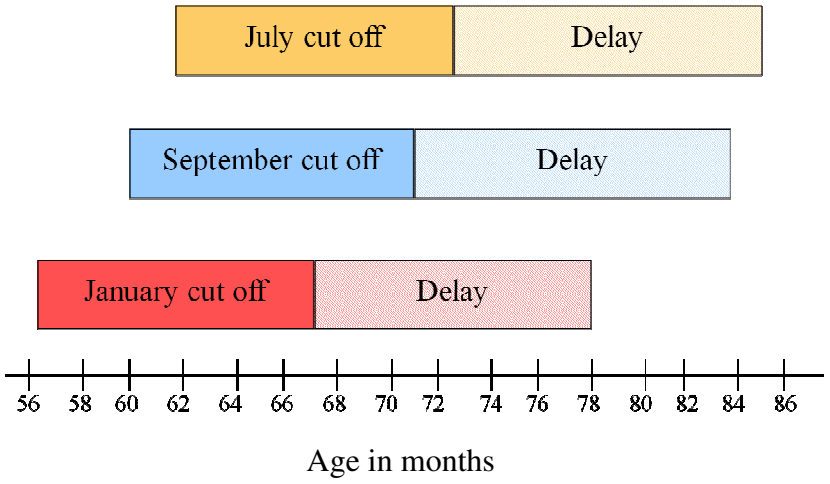

Figure 2: Age spread of students entering kindergarten including students who delay entry.

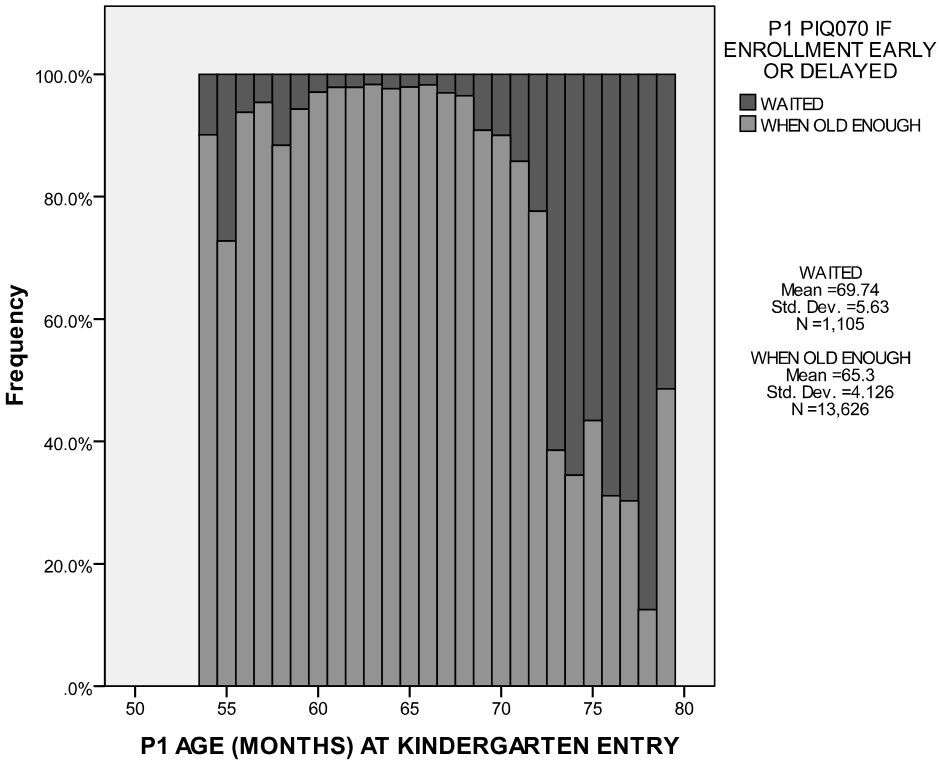

Figure 3: Some parents reported that their child was delayed when the child was too young to have been delayed by national cutoff dates. Some parents reported their child as having entered early when their child was too old by the national cutoff dates.

