PRE-K ARRANGEMENTS AT AGE 4 AND THE LIKELIHOOD OF RECEIVING SPECIAL EDUCATION SERVICES IN KINDERGARTEN

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ABSTRACT

There is extensive research on the short and long-term benefits of quality early childhood care and education. Generally the strongest positive effects are found among high quality demonstration projects. This study uses data from the Early Childhood Longitudinal Study, kindergarten class of 1998-99 and probit regression analysis to evaluate the effect of broad-based early childhood care and education arrangements of children in the year before they enter kindergarten on the likelihood a child receives special education services in kindergarten. I find that across all children in the analysis sample a child’s pre-K arrangements at age 4, after controlling for likely covariates, are not statistically significant predictors of a child receiving special education services in kindergarten. However, among children in low socio-economic status families, children in center-based care were moderately statistically significantly less likely to receive special education services in kindergarten than their peers in predominantly parental care.
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INTRODUCTION

There is extensive research on the positive effects of quality early childhood care and education (ECCE) for low-income children and families. Studies show that low-income children who have received quality ECCE are more likely to perform better on a variety of measures of cognitive ability, social-emotional behavior, education outcomes, and economic well-being later in life (Barnett, 1995; Curri, 2001; Gormley, 2007; Haskins, 1989; Karoly, 1998). Unsurprisingly the largest and most enduring effects are found among a handful of high quality model demonstration programs. However, evidence is becoming increasingly available that documents positive effects of larger scale programs, such as Head Start, state-funded pre-kindergarten, and child care. These results are promising given the vast majority of children under age 5 spend at least some time in non-parental care arrangements.

Among the potential benefits of early childhood care and education is that it may diminish the need for children to receive special education services in elementary and high school. While early intervention will clearly not obviate the need for special accommodations for children with serious health impairments and intellectual disabilities, ECCE can represent a promising prevention strategy for children with less severe challenges, developmental delays, and emotional disturbances (Ramey, 1998). Model and broad-based programs have both been shown to reduce placement into special education, with higher quality programs demonstrating the most substantial results (Karoly, 1998; Barnett, 1995). However, it is often difficult to extrapolate from even research on some large-scale programs because the quality of programs varies greatly across, within, and
between settings and states. Further, children are in programs for varying amounts of time, both measured as when they start receiving care and the amount of time per week they are in care. Finally, a number of factors are correlated with both the likelihood a child is in a quality program, the type of program they are in, and outcomes of interest, including the likelihood a child receives special education in elementary school.

Child development is influenced by a combination of genetic and environmental factors. Low-income children are disproportionately more likely to have developmental delays and learning disabilities, and experience emotional and behavioral problems, than their higher income peers (Brooks-Gunn & Duncan, 1997). Such delays and disabilities can have long-lasting consequences. Children who start off behind their peers cognitively, emotionally or behaviorally in kindergarten either need special education interventions to help them catch up, or worse, they never do. If early childhood care and education can prevent the need for subsequent special education services it can save budgetary resources through reduced special education costs but more importantly can be life-changing for the individual children and families.

This paper focuses specifically on the ECCE arrangements of children in the year before they enter kindergarten. While states generally guarantee access to kindergarten for children starting around age 5, no such guarantee exists for younger children before kindergarten. Instead there exists a patchwork of Federal, state, local and private programs providing early childhood care and education to young children before they enter kindergarten. As a result, children are in a variety of settings depending on a host of factors including not least of all the availability of care in their communities, the ability of families to afford it, and the specific needs of families. Further, while Federal and state
governments invest approximately $13 billion in center-based Head Start and center and school-based pre-K programs, the Federal and state governments spends an additional $9.5 billion on more traditional child care through the Child Care and Development Fund (CCDF) (Department of Health & Human Services [HHS] Office of Child Care, 2012). The vast majority of CCDF funds are provided to families to help pay for the cost of child care from the provider of their choice, whether it be center-based, non-relative home-based, or relative care. This voucher aspect of child care makes it unique among ECCE programs and is attributable to the program’s origin as primarily an employment support for working families.

Given the prevalence of children in traditional child care arrangements, especially among at-risk children, their potential for reducing the need for special education services is a particularly important, yet understudied question. We know relatively little about the potential advantages of one type of child care arrangement over another.

This paper will examine the relative impact of different types of ECCE arrangements in the year before kindergarten—relative, non-relative home-based, center-based, and Head Start—on the subsequent need for special education services in kindergarten. I use data from the Early Childhood Longitudinal Survey-Kindergarten (ECLS-K) cohort class of 1998. The ECLS-K collected comprehensive data on children and families from kindergarten in 1998 through 2007, for most students their 8th grade. Importantly the base year survey includes information on the experiences of children prior to kindergarten. The result is a particularly rich dataset covering the experiences of young children from birth (though the data from birth through kindergarten is less robust) through adolescence. Because the ECLS-K provides a nationally representative sample, covering children in a
variety of pre-K arrangements, the results can be more easily generalized to the entire population of young children in the United States. The study utilizes probit regression analysis, controlling for a number of factors likely to be correlated with both the type of pre-K arrangement a child is in and whether or not they later need special education services, to evaluate the impact of pre-K arrangements on the subsequent need for special education services.

If I detect an association between early child care arrangements and a lower likelihood of need special education services once children enter school it will align with calls for greater public investments in improving the quality of child care received by our nation’s most vulnerable children (Wolfe, 2002).

BACKGROUND AND LITERATURE REVIEW

The basic landscape of early childhood care and education

While there is generally guaranteed access to kindergarten beginning around age five, children under age five or not yet in kindergarten are in a variety of care arrangements depending on any number of factors. Overall about 75 percent of four year olds and 50 percent of three year olds are in center or school-based care arrangements, including state-funded pre-K, Federally-funded Head Start, and private center-based care (National Institute for Early Education Research, 2012). The remaining children are in a combination of parental, relative, and non-relative home-based care.

A central challenge for many families is simply access to quality early childhood care and education programs, or in many cases access to care of any kind. This is of course most acute for low and middle income families. Head Start provides comprehensive early childhood care and education to low-income families generally living below the Federal
poverty level. In total about 950,000 three and four year olds are in Head Start, all but a small percentage in center-based programs (HHS Office of Head Start, 2012). However, Head Start is only able to serve about half of eligible children and programs across the country maintain significant waitlists or simply have to turn children and families away (Schmit & Ewen, 2012). State funded pre-K provides school and center-based care to an additional 1.3 million three and four year olds. Eligibility and access to state pre-K varies widely between states (NIEER, 2012). Finally, the Federally-funded Child Care and Development Fund (CCDF), and to a lesser extent the Temporary Assistance for Needy Families program and Social Services Block Grant, provides subsidies to low-income families to help pay for the costs of child care. Unlike Head Start and state-funded pre-K which directly fund providers, the vast majority of these funds, approximately 89 percent, go directly to families in the form of vouchers that they are free to use for any legally operating provider, as defined by the state (HHS Office of Child Care, 2011). As a result these funds pay for private care in a number of settings—approximately 66 percent of children are in center-based care, 5 percent in their own home, and 29 percent in another’s home (ibid.). The regulation of private child care providers varies greatly across states but regulation and oversight is most lax among home-based providers (Child Care Aware of America, 2012). Further, subsidy levels are generally far below market rates for child care. The Department of Health and Human Services recommends that states set subsidy levels at the 75th percentile of market rates in the area. In 2012 only one state set subsidy rates at the level (National Women’s Law Center, 2012).

