

THE EFFICACY OF EARLY CHILDHOOD SPECIAL EDUCATION

By

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Submitted to the graduate degree program in Educational Leadership & Policy Studies and the Graduate Faculty of the University of Kansas in partial fulfillment of the requirements for the degree of Doctor of Education.

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Date Defended: 16 May 2018

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Date Approved: 16 May 2018

Abstract

The purpose of this study was to examine the impacts of early childhood special education (ECSE) services on students' continued eligibility for special education services through the end of middle school and the similarities and differences in the sociodemographic characteristics of those who received ECSE services and those who began receiving special education services in Kindergarten. Given the lack of impact in studies about ECSE, this study investigated whether intervention prior to kindergarten impacts a students' long-term need for special education services differently than waiting until Kindergarten to provide that intervention. In addition, this study suggests an economic argument for investment in ECSE services.

This study divided a cohort of students into three groups: Group 1 – PK3 includes students who received two years of ECSE services, Group 2 – PK4 includes students who received one year of ECSE services, and Group 3 – K includes students who did not received special education services until their kindergarten years. First, the sociodemographic characteristics of these groups were compared using a series of four chi-square tests for independence. Then, Kaplan Meier survival analysis was used to describe the survival functions for each group. Finally, five models of survival functions using Cox regressions were run in order to examine the impact of various covariates on students' continued eligibility for special education.

The results of this study indicated that the sociodemographic makeup of these groups is inconsistent with regard to primary disability, race, and lunch status. Generally, racial minority students and students from low income households are less likely to be identified for ECSE

services. This study also found that students who received ECSE services were more likely to be dismissed for special education prior to the end of middle school than their peers who were not identified for special education until Kindergarten. Interestingly, students who received just one year of special education services were more likely to be dismissed at any point throughout the observation period than students who received two years of special education services. In addition, students who have a speech/language disability are significantly more likely than students with other primary disabilities to be dismissed from special education at any point throughout the observation period.

Acknowledgements

I am deeply indebted to my village for their ongoing mentorship, guidance, and support. Ms. Cathy Smith's high expectations and critical feedback set the foundation for all future reading and writing and instilled in me a belief that when we work hard enough, anything is possible. Mr. Ralph Neal, Dr. Gwen Poss, and Mr. Heath Sigg each provided incredible models of what school leadership should be and mentored me in ways that have been pivotal to my professional growth. Dr. Rick Ginsberg and my dissertation committee were willing to collaborate to create a product that we could all be proud of. In addition, thank you to all my family and friends who thoughtfully asked about my progress and reminded me that I was capable. Finally, I could not have completed this journey without the love and support of Phil, Theresa, Katie, and Jordan. I am grateful for your encouragement when the journey was frustrating, your patience when I turned down plans in order to write, and your perspective when I got too close to an obstacle. Thank you!

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Chapter 1: Introduction

An increasing body of research suggests that we begin formal schooling too late in children's lives. The gaps in levels of student knowledge when they arrive in Kindergarten are already large and both difficult and expensive to overcome. In fact, Heckman's (2011) research suggested, "schooling after the second grade plays only a minor role in creating or reducing gaps" (p. 34). The education, interventions, and interactions of children from birth to age 5 are vital and have significant impacts on long-term success. For example, Mitchell (2001) argued that "brain development research tells us that young children are learning from the earliest moments of life, and learning especially rapidly in their first five years" (p. 1). Given the vital importance of early learning on later life, research suggests that providing high quality and enriching experiences for students prior to kindergarten has the potential to have a significant impact on both school readiness and academic outcomes for students through much of their young lives.

As research supporting the importance of early intervention has grown, there has also been an immense amount of research that supports the investment in high quality early childhood programs and the ability of such programs to reduce the impacts of various risk factors including coming from a low-income household. Given the disparities that often exist in the environment and cognitive engagement of infants and toddlers from households with differing income levels, early intervention has the potential to bridge the academic gaps that are associated with differences in household income. For example, by age 3, children raised in high income households have been exposed to almost 250 percent more words than their low-income peers.

The impact of this difference effects students' language skills at least through elementary school (Schulte, 2016).

Similarly, as the body of research articulating the importance of early childhood development has grown, so has preschool enrollment. Early childhood programming and preschool enrollment in the United States have grown dramatically in the last fifty years. By 2005, approximately 75 percent of children started kindergarten with at least some preschool experience (Hustedt & Barnett, 2011; McAdams & Henry, 2006; Mitchell, 2001). These preschool programs have been created in waves starting in the 1960's when intervention for children from low-income households was initiated through Head Start (Mitchell, 2000). The 1980's wave of preschool expansion was driven by the A Nation At Risk report (Gardner, 1983), and the success of specific preschool programs including the Perry Preschool Project and the Abecedarian Project (Mitchell, 2000). In the 1990's, the National Education Goals helped to ensure that states were aware of the importance of school readiness (Mitchell, 2000). In response to this push for school readiness, since the early 2000's, several states have begun conversations about providing universal access to pre-kindergarten services (Mithaiwala, 2004). Since those conversations began, six states, namely Georgia, Oklahoma, Florida, West Virginia, Wisconsin and New York, have established universal pre-kindergarten programs (Cascio, 2017) although many other localities have established universal pre-kindergarten programs on a smaller scale (DeAngelis, Holmes Erickson, & Ritter, 2017). In particular, Georgia and Oklahoma are two of the oldest universal pre-kindergarten programs with Oklahoma's program reaching more than seventy percent of four-year-olds (Cascio, 2017; Magnuson & Waldfogel, 2016). In addition to these political forces, research in the field of neuroscience further underscores the

importance of supporting children's academic, social, and emotional development starting prior to kindergarten (Shonkoff, 2007).

Early childhood education (ECE) programs address a dual purpose in our society. First, they provide childcare for working parents. Second, they provide for academic, social and emotional development for young children (Hustedt & Barnett, 2011). Through the lens of these dual purposes, it becomes easier to identify and classify the wide-ranging benefits of early childhood programming. First, there are significant economic benefits to families and businesses when high quality early childhood programming is available. From a parental perspective, a high quality ECE program increases their ability to take a job, reduces turnover and absenteeism due to inconsistent childcare, and increases the productivity of workers while they are on the job. For example, Krumenauer & Deller (2009) argued that, "parents, particularly women, refrain from entering the labor force for lack of high quality, affordable early childhood care" (p. 7). Along these same lines, parents often must stay home with children when their childcare is unreliable. Given that the cost of hiring and training workers is high, research indicates that reducing turnover has a significant positive impact on individual business, and by extension, the economy as a whole (Krumenauer & Deller, 2009). Similarly, high quality ECE programs increase worker productivity (Dickens, Sawhill, & Tebbs, 2006). These increases in parental productivity result from decreased concern and worry about the nature of childcare facilities their children are in (Krumenauer & Deller, 2009). High quality ECE programs have been called a part of the infrastructure of a community that supports worker preparedness (Dickens et al., 2006).

A second major benefit of ECE programs comes from both the short- and long-term benefits that accrue to the children who participate in them. Major benefits for children who participate in high quality ECE programs include increased educational attainment, reduced need for remediation or special education placement, decreased need for grade repetition, increased graduation rates, higher lifetime earnings, better health outcomes, decreases in incarceration and teen pregnancy rates, and less reliance on public assistance (Anderson, et al., 2003; Blackman, 2002; Dickens et al., 2006; Doyle, Harmon, Heckman, & Tremblay, 2009; Shonkoff, 2007). These benefits impact children at different stages in their educational careers.

One benefit that is particularly important for children who participate in high quality ECE programs is higher levels of educational attainment. In their study of the economic outcomes from investment in ECE, Dickens et. al. (2006) found that, “At age twenty-seven, members of the program group were found to have levels of educational attainment 0.9 years greater than members of the no-program group. This difference was both statistically significant ($p < 0.016$) and economically substantial” (p. 9). Some researchers have posited that the reason ECE programs are able to increase educational attainment revolves around the ideas that students are started young when their brains are still forming and most able to internalize learning and habits (Heckman & Masterov, 2007). As Heckman & Masterov (2007) explained, “Skill begets skill, learning begets learning. Early disadvantage, if left untreated, leads to academic and social difficulties in later years. Advantages accumulate; so do disadvantages” (p. 447). Given that ECE programs have the ability to make a demonstrable difference in student opportunity and achievement, the interventions provided at this early state can have lasting impacts on academic achievement.

Along with increased educational attainment, early childhood programs reduce the rate of special education placement. A wide variety of research supports that interventions provided during ECE can offset risk factors that affect early academic, social, and emotional development (Doyle et al., 2009). In fact, Anderson et al's 2003 meta-analysis of the early childhood research found that:

Five studies (reported in six papers) measured cognitive outcomes in terms of special education placement...All five studies demonstrated reduction in special education placement for students who had been enrolled in early childhood development programs.

The medial effect size for special education placement was a difference of 14%. (p. 38)

Ultimately, studies have found that ECE programs have the ability to reduce the need for special education services. It is likely that addressing potential risk factors earlier in a child's educational career, even prior to formal schooling, can provide the necessary interventions and supports to increase educational success. While a wide range of benefits of high quality ECE programs have been identified in the research, these two major advantages provide some indication of the potential for ECE programs to provide supports for students with academic or social delays.

Purpose of this Study

A major weakness in the current early childhood research is its failure to address whether students who have already been identified as needing special education services at ages 3 and 4 years old are less likely to continue to need them in the future as a result of their special education and early childhood programming. Instead, the current research focuses on students who have not yet been identified as eligible for special education services and compares their

rate of placement to their peers who did not participate in the ECE program (MacGillivray & Lucia, 2011). To address this gap in the current research, this paper will examine the impact of early childhood education on students who have been identified as needing special education services by age three or four and determine if this impacts their persistence in special education through the end of eighth grade.

A specific subset of ECE programming is early childhood special education (ECSE) which provides early childhood services targeted to students identified as eligible for special education services. For the purposes of this research, ECSE is defined as the services provided to students who are eligible for special education services between the ages of 3 and 5 years old and prior to kindergarten entry.

The purpose of this study is to examine the impact of ECSE programming on the ongoing need for special education services through the end of eighth grade. In order to achieve this purpose, a cohort of special education students will be identified in order to compare those students who received ECSE services and those who did not in order to draw conclusions about the ability of ECSE services to mitigate the need for special education services through the end of middle school.

Statement of the Problem

High quality early childhood programs have been shown to have wide-ranging benefits for not only students enrolled in them but also for the families and communities they serve. Nevertheless, there is inconsistent access to high quality programs for all families and, in many cases, the costs of high quality early childhood education programs can be prohibitive. Public investment in ECE programs is critical to support the development of these young children. In

order to support strategic investment in early childhood programming, additional research is needed about the effectiveness of particular ECE programs, especially the under-researched field of ECSE.

Research Questions

In order to address this weakness in the current research, to support the purpose outlined above, and to aid in program evaluation, this paper will focus on the following research questions. Throughout the research, the ECSE services and programming in question refers to those provided through a particular suburban school district between 2005 and 2007.

- **RQ 1:** In what ways do the characteristics (rates of primary disability, race, gender and free and reduced lunch status) of those who receive ECSE services compare to those who do not receive special education services until Kindergarten?
- **RQ 2:** How does the likelihood of eligibility for special education services change over time for students who received ECSE services?
- **RQ 3:** How does the likelihood of eligibility for special education services change over time for students who began receiving special education services in Kindergarten?
- **RQ 4:** Are those students who received ECSE services more or less likely to be eligible for special education services throughout the observation period than those who were identified as needing special education services in kindergarten?
- **RQ 5:** To what extent do the impacts of ECSE programming differ based on the student's primary disability?
- **RQ 6:** To what extent do the impacts of ECSE programming differ based on the student's free and reduced lunch status, race, or gender?

Significance of the Study

The significance of this study to the body of research is three-fold. First, this study addressed the gap in the current research by examining a particular cohort of students to determine if students who participated in ECSE are more, less or equally likely to become ineligible for special education services than their peers who were not identified for special education services until Kindergarten. Second, this study provided an additional means of program analysis for ECSE programs that may be used to support continued or additional funding for ECSE programming. Third, this study analyzes the relative participation rates in ECSE programming for various demographic groups as well as the relative effectiveness for these different groups. This analysis provides important information about targeting ECSE programs to meet the needs of specific groups.

First, this study begins to address the gap in the current body of literature by supporting analysis of the impacts of ECSE on students who have already been identified as eligible special education services. A significant amount of attention has been paid to the wide-ranging benefits of high-quality ECE programming. In that vein, researchers have found both short- and long-term outcomes that benefit not only the child and his family, but the community as a whole as well (Dickens, et. al., 2006; Heckman & Masterov, 2007; MacGillvary & Lucia, 2011; Morgan, et. al., 2015; Anderson, et. al., 2003; Lloyd, 2018; Burnette, 2018). Included among these expansive benefits is the fact that ECE has been found to reduce the need for special education placement and other remediation for students who participate (Dickens et al., 2006). Nevertheless, ECSE is rarely examined independent of ECE as a whole and the ability of ECSE to provide sufficient intervention to reduce the need for special education over time has not been

examined. This study begins the process of addressing that weakness in the current literature and seeks to examine ECSE benefits specifically. In addition to adding to the body of ECSE literature by analyzing benefits for a specific subgroup of students, this study is significant in that it situates ECSE as a targeted ECE program that has unique challenges regarding the inclusion and matching of strategies necessary to address the juxtaposition of the developmentally appropriate practices outlined by ECE professionals and the requirements of IDEA (Christie & Roskos, 2017; Bruder, 1997; Justice et. al., 2014; Individuals with Disabilities Education Act, 2004).

Second, the significance of this study is also rooted in its examination of the economic factors at play. This study begins the process of reviewing the impact of ECSE on students who are identified as needing special education services prior to their K-12 schooling in order to elaborate further the financial benefits of investment in ECSE. The extensive economic analysis of Bartik (2011) among others identified that a significant proportion of the economic benefits of ECE programming comes from the reduced need for special education and other remediation programs. By extension, this study examines whether ECSE programs have the potential to reduce the need for special education services over time thereby reducing the net cost of providing services for that student by frontloading investment and intervention. These arguments provide those involved in public policy discussions with an economic argument for early and targeted intervention. Similarly, examining the pathways by which early childhood programs impact student outcomes in both the short and long term increases the generalizability of early childhood research, improve program design, and further support a causal link between early childhood program attributes and outcomes (Reyonlds, Ou, & Topitzes, 2004).

Finally, a third way that this study contributes to the body of ECSE literature is that it strategically examines the ways different demographic subgroups are represented in ECSE as compared to the population as a whole. Current research supports that not all demographic subgroups have equitable access to special education in general and ECSE in particular (Zhang, et. al., 2014; Morgan, et. al., 2015; Rhoad-Drogalis, et. al., 2018). This study will examine a particular program's participation rates and the differential success for different demographic subgroups. Examining the specific groups that benefit most from a particular ECSE program helps to target interventions and to further aid in program evaluation.

Limitations of the Study

Although the limitations of this study are described in more detail at the end of chapter 3, it is important to note that there are generally three broad categories of limitations to this exploratory study. First, this study cannot be generalized beyond the given context. Since a single cohort of students are followed from a single school district, it is not possible to generalize the results beyond that situation. Similarly, as with any regression-based study, any findings indicate a correlation between the given factors rather than any kind of causal relationship. Even in the presence of significant findings, only a correlation between variables can be assumed. Finally, given the data that are available, this study uses broad categorical and binary variables to make determinations. Specifically, the question of whether a student fits into a particular primary disability category does nothing to indicate the true extent of the disability. There are likely extreme variations in level of need among students in the same disability category. Along the same lines, use of whether or not a student has an individualized education program (IEP) can mask the positive outcomes for a student who needs fewer services or accommodations over

time. Despite the limitations of this study, however, it serves an exploratory purpose and provides initial insights into additional means of program evaluation for ECSE programs.

Study Outline

In the following chapter, this study introduces a conceptual framework that examines the neurological, biological, and psychological factors that support the need for early intervention in the form of ECSE for students who are identified as needing special education services prior to starting kindergarten. In addition, chapter 2 situates ECSE and ECE in a legal, historical, and economic context before examining three exemplary ECE programs in order to examine the wide-ranging benefits of good ECE programs. Chapter 3 then outlines the variety of quantitative methods, namely chi-squared tests for independence and Cox regressions, that will be used to provide quantitative analysis of a particular cohort of special education students. Chapter 4 then presents the results of that analysis by research question. Finally, chapter 5 then presents the findings in the context of the prior research, draws conclusions, and provides suggestions for further research.

Chapter 2: Literature Review

In its original purpose, publicly funded education in America was intended to support a functional democracy by producing educated voters. Some argue, however, that it is likely that the founding fathers also recognized that a functional and prosperous economy required an educated populace and that the benefits of such were distributed to the country as a whole (Rolnick & Grunewald, 2003). In the modern era, a free and high quality public education is the foundation for the American dream wherein anyone, regardless of family background or income, can achieve any goal. The foundation for this possibility relies on the belief that public education provides a level playing field for all children. Over 85 percent of children in the United States attend public schools and by the time students enter Kindergarten at age 5, there are often already significant gaps in student academic and social skills (Reardon & Portilla, 2015; Rolnick & Grunewald, 2003). Combine this with the fact that the most rapid brain development occurs prior to the start of traditional K-12 schooling and it becomes apparent that students who begin their educational career behind their peers are at a disadvantage (Shonkoff, et. al., 2009). In response to this concern, the importance of high quality early childhood programs has been on the rise over the last fifty years.

Originally, the idea of childcare outside the home in America was a product of the Industrial Revolution wherein specific groups supported infant schools so factory laborers could focus on their work (McAdams, Henry, Guensburg, & Moeller, 2004). While providing for the childcare needs of working parents is certainly still one of the purposes of preschool, high quality early childhood education is increasingly focused on providing an enriching environment to meet the academic, social and emotional development needs of young children (Hustedt & Barnett,

2011). In fact, the stated goal for early learning for the U.S. Department of Education (2016) is: “to improve the health, social-emotional, and cognitive outcomes for all children from birth through 3rd grade, so that all children, particularly those with high needs, are on track for graduating from high school college- and career-ready” (para. 1). High quality early childhood programs are essential to support student success through high school and beyond for all students, but the role of early childhood education is especially important for students with disabilities and for English Language Learners (U.S. Department of Education, 2016). For those students who are most at risk for academic underperformance, early intervention is particularly important.

This chapter focuses on examining the current research relating to ECE and ECSE programming and situating this study in the context of the current literature. First, the scientific and economic perspectives are analyzed in order to provide support for a possible connection between ECSE programming and reduced need for special education services over time in addition to providing an argument for public investment in such programming. Specifically, this scientific and economic framework will focus on the neuroscientific, psychological and biological reasons why early intervention aligns with the human capital theory found in economic research to support the importance of investment in ECE and ECSE. This review of literature also examines the legal framework for ECSE under the Individuals with Disabilities Education Act (IDEA) Part B and examines the nature of ECSE as a targeted ECE program including the concerns regarding disproportionate identification of both male and minority students for special education services. Finally, three exemplary ECE programs are analyzed and the wide-ranging benefits of general ECE programs that are currently established in the

literature are reviewed before identifying the gap in the current literature that this study begins to address.

A Scientific and Economic Basis for Investing in ECE

In order to examine the pathways by which early childhood intervention might help to close the gap between those students who are identified as needing special education services prior to kindergarten and their unidentified peers, it is important to understand the neuroscience of brain development especially for young children. This section will describe the sequential nature of brain development and the impact of environment on academic, social, emotional, and physical outcomes in order to underscore the importance of the timing of high quality intervention in order to help students identified as needing special education services catch up to their typically-developing peers.