Table 18: *Entry Eligibility by Birth Date and Cutoff Date and Consequent Age at Entry*

Will Turn 5:	August 1	August 1	December 1
Cut-off Date:	July 1	September 1	December 31
Eligible this Year?	No	Yes	Yes
Enter School at age	6 years, 1 month	5 years, 1 month	4 years, 9 months
If Delayed, Enter at age	7 years, 1 month	6 years, 1 month	5 years, 10 months

Table 19: *Categorization of Dockett and Perry's Components of Readiness (2002) as Compared to the Four Needs of Students*

Need	Component
Intellectual	**Knowledge**: number and letter recognition, ideas, language
	Skills: holding a pencil, tying shoelace, using a keyboard
Emotional	**Family issues**: family interactions at home or at school
	Disposition: innate factors contributing towards attitude
Social	**Social adjustment**: interactions with large group, responding to teacher
	Rules: behavior, actions
Physical	**Physical attributes**: age, health, height

Note. Education Environment as a component is missing from this table because it can arguably be considered under any of the four needs of students.

Table 20: *Students with birthdays straddling the cutoff date can be very close in age, but considered different classifications if entered in the same year.*

Birthday	Cutoff Date	If Entered Next Year
August 31	September 1	Delayed
September 2	September 1	Entered Normally

Table 21: *A Summary of Studies on Academic Outcomes in the order they appear in the paper*

Authors	Year	Grade	Results
McNamara	2004	kindergarten	Older > Younger in letter recognition
Warder	1999	kindergarten	Older students (Jan – Apr birthdays) outperform younger
Offenberg & Holden	1998	kindergarten	Age explains < 3% of student being on grade level
			Best age for starting kindergarten = 67 month
May	1998	4th grade	Younger surpass older in math and reading
Grau & DiPerna	2000	3rd grade	Delayed = Control
Stipek	2002	3rd grade	Delayed = Control by third grade in math and literacy
Lincove & Painter	2006	10th, 12th grade	Delayed < Control

Table 22: *Four Categories of Students to Compare and Frequencies*

	Normal Entry	Delayed Entry
Center-based Care	7866	424
No Center Based care	1170	98

Table 23: *Frequency of Race in ECLS-K*

	Frequency	Percentage
Not Ascertained	38	.2
White, non-Hispanic	9891	56.3
Black, non-Hispanic	2494	14.2
Hispanic, Race Specified	1497	8.5
Hispanic, Race not Specified	1565	8.9
Asian	1115	6.3
Native Hawaiian, Pacific Islander	201	1.1
American Indian, Alaskan Native	316	1.8
More than one race, non-Hispanic	448	2.6
Total	17565	100.0

Table 24*: Test of Between-Subjects Effects, complete sample,* ***beginning of year kindergarten****, Item Response Theory*

Source	SS	df	MS	F	P
Center-Based Care	13090.06	1	13090.06	125.28	.000
Entry	1293.51	1	1293.51	12.38	.000
Center-Based Care * Entry	3.32	1	3.32	.03	.859
Error	1276322.08	12215	104.49		
Total	1.260E7	12219			

a. R Squared = .037 (Adjusted R Squared = .036)

Table 25*: Test of Between-Subjects Effects, complete sample,* ***end of year kindergarten,*** *Item Response Theory*

Source	SS	df	MS	F	P
Center-Based Care	17550.76	1	17550.76	90.96	.000
Entry	291.31	1	291.31	1.51	.219
Center-Based Care * Entry	.28	1	.28	.00	.970
Error	2413698.03	12510	192.94		
Total	2.455E7	12514			

a. R Squared = .025 (Adjusted R Squared = .025)

Table 26: *Test of Between-Subjects Effects, complete sample,* ***end of year first grade****, Item Response Theory*

Source	SS	df	MS	F	P
Center-Based Care	42065.41	1	42065.41	86.18	.000
Entry	921.93	1	921.93	1.89	.169
Center-Based Care * Entry	82.39	1	82.39	.17	.681
Error	6047993.24	12390	488.14		
Total	7.325E7	12394			

a. R Squared = .026 (Adjusted R Squared = .026)

Table 27*: Test of Between-Subjects Effects, complete sample,* ***beginning of kindergarten,*** *Highest Level Proficiency.*