Given the high cost of child care, and quality care specifically, it should not be a surprise that many low-income families struggle to find quality, affordable early childhood
care and education. While the quality of care varies greatly within given settings (e.g. there are poor, good, and great Head Start programs, state pre-K programs, and child care programs), as a general matter and particularly for older children, center-based programs, including Head Start and state-funded pre-K specifically, are more tightly regulated and generally seen as higher quality. However, low-to moderate income children are less likely to be in center or school based care than their higher income peers: only about 65 percent of four year olds and 40 percent of three year olds in the bottom 40 percent of the income distribution are in such programs, compared to about 90 percent and 80 percent respectively for children in the highest income families (NIEER, 2012).

A right to free and appropriate public education for children with disabilities

Children receive special education services for a variety of reasons. At the Federal level, the Individuals with Disabilities Education Act (IDEA) (PL 101-476), and associated Department of Education regulations, define 14 types of childhood disabilities. Poor children face an increased likelihood of developing certain disabilities (Brooks-Gunn, 1997). Further, IDEA fundamentally supports the constitutional right of children with disabilities to a “free and appropriate public education” (FAPE) (Congressional Research Service, 2013). Under the law states are required to identify and evaluate all children with disabilities in need of special education services and provide services as appropriate. IDEA provides Federal funding to support this but states must ensure FAPE for children with disabilities regardless and Federal funding does not begin to fully fund education for children with disabilities. State and local governments must provide significant funding of their own to do so.
Although early childhood care and education cannot be expected to prevent many if not most childhood disabilities for which children receive special education services, there may be circumstances where it can make a difference. Indeed research on model demonstration programs supports that point. However, what about the approximately $24 billion annually Federal and state governments spend on broad-based pre-K and child care programs, including the $9.5 billion annually low-income families are free to use for child care in a variety of settings? Can traditional child care prevent the need for special education services in early elementary school, and do certain types of arrangements have benefits over others?

**Benefits of early childhood care and education for children**

Policy makers have for decades looked at quality early childhood interventions as a primary strategy to alleviate the deleterious effects of poverty on children's development. There is extensive research on the short, and long-term, benefits of early childhood education. A range of studies have found that low-income children who received quality ECCE, compared to their peers who did not, are more likely to have higher IQs, perform better on achievement tests, and have fewer behavior problems, and are less likely to repeat a grade, be placed into special education, or exhibit delinquent behavior (Barnett, 1995; Curri, 2001; Gormley, 2007; Haskins, 1989; & Karoly, 1998). Later in life, children who have received quality ECCE have been shown to be more likely to complete high school, be employed, and have higher earnings, and less likely to be involved with the criminal justice system (ibid.).

There is also extensive research specifically on the impact of ECCE on cognitive abilities and social-emotional behavior associated with children needing special education
services, and even directly with the utilization of special education services (Barnett, 1995; Haskins, 1989; & Karoly, 1998). The most significant effects on these domains, as well as more generally, are found among high quality model demonstration programs, most notably the High/Scope Perry Preschool program (Schweinhart & Weikard, 1981) and the Carolina Abecedarian Project (Campbell & Ramey, 1994).

The Carolina Abecedarian project was conducted from 1972-77 and involved the initial random selection of 109 low-income children into a treatment and control group. The 55 children in the treatment group received high quality comprehensive center-based, full-day/full-year care from infancy until they entered kindergarten. Students in the pre-school treatment group performed better on reading and math achievement tests and were less likely to repeat a grade or be placed into special education. Specifically, through age 15, 24.5% of children in the pre-school treatment group had been placed into special education compared to 47.7% of the control group (Campbell, 1994). The High/Scope Perry Preschool program demonstrated similarly positive results. It was conducted from 1962-7 and involved 123 low-income children aged 3-4 randomly selected for participation in a high-quality pre-school program or a control group. The treatment in this case included part-day center-based care and supplemental home-based services. Children in the treatment group performed better on a variety of measures of academic achievement, including less time spent in special education (Schweinhart, 1981).

The two studies above are two of the most oft cited by advocates of ECCE. However, they are far from representative of the typical experiences of low-income children in child care. Still, a research base has begun to build around more representative broad-based programs. The National Institute of Child Health and Human Development (NICHD) Study
of Early Child Care (started in 1991) followed 1,364 randomly selected families in 10 communities from birth to adolescence to broadly examine the relationship between early childhood experiences and child outcomes. This study found somewhat conflicting results, which nonetheless shed important insights into the nature of child care. Unsurprisingly, children in higher quality care performed better on measures of math, vocabulary, and memory than children in lower-quality care. Children in center-based care also performed better on measures of memory, but also had more reported behavioral problems and conflicts with mothers. Similarly, more time spent in care was associated with more behavior problems, fewer social skills, and fewer adaptive work habits (NICHD, 2005). The authors conclude that these results demonstrate the relative independence of key characteristics of child care. It is not enough to say that more time spent in care is associated with better outcomes, or that certain types of care are better than others. Instead, quality can exist in a variety of settings.

Other large-scale programs, though, have demonstrated positive outcomes on measures of interest here. The Child Longitudinal Survey followed 1,377 low-income children who participated in the Chicago Child-Parent Centers in 1985-6. The intervention was a half-day pre-school program for children aged 3-4. Children in the pre-school program were found to be significantly less likely to be placed into special education then children in the control group. Specifically researchers looked at the reasons for which children were placed into special education and found that children in the treatment group were less likely to be placed into special education for specific learning disabilities (Conyers, 2003). Generally studies of large-scale ECCE programs have found positive if not mixed results when evaluating the impact on special education placement. One study of
the literature found positive, statistically significant results in three of eight studies measuring such relationships (Barnett, 1995).

Most studies of large-scale programs, however, rely on evidence from special education received throughout elementary school, including Conyers and those reviewed by Barnett. This provides richer data but also introduces further complications as the effect is measured further away from the treatment. In those cases the benefits may derive from the ECCE program itself, the type of elementary school the child goes onto, or other child or family level characteristics. Controlling for likely covariates in that situation will be more challenging. This is not to say the benefits identified by those studies are any less important. They could be measuring enduring benefits to children’s cognitive development, benefits to the families of children that improve the home environment, or a combination of those and other factors. However, it is also possible the effect could go the other direction and possible unmeasured benefits could fade out because children go onto poorer quality elementary schools.