The science behind early cognitive, social, emotional, and physical development is rooted in the fields of neuroscience, psychology, and biology (Shonkoff, 2007). Recent research emphasizes the neurological reasons why early childhood education plays a vital role in, and helps to accelerate, later cognitive development in children (McAdams et al., 2004). High quality ECE programs are uniquely positioned to provide structured support for the development of the social, emotional, cognitive, language, and physical skills which provide a strong foundation for success in both school and the workplace (Shonkoff et al., 2007). In addition, the timing of early childhood programs coincides with a time of rapid brain development and growth. For example, Blackman (2000), argued that, “there exist biological reasons why an intervention, if properly timed and implemented, could make a substantial difference in the developmental outcome of a particular child” (p. 15). By aligning the timing of ECE with a time

when the child's brain is undergoing significant and rapid change, these interventions are potentially both more effective and more efficient than beginning that remediation process once children have entered Kindergarten. Shonkoff et al. (2007) argued that "the basic principles of neuroscience and human capital formation indicate that later remediation will produce less favorable outcomes than preventative intervention" (p. 16). Much like the adage that an ounce of prevention is worth a pound of cure, early intervention has the potential to reduce the need for remediation later. Not only is early intervention preferred to more intensive supports and later remediation, but it also has its roots in neurological processes occurring for younger children.

In addition to higher levels of effectiveness as a result of timing, earlier intervention also has the potential to be more cost-effective. For example, if early intervention for a student with a speech language disability or developmental delay could reduce or eliminate the need for costly interventions throughout their K-12 schooling, then public funding of that early intervention would be a cost-effective option (Blackman, 2000). If ECSE is successful in limiting the need for special education services throughout K-12 schooling, it has the potential to reduce the need for costly special education services by up to ten years' worth of services. Although the additional cost of meeting the needs of students identified for special education varies widely based on identified need or primary disability, the impact of reducing identification rates and participation in special education services has the potential to have a significant economic impact (Duncombe & Yinger, 2005).

Blackman (2000) continued, however, to explain that it is difficult to analyze whether the identified interventions are the cause of the improvement or if the developmental advancement would have occurred naturally over time. While this study will not attempt to identify whether

the interventions themselves are the cause of reduced need for special education services, it will examine whether there is a relationship between early intervention and a reduction in need for special education services for students who had previously been identified. Ultimately, one neurological reason why ECE, and by extension, ECSE, is important relies on the timing of early childhood programming and the high rate of brain development that is occurring at the same time.

Neurological research also indicates the interconnectedness of environment, experience, and development. A variety of research notes the importance of environment in the development of the brain and social, emotional, and academic development (Anderson et al., 2003; Heckman, 2006; Shonkoff, 2007). Failure of young children to achieve certain developmental milestones impacts all future development and the level of intervention needed to recover those milestones is frequently both intensive and expensive (Shonkoff et al., 2007). The implication of these two findings, the importance of environment and the sequential nature of development, is that the impact of ECE programs may snowball into increasing and self-reinforcing development and motivation (Heckman, 2006). By contrast, if critical phases of brain development are missed or delayed, there is a significant impact on later development. In many ways, the process of brain development is analogous to the concept of compound interest. Early investment in brain development becomes the foundation for exponentially increasing returns while failure to invest early results in the need for much more expensive actions in order to make up for lost time. As Heckman (2006) noted, “life cycle skill formation is a dynamic process in which early inputs strongly affect the productivity of later inputs” (p. 1900).

Developments in the field of neuroscience also support the hypothesis that high quality ECSE programs have the potential to reduce the need for special education services for those students who were identified as eligible for such services by the age of three. Given that timing of this intervention aligns with the time during which the brain is developing most rapidly and the sequential nature of brain development, ECSE programs may help put a child on an accelerated cognitive, social, and emotional pathway. These targeted early interventions have the potential to close the gap between those students with established disabilities or developmental delays and their peers and to limit the future need for special education services (Guralnick, 1997).

In addition to advances in the scientific support for early intervention from the field of neuroscience, recognition of the importance of human capital reinforces the importance of early intervention for both the individual child and for the economy. Human capital theory has been an area of focus for economists since the late 1700s, wherein the value of labor is noted and attempts are made to quantify the contribution of labor to the economy (Klees, 2016). Human capital refers to the knowledge, skills, labor, and abilities that an individual may contribute to his or her work (Sweetland, 1996). As part of this theory, economists recognize that human capital varies among individuals and suggest that in a market economy individuals who are more productive have higher lifetime earnings (Sweetland, 1996). Measures of productivity seek to quantify the amount of contribution a person makes to their company and the economy. As an extension of this theory, economists argue that investment in human capital can increase the productivity of individuals and the work force as a whole. Similarly, Gilead (2012), argued that although it is not the sole reason to do so, investment in education has economic benefits rooted

in human capital theory. Similarly, the father of market economics, Adam Smith, argued that the skills of the labor force are the driving force of the economy and are more valuable than the physical capital (Cohn, 1979). Human capital theory emphasizes the importance of individual skills, knowledge, and labor in economic development. In recognition of the benefits of investment in education, the General Assembly of the United Nations adopted a resolution in 1960 that supports the connection between educational investment and economic expansion (Resnik, 2006).

All other things being equal, human capital theory suggests that communities, states, and nations with higher levels of human capital will have higher levels of economic output than areas with lower levels of human capital. In fact, many economists argue that investment in human capital is the best way to improve the economy of a state or country (Olaniyan & Okemakinde, 2008). Human capital development can take many forms including formal schooling, learning-by-doing, and on-the-job training among others. Since the advent of the common school, formal education is the most comprehensive and structured way in which the United States addresses human capital development. As changes to the world economy are considered, Fitzsimons (2015) noted that human capital theory has been reformulated in order to “[stress] the significance of education and training as key to participation in the new global economy” (p. 1). Whether considered in a historical or more modern context, human capital theory suggests that investment in education is ultimately an investment in the human capital, and, by extension in the economic prosperity of the community.

When human capital theory and emerging neuroscience combine, they provide a strong argument for the potential of a high quality early education program to not only reduce the rate

of special education placement but to also potentially intervene for those children who have already been identified as needing special education services. Investment in high quality ECE and ECSE programs may influence an individual student's academic trajectory as well as their productivity as an adult. Given the timing of strategic intervention for and investment in children, ECSE programs has the potential to promote brain development and may allow students with learning disabilities, speech language deficiencies, developmental delays, or behavioral concerns to develop at a rate more like their unidentified peers (Kern & Clemens, 2007; Rhoad-Drogalis, et. al., 2018). Similarly, for those whose disabilities are more significant, coping strategies and interventions introduced in early childhood have the potential to reduce the level of intervention necessary by accelerating the trajectory of learning. Even if the ECE program does not fully eliminate the need for special education services for some students, it may reduce the intensity of services required. The impact of these outcomes influences not only the student individually but also the larger society in both the short and long term.

Early Childhood Education (ECE) & Early Childhood Special Education (ECSE)

Legal Requirements for Early Childhood Special Education (ECSE)

In order to understand the legal framework that guides ECE and ECSE at the federal and state level, this section will outline the laws that govern such programs and the ways that they have changed over time. Similarly, this section will examine the differences between public targeted and universal prekindergarten services as well as the challenges of balancing least restrictive environment requirements within a targeted prekindergarten program.

While preschool can be used to refer to any childcare services provided outside the home for children under the age of 5, ECE is a specific subset of these services with a focus on

developmental and educational objectives to support success in later schooling (Doyle et al., 2009). ECE programs take on a wide variety of forms and are frequently tailored to meet the needs of a specific type of student. Since 1986, an additional subset of ECE programs have been developed in the form of ECSE. Through the passage of Public Laws 94-142 and 99-457, special education services was made available first from ages 3 to 21, then to those children with disabilities from birth to entry into Kindergarten (Bailey & Bruder, 2005). Various amendments to the Education for All Handicapped Children Act (EAHCA) (1975), renamed the Individuals with Disabilities Education Act (IDEA) in 1990, have helped ensure that children receive appropriate interventions prior to entering formal schooling (Education for All Handicapped Children Act, 1975; Individuals with Disabilities Education Act, 2004). Part C of IDEA refers to the intervention services provided to infants and toddlers up to 36 months of age (Bailey & Bruder, 2005). These preventative programs focus on children with established risk or developmental delays and are managed by the state. Part B, on the other hand, articulates the necessary supports for all school age children (ages 3 to 22) and the services that public-school districts must provide. For the purposes of this study, ECSE will refer to those students who are attending ECE programs under Part B of IDEA prior to attending Kindergarten. ECSE is an entitlement program for all eligible 3- and 4-year-olds and the eligibility requirements are determined by the state.

In addition to representing a specific subset of ECE programs, ECSE is an example of a targeted early childhood program. Unlike universal programs, targeted early childhood programs are only available to children who meet specific criteria such as eligibility for special education services or coming from a low-income household. While some states are beginning to

consider, develop, and implement universal early childhood programs, there is some debate regarding whether a universal or targeted program is a better use of resources. Those in favor of targeted programs tend to argue, as Hustedt & Barnett (2011) suggested, “that children who are at greatest risk stand to benefit the most from a preschool education program; thus, limited government resources should be directed toward children who are most likely to benefit” (p. 179). Alternatively, those who favor universal early childhood programs, programs that are publicly funded and available to any child and family that opts in, argue that the benefits of providing services to nondisadvantaged students likely outweigh the costs of the program even though disadvantaged students benefit more from such services (Hustedt & Barnett, 2011). Under universal early childhood programs, students identified for special education services could potentially receive services although some researchers argue that this does not represent a strategic economic investment because the costs of providing benefits to children who do not have the same level of need reduce the overall efficiency of the programs. Nevertheless, many believe that programs that include children from more diverse backgrounds are likely to be higher quality than those who only serve a targeted group (Hustedt & Barnett, 2011).

In the state of Kansas, in addition to the ECSE programs that are mandated by federal law, the Kansas Preschool Program (KPP) also targets those children who meet one or more risk factors and provides ECE services through the school district at no cost (KSDE, 2018). Unlike ECSE, KPP is not an entitlement program and districts often have extensive waiting lists for access to this program. In order to meet the needs of both of these ECE programs, districts often take on different strategies. Some districts choose to blend their ECSE program and the KPP. Given that ECSE programs are also bound by the least restrictive environment expectations of

IDEA, some districts have chosen to use this blended approach as a way to provide peer models in a format that is often referred to as reverse mainstreaming. Other districts meet the least restrictive environment criteria by working to provide the necessary supports and services to children in their home or the preschool they would attend absent an identified disability (DeMonte, 2010). Short of having universal early childhood programs available, meeting the least restrictive environment mandate is more challenging for children in ECSE than it is for their peers who have started Kindergarten (Mithaiwala, 2004).

Although there are specific federal and state laws and regulations that govern ECE and ECSE, many states and local districts have adopted different approaches to meet the needs of students. In addition, there is an ongoing debate about the relative merits of targeted and universal prekindergarten programs. While most researchers recognize the benefits of ECE programs for all students, especially disadvantaged students, there is some disagreement as to whether the benefits for nondisadvantaged children outweigh the costs.

ECE & Special Education Disproportionate Representation

Decades of research have investigated the ways in which the special education population is demographically dissimilar to the school population as a whole (Zhang, Katsiyannis, Ju, & Roberts, 2014). Specifically, research has examined the overrepresentation of racial and ethnic minority students and male students in special education. Although there has been some conflicting research that argues that minority students may in fact be underrepresented in special education (Morgan et. al., 2015), concerns about overrepresentation of certain groups has led to federal regulations that mandate the reporting of overrepresentation of minority students in special education to the United States Department of Education (Zhang, et. al., 2014). By

contrast, the representation of racial minority and low-income students in ECSE does not consistently mirror that of the special education K-12 (Rhoad-Drogalis, et. al., 2018). Instead, students in these categories are often underrepresented in ECSE due to the political capital and access to important public services that are necessary for early identification for ECSE.

When considering the racial and ethnic representation in special education, the causes of minority disproportionate representation (MDR) are complex and interrelated. Research has suggested that minority students are overrepresented in all disability categories but the disparity is particularly acute in judgement-based disability categories such as intellectual disability, emotional disturbance, speech/language disability or specific learning disability (Harry & Anderson, 1994; Pinechura-Couture, Heins, & Tichenor, 2013). An accepted definition suggested by Chinn and Hughes (1987) suggested that disproportionate representation is ten percent higher or lower than the expected rate of placement based on the demographics of the population. For example, if the African American population in a district is 15%, then special education placement would be considered disproportionate if is more than 1.5% away (outside the 13.5% to 16.5% placement range).

The impact of judgement-based disability categories may be related to the fact that the education field is dominated by female, white educators. As a result, minority and male students are more likely to be pathologized as needing more specialized intervention when they do not fit the educator's view of an ideal student (Skrtic, 2012). The inability of an educator to meet the needs of a particular student is frequently the impetus for referral for special education evaluation. The combination of differential referral rates and biases inherent in the evaluation process has been hypothesized to result in MDR (Harry & Anderson, 1994). Additional research

has suggested that although minority status is correlated with higher rates of special education identification, there are covariates that are better predictive factors. Specifically, low birthweight, family income level, and the nature of parent-child interactions prior to school may explain the MDR. In fact, when these factors are accounted for, Morgan et al. (2015) argued that minorities may actually be underrepresented in special education.

From a gender perspective, disproportionate identification of male students for special education services also likely stems from these judgment-based categories and the behavioral and physiological differences between boys and girls. There are fundamental physiological differences in the sensory processing for boys and girls. For example, the neurological structure of the eye for boys is more attuned to movement whereas girls are better at identifying details. From an auditory perspective, girls have more acute hearing from an early age. These differences in sensing and processing can impact language development and other factors that teachers use to refer for special education evaluation (Rhoad-Drogalis, 2018; Pinechura-Couture et al., 2013). Similarly, the simple fact that boys tend to be more active than girls suggests that the nature of many classrooms is incongruent with the developmental needs of boys.

According to some scholars, when early childhood and early elementary are considered more closely, the level of overrepresentation of racial and ethnic minority students is less drastic or disappears altogether. Morgan et al. (2015) suggested that an underrepresentation of minority students in ECSE may be a result of less exposure to the professionals (primarily doctors and early childhood educators) who assist with identification of students for special education prior to kindergarten enrollment. Similarly, in ECSE there tend to be higher rates of students identified with speech-language disabilities and lower rates of students identified with as

emotionally disturbed (Rhoad-Drogalis, 2018). There is some thought that teachers and other professionals who assist with the identification process in early childhood avoid using the ED label in order to avoid stigmatizing the student too early (Rhoad-Drogalis, Sawyer, Justice & O'Connell 2018).

Overall, the concept of MDR focuses on whether the special education population and ECSE is demographically consistent with the district's population as a whole. Historically, there has been overrepresentation of both minority and male students, however, more recent research that accounts for socioeconomic status, among other variables, found that minority students may actually be underrepresented. Still other research indicates that these groups, minority and low-income students, are likely underrepresented in ECSE due to more limited exposure to the medical and educational professionals who assist in early identification.

ECE & ECSE Curricula

Unsurprisingly, the nature of the curriculum in ECE and ECSE is vital to the quality of the program (Bruder, 1997). In the early childhood setting it is vital that the curriculum focus on helping three- and four-year-olds to construct their own knowledge through hands-on and child-centered learning experiences, to develop language skills through the use of stories, songs and rhymes, and to practice social interactions and fine motor skills through meal and circle times as well as active and dramatic play (Kholopsteva, 2016; Follari, 2015). Similarly, curriculum must deliberately address the development of positive learning behaviors including persistence, motivation, responsibility, independence, and cooperation (Rhoad-Drogalis, et. al., 2018). The professional best practice for early childhood educators discourages the use of accountability models that might emphasize the focus on cognitive development over development in other

categories or subvert the importance of student choice and play in the developmental process (Follari, 2015).

While the Common Core State Standards, adopted by forty-two states by the fall of 2015, provided a clear and coherent curriculum for literacy and mathematics for grades K-12, those standards do not provide clear guidance for early childhood curriculum (Camera, 2015).

Although there is no federally adopted standard for early childhood curriculum, the ECE community and professional organizations such as the National Association for the Education of Young Children have developed a set of developmentally appropriate practices (DAPs) that support the specific needs of children ages three and four years old (McMullen et al., 2005). These DAPs are rooted in a set of core values that focus on and value early childhood as a unique stage in life that is not just focused on preparation for the future. Instead, practices for students at this age must be rooted in knowledge of child development, respect and support the important family connections, and view the child as a product of his family, culture and community in order to support him reaching his fullest potential (Follari, 2015).

In addition to the common core state standards and the DAP frameworks, the Head Start Performance Outcomes provide some guidance for early childhood educators to integrate tasks that address the physical, socioemotional, and cognitive development of young learners (Follari, 2015). For these young students, a developmentally appropriate curriculum incorporates social and emotional development with hands-on learning and significant levels of play and choice (Christie & Roskos, 2017; McMullen et al., 2005). Although instruction for ECE is teacher-directed, it should also be student-initiated and dependent largely on student choice and curiosity. DAPs incorporate a variety of whole-class, small-group, and individual activities that

blend skill development with student interests while teacher and student maintain shared control over classroom activities (Follari, 2015). Additionally, DAPs suggest that an ECE curriculum should focus on creating a language-rich environment with stories and songs in order to help build language and pre-literacy skills (Blumberg, Halfon & Olson, 2004). Curriculum in early childhood must achieve the delicate balance of having goals that are both achievable and challenging for individual students while motivating student curiosity by creating programs that incorporate student interest as well as the principles of human development (Copple & Bredekamp, 2009).

As a continuation of the integrated nature of a guaranteed and viable early childhood curriculum, high-quality programs embrace the preponderance of research that indicates an effective early childhood curriculum must involve the family as well as the child (Follari, 2015; Guralnick, 1997; National Association for the Education of Young Children (NAEYC), 2012). In fact, there have been calls to reconceptualize ECSE curriculum to incorporate the theory, legislation, and research around the importance of family to program success (Bruder, 1997; Bartik, 2011; Burns, LaRocco, Sharp & Sopko, 2017). Evidence also suggests that ECSE programming that incorporates family involvement and culturally-relevant practices lead to better outcomes for both students and their families (Fonseca, 2018).

Regardless of the nature of the curriculum, researchers and professionals tend to agree that the DAP for ECE is to avoid the rigorously academic approach with significant external evaluation (Bruder, 1997; Follari, 2015; McMullen et al., 2005; Copple & Bredekamp, 2009). In fact, Stipek et. al. (1992) argued that those programs that emphasize academic performance and evaluation “have been shown to result in low self-confidence and cautiousness in older children

who perform poorly compared to their classmates” (p. 12). Similarly, programs such as those that tended to supplant much of the social and emotional development in favor of academic outcomes achieved neither (Stipek et al., 1992). Although the adoption of Common Core State Standards may put additional pressure on early childhood programs to develop literacy and mathematical skills early, the professional organizations discourage such practice (National Association for the Education of Young Children (NAEYC), 2012). Despite the differences in ECE curricula, most programs seek to address one or more of the following areas: physical growth (including nutrition), mental health, language development, cognition, or social and emotional development (Nores & Barnett, 2010; Follari, 2015). Due to the rapid development that occurs for children at ages 3 and 4, it is critical that an ECE curriculum address the many ways that they are developing. Focusing on a single area to the detriment of other aspects of child development fails to meet the needs of the whole child.

Although many of the DAPs that are used for ECE are also appropriate for ECSE, there is an inherent tension between the philosophy of an early childhood program and the best practices of a traditional special education program. Recent practice in ECSE has focused on inclusion of students with identified disabilities in classrooms with their typically developing peers (Justice, Logan, Lin, & Kaderavek, 2014; Odom, 2000). Nevertheless, Bruder (1997) pointed out that the nature of curriculum for early childhood special education curriculum is a bit of a paradox; while early childhood education focuses on children constructing their own knowledge through hands-on experiences, special education historically focuses on more teacher-directed remediation of skill. The juxtaposition of these two approaches presents a problem that is unique to ECSE and creates a tension for instructional practice and implementation. Just as the Individual Education

Plan is mandated by IDEA to meet the specific needs of a unique school-age student, so too does professional best practice recommend that early childhood educators match the appropriate curriculum and intervention to the needs of the individual ECSE student (Bailey, 1997; Brown-Grisham, Hemmeter, & Peretti-Frontczak, 2005). Despite this contradiction, research supports the assertion that play in ECSE facilitates a variety of school readiness factors including pre-literacy skills, self-regulation, and development of fine and gross motor skills (Karin, et. al., 2011).