Source	SS	df	MS	F	P
Center-Based Care	22.43	1	22.43	23.48	.000
Entry	11.51	1	11.51	12.04	.001
Center-Based Care * Entry	.59	1	.59	.62	.431
Error	7786.83	8149	.96		
Total	34371.00	8153			

a. R Squared = .014 (Adjusted R Squared = .014)

Table 28*: Test of Between-Subjects Effects, complete sample,* ***end of kindergarten*** *HLP*

Source	SS	df	MS	F	P
Center-Based Care	59.99	1	60.00	50.95	.000
Entry	1.00	1	1.00	.85	.358
Center-Based Care * Entry	.01	1	.01	.01	.927
Error	13006.50	11046	1.18		
Total	89082.00	11050			

a. R Squared = .016 (Adjusted R Squared = .015)

Table 29*: Test of Between-Subjects Effects, complete sample,* ***end of first grade*** *HLP*

Source	SS	df	MS	F	P
Center-Based Care	99.51	1	99.51	74.16	.000
Entry	.43	1	.43	.32	.570
Center-Based Care * Entry	.08	1	.08	.06	.809
Error	15523.44	11568	1.34		
Total	246197.00	11572			

a. R Squared = .023 (Adjusted R Squared = .023)

Table 30*: Test of Between-Subjects Effects, non-disabled sample,* ***beginning of kindergarten,*** *Item Response Theory*

Source	SS	df	MS	F	P
Center-Based Care	12203.68	1	12203.68	115.55	.000
Entry	791.22	1	791.22	7.49	.006
Center-Based Care * Entry	17.83	1	17.83	.17	.681
Error	1110718.95	10517	105.61		
Total	1.106E7	10521			

a. R Squared = .038 (Adjusted R Squared = .038)

Table 31: *Test of Between-Subjects Effects, non-disabled sample,* ***end of kindergarten,*** *Item Response Theory*

Source	SS	df	MS	F	P
Center-Based Care	18185.17	1	18185.17	93.75	.000
Entry	124.39	1	124.39	.64	.423
Center-Based Care * Entry	195.62	1	195.62	1.01	.315
Error	2088252.57	10766	193.97		
Total	2.161E7	10770			

a. R Squared = .027 (Adjusted R Squared = .026)

Table 32*: Test of Between-Subjects Effects, non-disabled sample,* ***end of first grade****, Item Response Theory*

Source	SS	df	MS	F	P
Center-Based Care	42491.03	1	42491.03	88.23	.000
Entry	669.37	1	669.37	1.39	.238
Center-Based Care * Entry	81.78	1	81.78	.17	.680
Error	5156704.65	10707	481.62		
Total	6.474E7	10711			

a. R Squared = .028 (Adjusted R Squared = .028)

Table 33*: Test of between subject effects on Item Response Theory scores by **gender** at the beginning of kindergarten*

Source	SS	df	MS	F	P
Gender	543.72	1	543.72	5.17	.023
Center-Based Care	12443.17	1	12443.17	118.34	.000
Entry	874.70	1	874.70	8.32	.004
Gender * Center-Based Care	200.84	1	200.84	1.91	.167
Gender * Entry	149.83	1	149.83	1.43	.233
Center-Based Care * Entry	72.39	1	72.39	.69	.407
Gender * Center-Based Care * Entry	362.68	1	362.68	3.45	.063
Error	1105433.33	10513	105.15		
Total	1.106E7	10521			

a. R Squared = .043 (Adjusted R Squared = .042)

Table 34*: Test of between subject effects on Item Response Theory scores by **gender** at the end of first grade*

Source	SS	df	MS	F	P
Gender	6878.01	1	6878.01	14.39	.000
Center-Based Care	41025.14	1	41025.14	85.80	.000
Entry	1164.49	1	1164.49	2.44	.119
Gender * Center-Based Care	15.58	1	15.58	.03	.857
Gender * Entry	265.45	1	265.45	.56	.456
Center-Based Care * Entry	122.68	1	122.68	.26	.613
Gender * Center-Based Care * Entry	37.87	1	37.87	.08	.778
Error	5117584.09	10703	478.15		
Total	6.474E7	10711			

a. R Squared = .036 (Adjusted R Squared = .035)