This study largely eliminates those concerns by measuring the immediate relationship between pre-K arrangements the year before kindergarten and special education services received in kindergarten. Such an analysis introduces other limitations, described more fully below, but also helps provide additional insight into the possible immediate benefits of ECCE on the need for special education services. Further, it provides additional evidence for the incompletely answered question as to whether the reduction in special education services documented for intensive early childhood programs can be replicated in more conventional settings, and specifically in programs for children in the year before kindergarten.
Theoretical and conceptual framework

The underlying assumption that early childhood interventions can prevent the need for subsequent special education services is rooted in the idea that the earliest years of a child’s life are critical developmentally. More specifically, it is that child development is influenced by a combination of environmental and genetic factors. We know that children in low-income families are more likely to experience learning disabilities and developmental disabilities and exhibit emotional and behavioral problems than their higher income peers. Research indicates that children exhibiting such delayed cognitive development or behavioral problems may lack exposure to certain child-adult interactions very early in life (Ramey, 1998). These include things like encouraged exploration, mentoring in basic skills, celebration of developmental advances, and a rich and responsive language environment.

The case for quality ECCE as a primary prevention strategy is that it can alter basic environment in which the child grows up. Most directly this involves the child’s interactions with teachers and caregivers while in the program. However, quality programs also tend to emphasize parental involvement to improve parent-child interactions outside of the program and the general home environment, which can further indirectly effect cognitive and social-emotional development. This basic conceptual framework is outlined in Figure 1. If children living in poverty are at greater risk of experiencing certain learning disabilities, developmental delays, and emotional and behavioral problems, it follows that ECCE that alters the basic environment in which children live could prevent the development of such disabilities.
Key elements likely influencing these associations include the type of care arrangements—center-based, home-based, relative, or Head Start—the amount of time children spend in these arrangements per week and during the course of the year, and the stability of those arrangements including whether the child was in multiple arrangements. The quality of the programs undoubtedly plays a significant role as well, but is unmeasured here because of the limitations of the data. There are also multiple covariates that influence both the type of arrangements a child is in the year before kindergarten and whether or not they need and receive special education services in kindergarten. These include a variety of interrelated child and family-level factors such family income, parent’s education, family socio-economic status, family composition (i.e. single parent or two-parent household), and the stability of the home environment. Further, there may be geographic disparities; both across the country and by city/rural divisions, in the availability of child care and in the way special educations services are administered. To the extent possible these likely covariates are controlled for in the model.

DATA AND METHODS

Data

This study uses data from the Early Childhood Longitudinal Survey-Kindergarten (ECLS-K) cohort class of 1998 public use data file. The ECLS-K collected data on children and families from kindergarten in 1998 through 2007, for most students their 8th grade. Data was collected from a combination of children, parents, teachers, and schools and includes comprehensive information on the early childhood and adolescent experiences of a national representative sample of approximately 21,500 children. Importantly for this study, the base year survey includes retrospective data on the experiences of children
before they entered kindergarten. The specific analysis here uses data collected as part of the base year survey, including the pre-kindergarten experiences of children, through their first year of kindergarten.

**Analysis sample**

The analysis sample was restricted to children for whom there was complete data on each of the variables included in the fully specified model. This resulted in an analysis sample of 14,283 children. Where possible control variables that did not significantly impact the results were omitted from the model if they included substantial missing data that would have resulted in loss of observations. Of note, variables measuring the percent of children in the child’s school who are eligible to receive free or reduced-price lunch were omitted because of considerable missing data. Finally, the results were weighted based on specifications provided by the National Center on Education Statistics.

**Variables**

*Dependent variable: Special education services received in kindergarten*

The special education variables are defined simply, as children who received special education services in kindergarten according to data collected by field supervisors for the field management system (FMS). Data collected as part of the FMS was used to follow up and provide additional information from special education teachers on child-level data such as the type of disability as classified under IDEA, the severity of the disability, details of the child’s Individualized Education Program (IEP), and the services provided consistent with such IEP. However, much of this child level data, beyond simply whether the child received special education services, is restricted for participant confidentiality in the public
use data file and therefore unavailable for this analysis. Overall 3.5% of children in the survey for which special education data was available received special education services in kindergarten according to this measure. Data was missing for 6% of respondents.

*Key variables: Early childhood care and education the year before kindergarten*

The independent variables of interest are the early childhood care and education experiences of children in the year before kindergarten. The variables are measured as children who spent more than 20 hours per week and 6 months in selected arrangements—relative, non-relative home-based, center-based, and Head Start—as indicated by their parents. This equates roughly to 4 hours per day and a reasonable time period needed to measure substantive effects. This is not to say that program effects cannot be found under much shorter durations of care, particularly among very high quality programs.

*Control variables*

A variety of variables likely correlated with both the dependent variable and independent variables of interest were controlled for in the model. Family socio-economic status (SES) was controlled by including a dummy variable on whether the child was in the lowest quintile of SES. The SES is a composite variable created as part of the ECLS-K that included information on family income, parent’s education level, and parent’s occupation. Dummy variables were also created for whether the child’s family included two parents (either both biological, or one biological and one not), a single parent, or other, which included legal guardians and adoptive parents. The stability of the home environment was in part controlled by including a variable measuring the number of residences the child
lived in from birth to kindergarten (continuous variable); the number of years in which the family experienced severe financial problems, measured from 0 to 6 years; and a dummy variable for whether or not the family experienced severe food insecurity at any point before kindergarten. The model controls for whether or not the child had severe disabilities by including dummy variables if the child had severe enough disabilities before kindergarten to have been previously diagnosed for certain problems—including learning disability, problem with use of limbs, hearing problem, or speech problem—or if the child had received services for any of those diagnoses before kindergarten. Child birth data was also controlled for by including a variable on whether the child was born premature more than two weeks and a whether or not the child’s birth weight was more than 1.5 standard deviations from the mean. The child weight at kindergarten entry was similarly controlled if they weighed more than 1.5 standard deviations less than the mean child weight at kindergarten entry. Age at kindergarten entry was measured as a continuous variable and a dummy variable created if the child was a first time kindergartner. Information about the child’s kindergarten was also controlled by including dummy variables if the school was public or private, if it was full- or part-day, and if it consisted of a majority of minority students. Variables measuring the percent of free or reduced priced lunch eligible students were considered by ultimately left out because of considerable missing data. Finally, several dummy variables for standard controls such as race, gender, and geographic location were included.

Limitations

A central limitation, which challenges all research on ECCE, is that there is tremendous variance in the quality of programs that is not captured. The basic theoretical
framework outlined above argues that ECCE can prevent certain learning disabilities and emotional and behavioral problems associated with special education by altering the basic environment in which children live and the adult-child interactions they experience. Quite simply, this is very unlikely to be true for lower quality programs. The data collected as part of the ECLS-K has very limited data from which to deduce the quality of the program the child attended. Any conclusions drawn from this analysis will be limited by having to account for a wide range of quality, or by making imperfect assumptions of program quality from the available data.