The process of matching curricular approaches to student need suggests that ECSE programs are most effective when they address the deficits students have more specifically rather than providing a generic, holistic approach. For students at risk due to low birth weight, those at particular risk of developmental delays, curriculum has been found to be most successful when it focuses on the unique needs of the individual child, preferably in a developmentally appropriate learning environment (Donegan-Ritter & Kohler, 2017; Bailey, 1997). Meeting the unique needs of the child means addressing both the social, emotional, and behavioral needs and the academic needs of that student. Though it is true for all students, for ECSE students in particular it is critical that learning tasks provided to the student are at that student's instructional level (Kern & Clemens, 2007). Students with identified disabilities tend to have higher rates of maladaptive behavior as well as issues with concentration and emotional regulation (Rhoad-Drogalis, et. al., 2018) and these unproductive behaviors increase when learning tasks are mismatched with the student's skill level (Kerns & Clemens, 2007). In addition to strategically matching academic tasks to the student's individual needs, a variety of strategies can support the behavior of students as well. Highly organized classrooms that incorporate strategic behavior management strategies

including the use of picture schedules to support transitions between activities and student choice to increase task engagement and motivation have been found to support the development of positive learning behaviors and increased self-directedness in ECSE students. (Rhoad-Drogalis, 2018).

Similarly, students from low-income households, including those who are disproportionately identified as eligible for special education services, have been shown to benefit from a wide variety of high quality programs (Jeon, et. al, 2017; Bailey, 1997). Within these matching constraints, high quality curriculum for ECSE tends to be sequential and to incorporate concrete, hands-on activities while allowing some degree of student choice (Karin, et. al., 2011; Brophy & Alleman, 1991). The process of matching DAPs must include a focus on culturally and linguistically responsive practices as well as inclusion of services that support physical and mental health in addition to social services (Cate, Dell & Thompson, 2017).

High quality leadership for ECSE programming in particular is rooted in the ability to sustain excellent programs that balance the requirements of ECE and special education legislation (Burns, et. al, 2017). This critical component to effective ECSE programs involves providing effective and ongoing professional learning to staff that is targeted to effective matching of DAPs to student needs while also continuing to demonstrate empathy in a learner-centered environment (Burns, et. al, 2017).

Similarly, the importance of the LRE and inclusion of typically-developing peers is widely accepted as critical to ECSE curricula and its success (Chen, Lin, Justice & Sawyer, 2017; McLeod, Sutherland, Martinez, Conroy, Snyder & Southam-Gerow, 2016; Burns, et. al, 2017). Because peer interaction is critical to so many aspects of development, The Early

Childhood Technical Assistance (ECTA) Center’s policy statement emphasizes the importance of inclusion of children with disabilities in ECE programs rather than center-based programs (Cate, Dell & Thompson, 2017). Both by law and professional best practice, the process of matching student needs and ensuring the use of developmentally appropriate learning activities must occur in an inclusive setting where ECSE students are in classrooms with their typically developing peers (Odom, Buysse, & Soukakou, 2012). Beyond just the legal requirements for LRE, inclusion is critical because “observation and imitation of peers serve as key mechanisms through which children learn from peers” (Chen, Lin, Justice & Sawyer, 2017, p. 2). The opportunity to interact with their normally developing peers is critical to the development of students identified with disabilities as well.

Ensuring that ECSE students participate in inclusive classrooms has also been shown to help address this apparent juxtaposition between DAP and targeted intervention (Odom, et. al., 2012). In fact, a policy statement from the US Department of Education stated that ECSE students should have access to high-quality inclusive services that are supplemented by individualized supports as necessary (Brown-Grisham et al., 2005). Ultimately, ECSE students in inclusive classrooms have been shown to do as well or better than their peers in pull out settings (Odom, 2000). Specific research regarding language acquisition found that students with disabilities benefit from inclusion in classrooms with non-identified peers. The average language skills of an early childhood special education student’s classmates is significantly correlated with their language growth and social development without a significant negative impact on their typically developing peers (Chen, et. al., 2017; Justice et al., 2014). Along those same lines, research by Chen et. al., (2017) indicated that children with disabilities tend to play

with other students with the same disability but also learn from observation of and mimicking of their unidentified peers.

Additionally, ECSE curriculum needs to deliberately incorporate social, emotional, and behavioral programs. While a variety of programs are available for this purpose, students who exhibit problem behaviors are more likely to have behavioral and academic problems throughout elementary school (McLeod, et. al, 2016). Programs that include a variety of instructional and behavioral strategies aimed at building pro-social behavior and emotional regulation have been shown to provide sufficient supports to improve student outcomes. Those strategies include, among other factors, instruction focused on emotional regulation, problem solving, social skills and behavioral competence while also providing modeling, praise, choice, error correction, and supportive listening (McLeod, et. al, 2016).

Overall, the nature of high quality ECSE curriculum mirrors that of high quality ECE curriculum with a few strategic improvements. Unfortunately, there is a dearth of research around common, comprehensive evidence-based practices for ECSE specifically (McLeod, et. al, 2016). The curricular focus in effective ECE programs is on allowing learning and whole-child development to be rooted in play with significant amounts of student choice rather than being driven solely by academic outcomes. Similarly, ECE programs are most effective when they incorporate the student's family as well. While these aspects are also critical components of ECSE curricula, there is a tension between the play-driven aspect of ECE curricula and the focus on individual goals in special education. As a result, ECSE is best delivered in an inclusive setting where the individual goals are embedded in the play-driven curriculum or supplemented through individualized supports as necessary.

Exemplary Early Childhood Education Programs

As is noted in the annual *Quality Counts* report published by Education Week, what counts as high quality early childhood education programming can vary widely. Although most research agrees that early childhood programs are important to success in later schooling, what that ECE looks like in different states can vary widely (Burnette, 2018). Nevertheless, examination of exemplar programs, including their qualities and outcomes, can help to elaborate the important qualities that distinguish programs. By examining successful programs, a list of attributes that consistently correlate with program success can be developed.

Three programs in particular have been widely documented and are considered successful and high-quality ECE programs. It merits noting that while the body of research around high quality ECE is large, there are limited studies that examine ECSE programs in particular. These ECE programs, the Perry Preschool program, the Abecedarian program, and the Chicago Child-Parent Center program, provide good examples for examining what constitutes a successful program. While each of these programs differs in important ways, their similarities provide an insight into what a high quality ECE program must include. Galinsky (2006) pointed out, for example, that these three programs had several aspects in common: they began early, were research-based programs with high quality staff, small class sizes and were intensively focused on learning and development instead of just achievement. These critical similarities of successful ECE programs can be a starting point for local program design. On the other hand, it is also important that individual programs continue to monitor efficacy in order to make adjustments to continually increase effectiveness. Research does suggest that, at least from an economic perspective, the net benefit of a particular early childhood program is a function of the

intensity of interventions (Bartik, 2011). Put another way, the amount of time students participate in ECE programming is correlated to the intensity of positive outcomes. Nevertheless, Bartik (2011) recommended six program features as the basis for program analysis that largely mirror the aspects outlined by Galinsky. These program features include:

1. Class size and staff qualifications,
2. Interactions between staff and children,
3. Time intensity of the program,
4. The targeted program population,
5. Public or private sector program delivery and
6. Federal or more local administration.

The first three features outlined here incorporate the components Galinsky identified as critical. In addition, these six program features will represent the foundation for analyzing the nature of the three exemplar programs. Appendix A provides a table that compares the three programs across Bartik's six program features and each program is described in detail below using those factors as an outline.

Perry Preschool Program

The Perry Preschool Program was an experimental study that began in 1962 in Ypsilanti, Michigan and ran through 1967 (Bartik, 2011; Heckman, Moon, Pinto, Savelyev, & Yavitz, 2010). This early childhood education program made use of an experimental design and incorporated 58 experimental participants and 65 control group participants (Bartik, 2011). Researchers have continued to follow and collect data on program participants through age 40 (Heckman et al., 2010).

The Perry Preschool Program required that all teachers be college graduates and certified teachers (Bartik, 2011). Working in a 13:2 student to teacher ratio, the Perry Preschool Program utilized a curriculum focused on cognitive and social-emotional components through what they called a ‘plan-do-review’ process of active student learning. This curriculum emphasized staff observation of student interactions and supportive intervention through reflective questioning (Heckman et al., 2010). In addition to this student-centered and student-driven curriculum, the Perry Preschool Program incorporated weekly ninety-minute home visits to support student development (Bartik, 2011; Heckman et al., 2010).

In addition to the ninety-minute per week home visit, the Perry Preschool Program ran for two and a half hours a day, five days per week. Similarly, the program ran concurrently with the school year since it occurred in the public schools and lasted for 9 months out of the year. Given that eligible students could participate in the program for two years, the contact time for students could reach 750 curriculum-based hours with an additional 45 hours dedicated to home visits for one particular child (Heckman et al., 2010). These program characteristics for the Perry Preschool Program are summarized in the table in Appendix A.

The Perry Preschool Program was a targeted ECE program. The students eligible to participate in this program must have lived in the Perry Elementary School boundary area. From this group of children, eligible participants were identified by their IQ score and socioeconomic status. Children with IQ scores outside the seventy to eighty-five range and those with what were deemed untreatable mental defects were excluded from the study (Heckman et al., 2010). The overall program costs for each student for the two-year period were \$17,752 per child (in 2006 dollars) (Heckman et al., 2010). This targeted population represents students who qualify

for special education services under an intellectual disability category and also come from low-income households.

The benefits of the Perry Preschool Program have been investigated by a variety of researchers. The bulk of the documented benefits of this particular program can be classified as either academic or economic. In many cases, however, the academic impacts have been analyzed from an economic perspective as well.

From an academic perspective, students in the Perry Preschool program did not show a statistically significant difference in IQ after five years of exiting the program, however, those students in the experimental group did show higher achievement test scores. The difference between the experimental and control group achievement has been attributed to an increased motivation to learn (Heckman, 2006). This statistically significant difference in academic achievement was shown to persist at least through age 14 (Rolnick & Grunewald, 2003). Importantly, Perry Preschool program participants were also less likely to be identified as eligible for special education services during elementary and secondary school (Rolnick & Grunewald, 2003). A third academic benefit for those in the experimental group was that those students who attended the Perry Preschool program were 22 percent less likely to drop out of school (Bartik, 2011). Academically speaking, Perry Preschool participants had higher academic achievement and lower special education placement throughout much of K-12 and Perry students were also more likely to graduate from high school.

From an economic perspective, when participants from the Perry Preschool program were monitored through age 40, every dollar invested resulted in \$16.14 in returns. While the majority of these returns came from crime cost savings and increased earnings, \$11.35 and \$3.24

for every dollar invested respectively, there was also a significant return based on reduced need for special education services and welfare dependence as well as increased income tax revenue for the government (Bartik, 2011; Doyle et al., 2009; Shonkoff et al., 2007). These benefits may be explained by the fact that by age 27, program participants were four times more likely to earn at least \$24,000 per year and eighty percent less likely to be arrested five or more times than nonparticipants (Rolnick & Grunewald, 2003). The increased earnings paired with decreased incarceration rates resulted in higher tax revenues and lower public expenditures on public safety.

As a caveat, there is some concern that there are issues with Rolnick & Grunewald's 2003 study. Specifically, the lack of standard errors coupled with a low sample size raised concerns among some researchers (Heckman et al., 2010). In order to draw conclusions about the Perry Preschool Project and to generalize those results to a larger population requires more rigorous research and examination of early childhood programs. Nevertheless, even with more rigorous research standards, the rate of special education placement for female students was lower in the treatment group though there was no statistical difference for male students (Heckman et al., 2010). Additionally, even with these more rigorous standards, the rate of return on investment in the Perry Preschool Program is positive and exceeds 5.8 percent (Heckman et al., 2010).

Abecedarian Project

The Abecedarian Project was established in Chapel Hill, North Carolina, and ran from 1972 to 1977 (Bartik, 2011). Much like the Perry Preschool Project, the Abecedarian Project was established then implemented with an experimental design to evaluate it that incorporated 57

program and 54 control participants (Bartik, 2011). Researchers continued to gather data on those participating in this particular project through age 21.

Unlike the Perry Preschool Project that was targeted to eligible three- and four-year-olds, the Abecedarian project identified possible program participants even before birth and began providing interventions within the first few months of life. Although staffing ratios in the Abecedarian Project varied based on the child's age, all were college graduates working in pairs in classrooms of ten or fourteen students for three- and four-year-olds respectively. In order to recruit qualified candidates as teachers to support the individualized curriculum of the program, the Abecedarian Project provided pay comparable to the public school system (Bartik, 2011). Similarly, much like the Perry Preschool Project, the Abecedarian Project incorporated home visits every other week.

The Abecedarian Project targeted disadvantaged or at-risk families using a risk index that incorporated parent education level and IQ, family income, and welfare participation and single parent household status (M. L. Anderson, 2006; Bartik, 2011). This program was strategically designed to reduce later special education participation rates and provided significantly more direct contact with students than the Perry Preschool Project. The Abecedarian Project provided curricular services and child care for up to ten hours per day, four days per week. In addition, unlike the Perry Preschool Program, the Abecedarian Project ran for fifty weeks of the year for up to five years. In total, program participants could have up to 12,500 contact hours prior to Kindergarten enrollment (Bartik, 2011). Due to the full-day, full-year care that was available from birth to Kindergarten enrollment, the Abecedarian Project provided more than sixteen times the contact hours of the Perry Preschool Program. In alignment with the significantly increased

parameters of the program, the net program costs per student were also significantly higher than for the Perry Preschool Program, at a cost of a total \$64,297 per student over 5 years (Bartik, 2011). The critical program features for the Abecedarian Project are also outlined in the table in Appendix A.

The Abecedarian Project has been widely analyzed and researchers have noted both short- and long-term benefits for the program participants as compared to the control group. From a strictly monetary perspective, investment in the Abecedarian Project has consistently been found to have high rates of return. For example, when participants were monitored through age 21, the Abecedarian Project returned \$4.10 for every dollar invested. This return comes from \$0.16 in crime-cost savings, \$2.28 in reductions in rates of special education placement, public assistance usage and increased income taxes, and \$1.57 in increased earnings (Shonkoff, 2007). Bartik (2011), on the other hand, found increases in the earnings of state residents of \$2.25 for each dollar invested. Although Shonkoff and Bartik have substantial differences in their findings, the studies consistently found a significant return to each dollar invested.

In addition to the monetization of its benefits, researchers have found a wide variety of other benefits. For example, Rolnick and Grunewald (2003) concluded that program participants had higher levels of academic achievement in both math and reading than nonparticipants through much of their elementary and secondary schooling. These findings have been challenged by some researchers who identified that girls are more likely to demonstrate these gains than boys (M. L. Anderson, 2006). Nevertheless, there are data to support that program participants were both less likely to repeat a grade and less likely to be identified as eligible for

special education services through age fifteen (Rolnick & Grunewald, 2003). Again, Anderson (2006) casted some doubt on these findings and indicated that these findings may not hold true across genders. For example, special education placement does not change significantly for female students but male students demonstrate a significant decline in grade retention and special education placement (M. L. Anderson, 2006). Finally, as students who participated in the Abecedarian Project completed their K-12 education, they were found to be more likely to attend college than the nonparticipants (Bartik, 2011).

Chicago Child-Parent Center Program

The Chicago Child-Parent Center Program (CCPCP) began in Chicago, Illinois in 1967. Unlike the Perry Preschool Program or the Abecedarian Project, the CCPCP did not utilize an experimental design for evaluation (Bartik, 2011). Also, unlike the Perry Preschool Program and the Abecedarian Project that included only between fifty to sixty program participants, the CCPCP served over 1,500 children at multiple sites across the city. The Chicago Longitudinal Study sought to examine the impact of this program using a quasi-experimental design in which they matched children in the program to nonparticipants and monitored them through at least age 21 (Reyonlds, Temple, Robertson, & Mann, 2002).

The CCPCP began at age three and continued supportive services into elementary school. In the early childhood component of the program (ages three and four years old), each center was staffed by a head teacher and two coordinators. The lead teacher at each center had a bachelor's degree and was certified in early childhood education. These teachers were public school employees and they received regular staff development through the school district (Reyonlds et al., 2004). In the early childhood program, classrooms were set up with a 17:2 student to teacher

ratio and the curriculum focused on developing math and reading skills through diverse learning experiences (Bartik, 2011; Reynolds et al., 2004). In addition to these diverse learning experiences, the CCPCP incorporated an intensive parent program including outreach and home visits, although those programs were not as regular as those described in the Perry Preschool Program or the Abecedarian Project (Bartik, 2011; Reynolds et al., 2004).

The CCPCP, much like the Perry Preschool Program, provided half-day services, five days per week during the school year. However, the CCPCP increased student contact by extending an additional 6 weeks during the summer and incorporating services during elementary school as well (Bartik, 2011; Reynolds et al., 2004). As a result, the total contact time for students prior to kindergarten enrollment for the CCPCP was 1,260 hours or more than fifty percent more than the Perry Preschool Program. Much like the other two exemplar early childhood programs, the CCPCP was targeted to low income families (Bartik, 2011). Just as the other exemplar programs were, the critical program features of the CCPCP are summarized for ease of comparison in Appendix A.

The CCPCP has documented benefits to students in both the short and long term. In the short term, after controlling for family background, students in the CCPCP program were identified as significantly less likely to need special education services than those in alternative programming. Specifically, CCPCP students were eligible for special education services only 12.5 percent of the time as compared to 18.4 percent of the time for those who participated in an alternative all-day kindergarten program (Conyers, Reynolds, & Ou, 2003). Similarly, the Chicago Longitudinal Survey found that CCPCP participants had a dropout rate 11 percent lower

than their matched peers in addition to higher levels of educational attainment and lower levels of juvenile arrest (Reynolds et al., 2004).

From a monetary perspective, the benefits of the CCPCP far exceeded the costs of the program. Although the program was designed to reduce the dropout rate in Chicago Public Schools, the benefits of the program reached well beyond that original intent. In fact, the program was found to return \$7.14 for each public dollar invested through the long-term increases in economic well-being and tax revenue. Similarly, the reductions in grade repetition and special education placement reduced education costs and reduced rates of juvenile detention reduced costs as well (Reynolds et al., 2002). More than eighty-five percent of the monetary benefits of the CCPCP have been attributed to the early childhood interventions with the remainder of the benefits coming from the school-age programs that continued into elementary school (Reynolds et al., 2002).

Analyzing the Three Cases

These three exemplary programs, the Perry Preschool Project, the Abecedarian Project, and the Chicago Child-Parent Center Program, represent experimental attempts to analyze the short- and long-term impacts of targeted ECE programs. In addition, these three examples of high-quality ECE from the 1960's and 70's still provide guidance to program development today. Current professional best practice focuses on a blended curriculum that incorporates the physical, socioemotional, and cognitive development for young children (Follari, 2015). Although each program's structure and curriculum varied in significant ways, each focused on both the cognitive and socioemotional needs of students. The major aspects of each program based on Bartik's (2011) six features are outlined in Appendix A, and the most important

differences between the programs are outlined here. Of the six program features as outlined by Bartik (2011), three proved to be critical for comparative analysis: interactions between staff and students, time intensity, and targeted population. The three exemplar programs are analyzed in terms of these three features below.

The strategic interactions between students and staff are typically defined by the curriculum of the program. For each of these three programs, though less attention is paid to the physical development components of the curricula of each program, the use of student choice, individualized programming, and play indicates that these programs each had an active component. Similarly, just as current best practice emphasizes the importance of incorporating family in ECE and ECSE programs, each of these exemplary programs incorporated home visits at different intervals in order to support the child's development (Follari, 2015; Guralnick, 1997; National Association for the Education of Young Children (NAEYC), 2012). Recognition of the importance of meeting the various developmental needs of students and the importance of the home and family connection are just two of the attributes that may indicate a high-quality program (Bartik, 2011).

There are also significant differences between these three programs. Primarily, there are significant differences in the time intensity of the various programs. While the Abecedarian project was a full day program, the Perry Preschool Program and the CCPCP were only half day programs. Although it is unwise to draw conclusions from these three examples alone, these findings may indicate that the impact of the time intensity of the program is secondary to the quality of the teachers and curricular pedagogy they are using. Although there is need for further research about the critical curricular components of ECSE, these findings suggest that what

students are doing during their ECE experiences and how activities are structured may be critical to the relative success of the program.