Table 35*: Test of between subject effects on Item Response Theory scores by* ***Socio-Economic Status*** *at the beginning of kindergarten*

Source	SS	df	MS	F	P
SES	13582.51	1	13582.51	135.61	.000
Center-Based Care	4318.63	1	4318.63	43.12	.000
Entry	499.38	1	499.38	4.99	.026
SES * Center-Based Care	61.48	1	61.48	.61	.433
SES * Entry	13.28	1	13.28	.13	.716
Center-Based Care * Entry	15.00	1	14.99	.15	.699
SES * Center-Based Care * Entry	104.75	1	104.75	1.05	.306
Error	1052967.47	10513	100.16		
Total	1.106E7	10521			

a. R Squared = .088 (Adjusted R Squared = .088)

Table 36*: Test of between subject effects on Item Response Theory scores by* ***Socio-Economic Status*** *at the end of first grade.*

Source	SS	df	MS	F	P
SES	77650.62	1	77650.62	172.99	.000
Center-Based Care	10696.11	1	10696.11	23.83	.000
Entry	344.79	1	344.79	.77	.381
SES * Center-Based Care	443.79	1	443.79	.99	.320
SES * Entry	62.57	1	62.57	.14	.709
Center-Based Care * Entry	41.45	1	41.45	.09	.761
SES * Center-Based Care * Entry	56.43	1	56.43	.13	.723
Error	4804201.48	10703	448.87		
Total	6.474E7	10711			

a. R Squared = .095 (Adjusted R Squared = .094)

Table 37*: Test of between subject effects on Item Response Theory scores by* ***Linguistic Minority*** *at the beginning of kindergarten.*

Source	SS	df	MS	F	P
Linguistic Minority	111.34	1	111.34	1.07	.302
Center-Based Care	4491.09	1	4491.09	43.01	.000
Entry	335.61	1	335.61	3.21	.073
Linguistic Minority * Center-Based Care	286.85	1	286.85	2.75	.097
Linguistic Minority * Entry	4.60	1	4.60	.04	.834
Center-Based Care * Entry	25.36	1	25.36	.24	.622
Linguistic Minority * Center-Based Care * Entry	38.90	1	38.90	.37	.542
Error	1275107.77	12211	104.42		
Total	1.260E7	12219			

a. R Squared = .037 (Adjusted R Squared = .037)

Table 38*: Test of between subject effects on Item Response Theory scores by* ***Linguistic Minority*** *at the end of first grade.*

Source	SS	df	MS	F	P
Linguistic Minority	7927.85	1	7927.85	16.35	.000
Center-Based Care	15751.76	1	15751.76	32.49	.000
Entry	21.31	1	21.31	.04	.834
Linguistic Minority * Center-Based Care	303.46	1	303.46	.63	.429
Linguistic Minority * Entry	174.46	1	174.46	.36	.549
Center-Based Care * Entry	3.84	1	3.84	.01	.929
Linguistic Minority * Center-Based Care * Entry	15.04	1	15.04	.03	.860
Error	5930436.69	12232	484.83		
Total	7.245E7	12240			

a. R Squared = .030 (Adjusted R Squared = .030)

Table 39*: Test of between subject effects on Item Response Theory scores by* ***Race/Ethnicity*** *at the beginning of kindergarten*

Source	SS	df	MS	F	P
Race/Ethnicity	5211.96	1	5211.96	49.84	.000
Center-Based Care	9099.60	1	9099.60	87.01	.000
Entry	261.61	1	261.61	2.50	.114
Race/Ethnicity * Center-Based Care	304.92	1	304.92	2.92	.088
Race/Ethnicity * Entry	641.41	1	641.41	6.13	.013
Center-Based Care * Entry	.43	1	.43	.00	.949
Race/Ethnicity * Center-Based Care * Entry	94.23	1	94.23	.90	.343
Error	1099490.47	10513	104.58		
Total	1.106E7	10521			

a. R Squared = .048 (Adjusted R Squared = .047)

Table 40*: Test of between subject effects on Item Response Theory scores by* ***Race/Ethnicity*** *at the end of first grade*