Another limitation, both of available data and the study design, concerns the receipt of special education services in kindergarten. A relatively small percentage of children receive special education services in kindergarten period. For many children, this is their first experience in a formal school setting and schools, for various reasons, simply do not identify many children in kindergarten as having a disability under IDEA unless they have severe or previously diagnosed disabilities (Litty & Hatch, 2006). Further, the data in the public use data set includes substantial restricted data on the specific disabilities as identified under IDEA, the severity of their disabilities, and the types of services and accommodations they receive in kindergarten. This provides considerably richer data that is unfortunately unavailable in the dataset used here.

Finally, and similarly because of both the availability of data and the study design, the data analyzed focuses on the pre-K arrangements of the child in the year before they enter kindergarten. The child care arrangements of children from birth are undoubtedly important for their cognitive and socio-emotional development, and ultimately for whether or not they need or receive special education services in kindergarten. Detailed data is
simply not available on the ECCE arrangements of children since birth. As a result the study focuses on the year before kindergarten but that still allows for an analysis with significant public policy implications.

**Methods and analytic approach**

This study uses a probit regression analysis to measure the relationship between specified variables on the likelihood a child receives special education in kindergarten. The basic model can be expressed by the equation below:

\[
Pr(y_i = 1 | x_{5i} = 0) = F(b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5)
\]

where \( y_i \) is measured as a dichotomous variable from 0 to 1, \( x_i \) is a vector of pre-kindergarten care arrangement (relative, non-relative home-based, center-based, Head Start, and multiple arrangements), \( x_2 \) is a dummy variable for pre-identified disability, \( x_3 \) is a dummy variable for pre-kindergarten receipt of special education services, \( x_4 \) is a vector of child characteristics, and \( x_5 \) is a vector of family characteristics. The coefficients on the independent variables can be interpreted as the percentage point change in the likelihood a child received special education services in kindergarten.

The model will produce biased estimates of the effect of specified pre-K arrangements on special education if it omits variables that are correlated with both the type of pre-K arrangements a child is in and whether or not they receive special education services. Therefore the model controls for the likely covariates described above.
RESULTS

Descriptive results

From Table 1 we see that center-based care is the most common pre-k arrangement, with 58% of children in center-based care at any point in the year before kindergarten. Restricting this to children who have spent at least 20 hours per week and 6 months in center-based care, 25% percent of children now fall into that category. The next most common arrangements, in order, are relative (13%), non-relative home-based (9%), and Head Start (7%). As described above these variables are measured as any child who has spent the specified amount in a given care arrangement, and some children spend time in multiple arrangements. This analysis controls for that by creating variables for children in multiple arrangements. In total 26% of children spent any amount of time in multiple arrangements the year before kindergarten, but only 6.1% spent more than 20 hours and 6 months in more than one arrangement.

The type of pre-K arrangement a child is in can depend on any number of factors. Table 2 displays selected characteristics of the survey population by their type of pre-K arrangement. A number of differences stand out. Unsurprisingly, children in Head Start are more likely to be black and from families of lower socio-economic status with single and less educated parents and have mothers who first gave birth at a younger age. Of children in Head Start 45% are in the first quintile of SES, compared to 21% of children in relative care and 10% of children in center-based care. Children in Head Start are also more likely to have been diagnosed with a learning disability before kindergarten. Finally, they are also more likely to go onto kindergarten in schools with higher percentages of minority and free lunch eligible students. Each of these factors are likely to be correlated...
with both the type of pre-K arrangement a child is in and whether or not they need or receive special education services in kindergarten. A few other trends from Table 2 stand out. Children in non-relative and center-based care seem pretty similar and are less likely to be from low SES families and more likely to have more highly educated parents than children in relative care or Head Start. However, children in non-relative care are more likely to be white (73%) than children in center-based care (57%).

Turning to the independent variables of particular interest, 10% of children who received special education services in kindergarten spent more than 20 hours per week in Head Start the year before kindergarten. Comparatively 7% of children in the survey population were in Head Start for 20 or more hours per week in the year before kindergarten. In contrast a lower percentage of children who received special education services in kindergarten were in relative, non-relative, and center-based care than in the survey population as a whole. For example, 25% of children in the survey population were in center-based care but only 20% of children who received special education services were in center-based care. This follows naturally from the data presented above that many of the factors positively correlated with whether or not a child receives special education services are also positively correlated with whether or not they were in Head Start. Similarly factors positively correlated with special education services are negatively correlated with being in center-based and non-relative care. This is the relationship explored below.

Table 3 includes selected characteristics of children who received special education services in kindergarten. From that table we see that children who received special educations services are more likely to be from families of low SES, 28% of children in
special education compared to 19% of children in the survey population. Unsurprisingly, children who received special education services in kindergarten are considerably more likely to have been diagnosed with a disability—learning, physical, speech, or hearing—before kindergarten. Clearly some share of these children has health or other limiting conditions for which special education is designed to address.

The key question is whether certain pre-K arrangements in the year before kindergarten could reduce the need for special education services among children with more mild disabilities. Table 4 describes the simple relationship between the type of pre-K arrangement a child is in whether or not they receive special education services in kindergarten. As seen, children in Head Start are significantly more likely to go on and need special education services in kindergarten than children in other arrangements. This is not unexpected as Head Start explicitly provides services to children with disabilities as well as low-income children more at-risk for developing certain disabilities. Children in center-based, non-relative home-based, and relative care are all less likely to receive special education services in kindergarten, compared to children in Head Start as well as children that have not spent more than 6 months and 20 hours per week in non-parental care. This relationship, however, is obviously a simplified version. A variety of other factors are correlated with both the pre-K arrangements of children and whether or not they need special education services in kindergarten, biasing any estimates that do not take them into account. The probit models below analyze the relationship more completely.

**Model results**

The results from the probit analysis are summarized in Table 5. The first is a simple model including basic demographic and family characteristics. From this model we
see that low SES status is the most substantial predictor of a child receiving special education in kindergarten. Controlling for basic demographic, child, and family background characteristics, a child from a family in the lowest quintile SES is 2.6 percentage points more likely to receive special education services in kindergarten than their higher SES peers. Given the low percentage of children in kindergarten who receive special education services this is a particularly substantial result. Basic child birth information is also substantially and significantly associated with a child receiving special education services in kindergarten. A child born at least two weeks premature is 1.6 percentage points more likely to receive special education services than a child born closer to full term. Similarly, a child born at a weight lower than 1.5 standard deviations from the mean (about 4.7 pounds) is 1.7 percentage points more likely to receive special education services in kindergarten, holding other demographic and family background characteristics constant.

The results from this simple model are generally expected. At first glance, however, race, which is a significant predictor of receiving special education services, is surprising. According to the model minority children are less likely to receive special education services than their white peers, holding these basic demographic and family background characteristics constant. There is significant debate over the over or underrepresentation of minority children in special education (U.S. Commission on Civil Rights, 2011). The concern is generally that minority children may be more likely to be placed into special education than their comparable peers. The results from this simple model, however, seem to indicate that minority children are less likely to receive special education services and are perhaps underrepresented, at least in kindergarten. It could be that minority children
are less likely to be identified early on as needing special education, compared to their white peers, or that something about the schools minority children go onto in kindergarten make them less likely to receive special education.