Similarly, although all three programs were targeted ECE programs (as opposed to universal programs), the programs differed slightly in the types of students they targeted. Both the Abecedarian Project and the CCPCP targeted children from families that were deemed to be at-risk in some fashion. Although the CCPCP focused primarily on children from low-income households, the Abecedarian Project used a more complicated risk index that incorporated household income, parental income, and single-parent status. As a contrast, the Perry Preschool Program used household income in combination with the child's IQ score to determine eligibility for the program. For this reason, the Perry Preschool Program is more like an ECSE program than the other two programs. Both the Perry Preschool Program and The Abecedarian Project were experimental programs that only lasted for a short time. The CCPCP was, instead, a longitudinal study that followed students for a much longer period of time. Through the lens of the six features that Bartik (2011) outlines, these three exemplary ECE programs, and ECSE programs by extension, can be compared to other programs in order to further identify and generalize the vital features of a high quality program.

In terms of Bartik's (2011) other three program features, the three programs are largely similar. First, for class sizes, all three programs had low student-to-teacher ratios and followed the practice of consistently having two adults in the room. Similarly, teachers in all three programs were college graduates with specialized training and certification as teachers. Second, all three programs were specifically designed to be public programs that, within the targeted

population, were open to anyone. Finally, all three programs were administrated locally, despite the source of funding.

General Benefits of ECE

The benefits of ECE in general have been widely researched and analyzed resulting in a large body of literature that outlines benefits in a variety of categories. Specifically, the immediate benefits of high-quality ECE programming include the impacts childcare has on the ability of parents to work outside the home. In addition, there are both short- and long-term benefits to the child who participates in the ECE programs. Finally, there are benefits to the community as a whole to having citizens who have participated in ECE programs. As was noted with each of the three exemplary programs, each of these results have an economic impact that can support investment in ECE programs.

Investment in ECE has been analyzed in various communities in the last several years as state and county governments seek to examine the benefits of public support for early childhood programs. The results of research on these benefits have consistently indicated that investment in high-quality ECE programs pays significant dividends to the local economy through a variety of forces (Bartik, 2011; MacGillvary & Lucia, 2011; Dickens et al., 2006). Frequently the benefits of early childhood education programs are used to justify the investment of public funds into such programs. Nevertheless, as was described in the previous section, there is a wide variety of benefits, both monetary and non-monetary, that have been found across multiple early childhood programs that benefit the student, family, and general public.

The identified benefits of high-quality ECE impact not only the parents and their children in the program but also the community as a whole. MacGillvary & Lucia's (2011) research

examined ECE as an important part of the infrastructure as well as the benefits of the ECE industry on the state of California. In this context, high quality ECE programs have been found to increase worker productivity (for parents with children in the programs) and decrease absenteeism and turnover (MacGillvary & Lucia, 2011). This increase in worker productivity ultimately saves companies money and boosts the local economy. Long-term impacts of high quality ECE have been found to include higher educational attainment, reduced need for special education interventions or other remediation, decreases the likelihood a child will repeat a grade, reduces crime, and reduces dependence on public assistance (MacGillvary & Lucia, 2011). When steps are taken to monetize these outcomes, even conservative estimates agree that any investment in ECE programming is recouped many times over throughout the succeeding decades.

From a parental perspective, high quality ECE programs increases the ability to work, reduces turnover and absenteeism due to inconsistent childcare, and increases the productivity of workers while they are on the job. In many cases, the paucity of high quality ECE programs in a community or the prohibitive costs cause parents (frequently the mother) to refrain from entering the labor market (Krumenauer & Deller, 2009). Along these same lines, parents often must stay home with children when their childcare is unreliable. Given that the cost of hiring and training workers is high, research indicates that reducing turnover has a significant positive impact on individual businesses, and by extension, the economy as a whole (Krumenauer & Deller, 2009). Similarly, high quality ECE programs increase worker productivity (Dickens et al., 2006). These increases in parental productivity result from decreased concern and worry about the nature of the childcare facilities their children are in (Krumenauer & Deller, 2009). High quality ECE

programs have even been called a part of the infrastructure of a community that supports worker preparedness (Dickens et al., 2006).

ECE programs not only benefit parents and companies, but there are also significant and long-term benefits to the children who participate in these programs. One major benefit to children is higher levels of educational attainment. In their analysis of the effects of investment in early education on economic growth, Dickens et. al. (2006) found that children who participated in ECE programs had levels of educational attainment that were statistically higher than their peers who did not participate in such programs. In fact, they found that students who received ECE services had 0.9 years higher educational attainment and that this difference in attainment had a substantial economic impact on those students in terms of their earnings. Some researchers have posited that the reason ECE programs are able to increase educational attainment revolves around the idea that students are started young when their brains are still forming and most able to internalize learning and habits (Heckman & Masterov, 2007). As Heckman & Masterov (2007) explained, “Skill begets skill; learning begets learning. Early disadvantage, if left untreated, leads to academic and social difficulties in later years. Advantages accumulate; so do disadvantages” (p. 447). Increased educational attainment is also correlated with higher average earnings both annually and over a lifetime (Cohn, 1979; Day & Newburger, 2002). These increases in earnings on a large scale benefit the community in addition to the individual benefits.

Another significant set of benefit to students and the community that results from high quality ECE programs are the reduced need for remediation and special education services as well as a reduced likelihood of repeating a grade (Dickens et al., 2006). Each of these types of

intervention programs can be particularly costly, but ECE programming helps to intercede on academic disadvantages earlier in a child's schooling when it is both easier and less expensive to remediate. Similarly, repeating a grade is one of the highest predictors for whether a student will drop out of school. As a result, decreasing retention in this way has been shown to have a positive result on graduation rates (Dickens et al., 2006). Other benefits include reduced incarceration rates (Committee for Economic Development, 2006; MacGillvary & Lucia, 2011), lower rates of teen pregnancy, and decreased reliance on public assistance (Dickens et al., 2006). Each of these impacts certainly benefits the individual, but these benefits also accrue collectively to the community and society as a whole.

The benefits of high quality ECE programs are certainly wide-reaching and can allow the money spent on such programs to be viewed as an investment in the community. The impacts that students of high quality ECE programs have when they become working adults are significant. Based on their analysis of ECE programs in California, MacGillvary & Lucia (2011) argued that, “[c]ollectively, as adults, the participants in these programs did significantly better than the control groups on measures of economic performance, health, lower criminality, and education” (p. 15). Those who participated in the programs did better in school and earned higher wages, which ultimately resulted in higher tax revenues (MacGillvary & Lucia, 2011). The economic benefits of investment in ECE programs are said to fully offset the costs of the program by the seventeenth year. The costs of ECE programs are recouped over time, and after the breakeven point in year seventeen, all benefits are strictly positive due to higher earnings, relatively lower crime rates, and lower use of public assistance programs (MacGillvary & Lucia, 2011). In fact, these data indicate that every dollar invested in providing universal preschool

programs returns somewhere between \$2 and \$7.16 (Committee for Economic Development, 2006; MacGillvary & Lucia, 2011).

The reasons why investment in ECE programs are economically beneficial coincide with the nature of human capital theory. Differences in student background knowledge are already evident as early as kindergarten. Similarly, those gaps in student knowledge are both more difficult (and more expensive) to remedy in elementary and secondary school (Committee for Economic Development, 2006). As a result, addressing those gaps in student knowledge through ECE programs works to level the playing field for all students in a way that elementary education cannot. Indeed, The Coleman Report (1966) argued that the largest influence on student achievement comes from family and home factors outside of the control of the regular school system. Due to these family level differences, many children enter kindergarten at widely varying levels of ability and that K-12 schools are largely unable to ameliorate these differences. Some of the differences in student achievement that are a product of family factors may be addressed prior to a student entering kindergarten through high quality ECE programs.

Although much attention has been paid to the impacts of high quality ECE, less attention has been paid specifically to the impacts of high quality ECSE services. When considering the impact of early childhood programming on students who have been identified as needing special education services, it is important to note that these students typically experience a confluence of issues that make their needs especially acute. In fact, studies that have looked into the predictors for special education placement based on demographic data consistently find that poverty is the most significant predictor of special education placement (Harry & Anderson, 1994; Morgan, et al., 2015; Conyers et al., 2003). For this reason, when examining the question of whether early

childhood special education helps to reduce the likelihood that a student will remain eligible for services, one must also evaluate whether the intervention was differentially appropriate for students from low income households. Anderson et al. (2003) pointed out that “early childhood intervention programs seek to prevent or minimize the physical, cognitive, and emotional limitations of children disadvantaged by poverty” (p. 32). It is possible that those programs which have reduced the readiness gap between different socioeconomic groups may also be successful in reducing the need for special education services. Similarly, given that students from low income families benefit more from formal early childhood programming than those from higher income families, it is possible that high-quality early childhood programming will serve to meet the needs of students who have been identified as needing special education services (Doyle et al., 2009).

From a larger-scale perspective, the *Quality Counts* survey is an annual reporting by Education Week that provides a comprehensive assessment of education in each state analyzes trends in education across the country as well as ranking states across a series of factors. In the most recent *Quality Counts* report, Lloyd (2018) indicated that the states that score the highest overall also tended to have the highest scores on factors related to educational foundations in early childhood. Early childhood foundations included not only ECE and the funding provided for it but also factors such as family income and parental education. For example, New York ranks in the top 20 percent of states and has recently provided an additional \$2.7 million for early learning centers, ECE teacher training, and screening learning disabilities prior to kindergarten (Burnette, 2018). Along these same lines, the converse also tends to be true. States who score lower in ECE also struggle with their overall score on the report as well (Lloyd, 2018).

Although these findings do not necessarily suggest causation, there is consistently a correlation between early childhood factors and overall academic achievement and educational success for the state.

Ultimately, the benefits of ECE are can be categorized as immediate or long-term and analyzed in terms of whether they are benefits for the student who participated in ECE, the family of that student, or the larger community. Investment in ECE is a form of long-term public investment where the costs are ultimately recouped many times over. Unfortunately, since it frequently takes approximately seventeen years for the investment to break even, this form of public investment is too often overlooked and politically problematic. The immediate benefits of ECE accrue to the family and to their employers in the form of increased employment rates and productivity and reduced absenteeism and turnover. The next layer of benefits are benefits to students who participated in ECE. In the short term, this student shows signs of increased kindergarten readiness as a result of ECE. As time progresses, this student also shows a decreased placement in special education, decreased repetition of a grade, higher graduation rates as well as higher educational attainment overall. This is the likely result of the timeliness of the intervention and its alignment with the biological, psychological, and neurological development of the student. Finally, the long-term benefits to both the student and the community include lower crime rates, less welfare dependence, and lower rates of teen pregnancy as well as increased health and wages over time. Given these expansive benefits of ECE, public funds spent in this area are frequently a sound investment in both individuals and the community as a whole.

Gap in the Current Research

Although there is significant research available that discusses the benefits of ECE programs that target students from low-income households (Conyers et. al., 2003; Doyle et. al, 2009; Committee for Economic Development, 2006), there is currently little research describing or evaluating early childhood projects designed specifically for students with identified physical or learning disabilities. Research widely provides evidence of the diverse benefits of early childhood education for students, but the research does not examine the ability of these high-quality programs to provide interventions for students who were identified as needing special education services prior to kindergarten. Given the ability of high quality ECE programs to reduce the need for special education services for students in K-12 (MacGillvary & Lucia, 2011), it begs the question of whether students already identified as needing special education services have sufficient benefit from early intervention to close the gap between them and their unidentified peers.

Similarly, although the MDR that has been frequently described in the research usually does not expressly examine early childhood education, this research will investigate the differential representation and impact of specific ECSE services based on race, gender, and socioeconomic status in order to elaborate the program analysis. Similarly, this research investigates if there is a differential impact of the ECSE services based on primary disability category in order to further investigate the potential impact of judgement-based categories on MDR.

In addition to this gap in the research, developing research in the field of early childhood education argues for the importance of further research in order: (1) to identify they ways in

which ECE impacts students, (2) to increase the generalizability of the results, (3) to aid program design as a means to improve student success, and, (4) to strengthen the causal reference between program design and outcomes (Reynolds et al., 2004). This study will begin the process of filling two of these gaps in the body of literature by examining the impacts of ECSE as a targeted ECE program and aiding in program evaluation for a particular program.

Although significant research has begun to articulate the importance of ECE and to identify the important features of high quality programming, further research is needed to elaborate on the benefits of ECSE and to aid in program analysis and design.

Summary

The United States Department of Education (2016) argued that for students most at risk, high-quality ECE intervention is especially important. Whether that risk is being identified as requiring ECSE services or coming from a low-income household, the reason why ECE is critical for individual students stems from the neurological development that occurs for students who are three, four, and five years old. Aligning intervention to a time of rapid brain development allows for both more effective and less expensive programs than later remediation. Because skill development in young children is sequential, ECE and ECSE are successful because they establish a solid foundation for children early helps to ensure that critical developmental milestones are achieved on time or apply appropriate interventions in a timely manner.

ECSE is a specific subset of ECE and is a target program that meets the federal requirements outlined by public law 94-142, public law 99-457 and the Individuals with Disabilities Education Act Part B. ECSE programs face an ongoing tension between the use of DAPs that encourage play and discourage the use of accountability models and the federal

special education requirements that require accountability to the goals of the student's individualized education plan (IEP). In order to balance the constraints from both sides, high quality ECSE must strategically match practices with the needs of individual students in an inclusive setting without limiting the level of student choice within the program.

Exemplary early childhood education programs have been widely researched, analyzed and scrutinized. Immediate benefits of ECE programming include higher employment and productivity rates and lower absenteeism and turnover for families who have children enrolled in the programs. Also, in the short term, the students who participate in ECE programs see increased kindergarten readiness, high levels of curiosity and achievement, decreased need for special education services or other remediation, and higher graduation rates. In the long run, ECE program participation has been correlated with higher levels of educational attainment, health and wages in addition to lower levels of crime, welfare dependence, and teen pregnancy.

Despite the wide-ranging documented benefits of providing high quality early intervention, research has yet to critically examine whether ECSE programs in particular provide services to three- and four-year-olds who have already been identified as needing special education in order to reduce their need for special education services through the end of middle school. The evidence of successful high-quality ECE programs is extensive but, to date, these same investigations are not consistently applied to ECSE. From an academic perspective, just as neuroscience provides explanation for why ECE is successful for students, the same logic may also be used to justify investigation into the benefits of ECSE for students who have identified developmental delays or other cognitive, behavioral, or behavioral disabilities. Given that the curriculum of ECSE largely mirrors that of ECE with a few strategic adjustments to meet IDEA

requirements, it follows that ECSE has the opportunity to have significant benefits to students, their families, and the community as a whole. Similarly, from an economic perspective, given a substantial portion of the net benefit of ECE comes from reduced special education identification (Shonkoff, 2007), it follows that the economic benefits of ECSE are likely to be equally significant.

Using the methodology outlined in Chapter 3, this study will begin the process of examining the benefits of ECSE by focusing on the ability of ECSE programming to reduce the need for special education services later in the schooling of those students compared to those students who did not receive such services. Similarly, this study will investigate the differences between the demographics of students who do and do not receive ECSE services in a particular district in order to both examine the nature of disproportionate representation for students in these programs and also to examine the effectiveness of these programs on these different subgroups of students. In all, this study will begin the process of filling the gap in the current literature involving limited examination of the long-term impacts of ECSE on special education eligibility through the end of middle school as well as potentially providing additional economic justification for either continued or increased investment in these programs.

Chapter 3: Methodology

Purpose

Although examining the impact of high quality ECE programs has been a focus for some time, the purpose of this study is to add to and fill a gap in that body of current research. While much attention has been paid to the benefits of ECE programs on the whole, to date, research has not specifically considered the ability of high quality programs to mitigate the instructional, speech/language, or behavioral needs of students who are identified as needing special education services prior to kindergarten enrollment. Specifically, this research investigates if a particular ECSE program is able to provide sufficient intervention for students at ages three and four in order for students to become ineligible for special education services.

Research Questions

In order to address the purposes outlined, this research examines cohorts of children who received special education in one Midwestern school district at some point between the ages of three and five. These students are separated into three groups and followed through the end of eighth grade. Group 1 consists of students who began receiving ECSE services at the age of three in the 2005-2006 school year, Group 2 consists of students who began receiving ECSE services at the age of four in the 2006-2007 school year, and Group 3 consists of students who began receiving special education services during their Kindergarten year in the 2007-2008, typically at age 5. As appropriate for the research questions outlined below, Group 1 – PK3 and Group 2 – PK4 are compared to Group 3 – K on a pairwise basis. In order to provided targeted analysis of this particular ECSE program, the following research questions are investigated:

- **RQ 1:** In what ways do the characteristics (rates of primary disability, race, gender and free and reduced lunch status) of those who receive ECSE services compare to those who do not receive special education services until Kindergarten?
- **RQ 2:** How does the likelihood of eligibility for special education services change over time for students who received ECSE services?
- **RQ 3:** How does the likelihood of eligibility for special education services change over time for students who began receiving special education services in Kindergarten?
- **RQ 4:** Are those students who received ECSE services more or less likely to be eligible for special education services throughout the observation period than those who were identified as needing special education services in kindergarten?
- **RQ 5:** To what extent do the impacts of ECSE programming differ based on the student's primary disability?
- **RQ 6:** To what extent do the impacts of ECSE programming differ based on the student's free and reduced lunch status, race, or gender?

Research Design

In order to address these research questions, this study is descriptive in design using program evaluation research techniques to examine the impacts of ECSE programming in a particular school district on a student's eligibility for special education services throughout elementary and middle school. This research employs quantitative and longitudinal techniques to examine the relationship between participation in a particular ECSE program and the need for special education services later in schooling. This longitudinal study uses archival data from annual May enrollment snapshots from a single large, suburban school district to follow a cohort

of students over a period of eleven years. Students who were identified for special education services at age three and four were compared to those getting services in kindergarten. These students were sorted into three groups: Group 1 includes students who began receiving special education services at age three (PK3), Group 2 is comprised of students who began receiving special education services at age four (PK4), and Group 3 represents students who began receiving special education services in kindergarten (K).

Population of Study

This study investigates the ECSE program in a particular suburban, midwestern school district. The district examined covers seventy-two square miles in serves students in more than ten cities, municipalities, and townships. During the 2016-17 school year, this district served approximately 28,000 students in forty-five elementary, middle, and high schools (School District, 2017). Of these students, 64.2 percent were white, 9.2 percent were African American, 18.2 percent were Hispanic and 8.4 percent of students' race was identified as other. Over the last five years, the percent of students who were African American or Hispanic has grown slightly, up 0.6 percentage points and 2.2 percentage points respectively. In addition, 37.41 percent of students were categorized as economically disadvantaged due to their free or reduced lunch status. This value was up nearly 2 percentage points over the past five years. The school district also serves a growing population of English Language Learners with 11.26 percent of students needing these specialized services in 2016, up approximately 1 percentage going from 2012. Although the changes occurring in this district are not dramatic, there has been increasing diversity in the area over time. Similarly, in 2016, 8.27 percent of students were identified as eligible for special education services. The rate of special education placement has declined by

approximately 1.3 percentage points since 2012. Finally, the male to female ratio in 2016 was 51.4 to 48.6 (State Department of Education, 2016).

This study followed a cohort of students who began receiving special education services under one of three scenarios. First, any child who began ECSE programming at the age of three during the 2005-2006 school year was included in the study. Second, any child who began receiving ECSE services at age four during the 2006-2007 school year was included as well. Initial comparisons were made between Group 1 – PK3 and Group 2 – PK4 were made in order to determine if these groups should be combined throughout the study or compared to Group 3 in a pairwise fashion. As is noted under research question 1, demographically, Group 1 – PK3 and Group 2 – PK4 were significantly different from one another and this justified maintaining them as separate groups throughout the study. Third, this study also examined those students who began receiving special education services at some point in kindergarten during the 2007-2008 school year. This cohort of students, Group 1 – PK3, Group 2 – PK4, and Group 3 - K, were followed through the end of their eighth-grade year during the 2015-2016 school year. All students in the cohort were in the same grade level throughout the years of analysis as shown in Table 1. The size of group declined in size throughout the duration of the observation period. The decreases in numbers represent students who left the district during the observation period and did not return.