Source	SS	df	MS	F	P
Race/Ethnicity	40232.64	1	40232.64	85.45	.000
Center-Based Care	24204.37	1	24204.37	51.41	.000
Entry	5.76	1	5.76	.01	.912
Race/Ethnicity * Center-Based Care	341.82	1	341.82	.73	.394
Race/Ethnicity * Entry	1511.30	1	1511.30	3.21	.073
Center-Based Care * Entry	70.02	1	70.02	.15	.700
Race/Ethnicity * Center-Based Care * Entry	23.27	1	23.27	.05	.824
Error	5039342.90	10703	470.84		
Total	6.474E7	10711			

R Squared = .050 (Adjusted R Squared = .050

Table 41*: Test of between subject effects on Item Response Theory scores by* ***Disability Status*** *at the beginning of kindergarten*

Source	SS	df	MS	F	P
Disability Status	1112.36	1	1112.36	10.71	.001
Center-Based Care	6473.17	1	6473.17	62.32	.000
Entry Status	1917.85	1	1917.85	18.47	.000
Disability Status * Center-Based Care	324.73	1	324.73	3.13	.077
Disability Status * Entry Status	350.39	1	350.39	3.37	.066
Center-Based Care * Entry Status	56.72	1	56.72	.55	.460
Disability Status * Center-Based Care * Entry Status	127.58	1	127.58	1.23	.268
Error	1267764.94	12206	103.86		
Total	1.260E7	12214			

a. R Squared = .043 (Adjusted R Squared = .042)

Table 42*: Test of between subject effects on Item Response Theory scores by* ***Disability Status*** *at the end of first grade*

Source	SS	df	MS	F	P
Disability Status	15833.89	1	15833.8	32.84	.000
Center-Based Care	18695.45	1	18695.45	38.78	.000
Entry Status	3359.20	1	3359.20	6.97	.008
Disability Status * Center-Based Care	1787.27	1	1787.27	3.71	.054
Disability Status * Entry Status	1259.62	1	1259.62	2.61	.106
Center-Based Care * Entry Status	689.67	1	689.67	1.43	.232
Disability Status * Center-Based Care * Entry Status	1163.81	1	1163.81	2.41	.120
Error	5968948.74	12381	482.11		
Total	7.322E7	12389			

a. R Squared = .043 (Adjusted R Squared = .042)

Table 43: *Test of between subject effects on Item Response Theory scores by* ***Special Education Status*** *at the beginning of kindergarten*

Source	SS	df	MS	F	P
Special Education	1307.66	2	653.83	6.30	.002
Center-Based Care	687.43	1	687.43	6.62	.010
Entry	301.89	1	301.89	2.91	.088
Special Education * Center-Based Care	542.99	2	271.49	2.61	.073
Special Education * Entry	488.30	2	244.15	2.35	.095
Center-Based Care * Entry	93.49	1	93.49	.90	.343
Special Education * Center-Based Care * Entry	139.23	2	69.61	.67	.512
Error	1267782.14	12207	103.86		
Total	1.260E7	12219			

a. R Squared = .043 (Adjusted R Squared = .042)

Table 44: *Test of between subject effects on Item Response Theory scores by* ***Special Education Status*** *at the end of first grade*

Source	SS	df	MS	F	P
Special Education	24642.67	1	24642.67	51.24	.000
Center-Based Care	5051.21	1	5051.21	10.50	.001
Entry	1376.73	1	1376.73	2.86	.091
Special Education * Center-Based Care	242.02	1	242.02	.50	.478
Special Education * Entry	576.51	1	576.51	1.20	.274
Center-Based Care * Entry	29.59	1	29.59	.06	.804
Special Education * Center-Based Care * Entry	13.32	1	13.32	.03	.868
Error	5889670.82	12247	480.91		
Total	7.264E7	12255			

a. R Squared = .038 (Adjusted R Squared = .038)

[i] Formula for Composite Redshirt:

value=IF(“age”>=75, “definitely redshirted” ,IF(AND(“age”>=63,”age”<75), “maybe on time” ,IF(AND(“age”>=56,”age”<63), “definitely on time” ,IF(AND(“age”<56,”age”<>""), “early”,"blank"))))