The second model introduces key characteristics about the child as they are entering kindergarten and in kindergarten, including information on their kindergarten itself. Most of the relationships from Model 1 maintain their significance, though after controlling for the additional variables in Model 2 they become slightly less substantial and significant. Notably SES remains a substantial and significant predictor, as does race. Of the variables added of interest, children in public schools are 1.8 percentage points more likely to receive special education services. It is likely this effect was being captured by the coefficients on SES and race in model 1, which are all lower in model 1 than Model 2.

Our independent variables of interest are first measured in Model 3. Controlling for child level, family background, geographic, and kindergarten factors included in Model 2 none of the coefficients on the pre-K arrangement variables are statistically significant. Further, there was not much change in the coefficients on variables measuring SES and race. This would seem to indicate there is not much correlation between pre-K arrangement and receiving special education services in kindergarten that’s not already accounted for by the previous model.

Much of the research on early childhood education and care stresses the importance of early intervention, and particularly in the earliest years of life. This study, partly because of limitations but also out of the study’s design, focuses on the experiences of children the year before kindergarten. No amount of intervention at age 4 will be able to prevent the need for special education for children with severe disabilities. Even for
children with less severe but still pronounced disabilities it is an uphill climb for pre-K at age 4 to be able to prevent the need for special education. Models 4 and 5 attempt to account for this by controlling for children who have been diagnosed with learning or physical disabilities before kindergarten (Model 4) and who have received services for those disabilities before kindergarten (Model 5).

In the fully specified Model 5, as expected being previously diagnosed with a disability or receiving special education services for that disability prior to kindergarten are significant and substantial predictors of receiving special education services in kindergarten. Children previously diagnosed with a learning disability are 3 percentage points more likely to receive special education services in kindergarten than their peers who have not, controlling for the host of factors in Models 1-3. Challenging the central hypothesis of this paper though, pre-K arrangements as specified by the model still remain insignificant predictors of receiving special education services in kindergarten. However, of note the coefficient on center-based care is the closest to statistical significance at p=.182. Further, the coefficients on each of pre-K arrangement variables, if statistically insignificant, are in the expected direction.

Coefficients on other variables of interest have also moved substantially in the fully specified model. In Model 5 children in the lowest SES quintile are 1.3 percentage points more likely to receive special education in kindergarten than their higher income peers, compared to 2.7 percentage points in the unspecified model. This implies that children from low SES families are more likely to have disabilities identified before kindergarten. Considering it is unlikely low SES children are simply more likely to be diagnosed for a
disability their higher SES peers with the same disability are not, it follows that low SES children are more likely to have more severe, more easily identifiable disabilities. As discussed above and more thoroughly below, there is considerable variation in the quality of pre-K programs both within and between the categories specified here. Among children across income groups and family backgrounds, pre-K programs must provide enriching environments they would not receive outside of the program. This bar is highest among higher SES families that are more able to provide enriching environments. Very-high quality programs may be able to achieve this but among broad-based pre-K programs across the quality spectrum it is less likely.

Therefore the sixth and final model presented here, shown separately in Table 6, applies Model 5 to the subgroup of low SES children. Specified in this way, the coefficient on center-based care is moderately statistically significant (p=.061). This indicates that a child from a low SES family that received center-based care for more than 20 hours per week and 6 months in the year before kindergarten is 1.8 percentage points less likely to receive special education services in kindergarten, controlling for the factors described above. The relationship between children in non-relative home-based care and Head Start are similar but even less statistically significant than with center-based care.

**DISCUSSION**

The basic results from the fully specified model demonstrate the challenges of finding statistically significant effects of broad based early childhood programs. In the fully specified Model 5, none of the coefficients on the independent variables of interest were statistically significant. This result, focusing on the population of young children at large, is largely consistent with research. There is not only considerable variation in the quality of
early childhood programs but most are simply not of very high quality. Quality is notoriously difficult to measure in early childhood care and education but a recent study by NICHD estimated that “most child care settings in the United States provide care that is ‘fair’” and only 10 percent are very high quality (NICHD, 2007). Obviously not all programs can be high quality but this underscores the extent to which we as policy analysts, let alone parents, lack basic information about the quality of early childhood care and education programs. The information we do know is often disappointing. While state pre-K programs and Head Start are generally tightly regulated, child care programs are very lightly regulated, with considerable variation between states (Child Care Aware of America, 2012). The average child care subsidy is about $5,500 (HHS Office of Child Care, 2011) and the average spent per pupil in state pre-K is $4,200 (NIIER, 2012) and even the average spent per pupil in Head Start is $7,800 (HHS Office of Head Start, 2012). These amounts dwarf in comparison to the amount spent per pupil in the oft-cited model demonstration programs like the Perry Preschool and Carolina Abecedarian Project. To the extent resources drive quality we are getting what we pay for.

The results from Model 5 largely demonstrate this fact. The pre-K arrangements in the year before kindergarten are not significant predictors of receiving special education in kindergarten among the population as a whole. However, the move in the coefficients on pre-K arrangements, specifically on center-based care, from models 5 to 6, if still only bordering on statistical significance, is consistent with the analytical framework presented here. If we accept the significance of the results, children in low SES families that receive a significant amount of center-based care in the year before kindergarten are less likely to receive special education services in kindergarten than their peers, controlling for a wide
range of covariates. The research underlying the theoretical framework here is that children who experience learning disabilities, developmental delays or behavior problems may lack exposure to certain child-adult interactions and stimuli (Ramey, 1998). Children in low SES families are less likely to experience such critical interactions in their home environment than their higher SES peers. Therefore, even if non-parental care arrangements are not of the highest quality, if those arrangements expose children to more interactions than they would experience in their home environment, it could improve cognitive and socio-emotional development and decrease the likelihood of needing special education services in kindergarten as a result. The results from Model 6 at least seem to point in that direction.