Table 1: Cohort Enrollment by Year

	2005- 2006	2006- 2007	2007- 2008	2008- 2009	2009- 2010	2010- 2011	2011- 2012	2012- 2013	2013- 2014	2014- 2015	2015- 2016
	ECSE age 3	ECSE age 4	K	1 st	2 nd	3 rd	4 th	5 th	6 th	7 th	8 th
Group 1 – PK3	62	62	62	56	53	52	48	45	40	37	35
Group 2 – PK4	--	38	38	33	32	31	29	26	26	25	24
Group 3 - K	--	--	60	48	40	37	31	30	30	28	25

Due to changes in the curriculum and programming that have occurred throughout the observation period, identifying the treatment for this cohort is a challenge. The type of ECSE services students received in this particular district during the 2005-2006 school year or the 2006-2007 depended largely on the individual student. A variety of factors impacted the types of services a student received and where those services were provided. The student’s IEP determined the types of services and the intensity of those services. For example, a student with a speech language disability may have indirect services where the special education teacher structures activities and gives guidance to the classroom teacher in order to support individualized instruction in that area. Alternatively, in more extreme situations, the student may receive more directed services from the speech language pathologist. Similarly, the location of those services can also vary. Some students received their specialized services through a district-provided preschool program while others may receive services in their home or private preschool to satisfy the least restrictive environment requirements under IDEA. Due to FERPA regulations, data are not available that would make it possible to disaggregate how many students received services in different settings and the time intensity of those services. Nevertheless, without specific information about the treatment for individual students or the

curriculum as a whole, it is not possible to control for the nature of student-teacher interactions as was noted by Bartik (2011) and examined for the three exemplary programs.

Quantitative Data Sources & Collection Methods

As referenced above, this study followed a cohort of students who began ECSE programming at the age of three during the 2005-2006 school year, then added students who received ECSE services at age four during the 2006-2007 school year, and also includes students who began receiving special education services during kindergarten in the 2007-2008 school year. This cohort was broken into three groups. Group 1 – PK3 includes 62 students, Group 2 – PK4 includes 38 students, and Group 3 – K includes 60 students for a total of 160 students included in the study. This cohort of students was reexamined based on their special education eligibility status annually through eighth grade during the 2015-16 school year.

The data required for this research were drawn from archived annual May enrollment snapshots stored on secure district servers in the district's Department of Assessment and Research. Data were provided by the coordinator of research and assessment in that school district. Eleven separate annual reports were used to create the required data set. The eleven years began with the 2005-06 school year and continued through the 2015-2016 school year. The data collected in 2005-2006, 2006-2007, and 2007-2008 were used to appropriately identify each student as belonging to Group 1 – PK3, Group 2 – PK4, or Group 3 - K. Any student not identified as receiving special education services under one of the described conditions was eliminated from the data set.

The 2007-08 data set allowed for identification of the critical demographic information. Specifically, the 2007-08 report provided the primary disability, gender, race, and free/reduced lunch status for each student in the study. The remaining annual reports provided an annual accounting of each student's special education eligibility. In preparing the data for analysis a few modifications to the data set were made. First, for students who moved out of the district and then returned to the district in later years, it was assumed that they maintained the same IEP status until their return to the district. This assumption affected seven students in Group 1 – PK3, eight students in Group 2 – PK4, and six students in Group 3 – K. Similarly, there were four total students for whom the data showed that they became ineligible for special education services within the identified timeframe but were later placed back on an IEP. For the purposes of this study, the focus was on the first time that students became ineligible for an IEP and, as a result, their years in special education was calculated based on the first ineligibility date. This assumption impacted two students in Group 1 – PK3 and two students in Group 3 – K. Finally, students who received ECSE services but did not enroll in Kindergarten in the district were removed from the study resulting in the samples sizes outlined in Table 1.

In addition to sorting students into groups based on when they began receiving special education services, the data were coded to create primary disability categories. Primary disabilities are reported as one of fourteen possible disability categories: autism (AM), deaf-blindness (DB), developmental delay (DD), emotional disturbance (ED), giftedness (GI), intellectual disability (ID), hearing impairment (HI), specific learning disability (LD), multiple disabilities (MD), other health impairment (OH), orthopedic impairment (OI), speech/language disabilities (SL), traumatic brain injury (TB), or visual impairment (VI) (Center for Parent

Information and Resources, 2017). For the purposes of this study, the data analysis excluded students with a giftedness (GI) label.

Due to the small samples that occurred in certain low incidence disability categories, the remaining thirteen possible categories were clustered around similar types in order to ensure appropriate group sizes for analysis. For the purposes of this study, specific learning disability (LD) and speech/language disabilities (SL) were considered high-incidence disabilities and were examined individually. Although emotional disturbance (ED) is typically identified as a high incidence disability category, due to a limited number of students in this category (N=3), this category was excluded from analysis in research question 5. Other disability categories were considered low-incidence and clustered to allow for adequate sample sizes (Murray & Pianta, 2007; Wagner & Blackorby, 2002). Specifically, physical impairments, including deaf-blindness (DB), hearing impairment (HI), other health impairment (OH), orthopedic impairment (OI), traumatic brain injury (TB), and visual impairment (VI) were coded together for analysis. Similarly, the remaining cognitive categories, autism (AM), developmental delay (DD), intellectual disability (ID) and multiple disabilities (MD) were clustered for analysis since no individual category had sufficient size to be analyzed individually. Four categories of primary disability were analyzed throughout the study: specific learning disability (LD), speech/language disabilities (SL), clustered physical impairments (PI) and clustered other cognitive impairments (CI) as noted in Table 2 below. Finally, all data were collated for analysis using the variables outlined in Table 3.

Table 2: Primary Disability Groups

Learning Disabled (LD)	Speech/Language (SL)	Physical Impairment (PI)	Cognitive Impairment (CI)
Specific Learning Disability	Speech/Language Disability	Deaf-Blindness	Autism
		Hearing Impairment	Developmental Delay
		Other Health Impairment	Intellectual Disability
		Orthopedic Impairment	Multiple Disabilities
		Traumatic Brain Injury	
		Visual Impairment	

Table 3: Variables and Data Organization

Variable	Description	Codes/Values
ID	Unique student identification number	7-digit identification code
GROUP	Group assignment	1 = Group 1 – PK3 2 = Group 2 – PK4 3 = Group 3 – K
RACE	Student race	1 = American Indian 2 = Asian/Pacific Islander 3 = Black – Non-Hispanic 4 = Hispanic 5 = White – Non-Hispanic 6 = Multi-Ethnic
GENDER	Student gender	0 = Male 1 = Female
LUNCH	Student lunch payment status	0 = Neither 1 = Reduced price 2 = Free
PRIMDIS	Primary disability category	1 = Learning disability (LD) 2 = Speech language (SL) 3 = Physical impairment (PI) 4 = Cognitive impairment (CI)
TIME	Number of years receiving SPED services	Number of years
SPEDSTAT	Special education status in last year of data available for that student	0 = Not in SPED 1 = Still in SPED

Data Analysis Procedures

Research Question 1

- **RQ 1:** In what ways do the characteristics (rates of primary disability, race, gender and free and reduced lunch status) of those who receive ECSE services compare to those who do not receive special education services until Kindergarten?

Initially, simple descriptive statistics and percentage breakdowns were used to describe the composition of the three groups. The purpose of this analysis was to identify the ways in which the groups are alike from a demographic perspective. The makeup of Group 1 – PK3, Group 2 – PK4, and Group 3 -K were calculated and reported independent of the other groups with regards to primary disability, race, gender, and free/reduced lunch status.

In addition to this descriptive analysis, this research question was answered using a series of four chi-square tests for independence. Each test compared whether there is a significant relationship between group classification and one other demographic variable. The first chi-square test for independence analyzed whether the race is independent from group assignment. Similarly, the three remaining chi-square tests analyzed whether gender, free/reduced lunch status, and primary disability respectively were independent from group assignment.

Analysis of this kind helped to critically examine if there were factors that caused statistically significant differences between the types of students who were identified for special education services prior to kindergarten and those that were identified for special education in kindergarten. In other words, this analysis determined if the three groups were similar to one another demographically or if there were factors that caused a certain type of student to be more likely to be in one group or another.

Research Questions 2 and 3

- **RQ 2:** How does the likelihood of eligibility for special education services change over time for students who received ECSE services?
- **RQ 3:** How does the likelihood of eligibility for special education services change over time for students who began receiving special education services in Kindergarten?

These questions include parallel structure that suggests the only difference in the analysis for research question 2 versus research question 3 is the group being analyzed. Rather than comparing the three groups to one another, research questions 2 and 3 compare each group to itself over time through the end of middle school. In order to address these questions, the Groups 1, 2, and 3 were analyzed independently of one another to determine how the rate of special education participation in these groups has changed annually from kindergarten through the end of eighth grade. Under research question 2, Group 1 – PK3 and Group 2 – PK4 were each analyzed separately using a Kaplan Meier survival analysis method in SPSS. This analysis calculated the cumulative number of students who have been deemed ineligible for special education services and the survival ratio annually for each group. This method of analysis accounted for the students who left the district prior to being dismissed from special education services. Because research question 2 included two ECSE groups, a Breslow (generalized Wilcoxon) significance test was used to analyze differences between the survival functions for the two groups. For research question 3, Group 3 - K was analyzed in the same way as Group 1 – PK3 and Group 2 – PK4 were under research question 2 using a Kaplan Meier survival analysis only.

Research Questions 4, 5, and 6

In order to answer the final three research questions, this study used a series of Cox regressions in order to model and compare the survival rates of the groups over time. Model 1 addressed RQ 4, model 2 investigated RQ 5, and models 3, 4, and 6 provided analysis to answer RQ 6. The Cox regression is a form of survival analysis that allows the introduction of specific covariates. The covariate in question for each model depends on the research question under analysis. For RQ 4, model 2 analyzed all three groups' survival rates without any additional covariates. Under RQ 5, the covariate of primary disability category was added to the Cox regression model in order to identify whether this addition led to significance for any of the variables in the regression. Similarly, RQ 6 added in the demographic covariates of race and lunch status individually in models 3 and 4 respectively in order to again identify the impact of those variables on the significance of other factors in the regression. Finally, under model 5, the Cox regression was run with the full model including all available covariates: group assignment, primary disability, race, lunch status, and gender.

Table 4: Cox Regressions

Model 1	Model 2	Model 3	Model 4	Model 5
RQ 4	RQ 5	RQ 6	RQ 6	RQ 6
GROUP	GROUP + PRIMDIS	GROUP + PRIMDIS + RACE	GROUP + PRIMDIS + LUNCH	GROUP + PRIMDIS + RACE + LUNCH + GENDER

- **RQ 4:** Are those students who received ECSE services more or less likely to be eligible for special education services throughout the observation period than those who were identified as needing special education services in kindergarten?

For research question 4, the Cox regression model used TIME as the time variable in order to identify the number of years that a student was part of the study, SPEDSTAT as the status variable to indicate whether a student was still identified as needing special education services when they left the cohort, and GROUP was included as a categorical covariate. The TIME variable indicated the time, in years, that the student was observed with a maximum observation timeframe of eleven years. TIME was determined in one of two methods. First, the first year of IEP service in the district was subtracted from the last year of IEP eligibility. Alternatively, for students who leave the district the time observed was calculated by subtracting the last year of IEP eligibility in the district and the first year of IEP service. The second variable, SPEDSTAT, indicated each student's special education status at the end of the observation period. The third variable, GROUP, was a categorical variable to represent group assignment. Ultimately, this model assisted in identifying how persistence in special education eligibility is significantly related to group assignment and informs an answer to research question 4 (Hosmer & Lemeshow, 1999).

The second Cox regression investigated research question 5 by incorporating a regression model on the survival function (Hosmer & Lemeshow, 1999). Recall that research question 5 is as follows:

- **RQ 5:** To what extent do the impacts of ECSE programming differ based on the student's primary disability?

The second Cox regression expanded on model one and incorporated the additional covariate of primary disability group, as outlined in Table 4, in addition to group assignment in order to determine whether the ECSE program has a differential impact on students with

different types of documented disabilities. This addition of primary disability to the Cox regression model allowed for characterization of changes in the distribution based on both group assignment and primary disability (Hosmer & Lemeshow, 1999). Analysis of the SPSS output in this situation allowed for analysis related to statistical significance of the coefficients on variables in the regression.

The final three Cox regression models supported analysis related to research question 6.

- **RQ 6:** To what extent do the impacts of ECSE programming differ based on the student's free and reduced lunch status, race, or gender?

The third Cox regression model incorporated the covariates of race and free/reduced lunch status one at a time in order to analyze if the ECSE services are more beneficial for students in certain demographic groups. Ultimately, model 3 provided insights into whether there were statistically significant differences in the need for ongoing special education services over time based on race with model 4 providing similar insights with regard to free/reduced lunch status. Finally, model 5 incorporated all the sociodemographic factors: race, lunch status, and gender in order to analyze the combined effects of all covariates.

Summary

In total, the chi-square tests for independence, Kaplan Meier survival analysis, and five Cox regression models combined to answer the research questions that sought to interpret the degree to which ECSE services reduce the need for special education services through the end of eighth grade. Critical analysis of these components provided information on whether students were equally likely to need special education services in eighth grade if they received ECSE interventions at age three or age four, if there is a statistical difference based on when special

education services begin, and if there is there is a differential impact of ECSE services based on primary disability or specific the demographic data of race, socioeconomic status or gender.

Limitations of Study

Although this study provided important program analysis, there are several limitations to the generalizability of the data. First, given that the research followed a cohort of students from the 2005-2006 school year, the results of the research are only applicable to that year's class. In education, programs and processes frequently change year to year. This research does not capture any changes in the nature of ECSE programming since the 2006-2007 school year. Therefore, the results of this study can provide some information about the nature of the ECSE program in those years but is not generalizable beyond that cohort of students. Multiple cohorts and stable programming would be required to have increased generalizability to the district as a whole.

Second, because the analysis in this study focused on a single school district, the results of the study cannot be generalized beyond that district. Although comparisons may be made to the ECSE services provided in other districts, each district is different and these differences limit the ability of this study to be generalized to other locations. The program analysis used in this research could serve as a framework by which other districts could examine their ECSE programs, but in order to increase generalizability, this research would need to be expanded to include multiple districts in multiple regions and with a wide variety of demographic make ups.

Third, this study makes no claims that the ECSE services provided in the district are the cause of any significant findings. There are and were many factors that may influence the findings including differential rates of primary disability categories in the three groups or the

social capital of parents and families needed to access ECSE services in the first place. This study was only able to identify any correlation between ECSE and special education eligibility throughout elementary and middle school.

Fourth, the use of primary disability categories as a major variable for analysis presented problems because of the inherent limitations of the primary disability category itself. The primary disability category is a tool developed by educators and IDEA to be an important indicator of a particular student's unique needs, however the categorization process frequently falls short of describing the academic and physical challenges of that particular student. Parents frequently report multiple disabilities and concerns for students who have a primary disability category other than multiple disabilities (Wagner & Blackorby, 2002). For example, a student with a primary disability category of emotional disturbance (ED) may also have a specific learning disability (LD) or a speech/language impairment (SL). The use of the primary disability category to describe the student's disability masked these additional academic and physical limitations.

Fifth, due to the data that were available, the study used only eligibility for special education to describe progress for students in the study. The use of simple yes or no information about whether a student has an IEP failed to capture any reduction in serviceable minutes a student receives over time. As a result, a student may make significant academic progress and even move from intensive to indirect services but that progress was not captured in this study.

Sixth, and importantly, the ability to investigate the quality of the ECSE programming for the students in this cohort is significantly limited. Given that this study used historical data for a cohort that received ECSE services starting more than twelve years ago, identifying the

particular nature of teacher-student interactions presents a significant challenge. As a result, future research would benefit from analyzing both special education survival rates over time and the nature of the ECSE curriculum and services provided.

Finally, although the author of this dissertation does not have any connection to the ECSE program directly, as a district employee, there are may be some bias due to a degree of partiality.

Chapter 4: Results

The purpose of this study was to examine the impacts of early childhood education programming on students' special education eligibility through the end of middle school by comparing students' persistence in special education programming through the end of eighth grade as compared to students who did not begin receiving special education services until their Kindergarten year. Although there is significant research to support that high quality early childhood education programs may reduce the need for special education services, the research does not examine the impact of early childhood special education services on children who are already identified as eligible for special education at age three or four. In order to address this weakness in the current research, this paper focuses on the following six research questions:

- **RQ 1:** In what ways do the characteristics (rates of primary disability, race, gender and free and reduced lunch status) of those who receive ECSE services compare to those who do not receive special education services until Kindergarten?
- **RQ 2:** How does the likelihood of eligibility for special education services change over time for students who received ECSE services?
- **RQ 3:** How does the likelihood of eligibility for special education services change over time for students who began receiving special education services in Kindergarten?
- **RQ 4:** Are those students who received ECSE services more or less likely to be eligible for special education services throughout the observation period than those who were identified as needing special education services in kindergarten?
- **RQ 5:** To what extent do the impacts of ECSE programming differ based on the student's primary disability?

- **RQ 6:** To what extent do the impacts of ECSE programming differ based on the student's free and reduced lunch status, race, or gender?

In the following sections, the results of the quantitative analysis to answer these research questions will be described.

Research Question 1

In order to answer the first research question, in what ways do the characteristics (rates of primary disability, race, gender and free and reduced lunch status) of those who receive ECSE services compare to those who do not receive special education services until Kindergarten, the three groups (Group 1 – PK3, Group 2 – PK4, and Group 3 – K) were compared using a Chi-Square test for independence to determine if there are statistically significant differences between the groups based on race, gender, lunch status, or primary disability. Prior to running the statistical tests for independence, the demographic characteristics of each group were compared in more general terms to identify proportional composition of the group in terms of race, gender, lunch status, and primary disability respectively.

Race

As displayed in Table 5, initial analysis of Group 1 – PK3, Group 2 – PK4, and Group 3 – K showed that Group 1 is 5 percent Asian/Pacific Islander, 2 percent Black – Non-Hispanic, 6 percent Hispanic, 87 percent White – Non-Hispanic, and 0 percent Multi-Ethnic. By comparison, Group 2 is 5 percent Asian/Pacific Islander, 5 percent Black – Non-Hispanic, 13 percent Hispanic, 74 percent White – Non-Hispanic, and 3 percent Multi-Ethnic while Group 3 is 2 percent Asian/Pacific Islander, 17 percent Black – Non-Hispanic, 12 percent Hispanic, 62 percent White – Non-Hispanic, and 8 percent Multi-Ethnic.

Table 5: Group Assignment and Race

	Asian/Pacific Islander	Black Non-Hispanic	Hispanic	White Non-Hispanic	Multi-Ethnic
Group 1	5%	2%	6%	87%	0%
Group 2	5%	5%	13%	74%	3%
Group 3	2%	17%	12%	62%	8%

A two-way contingency table analysis was also conducted to evaluate whether group assignment was independent of race. The two variables analyzed were group assignment with three levels (Group 1 – PK3, Group 2 – PK4, and Group 3 - K) and race with five levels (Asian/Pacific Islander, Black - Non-Hispanic, Hispanic, White – Non-Hispanic, and Multi-Ethnic). Given that 60 percent of cells had an expected value less than 5, the Likelihood Ratio was used to determine statistical significance. Group assignment and race were found to be significantly related, Likelihood Ratio (8, N=160) = 22.000, $p = 0.005$, Cramer’s V = 0.250. This significant relationship between group assignment and race indicates that group assignment is dependent on race. Additionally, the Cramer’s V value of 0.250 indicates a moderate relationship between these two variables. In other words, the Cramer’s V value indicates that that race has a moderate impact on group assignment.

Gender

Initial analysis of the three groups based on gender, identified that Group 1 is 77 percent male and 23 percent female, Group 2 is 76 percent male and 24 percent female while Group 3 is 83 percent male and 17 percent female. These results are outlined in Table 6 below.

Table 6: Group Assignment and Gender

	Male	Female
Group 1	77%	23%
Group 2	76%	24%
Group 3	83%	17%

A two-way contingency table analysis was conducted to evaluate whether group assignment was independent of gender. The two variables analyzed were group assignment with three levels (Group 1 – PK3, Group 2 – PK4, and Group 3 - K) and gender with two levels (Male and Female). Group assignment and gender were not found to be significantly related, Pearson $\chi^2(2, N=160) = 0.936, p = 0.626$. Although clearly more male than female students are represented in the cohort data, there is not a statistically significant relationship between group assignment and gender. Therefore, group assignment is independent of gender.

Lunch Status

Initial analysis of the three groups and lunch status, identified that Group 1 as being 21 percent free lunch, 23 percent reduced price lunch, and 56 percent of students had full price lunch. By comparison, Group 2 is 26 percent free lunch, 16 percent reduced price lunch, and 58 percent full price lunch while Group 3 is 48 percent free lunch, 10 percent reduced price lunch, and 42 percent full price lunch. These results are outlined in Table 7 below.

Table 7: Group Assignment and Lunch Status

	Free Lunch	Reduced Price Lunch	Full Price Lunch
Group 1	21%	23%	56%
Group 2	26%	16%	58%
Group 3	48%	10%	42%

A two-way contingency table analysis was conducted to evaluate whether group assignment was independent of lunch status. The two variables were group assignment with three levels (Group 1 – PK3, Group 2 – PK4, and Group 3 - K) and lunch status with three levels (Full Price, Reduced, and Free Lunch). Group assignment and lunch status were found to be significantly related, Pearson $\chi^2(4, N=160) = 14.037, p = 0.007$, Cramer’s V = 0.296. This

significant relationship between group assignment and lunch status indicates that group assignment is dependent on lunch status. Similarly, the Cramer’s V value of 0.296 indicates a moderate relationship between these two variables. In other words, the Cramer’s V value indicates that that lunch status has a moderate impact on group assignment.

Primary Disability

Initial analysis of the three groups, Group 1 – PK3, Group 2 – PK4, and Group 3 – K identified that in Group 1, 13 percent of students were identified as having a learning disability, 65 percent were identified as speech/language, 11 percent had a physical impairment and 11 percent had a cognitive impairment. By comparison, in Group 2, 3 percent of students were identified as having a learning disability, 71 percent were identified as speech/language, 5 percent had a physical impairment and 21 percent had a cognitive impairment while in Group 3 18 percent of students were identified as having a learning disability, 62 percent were identified as speech/language, 12 percent had a physical impairment and 5 percent had a cognitive impairment. These results are outlined in Table 8 below.

Table 8: Group Assignment and Primary Disability

	Learning Disability	Speech/ Language	Physical Impairment	Cognitive Impairment
Group 1	13%	65%	11%	11%
Group 2	3%	71%	5%	21%
Group 3	18%	62%	12%	5%

A two-way contingency table analysis was conducted to evaluate whether group assignment was independent of primary disability. The two variables were group assignment with three levels (Group 1 – PK3, Group 2 – PK4, and Group 3 - K) and primary disability with five levels (Learning Disabled, Emotional Disturbance, Speech Language, Physical Impairment,

and Cognitive Impairment). Given that 40 percent of cells had an expected value less than 5, the Likelihood Ratio was used to determine statistical significance. Group assignment and primary disability were found to be significantly related, Likelihood Ratio (8, N=160) = 16.556, $p = 0.035$, Cramer's $V = 0.214$. This significant relationship between group assignment and primary disability indicates that group assignment is dependent on primary disability. Additionally, the Cramer's V value of 0.214 indicates a moderate relationship between these two variables. Overall, the Cramer's V value indicates that that primary disability has a moderate impact on group assignment.

Summary

Overall, the statistical analysis for research question 1 finds that group assignment, and by extension when a student begins receiving special education services, is dependent on race, lunch status, and primary disability for this cohort of students as is summarized in Table 9. Gender does not have a significant correlation with group assignment. A closer look at the results provided in Table 5 and 7 also indicate that white students and students from higher income households tend to begin special education programming earlier than their minority or lower income peers. Interestingly, although there are significantly more males than females in ECSE as is identified in Table 6, this extreme disproportionality is consistent across all groups, and, as a result, gender is unrelated to group assignment. Additionally, Table 8 indicates that the primary disabilities of speech/language and cognitive impairment are over-represented in Group 2 as compared to the other two groups.

Table 9: Summary of Chi-Square Tests for Independence of Covariates

	df	X² Value	p-value	Cramer's V
Race	8	22.000	0.005	0.250***
Gender	2	0.936	0.626	--
Lunch Status	4	14.037	0.007	0.296***
Primary Disability	8	16.556	0.035	0.214***

***moderate relationship

Research Question 2

In order to answer the second research question, how does the likelihood of eligibility for special education services change over time for students who received ECSE services, a Kaplan Meier survival analysis was run for Group 1 – PK3 and Group 2 – PK4 respectively using SPSS. In analyzing Group 1 and Group 2 over the specified time frame, a large percentage of students became ineligible for special education services. As is outlined in Table 10, Group 1 – PK3 started with 62 students and through then end of eighth grade 31 (50 percent) of them were dismissed from special education services. Put another way, 31 students experienced the ‘hazard’ of the model and were dismissed from special education services. Also, for Group 1- PK3, 27 students (44 percent) were censored in the data set meaning that they moved out of the district during the observation period. Similarly, Group 2 – PK4 started with 38 students and through the end of eighth grade 21 (55 percent) became ineligible for special education. Group 2 – PK4 had 14 students (37 percent) censored.

For the purposes of this study, ‘survival’ represents students who continued to be eligible for and receive special education services. Similarly, the ‘hazard’ in the model represents students who became ineligible for special services. Additionally, for the purposes of this study, ineligibility of special education and being dismissed from or exiting special education all

indicate that through an IEP review process, the student was identified as no longer needing special education services.

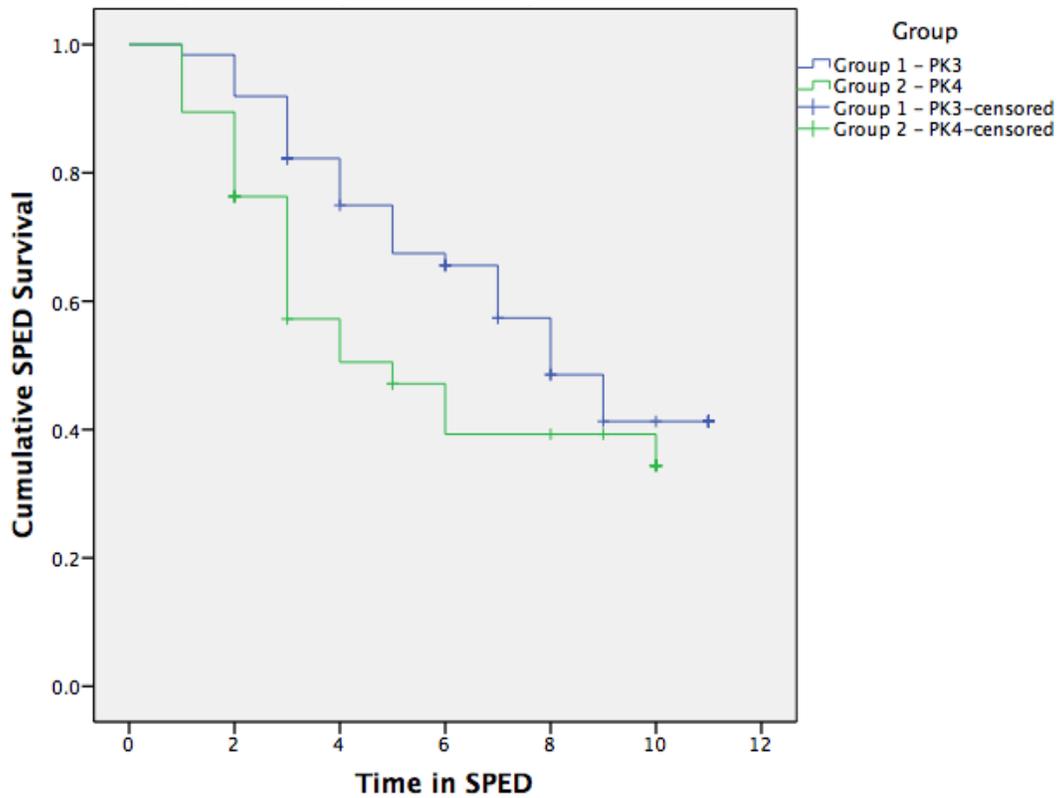
Table 10 below outlines the cumulative survival proportion at the end of each school year. In Table 10, Years represents the number of years of possible special education service provided, the Number of Events indicates the cumulative number of students who have been dismissed from special education, and the Estimate column is the proportion of students in that particular group who continued to need special education services at the given point in the observation period. SE gives the standard error of that Estimate.

Since all students were followed through the end of eighth grade, students in Group 1 – PK3 may have up to 11 years of data while students in Group 2 – PK4 have up to 10 years of data. Graph 1 represents the changes in the estimate values that are provided in Table 10 over the given timeframe and identifies the points in time when a student is censored from the data set. For this study, a student is censored if he or she moves out of the school district. Graph 1 gives a visual representation of the likelihood that a student in the given group will leave special education services at the given point in time assuming that they have not left special education yet.

Table 10: Cumulative Survival Rates Over Time for Groups 1 and 2

Years	Cumulative Proportion Surviving at the Time					
	Group 1 – PK3			Group 2 – PK4		
	# of Events (dismissed)	Estimate	SE	# of Events (dismissed)	Estimate	SE
1	1	0.984	0.016	4	0.895	0.050
2	5	0.919	0.035	9	0.763	0.069
3	11	0.823	0.049	15	0.572	0.085
4	15	0.749	0.056	17	0.505	0.087
5	19	0.675	0.062	18	0.471	0.088
6	20	0.656	0.063	20	0.393	0.089
7	24	0.574	0.067	20	0.393	0.089
8	28	0.486	0.070	20	0.393	0.089
9	31	0.413	0.071	20	0.393	0.089
10	31	0.413	0.071	21	0.344	0.090
11	31	0.413	0.071			

Figure 1: Groups 1 & 2's Special Education Survival Functions



In addition to the descriptive analysis of the survival rate provided by the Kaplan Meier survival analysis, Group 1 – PK3 and Group 2 – PK4 were compared to see if the groups are statistically distinct in terms of their survival rates. A Breslow (generalized Wilcoxon) test was run to determine if there were statistically significant differences in the survival distribution for those students who began ECSE at age 3 as compared to those who began ECSE at age 4. The survival distributions for the two groups were statistically different, $\chi^2 (1) = 5.609$, $p = 0.018$. Given that the p-value is less than 0.05 and that the two lines in Graph 1 never cross, the differences between Group 1 and Group 2 are considered statistically significant. Also, as outlined in the Graph 1, students in Group 2 – PK4, had a lower survival rate over time than students in Group 1 – PK3. Put another way, students who were in Group 2 were more likely to stop being eligible for special education services at any point in time than students in Group 1 – PK3.

Research Question 3

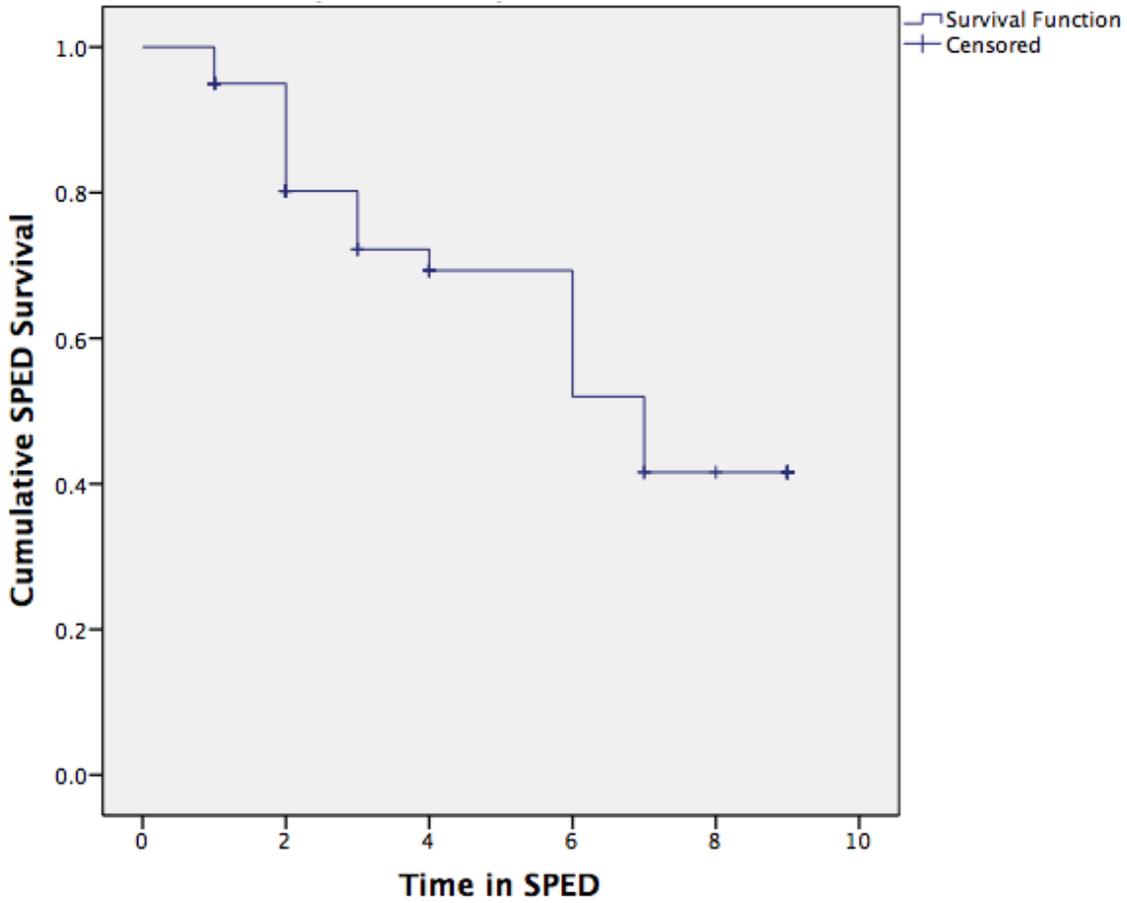
In order to answer the third research question, how does the likelihood of eligibility for special education services change over time for students who began receiving special education services in Kindergarten, a Kaplan Meier survival analysis was run for Group 3 – K. Just as with research question 2, ‘survival’ represents students who continued to be eligible for and receive special education services. Similarly, the ‘hazard’ in the model represents students who became ineligible for special services. Group 3 - K started with 60 students and through then end of eighth grade 22 (36.7 percent) of them became ineligible for special education services. Similarly, 35 students (58 percent) were censored from the data set due to leaving the district prior to the end of the observation period. Table 11 below outlines the cumulative survival

proportion at the end of each school year. Just as it did in research question 2, years represents the number of years of possible special education service provided, the number of events indicates the cumulative number of students who have been dismissed from special education, the estimate gives the proportion of students from Group 3 who continued to receive special education services at the given point in the observation period, and SE gives the standard error of that estimate. Group 3 - K students were followed for up to 9 years. Similarly, Graph 2 models the hazard function for Group 3 - K and graphically represents the changes in the estimate values that are provided in Table 11 over the given timeframe and identifies the points in time when a student is censored from the data set.

Table 11: Cumulative Survival Rates Over Time for Group 3

Cumulative Proportion Surviving at the Time			
Group 3 – K			
Years	# of Events	Estimate	SE
1	3	0.950	0.028
2	10	0.802	0.057
3	13	0.722	0.067
4	14	0.693	0.070
5	14	0.693	0.070
6	19	0.520	0.085
7	22	0.416	0.087
8	22	0.416	0.087
9	22	0.416	0.087

Figure 2: Groups 3's Special Education Survival Function



Research Question 4

Research question 4 seeks to examine whether students who received ECSE services were more or less likely to be eligible for special education services over time than those who were identified as needing special education services in kindergarten. In order to answer this research question, a Cox Regression was used to model the relative survival of the groups over time. Table 12 below outlines the results of the Cox Regression analysis that compared Groups 1 – PK3 to Group 2 – PK4 and Group 3 - K respectively. The B value in the table represents the

coefficient for the GROUP assignment in the regression. A negative B value indicates that the group is less likely to become ineligible for special education services than Group 1 – PK3 while a positive B value indicates that the group identified is more likely to become ineligible for special education services than Group 1 - PK3. In addition, the coefficient value, B, the standard errors (SE) are include in the table. Similarly, the Exp(B) is the hazard ratio and is a value that allows for a more specific comparison of that the variables. When the one is subtracted from Exp(B), the percent more or less likely to exit special education can be identified. Finally, statistical significance is noted on the B value when appropriate.

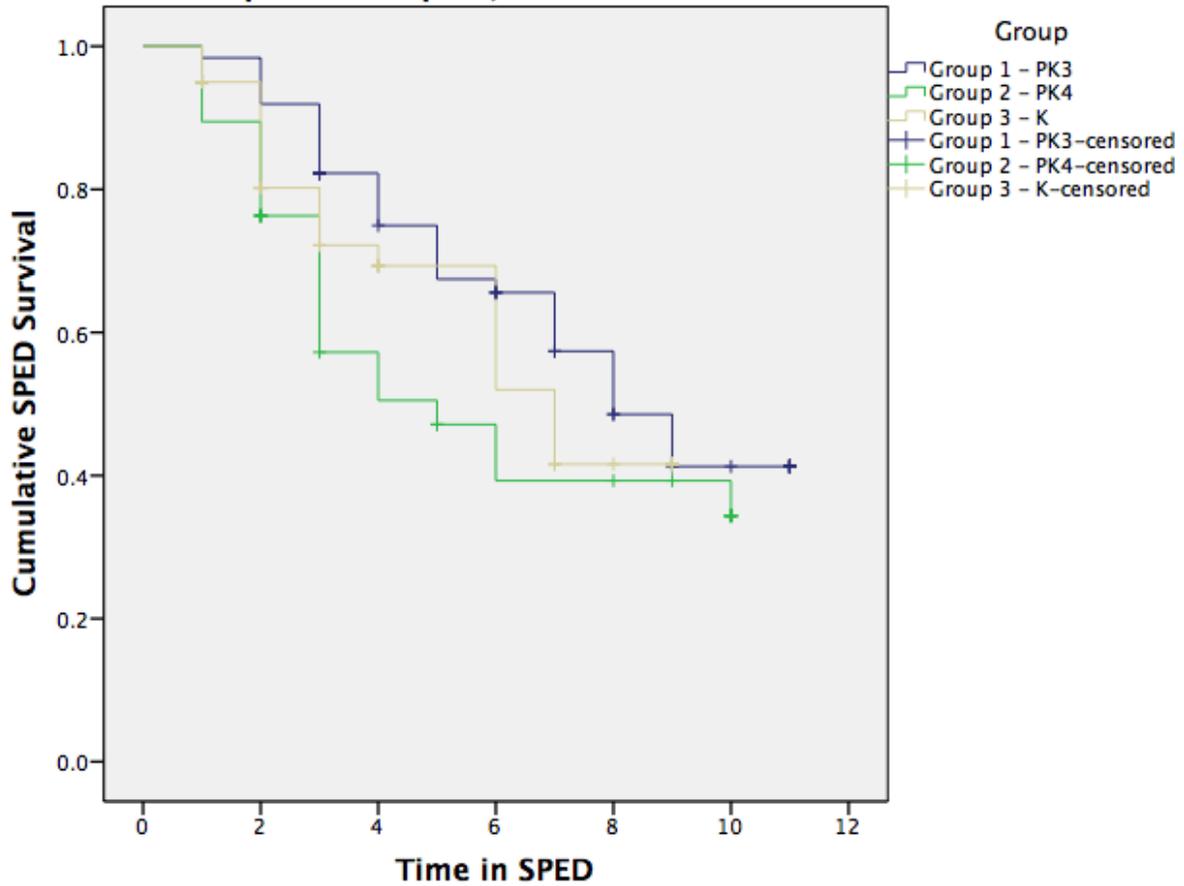
Table 12: Model 1-Cox Regression on Group Assignment

	Model 1 – RQ4	
	B (SE)	Exp(B)
Group – Compare to Group 1 – PK3		
Group 2 – PK4	0.448 (0.284)	1.566
Group 3 – K	0.205 (0.281)	1.227

*p<0.10, **p<0.05, ***p<0.01

As outlined in Table 12, in the Cox Regression involving group assignment none of the variables are statistically significant. Graph 3 provides an alternative representation of the relative survival rates of all three groups. Interestingly, and in alignment with the information provide under RQ 2 and RQ 3 described above, Group 2 – PK4 consistently has the lowest survival rate (highest rate of dismissal special education) among all three groups and Group 3 has the second lowest survival rate at all but two checkpoints throughout the period under examination.