Access to quality, affordable childcare is a consistent problem facing low and moderate income families. The current patchwork of programs that make up the early childhood care and educations system in the U.S. simply leaves many without quality affordable care options. At the same time there is consistent and growing research on the benefits of quality early childhood care and education for children, families, and society as whole. This study adds to that consistently growing research. That it does not show statistically significant results among the population of young children as a whole, but other studies of high quality programs have, argues for improving the availability of high quality programs. Further, the moderately statistically significant results from the model restricted to low SES children show that access to any formal child care arrangements can have a positive effects, including reducing the need for special educations services as measured here. Finally, this study, measuring the effects on receiving special education services in kindergarten alone, demonstrates the possible immediate effects of early
childhood care and education. Promises of return on investments of early childhood care and education often rely on benefits accumulated to children, schools, and the social and criminal justice systems over decades. This study helps show that investments at age four can have immediate cost savings in kindergarten. This should be a consideration of all policy makers when evaluating both investments and cuts to Federal, state, and local investments in early childhood care and education.
## Figures and Tables

### Table 1: Selected Survey Population Sample Characteristics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Full Sample</th>
</tr>
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<tr>
<td>Received special education services in kindergarten</td>
<td>3.5%</td>
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<tr>
<td><strong>Basic child characteristics</strong></td>
<td></td>
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<td>Race</td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td>15.1%</td>
</tr>
<tr>
<td>White</td>
<td>55.2%</td>
</tr>
<tr>
<td>Hispanic</td>
<td>17.9%</td>
</tr>
<tr>
<td>Asian</td>
<td>6.4%</td>
</tr>
<tr>
<td>Other</td>
<td>5.4%</td>
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<tr>
<td>Gender – Male</td>
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<tr>
<td>Mother’s age at birth (mean)</td>
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<tr>
<td>Born premature - 2 wks or more</td>
<td>16.7%</td>
</tr>
<tr>
<td>(standard deviation)</td>
<td>(1.3)</td>
</tr>
<tr>
<td>Child birth weights (pounds) (mean)</td>
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</tr>
<tr>
<td>(standard deviation)</td>
<td>(1.3)</td>
</tr>
<tr>
<td>Low-birth-weight (1.5 SD from mean)</td>
<td>6.2%</td>
</tr>
<tr>
<td>(standard deviation)</td>
<td>(4.3)</td>
</tr>
<tr>
<td>Age (months) at Kindergarten Entry (mean)</td>
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</tr>
<tr>
<td>(standard deviation)</td>
<td>(4.3)</td>
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<tr>
<td>First-time kindergarten</td>
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<tr>
<td>Low-weight at entry (1.5 SD from mean)</td>
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<td>Low height at entry (1.5 SD from mean)</td>
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<td>Family Type</td>
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<td>More than High School</td>
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<tr>
<td>College or higher</td>
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<td>Mom worked before Kindergarten</td>
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<td>Number of residences before K</td>
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<tr>
<td>(standard deviation)</td>
<td>(1.4)</td>
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<tr>
<td>Food insecure in kindergarten</td>
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<tr>
<td><strong>Kindergarten Information</strong></td>
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<td>Location</td>
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<tr>
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<tr>
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<tr>
<td>Northeast</td>
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<tr>
<td>Midwest</td>
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</tr>
<tr>
<td>South</td>
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</tr>
<tr>
<td>Variable</td>
<td>Full Sample</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>West</td>
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</tr>
<tr>
<td>Kindergarten full day</td>
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</tr>
<tr>
<td>Kindergarten &gt;50% minority students</td>
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</tr>
<tr>
<td>Kindergarten &gt;50% free lunch eligible</td>
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<tr>
<td>Any relative</td>
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</tr>
<tr>
<td>Relative 20 hrs/wk + 6 months/yr</td>
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</tr>
<tr>
<td>Any non-relative</td>
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</tr>
<tr>
<td>Non-relative home-based 20 hrs/wk + 6 months/yr</td>
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<tr>
<td>Any Center</td>
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</tr>
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<td>Center-Based 20 hrs/wk + 6 months/yr</td>
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</tr>
<tr>
<td>Any Head Start</td>
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</tr>
<tr>
<td>Head Start 20 hrs/wk</td>
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</tr>
<tr>
<td>Multiple arrangements</td>
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</tr>
<tr>
<td>Multiple arrangements 20 hrs/wk + 6 months/yr</td>
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</tr>
<tr>
<td>No non-parental pre-K</td>
<td>19.4%</td>
</tr>
<tr>
<td>No non-parental pre-K 20 hrs/wk + 6 months/yr</td>
<td>52.5%</td>
</tr>
<tr>
<td>Number of pre-K arrangements (mean)</td>
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</tr>
<tr>
<td>Use of limbs</td>
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<tr>
<td>Speech problem</td>
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<td>Hearing problem</td>
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<td>Pre-K therapy received</td>
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<tr>
<td>Occupational therapy</td>
<td>1.3%</td>
</tr>
<tr>
<td>Physical therapy</td>
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**Source:** Early Childhood Longitudinal Study, Kindergarten Class of 1998-99.
<table>
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<tr>
<th>Basic child characteristics</th>
<th>Relative</th>
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<th>Center</th>
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<td>5.3%</td>
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<td>4.6%</td>
<td>6.0%</td>
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<tr>
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<td>6.1%</td>
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<td>23.9</td>
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<td>(5.7)</td>
<td>(4.1)</td>
<td>(5.6)</td>
<td>(5.3)</td>
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<tr>
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<td>17.6%</td>
<td>16.8%</td>
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<td>17.1%</td>
<td>16.4%</td>
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<td>(1.3)</td>
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<td>6.1%</td>
<td>8.6%</td>
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<td>5.9%</td>
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<td>Age (months) at kindergarten entry</td>
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<td>(4.3)</td>
<td>(4.1)</td>
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<td>95.6%</td>
<td>94.6%</td>
<td>94.7%</td>
<td>95.2%</td>
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<tr>
<td>Low-weight at kindergarten entry</td>
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<td>1.0%</td>
<td>1.2%</td>
<td>1.1%</td>
<td>0.9%</td>
<td>1.7%</td>
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<table>
<thead>
<tr>
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<td>Family Type</td>
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<td>Two parents</td>
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<td>76.0%</td>
<td>70.1%</td>
<td>46.7%</td>
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<td>15.2%</td>
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<tr>
<td>Other</td>
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<td>3.5%</td>
<td>6.8%</td>
<td>4.3%</td>
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<tr>
<td>Parents highest education level</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Less than high school</td>
<td>11.1%</td>
<td>3.4%</td>
<td>4.6%</td>
<td>19.8%</td>
<td>9.2%</td>
<td>11.3%</td>
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<tr>
<td>High school</td>
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<td>21.5%</td>
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<td>25.4%</td>
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<tr>
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<td>5.7%</td>
<td>21.6%</td>
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<tr>
<td>Mom worked before kindergarten</td>
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<td>87.9%</td>
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<td>24.7%</td>
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<td>28.1%</td>
<td>20.8%</td>
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<tr>
<td>Lowest SES</td>
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<tr>
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<td>0.35</td>
<td>0.33</td>
<td>0.57</td>
<td>0.41</td>
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<td>(1.5)</td>
<td>(1.4)</td>
<td>(1.6)</td>
<td>(1.6)</td>
<td>(1.3)</td>
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<tr>
<td>Food insecure any point in kindergarten</td>
<td>10.8%</td>
<td>6.1%</td>
<td>6.1%</td>
<td>17.2%</td>
<td>10.7%</td>
<td>9.3%</td>
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<table>
<thead>
<tr>
<th>Pre-Identified Disability/Services Received</th>
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<tr>
<td>Disability diagnosed before K</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Learning disability</td>
<td>2.4%</td>
<td>2.9%</td>
<td>3.4%</td>
<td>4.6%</td>
<td>3.7%</td>
<td>3.0%</td>
</tr>
<tr>
<td>Use of limbs</td>
<td>1.0%</td>
<td>1.2%</td>
<td>1.2%</td>
<td>0.7%</td>
<td>1.1%</td>
<td>1.4%</td>
</tr>
<tr>
<td>Speech</td>
<td>6.8%</td>
<td>7.2%</td>
<td>7.0%</td>
<td>9.0%</td>
<td>8.0%</td>
<td>7.9%</td>
</tr>
<tr>
<td>Hearing</td>
<td>0.9%</td>
<td>1.5%</td>
<td>1.4%</td>
<td>1.7%</td>
<td>1.3%</td>
<td>1.3%</td>
</tr>
<tr>
<td>Pre-K therapy received</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Special needs class</td>
<td>1.5%</td>
<td>1.9%</td>
<td>2.0%</td>
<td>2.4%</td>
<td>2.2%</td>
<td>2.2%</td>
</tr>
<tr>
<td>Physical therapy</td>
<td>0.9%</td>
<td>1.0%</td>
<td>1.0%</td>
<td>1.1%</td>
<td>1.0%</td>
<td>1.0%</td>
</tr>
<tr>
<td>Occupational therapy</td>
<td>1.0%</td>
<td>1.2%</td>
<td>1.2%</td>
<td>1.0%</td>
<td>1.3%</td>
<td>1.4%</td>
</tr>
</tbody>
</table>
## Table 2: Selected Characteristics of Children in Specified Pre-K Arrangements More Than 6 Months and 20 Hours Per Week in the Year Before Kindergarten