Figure 3: Groups 1, 2 and 3's Special Education Survival Functions



Research Question 5

Research question 5 seeks to examine to what extent the impacts of ECSE programming differ based on the student's primary disability. Recall that Table 2 outlined the primary disability categories used for this analysis. Specific learning disability (LD) and speech/language (SL) were considered independently. Due to the small number of students identified with emotional disturbance (ED) was too small for analysis, these students are excluded from analysis for this research question. Similarly, physical impairments, including

deaf-blindness (DB), hearing impairment (HI), other health impairment (OH), orthopedic impairment (OI), traumatic brain injury (TB), and visual impairment (VI) were coded together for analysis, while the remaining cognitive categories, autism (AM), developmental delay (DD), intellectual disability (ID) and multiple disabilities (MD) were clustered for analysis since no individual category had sufficient size to be analyzed individually. Ultimately, the four categories of primary disability were analyzed throughout the study: specific learning disability (LD), speech/language disabilities (SL), clustered physical impairments (PI) and clustered other cognitive impairments (CI) as noted in Table 2. In order to answer this research question, two Cox Regression analyses were used to model the relative survival of the groups over time with the addition of a covariate for primary disability. In addition, throughout this analysis, all comparisons are made in contrast to Group 3 for group assignment and to the cognitive impairment (CI) category for primary disability.

First, a Cox Regression was run to compare the survival rates (persistence in special education) for Groups 1 and 3 with primary disability incorporated as an additional covariate. Table 13 below outlines the results of the Cox Regression analysis that compared Groups 1 – PK3 to Group 2 – PK4 and Group 3 - K respectively in addition to comparing the primary disability category of cognitive impairment to learning disability, speech language and physical impairment respectively.

Table 13: Model 2-Cox Regression on Group Assignment & Primary Disability

	Model 2 – RQ5	
	B (SE)	Exp(B)
Group – Compare to Group 1 – PK3		
Group 2 – PK4	0.487* (0.287)	1.628
Group 3 – K	0.266 (0.292)	1.305
Primary Disability – Compare to Cognitive Impairment		
Learning Disabled	0.412 (0.534)	1.509
Speech Language	0.632 (0.410)	1.882
Physical Impairment	-1.033 (0.805)	0.356

*p<0.10, **p<0.05, ***p<0.01

When the primary disability covariate was added to Model 2, a statistically significant difference between Group 1 – PK3 and Group 2 – PK4 is identified. In this situation, when one is subtracted from the hazard ratio $\text{Exp}(B) = 1.628$ we find that students in Group 2 – PK4 are 62.8% more likely to become ineligible for special education at any given point in time during the observation period as compared to students in Group 1 – PK3 assuming that they have not already become ineligible for special education services. The differences between Group 1 – PK3 and Group 3 – K are still not statistically significant under Model 2.

Research Question 6

Research question 6 is similar to research question 5 in that it examines the impact of additional covariates on the impacts of ECSE. Where research question 5 examines the impacts of the primary disability status on the rate of persistence in special education, research question 6 adds additional covariates to model 2. For this research question, a series of Cox regression analyses were conducted to build upon model 2 with the addition of a covariates for race and

lunch status respectively. Finally, a full model Cox regression was run that incorporated group assignment, primary disability, race, lunch status and gender.

Model 3 – Group Assignment, Primary Disability & Race

For model 3, a Cox regression analysis was conducted to analyze group assignment, primary disability, and race. With the addition of the race variables, as compared to model 2, additional coefficients are identified as statistically significant as is outlined in Table 14. Under this new model, the coefficient for the Group 2 – PK4 is statistically significant as is the coefficient for Speech Language under the primary disability covariate.

Table 14: Model 3-Cox Regression on Group Assignment, Primary Disability & Race

	Model 3 – RQ6	
	B (SE)	Exp(B)
Group – Compare to Group 1 – PK3		
Group 2 – PK4	0.487* (0.294)	1.627
Group 3 – K	0.171 (0.308)	1.187
Primary Disability – Compare to Cognitive Impairment		
Learning Disabled	0.510 (0.548)	1.666
Speech Language	0.726* (0.429)	2.068
Physical Impairment	-0.951 (0.822)	0.386
Race – Compare to Multi-Ethnic		
Asian/Pacific Islander	-0.951 (0.792)	0.386
Black – Non-Hispanic	-0.347 (0.689)	0.707
Hispanic	-0.459 (0.612)	0.632
White	-0.548 (0.554)	0.578

*p<0.10, **p<0.05, ***p<0.01

Using the hazard ratios in this situation to explain the impacts of these variables finds that Group 2 – PK4 students are 62.7% more likely to become ineligible for special education services when compared to Group 1 – PK3 students over the given timeframe assuming that they were not already dismissed from special education. Just as was identified in Model 2, there is not a statistically significant difference between the survival rates of Group 1 – PK3 and Group 3 – K in the observation period. Similarly, students who are identified with a speech language primary disability are 106.8% more likely to become exited from special education services at any point in the given timeframe than students who were classified as having a cognitive impairment assuming the student has not already been dismissed from special education. Neither students identified as having a learning disability nor those with a physical impairment were different at a statistically significant level from those with a cognitive impairment.

Model 4 – Group Assignment, Primary Disability & Lunch Status

For model 4, a Cox regression analysis was conducted to analyze group assignment, primary disability, and lunch status. With the addition of the variables for lunch status as an additional covariate, additional coefficients are identified as statistically significant as is outlined in Table 15. In model 5, the coefficients for the Group 2 – PK4, Speech Language and Reduced-Price Lunch are statistically significant. Using the hazard ratios for this model to explain the impacts of these variables indicates that Group 2 – PK4 students are 67.2% more likely to become ineligible for special education services when compared to Group 1 – PK3 students over the given timeframe. In Model 4 there still is not a statistically significant difference between Group 1 – PK3 and Group 3 – K.

Students who are identified with a speech language primary disability are 105.8% more likely to become exited from special education services at any point in the given timeframe than students who were classified as having a cognitive impairment. Finally, students who receive reduced-price lunch are 87.8% more likely to be dismissed from special education services than students who receive a free school lunch assuming they have not already been dismissed.

Table 15: Model 4-Cox Regression on Group Assignment, Primary Disability & Lunch Status

Model 4 – RQ6		
	B (SE)	Exp(B)
Group – Compare to Group 1 – PK3		
Group 2 – PK4	0.514* (0.290)	1.672
Group 3 – K	0.430 (0.307)	1.537
Primary Disability – Compare to Cognitive Impairment		
Learning Disabled	0.439 (0.533)	1.551
Speech Language	0.722* (0.418)	2.058
Physical Impairment	-0.842 (0.816)	0.431
Lunch Status – Compare to Free Lunch		
Full Price	0.310 (0.305)	1.364
Reduced Price	0.630* (0.382)	1.878

*p<0.10, **p<0.05, ***p<0.01

Model 5 - Group Assignment, Primary Disability, Race, Lunch Status & Gender

When model 5, which is the full model that incorporates group assignment, primary disability, race, lunch status, and gender is analyzed, only the coefficients for Group 2 – PK4 and Speech Language remain statistically significant. The effect of receiving reduced price lunch is mitigated by the race and gender covariates. Much like in the previous models, Group 2 – PK4 is 64.7% more likely to be exited from special education services than students in Group 1 – PK3 at any given point in the observation period assuming they have not already been dismissed from

special education. Similarly, students who are identified with the primary disability of speech language are 121.8% more likely to become ineligible for special education services than students who are identified with a primary disability in the cognitive impairment category at any point in the observation period when they have not already become ineligible.

Table 16: Model 5-Full Model Cox Regression

	Model 5 – RQ6	
	B (SE)	Exp(B)
Group – Compare to Group 1 – PK3		
Group 2 – PK4	0.499* (0.299)	1.647
Group 3 – K	0.325 (0.322)	1.384
Primary Disability – Compare to Cognitive Impairment		
Learning Disabled	0.517 (0.545)	1.677
Speech Language	0.796* (0.433)	2.218
Physical Impairment	-0.778 (0.830)	0.459
Race – Compare to Multi-Ethnic		
Asian/Pacific Islander	-1.018 (0.804)	0.361
Black – Non-Hispanic	-0.266 (0.706)	0.767
Hispanic	-0.395 (0.632)	0.673
White	-0.510 (0.558)	0.601
Lunch Status – Compare to Free Lnch		
Full Price	0.334 (0.310)	1.396
Reduced Price	0.612 (0.383)	1.844
Gender – Compare to Female		
Male	-0.155 (0.310)	0.856

*p<0.10, **p<0.05, ***p<0.01

Summary

The six research questions provided the necessary framework to investigate the impacts of ECSE programming in a particular suburban school district and to examine the

sociodemographic characteristics of students who are identified for ECSE services at age 3, age 4 and those who did not begin receiving special education services until kindergarten. Initial analysis that there are statistically significant differences between the groups based on race, lunch status, and primary disability. This finding indicates that students are not all equally likely to begin receiving special education services at the same time. Depending on the student's race, socioeconomic status and disability category, he or she may be more or less likely to begin receiving services prior to kindergarten enrollment or at age 3 rather than age 4.

Group 1 – PK3, Group 2 – PK4, and Group 3 – K were then analyzed separately to calculate each group's survival function. This survival function provides the probability of a student in that particular group continuing in special education services at any given point in the observation period assuming he or she has not already been dismissed from special education while also accounting for censored data. As is outlined in Tables 11 and 12 as well as Graph 3, these survival rates are calculated at each point in the observation period for each group and then can be compared over time. Surprisingly, Group 2 – PK4 had the lowest survival rate (highest rate of dismissal from special education) throughout the observation period.

A summary of the findings from research questions 4, 5, and 6 are outlined in Appendix B where all Cox regression models are compared. Although model 1 did not indicate any statistical significance for group coefficients, with the addition of the primary disability covariate in model 2, the coefficient for Group 2 – PK4 was statistically significant indicating that students in that group were significantly more likely to be dismissed from special education services than students in Group 1 – PK3. When compared to Group 1 – PK4, there was no such significance

for Group 3 – K. Ultimately, in model 2, when primary disability was controlled for, Group 2 – PK4 was identified as more likely to experience the hazard than students in Group 1 – PK3.

Under model 3, when group assignment, primary disability and group assignment were considered as covariates, Group 2 – PK4 was still superior to Group 1 – PK3 with regard to reducing the need for special education services. Additionally, although race had no statistical significance in the model, when it was controlled for, students with a speech language disability were identified as more likely to become ineligible for special education as compared to students with a cognitive impairment. Similarly, in model 4, group assignment, primary disability and lunch status were included in covariates. Much like model 3, Group 2 – PK4 was again identified as more likely to become ineligible for special education services than Group 1 – PK3 and students with speech language as their primary disability were more likely to become ineligible for services as compared to students with a cognitive impairment. In this model, however, students who received a reduced-price lunch were more likely to become ineligible for special education services than students who received a free lunch.

The final model, model 5, incorporated group assignment, primary disability, race, lunch status and gender. When all these sociodemographic variables are controlled for, Group 2 – PK4 continues to be more likely to become ineligible for special education than Group 1 – PK3 (with Group 3 – K not being statistically different from Group 1 – PK3) and students whose primary disability is listed as speech language are more likely to become ineligible for special education than students with a cognitive impairment. Under this final model, all other effects fall away.

Chapter 5: Discussion

A vast body of research indicates that ECE has wide-ranging benefits for students in both the short and long term. Among these benefits, research has identified that students who participated in high quality ECE programming are less likely to need special education services throughout their schooling. This belies an economic benefit to early investment in education for children and supports the idea that early intervention works due to the alignment of intervention to a timeframe when children's brains are developing most rapidly. Nevertheless, the dearth of research on the impacts of ECE programming on students who have already been identified as requiring special education services is a significant weakness in the current literature. It is critical to note that although ECE research is used as a foundation for this study, this study is, nevertheless, narrowly focused on the impacts of ESCE.

The results of this study begin the process of addressing this gap in the literature and beg many questions that can be addressed by future research. In this chapter, the findings related to each research question are examined in the context of the existing literature in order to draw meaning from the findings and to answer the question. General findings and conclusions will be discussed and the limitations of this study are examined in the context of areas for future research.

Research Question 1

Research question 1 asked: In what ways do the characteristics (rates of primary disability, race, gender and free and reduced lunch status) of those who receive ECSE services compare to those who do not receive special education services until Kindergarten? Through some descriptive analysis of the groups and four Chi-Squared Test of Independence, and as

outlined in Table 9 on page 79, three of the four sociodemographic variables have a statistically significant association with group assignment. Specifically, there is a relationship between race, lunch status, and primary disability and group assignment respectively. Only for gender was there not a statistically significant relationship in gender representation based on group assignment. That said, all three groups contain far higher rates of male to female students than the general student population.

As was outlined in the literature review, research indicated that while there is an overrepresentation of racial minority students in special education in general, there is likely an underrepresentation of these students in ECSE programming (Harry & Anderson, 1994; Pinechura-Couture, Heins, & Tichenor, 2013; Morgan et al., 2015). Closer inspection of Table 5 on page 75, coupled with the significant results of the Chi-Square Test, supports Morgan et al.'s (2015) research that suggests that minority overrepresentation may not hold true for ECSE. Group 1 – PK3 consists of just 2 percent black students compared to 5 and 17 percent black students respectively for Group 2 – PK4 and Group 3 – K. When these values are compared to 9.2 percent black students in the district's population as a whole during the 2016-2017 school year, it appears that black students are underrepresented in ECSE but overrepresented in the Kindergarten group. This level of underrepresentation supports the **emerging** literature that racial minority students are less likely to be identified for ECSE services due to less access to the professionals who support early identification such as pediatricians and preschool teachers (Morgan et. al., 2015; Rhoad-Drogalis, 2018). Morgan et. al. (2015) also suggested that access to these kinds of professionals is more closely tied to socioeconomic status than it is to race, but,

regardless of the defining characteristics, the level of social capital and parental efficacy is critical to early identification and impacts a student's access to early intervention through ECSE.

Additionally, the overrepresentation of black students in Group 3 - K may be the result of delayed identification of students who were overlooked for participation in ECSE programming. In support of this corrective identification hypothesis, when all three groups are considered together, 8.7 percent of students in all three groups are black. This proportion is well within the plus or minus 15 percent range when compared to the school population as a whole that is outlined by Chinn and Hughes (1987). Given that the district population is 9.2 percent black, the proportionate range according to Chinn and Hughes (1987) would be between 7.82 and 10.58 percent. 8.7 falls well within this acceptable range. In terms of minority disproportionate representation, the findings of this study indicated that racial minority students, especially black students, are underrepresented in ECSE programs but they identified at such a rate in Kindergarten that results in a more proportional representation. It is important to note that the participation rates of racial minority students are not consistent across ECE and ECSE. Specifically, many ECE programs are targeted to students with specific risk factors that result in higher than expected rates of racial minority students. ECSE programs, on the other hand, both in Morgan et. al.'s (2015) research and in this study, tend to have much lower than expected rates of racial minority student identification.

When considering the question of whether group assignment is dependent on gender, the results of the Chi-Square Test of Independence found that there is not a significant relationship between gender and group assignment. This finding is the result of the fact that the ratio of male to female students across the three groups is fairly consistent. However, it is important to note

despite the fact that group assignment is not dependent on gender, on the whole, male students are significantly overrepresented in ECSE. In all three groups, in excess of 75 percent of students identified for special education services were male. When compared to the district being 51.4 percent male, this overrepresentation of male students supports the current literature that suggests male students are more frequently identified for special education services due to neurological and developmental differences (Rhoad-Drogalis, 2018; Pinechura-Couture et al., 2013). These differences in male and female perception, both auditory and visual, are likely to be especially acute at an early age. Despite the fact that male students are identified for special education in this study at a rate of 3 or 4 to 1 compared to female students, gender did not have an impact on when a student would be identified to begin receiving special education throughout the study. In addition to the differences in auditory and visual perception for male and female students, boys' active behavior is also often a reason for male overrepresentation in ECSE (Skrtic, 2012).

The fact that a socioeconomic factor such as lunch status was significantly related to group assignment is also unsurprising given the literature. Morgan et. al. (2015) argued that students from low income households were significantly less likely to be identified for ECSE but were much more likely to be identified for special education during K-12 schooling. In much the same way that racial minority students are not identified at the same rate for ECSE services, the same can be said for students from low-income households. Similarly, just as the difficulty in identifying eligible students from low-income households for ECSE may stem from identification disparities in the Part C programs under IDEA (the infant toddler programs), the

access to resources such as physicians and outside child care may perpetuate these differences and hinder identification (Morgan et. al., 2015).

As is outlined in Table 7 on page 76, in this study the proportion of students in Group 1 – PK3 who received free lunch was less than half of that of Group 3 – K with 21 percent and 48 percent respectively. While this may initially suggest that low income students are less likely to be identified for ECSE services, when students receiving free and reduced-price lunches are combined the gap between Group 1 – PK3 and Group 3 – K narrow significantly to 44 and 58 percent respectively. Nevertheless, given that students receiving free lunch represent higher poverty than those receiving a reduced-price lunch, there is some indication that there is disparity in the timing when and rate at which students are identified for ECSE services.

Across all three groups the rate of participation of low-income students (students receiving free or reduced-price lunch) are over represented in all three groups as compared to the district's population as a whole. Specifically, the district was noted to be 37.41 percent free or reduced lunch with Group 1 – PK3, Group 2 – PK4, and Group 3 – K having 44, 42, and 58 percent of students receiving free or reduced-price lunch respectively. Overall, the overrepresentation of low income students in special education as a whole confirms the research of Morgan et. al. (2015), but given that low income students are consistently overrepresented in ECSE programming as well contradicts Rhoad-Drogalis's (2018) research suggesting that low income students are not identified for special education prior to kindergarten at equitable rates due to more limited access to critical means of identification. Much like was outlined with regard to racial minority students, this pattern of identification is likely the result of differing

levels of parental efficacy, differences in social capital, and differential access to primary care physicians and preschool professionals.

Finally, primary disability was also identified as being significantly related to group assignment. Although the fact that well over half of the students in all three groups are identified as needing services in the area of speech/language is unsurprising given the literature indicating that educators tend to identify speech/language concerns earlier than many other disabilities in order to avoid stigmatizing a student too early (Rhoad-Drogalis et. al., 2018), the relative proportions of the categories in three groups did not follow a predictable pattern. Closer inspection of Table 8 on page 77 shows that Group 2 – PK4 has higher rates of speech/language identified students and students with a primary disability in the cognitive impairment category than Group 1 – PK3 and Group 3 - K. By contrast, Group 1 – PK3 and Group 3 – K had higher rates of students with primary disabilities of learning disabled or a disability in the physical impairment category than Group 2 – PK4 did. It is unclear what contributes to these patterns of primary disability proportions, but the results for research question 5 and 6 clearly relied on these differences. Ultimately, these differences in primary disabilities across groups likely contribute to why Group 2 – PK4 has the lowest survival rates.

Overall, in answer to research question 1, the three groups of students that are analyzed throughout this study are not equivalent to one another from a sociodemographic standpoint. There are specific differences in the three groups that largely support the current literature regarding disproportionate representation and the disability classifications that are most frequently identified for ECSE. The major contradiction that this study provided to the current literature is that black students were neither over nor underrepresented on the whole across the

three groups as the current literature argues they are likely to be (Harry & Anderson, 1994; Pinechura-Couture, Heins, & Tichenor, 2013, Morgan, et. al., 2015). Even though there are significant differences in the racial makeup across the groups, when all three groups are taken together, black students appear to be appropriately represented in special education as compared to the general education population. Nevertheless, there is still work to do to ensure that students from various at-risk populations are identified at equitable rates for early intervention and ECSE services.

Research Question 2

Research questions 2 asked: How does the likelihood of eligibility for special education services change over time for students who received ECSE services? Table 10 and Figure 1 on pages 81 outline the cumulative survival rates for Group 1 – PK3 and Group 2 – PK4 over the observation period. As these displays indicate, the percent of students surviving in special education declines much more rapidly early in the observation timeframe for Group 2 – PK4 than it does for Group 1 – PK3. By contrast, Group 1 – PK3’s survival rates decrease by approximately regular intervals over time. However, both groups’ survival rates begin to flatten out almost asymptotically. For Group 1 – PK3, this flattening occurs between fifth and sixth grades whereas it occurs between third and fourth grade for Group 2 – PK4.

Given the gap in the current literature, there are not studies that specifically examine the rates at which students who received ECSE services become ineligible for special education services over time. Instead, this initial description of the survival function, the stepwise function that models the percentage of the cohort remaining in special education at a given point in time, set the stage for further analysis.

Throughout the observation period, Group 2 – PK4 was found to have a lower survival rate than Group 1 – PK3 students and the difference between the two groups' survival rates was statistically significant. This finding appears to contradict the initial hypothesis that students who received ECSE for two years would show higher rates of dismissal than students who only received one year of ECSE services. Throughout the literature presented, researchers agreed that the timing of ECSE aligned with a phase of neurological development which made this time frame especially primed to support intervention for students who needed it (Anderson, et. al, 2003; Blackman, 2000; Heckman, 2006; McAdams, et. al., 2004; Shonkoff, 2007). Along these same lines, evidence from the three exemplary programs, the Perry Preschool Project, Abecedarian Project, and the Chicago Child-Parent Center Program, indicated that increased time intensity of ECE programming tended to have larger net benefits from an economic perspective (Bartik, 2011). This study, by contrast, found that for the particular benefit under examination – ineligibility for special education services – additional time intensity was inversely related to the desired outcome. Instead, students who only received one year of ECSE services were more likely to become ineligible for special education services at any given time in the observation than the students who received two years of services. However, Group 2 – PK4 also had the highest rates of Speech Language identified students who were found to be the ones most likely to become ineligible for services.

Referring back to the results associated with research question 1 may provide some insight as to why additional time intensity did not result in reduced need for special education services. As is examined in more detail in research questions 5 and 6, the composition of Group 2 – PK4 in terms of primary disability classification rates, racial breakdown and socioeconomic

makeup compared to Group 1 – PK3 may help to explain this outcome. On the whole, Group 2 – PK4 tended to have higher rates of racial minority students (specifically black and Hispanic), students receiving free lunch, and speech language or cognitive impairment identification than Group 1 – PK3. The current literature around special education identification suggests that students who are less demographically like the educators who assist with the identification process are more likely to be identified for special education services through inherent biases in the identification and evaluation processes (Skrtic, 2012; Harry & Anderson, 1994). If that logic holds true, then a group with high rates of these students (i.e. racial minority and low income) should also be more likely to stay in special education services over time (Morgan et. al., 2015). Nevertheless, this study found just the opposite that the group with high rates of minority and free lunch students were less likely to continue needing special education services. This may suggest that primary disability categorization plays a bigger role in special education survival rates for students in ECSE than other demographic factors. This hypothesis is explored in further detail with research questions 5 and 6.

Research Question 3

Research question 3 asked: How does the likelihood of eligibility for special education services change over time for students who began receiving special education services in Kindergarten? In contrast to Group 1 – PK3 which had relatively consistently sized decreases in survival proportions over time and Group 2 – which had larger decreases in beginning with a leveling off that occurred earlier in the observation, Group 3 – K’s survival rates and graph do not show similar patterns. Instead, a large portion of students would become ineligible at a time with a few years where no one else became ineligible for special education as is outlined in

Table 11 and Figure 2 on pages 83 and 84. Similarly, like Group 1 – PK3, Group 3 – K began leveling off between fifth and sixth grades. These generalized and descriptive findings are further analyzed under research questions 4, 5, and 6, where all three groups are compared to one another.

Research Question 4

Research question 4 asked: Are those students who received ECSE services more or less likely to be eligible for special education services throughout the observation period than those who were identified as needing special education services in kindergarten? As is noted in Figure 3 on page 86, Group 2 – PK4 consistently has the lowest survival rates in special education of the three groups. Group 1 – PK3, with the exception of two checkpoints in the observation period, consistently had the highest survival rates for students in special education. Group 3 – K's survival rates typically fell somewhere between the other two groups when censored data was accounted for. This rough analysis contradicts the literature in much the same way that it did under research question 2. Given all the research about the importance of the timing of intervention (Shonkoff, 2007; Heckman, 2006, Bartik, 2011), it is surprising that Group 1 – PK3 had the highest survival rates in special education. Further investigation of the differences in the survival rates for the groups during the observation period with the Cox regression analysis in model 1 (described in Table 12 on page 85) found that group assignment does not have a statistically significant impact on special education survival during the observation period. This finding gets more fully investigated and interrogated in the final two research questions.

Research Question 5

Research question 5 asked: To what extent do the impacts of ECSE programming differ based on the student's primary disability? In short, primary disability appears to have an impact on the impacts of ECSE programming but not always in the ways expected. For research question, a Cox regression was run that investigated the impact of group assignment and primary disability on student persistence in special education over time. As was noted under research question 4, when group assignment alone was analyzed in this way, there was no statistical significance; however, when primary disability was controlled for, a statistically significant difference between the survival rates of Group 1- PK3 and Group 2 – PK4 was identified. Put another way, when primary disability was controlled for, Group 2 – PK4 was found to be approximately 63 percent more likely to become ineligible for special education services than Group 1 – PK3. One major reason for this statistical significance may be higher rates of speech language identification for students in Group 2 – PK4 compared to Group 1 – PK3 (71 vs 65 percent respectively). Group 2 – PK4 also had higher rates of cognitive impairments than Group 1 – PK3. Recall that the cognitive impairment included primary disabilities such as autism or developmental delay.

One hypothesis in this situation is that these disability categories are easier to remediate with high quality ECSE programming and curriculum directed toward social interaction with normally developing peers than some of the other types of primary disabilities that were more common in Group 1 – PK3. In the literature, Morgan et. al. (2015) warned that it is possible that ECSE programming is not the real reason why students no longer need special education services. Instead, these authors caution that students with speech language deficits or

developmental delays may simply have progressed through developmental milestones at different rates and would have achieved success even in the absence of ECSE services. On the other hand, other researchers argue this may be the result of the developmentally appropriate practices (McMullen et. al., 2005), deliberately organized dramatic play activities (Kholopsteva, 2016; Follari, 2015), strategically matched strategies (Donegan-Ritter & Kohler, 2017; Kern & Clemens, 2007) and the inclusion model (Chen et. al., 2017; McLeod, et. al., 2016; Burns, et. al. 2017) that met the specific needs of the student in order to promote behaviors and skills more like the student's typically developing peers. Although it would take additional research into the curriculum used in a particular ECSE program, the types of disabilities that were more prevalent in Group 2 – PK4 were also those that typically have a lower intensity and need for intervention than those that appeared in Group 1 – PK3 including physical impairments and specific learning disabilities.

Research Question 6

Research question 6 asked: To what extent do the impacts of ECSE programming differ based on the student's free and reduced lunch status, race, or gender? To fully investigate this question, Cox regression models 3, 4 and 5 were run with different combinations of covariates. Model 3 incorporated the covariates of group assignment, primary disability and race as is outlined on the summary table provided in Appendix B. As an extension of model 2 with research question 5, when the race covariate was added, Group 2 – PK4 continued to be statistically significantly more likely to be dismissed from special education at any given time in the observed timeframe than Group 1 – PK3. Unlike with model 2, when race was controlled for, statistical significance was illuminated for the speech language primary disability as

compared to cognitive impairments as well. Although this model indicated that race on its own is not statistically significant in its contribution to survival rates, a potential reason for these findings may be that students with speech language deficits are more likely to be in a particular race rather than proportionally distributed across all races. If true, this is yet another confirmation of the literature that students in the more judgement-based disability categories are likely to be disproportionately minority students (Morgan, et. al., 2015).

In model 4, the covariates of group assignment, primary disability and lunch status were examined using a Cox regression. Much like Model 3, when lunch status is added to the model, Group 2 – PK4 continued to have survival rates that are lower than those of Group 1 at a statistically significant level and the disability category of speech language consistently has survival rates that are lower than the cognitive impairment category. In this model, however, students who receive a reduced-price lunch are more likely to be dismissed from special education services at a statistically significant level as compared to free lunch students. Much like model 3, this likely means that speech language students are disproportionately represented among the reduced-price lunch group.

The final model incorporates all possible covariates: group assignment, primary disability, race, lunch status and gender. In this model, only Group 2 – PK4 and speech language are more likely to be dismissed from special education at statistically significant level as compared to Group 1 – PK3 and those with a cognitive impairment respectively. All other effects fall away which indicates that speech language and group assignment tend to have independent effects on special education persistence over time.

Conclusions

At a macro level, starting interventions earlier pays off for students. Group 1 – PK3 had 50% of the students (31 out of 62) from the original group that were dismissed from special education services compared to 55% of students from Group 2 – PK4 (21 out of 38) and 37% from Group 3 – K (22 out of 60). As these values are considered at the big picture level, these findings support the neurological argument for early intervention. When students receive early intervention that is timed to align with rapid brain development, then the need for special education services is reduced over time (McAdams, et. al., 2004; Blackman, 2000; Shonkoff, et. al., 2007). In addition, the significant differences in the make up each group, whether in terms of the types of disabilities or the sociodemographic characteristics that comprised each group, also impacted the likelihood that students in a particular group would be dismissed from special education services. This additional nuance is explained in more detail below and in the analysis of research questions 4, 5, and 6.

The most surprising results of these models is that the largest differences in special education survival rates did not come from comparing ECSE services to those students who began receiving special education services in Kindergarten. Instead, the results from both research question 2 and research question 6 indicated that the largest differences came from comparing those who received one year of ECSE services to those who received two years of such service. To compound that surprise, when other covariates are controlled for, the students with one year of ECSE services consistently had higher rates of dismissal from special education than students who received two years of ECSE services. These findings provide some further nuance to the literature that states ECSE services are uniquely timed with a period of rapid

neurological development to intervene and provide supportive structures to allow students with disabilities to develop more like their peers (McAdams, et. al., 2004; Blackman, 2000; Heckman, 2006).

These confounding findings could be the result of several different situations that are not fully described with the current data set. One possibility involves nuance and inconsistency with the labeling process with regard to primary disability. In situations where students are dual identified, the disability that is used as the primary disability may have an impact. Second, even though there was not any significance in the variables for Black and Hispanic students in the various models, the small sample size may be masking important factors. Specifically, it is possible that Black and Hispanic students are more likely to respond to the ECSE treatments but that the small sample sizes in this study limited the ability to identify any significant impact.

Instead, it can be concluded that when other sociodemographic factors are controlled for, primary disability categorization is the strongest predictor of the group's survival rates. For the students identified with a speech language disability, it is likely that the strategically designed ECSE curriculum, developmentally appropriate practices, curricular matching and inclusion models that foster student-driven play are most meaningful (Follari, 2015; McMullen, et. al., 2005; Blumberg, Halfon & Olson, 2004). Unlike students who have more significant disabilities, students with speech language disabilities have their developmental needs met best in the ECSE setting. By contrast, it may be that a student identified as emotionally disturbed may struggle, even in an inclusive setting with strong peer models, to adjust her behavior due to the types of peer interactions among special education students even in inclusive ECSE classrooms (Chen et. al., 2017). Similarly, given the tension between DAPs for ECE and the IEP

requirements for special education students (Morgan, et. al., 2015), it is likely more challenging to meet the unique needs for students identified as learning disabled or having a type of physical impairment in the ECSE setting than it is for students identified as needing speech language instruction.

The differences between the three groups under observation represent important aspects of the groups to help inform how and when students are identified for services. Based on the trends in student demographics in each group, students with disability classifications that are likely to require intensive intervention are more likely to be identified either by age 3 and to be a part of Group 1 – PK3 or to be overlooked until kindergarten enrollment and be a part of Group 3 – K. As a result, these two groups have a disproportionately high number of high need students whereas students with disabilities that require less intensive intervention, specifically speech language are disproportionately identified at age 4 and assigned to Group 2 – PK4. These data further underscore the theory that the time intensity of services (1 year vs 2 years of ECSE service) is less impactful for students than their individualized needs as partially identified with their primary disability category. This likely also means that the ECSE curriculum of this particular program is uniquely suited to the needs of speech language students.

Finally, it is important to recognize that ECSE represents a variety of programs and services and cannot be classified as a single treatment. For this study in particular, the lack of access to the types of services students received, the intensity of those services, where those services were provided, and, more generally, the nature of the curriculum implemented, presents a significant challenge and limits the ability of this study to analyze the program quality as it relates to outcomes. The ability to include additional covariates to represent the nature or

intensity of services provided would make for a more robust program evaluation. However, the diversity of services provided in ECSE presents a significant challenge to researchers as they attempt to analyze programs at a systems level. Until treatment is controlled for, it is challenging to draw conclusions about the specific impacts of curriculum and to further identify the research-based best practice. True program analysis requires knowledge of the curriculum and services as well as information about the other six program features outlined by Bartik (2011).

Recommendations for Future Research

Based on the findings outlined above, there are several limitations that give way to areas for future research. The first limitation is the sample size used here. This study focuses on a particular cohort of students who received ECSE services during the 2005-2006 or 2006-2007 school years. In order to aid in program evaluation, it would be important to use multiple cohorts of students over several years. This increase in sample size and the inclusion of multiple cohorts would increase the generalizability of the findings to the ECSE program in that district beyond a single class of students. Larger sample size would also address the potential problem of little significance for the factor of race discussed in the conclusions.

Along these same lines, in order to increase the generalizability of the findings of this study to ECSE programming on a larger scale, additional districts' data must be included for multiple years. Although the framework outlined here may be used on a larger scale to draw conclusions about ECSE more generally, the current study can only represent a specific cohort of students in a specific district.

Third, increasing the same sizes by inclusion of other cohort years and other districts reduces the need for clustering of primary disability categories. Given the fact that primary

disability has been shown to have significant explanatory power in the models outlined, future research would benefit from significantly large sample sizes to make more specific determinations about the efficacy of ECSE services on particular disabilities.

Fourth, this study was not able to evaluate the quality of the ECSE programming. Although there are mechanisms provided to do that analysis, given the longitudinal nature of the analysis, specific observation and analysis of the program was not available for this study. One area for future research would include more in-depth analysis of the quality of the ECSE services provided perhaps using Bartik's (2011) six program features for quality ECE programs.

Fifth, this study examined the special education representation levels for black students in each of the three groups in question. While black students were significantly underrepresented in ECSE programs, when the groups were taken together, the representation levels were on par with that of the district as a whole. This might indicate that although black students do not have the same access to ECSE services as their white peers, they are identified for services in Kindergarten at an accelerated rate in order to result in equitable rates of identification. This contradiction to the current literature merits additional investigation through additional cohorts and districts in order to determine the generalizability of these findings.

Finally, this study uses the blunt data point of whether or not a student has an IEP in a given school year to determine the efficacy of ECSE programming. Although such data was not available to this researcher, the ability to identify and analyze changes in the minutes of service and types of service a student receives over time may outline impacts of ECSE programming that could not be captured in this particular study.

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Appendix A

Appendix A: Comparison of Three Exemplary Programs Using Bartik's (2011) Six Program Features

Program Feature	Perry Preschool Program (1962)	Abecedarian Project (1972)	Chicago Child-Parent Center Program (1967)
Class size & staff qualifications	<p>Ratio:</p> <ul style="list-style-type: none"> • 13:2 (S:T) <p>Staff Qualifications: All teachers were college graduates and certified teachers</p>	<p>Ratio:</p> <ul style="list-style-type: none"> • 3yo – 10:2 (S:T) • 4 & 5 yo – 14:2 (S:T) <p>Staff Qualifications: College graduate, pay comparable to public school teachers</p>	<p>Ratio:</p> <ul style="list-style-type: none"> • ECE: 17:2 (S:T) • Kinder.: 25:2 (S:T) <p>Staff Qualifications: Each center is staffed by head teacher and two coordinators, lead teachers had bachelor's degrees, certified in ECE, public school employees, provided regular staff development</p>
Staff / child interactions	<p>Weekly home visits (1.5 hours each week)</p> <p>Curriculum focused on cognitive and social-emotional components through what they called a “plan-do-review” process of active student learning</p> <p>Emphasis on staff observation of student interactions and supporting through reflective questioning</p>	<p>Home visits every other week</p> <p>Individualized curriculum</p>	<p>Focused on math & reading skill development through structured though diverse learning experiences</p> <p>Parent-teacher coordinator & school-community representative</p> <p>Intensive parent program, outreach/home visits health & nutrition supports</p>

Program Feature	Perry Preschool Program	Abecedarian Project	Chicago Child-Parent Center Program (1967)
Time intensity - hrs/day, - days/wk, - wks/yr - # of yrs	2.5 hours/day 5 days/week 9 months/yr (30 weeks) 2 years Total Contact Hours: 750	Up to 10hrs/day 4 days/week 50 weeks/year 5 years Total Contact Hours: Up to 12,500	3 hrs/day 5 days/week 9 mo/year + 6 weeks in summer 2 yrs but extended support from age 3 to 9 Total Contact Hours: 1,260 excluding extended support
Target population	Students in the Perry Elementary School boundary area Students identified by IQ score and socioeconomic status “Those with scores outside the range of 70-85 were excluded, as were those with untreatable mental defects” (Heckman, et.al, 2010, no page)	Targeted disadvantaged or at-risk families using a risk index <ul style="list-style-type: none"> • Parent education level & IQ • Family income level & welfare participation • Single-parent households 	Targeted for low income families
Public vs. Private	Occurred in public schools	Publicly funded – began in collaboration with local hospital	Largely associated with the public schools
Federal vs. Local Administration	State & local administration	State & local administration	Paid for using federal Title I funds; administered locally

Appendix B

Appendix B: Comparison of Cox Regression Models for Research Questions 4, 5, and 6

	Model 1 – RQ4 B Exp(B) (SE)	Model 2 – RQ5 B Exp(B) (SE)	Model 3 – RQ6 B Exp(B) (SE)	Model 4 – RQ6 B Exp(B) (SE)	Model 5 – RQ6 B Exp(B) (SE)
Group					
Group 2 – PK4	0.448 (0.284)	0.487* (0.287)	0.487* (0.294)	0.514* (0.290)	0.499* (0.299)
Group 3 – K	0.205 (0.281)	0.266 (0.292)	0.171 (0.308)	0.430 (0.307)	0.325 (0.322)
Primary Disability					
Learning Disabled		0.412 (0.534)	0.510 (0.548)	0.439 (0.533)	0.517 (0.545)
Speech Language		0.632 (0.410)	0.726* (0.429)	0.722* (0.418)	0.796* (0.433)
Physical Impairment		-1.033 (0.805)	-0.951 (0.822)	-0.842 (0.816)	-0.778 (0.830)
Race					
Asian/Pacific Islander			-0.951 (0.792)		-1.018 (0.804)
Black – Non-Hispanic			-0.347 (0.689)		-0.266 (0.706)
Hispanic			-0.459 (0.612)		-0.395 (0.632)
White			-0.548 (0.554)		-0.510 (0.558)
Lunch Status					
Full Price				0.310 (0.305)	0.334 (0.310)
Reduced Price				0.630* (0.382)	0.612 (0.383)
Gender					
Male					-0.155 (0.310)

*p<0.10, **p<0.05, ***p<0.01