<table>
<thead>
<tr>
<th>Kindergarten Information</th>
<th>Relative</th>
<th>Non-Relative</th>
<th>Center</th>
<th>Head Start</th>
<th>Multiple</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Location</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>City</td>
<td>45.6%</td>
<td>36.5%</td>
<td>46.4%</td>
<td>41.9%</td>
<td>46.2%</td>
<td>40.5%</td>
</tr>
<tr>
<td>Suburban/large town</td>
<td>33.4%</td>
<td>35.6%</td>
<td>40.3%</td>
<td>27.2%</td>
<td>32.3%</td>
<td>38.9%</td>
</tr>
<tr>
<td>Rural/small Town</td>
<td>21.1%</td>
<td>27.9%</td>
<td>13.4%</td>
<td>30.9%</td>
<td>21.5%</td>
<td>20.5%</td>
</tr>
<tr>
<td>Northeast</td>
<td>17.8%</td>
<td>18.9%</td>
<td>16.1%</td>
<td>14.1%</td>
<td>14.7%</td>
<td>20.1%</td>
</tr>
<tr>
<td>Midwest</td>
<td>26.8%</td>
<td>37.7%</td>
<td>18.3%</td>
<td>18.2%</td>
<td>21.1%</td>
<td>27.2%</td>
</tr>
<tr>
<td>South</td>
<td>34.1%</td>
<td>22.6%</td>
<td>46.1%</td>
<td>52.9%</td>
<td>46.1%</td>
<td>26.0%</td>
</tr>
<tr>
<td>West</td>
<td>21.3%</td>
<td>20.8%</td>
<td>19.5%</td>
<td>14.8%</td>
<td>18.1%</td>
<td>26.7%</td>
</tr>
<tr>
<td>Kindergarten full day</td>
<td>59.0%</td>
<td>49.2%</td>
<td>70.3%</td>
<td>72.3%</td>
<td>69.4%</td>
<td>48.4%</td>
</tr>
<tr>
<td>Kindergarten &gt;50% minority students</td>
<td>46.2%</td>
<td>18.7%</td>
<td>33.5%</td>
<td>64.5%</td>
<td>46.1%</td>
<td>30.8%</td>
</tr>
<tr>
<td>Kindergarten &gt;50% free lunch eligible</td>
<td>29.8%</td>
<td>13.4%</td>
<td>22.8%</td>
<td>53.4%</td>
<td>34.5%</td>
<td>19.2%</td>
</tr>
<tr>
<td>Public school</td>
<td>82.9%</td>
<td>76.8%</td>
<td>69.0%</td>
<td>96.3%</td>
<td>80.3%</td>
<td>80.8%</td>
</tr>
</tbody>
</table>

**Source:** Early Childhood Longitudinal Study, Kindergarten Class of 1998-99.
### Table 3: Selected Statistics of Children Receiving Special Education Services in Kindergarten

<table>
<thead>
<tr>
<th>Basic child characteristics</th>
<th>Received Special Education Services in Kindergarten</th>
</tr>
</thead>
<tbody>
<tr>
<td>Race</td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td>16.4%</td>
</tr>
<tr>
<td>White</td>
<td>62.1%</td>
</tr>
<tr>
<td>Hispanic</td>
<td>14.4%</td>
</tr>
<tr>
<td>Asian</td>
<td>2.9%</td>
</tr>
<tr>
<td>Other</td>
<td>4.3%</td>
</tr>
<tr>
<td>Gender – Male</td>
<td>66.7%</td>
</tr>
<tr>
<td>Mother’s Age at Birth (mean)</td>
<td>22.8 (standard deviation) (5.5)</td>
</tr>
<tr>
<td>Born premature - 2 wks or more</td>
<td>25.4%</td>
</tr>
<tr>
<td>Child birth weights (pounds) (mean)</td>
<td>7.1 (standard deviation) (1.6)</td>
</tr>
<tr>
<td>Low-birth weight</td>
<td>13.3%</td>
</tr>
<tr>
<td>Age (months) at kindergarten entry (mean)</td>
<td>65.9 (standard deviation) (4.9)</td>
</tr>
<tr>
<td>First-time kindergartner</td>
<td>84%</td>
</tr>
<tr>
<td>Low-weight at kindergarten</td>
<td>3.2%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Family background</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Family Type</td>
<td></td>
</tr>
<tr>
<td>Two parents</td>
<td>67.0%</td>
</tr>
<tr>
<td>Single parent</td>
<td>26.0%</td>
</tr>
<tr>
<td>Other</td>
<td>7.1%</td>
</tr>
<tr>
<td>Parents highest education level</td>
<td></td>
</tr>
<tr>
<td>Less than High School</td>
<td>11.1%</td>
</tr>
<tr>
<td>High School</td>
<td>35.8%</td>
</tr>
<tr>
<td>More than high school</td>
<td>32.2%</td>
</tr>
<tr>
<td>College or higher</td>
<td>20.9%</td>
</tr>
<tr>
<td>Mom worked before kindergarten</td>
<td>64.4%</td>
</tr>
<tr>
<td>Below poverty level</td>
<td>29.0%</td>
</tr>
<tr>
<td>First quintile SES</td>
<td>27.6%</td>
</tr>
<tr>
<td>Years of money problems before K (years)</td>
<td>0.5 (standard deviation) (1.2)</td>
</tr>
<tr>
<td>Number of residences before K</td>
<td>2.3 (standard deviation) (1.6)</td>
</tr>
<tr>
<td>Food insecure any point in kindergarten</td>
<td>10.4%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Kindergarten information</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td></td>
</tr>
<tr>
<td>City</td>
<td>29.6%</td>
</tr>
<tr>
<td>Suburban/large town</td>
<td>47.7%</td>
</tr>
<tr>
<td>Rural/small town</td>
<td>22.7%</td>
</tr>
<tr>
<td>Northeast</td>
<td>28.0%</td>
</tr>
<tr>
<td>Midwest</td>
<td>18.0%</td>
</tr>
<tr>
<td>South</td>
<td>44.1%</td>
</tr>
<tr>
<td>West</td>
<td>9.9%</td>
</tr>
<tr>
<td>Kindergarten full day</td>
<td>58.5%</td>
</tr>
<tr>
<td>Kindergarten &gt;50% minority students</td>
<td>30.0%</td>
</tr>
<tr>
<td>Kindergarten &gt;50% free lunch eligible</td>
<td>29.4%</td>
</tr>
</tbody>
</table>
### Table 3: Selected Statistics of Children Receiving Special Education Services in Kindergarten

<table>
<thead>
<tr>
<th>Pre-k arrangements</th>
<th>Received Special Education Services in Kindergarten</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public school</td>
<td>90.7%</td>
</tr>
<tr>
<td>Pre-k arrangements</td>
<td></td>
</tr>
<tr>
<td>Any relative care</td>
<td>23.1%</td>
</tr>
<tr>
<td>Relative 20 hrs/wk + 6 mo/yr</td>
<td>11.2%</td>
</tr>
<tr>
<td>Any non-relative care</td>
<td>13.5%</td>
</tr>
<tr>
<td>Non-relative 20 hrs/wk + 6 mo/yr</td>
<td>7.7%</td>
</tr>
<tr>
<td>Any center-based care</td>
<td>49.7%</td>
</tr>
<tr>
<td>Center-based 20 hrs/wk + 6 mo/yr</td>
<td>20.2%</td>
</tr>
<tr>
<td>Any Head Start</td>
<td>18.0%</td>
</tr>
<tr>
<td>Head Start 20 hrs/wk</td>
<td>10.4%</td>
</tr>
<tr>
<td>Multiple arrangements</td>
<td>25.0%</td>
</tr>
<tr>
<td>Multiple arrangements 20 hrs/wk + 6 mo/yr</td>
<td>6.7%</td>
</tr>
<tr>
<td>No non-parental pre-K</td>
<td>23.5%</td>
</tr>
<tr>
<td>No non-parental pre-K 20 hrs/wk + 6 mo/yr</td>
<td>57.4%</td>
</tr>
<tr>
<td>Number of pre-K arrangements</td>
<td>1.2</td>
</tr>
<tr>
<td>(standard deviation)</td>
<td>(1.0)</td>
</tr>
</tbody>
</table>

### Pre-identified disability/services received

<table>
<thead>
<tr>
<th>Disability diagnosed before K</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning disability</td>
<td>27.1%</td>
</tr>
<tr>
<td>Use of limbs</td>
<td>11.6%</td>
</tr>
<tr>
<td>Speech</td>
<td>52.2%</td>
</tr>
<tr>
<td>Hearing</td>
<td>8.2%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pre-K therapy received</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Special needs class</td>
<td>22.6%</td>
</tr>
<tr>
<td>Occupational therapy</td>
<td>16.3%</td>
</tr>
<tr>
<td>Physical therapy</td>
<td>13.0%</td>
</tr>
</tbody>
</table>

**Source:** Early Childhood Longitudinal Study, Kindergarten Class of 1998-99.
<table>
<thead>
<tr>
<th>Relative</th>
<th>Non-Relative</th>
<th>Center</th>
<th>Head Start</th>
<th>Multiple</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.0%</td>
<td>2.8%</td>
<td>2.7%</td>
<td>5.1%</td>
<td>3.7%</td>
<td>3.7%</td>
</tr>
</tbody>
</table>

**Source:** Early Childhood Longitudinal Study, Kindergarten Class of 1998-99.
<table>
<thead>
<tr>
<th>Basic Child &amp; Family Characteristics</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
<th>Model 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>-0.016 **</td>
<td>-0.015 **</td>
<td>-0.015 **</td>
<td>-0.007</td>
<td>-0.007</td>
</tr>
<tr>
<td>Hispanic</td>
<td>-0.017 **</td>
<td>-0.009</td>
<td>-0.009</td>
<td>-0.003</td>
<td>-0.004</td>
</tr>
<tr>
<td>Asian</td>
<td>-0.021 **</td>
<td>-0.016 **</td>
<td>-0.016 **</td>
<td>-0.007</td>
<td>-0.007</td>
</tr>
<tr>
<td>Other race</td>
<td>-0.010</td>
<td>-0.006</td>
<td>-0.006</td>
<td>-0.001</td>
<td>-0.002</td>
</tr>
<tr>
<td>Male</td>
<td>0.020 **</td>
<td>0.015 **</td>
<td>0.015 **</td>
<td>0.007 **</td>
<td>0.007 **</td>
</tr>
<tr>
<td>Mother’s age first birth</td>
<td>-0.001</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>Born more than 2 weeks premature</td>
<td>0.016 **</td>
<td>0.013 **</td>
<td>0.013 **</td>
<td>0.004</td>
<td>0.003</td>
</tr>
<tr>
<td>Low birth weight</td>
<td>0.017 **</td>
<td>0.012</td>
<td>0.012</td>
<td>0.005</td>
<td>0.004</td>
</tr>
<tr>
<td>Single parent</td>
<td>0.002</td>
<td>0.001</td>
<td>0.001</td>
<td>-0.001</td>
<td>0.000</td>
</tr>
<tr>
<td>Other parent</td>
<td>-0.008</td>
<td>-0.008</td>
<td>-0.008</td>
<td>-0.012</td>
<td>-0.013 **</td>
</tr>
<tr>
<td>Mom worked before K</td>
<td>-0.011 **</td>
<td>-0.009 **</td>
<td>-0.008 **</td>
<td>-0.005</td>
<td>-0.006 **</td>
</tr>
<tr>
<td>First quintile SES</td>
<td>0.027 **</td>
<td>0.022 **</td>
<td>0.021 **</td>
<td>0.012 **</td>
<td>0.013 **</td>
</tr>
<tr>
<td>Poverty</td>
<td>0.004</td>
<td>0.003</td>
<td>0.003</td>
<td>0.004</td>
<td>0.003</td>
</tr>
<tr>
<td>Parent Education: HS or less</td>
<td>-0.003</td>
<td>-0.006</td>
<td>-0.005</td>
<td>0.001</td>
<td>0.001</td>
</tr>
<tr>
<td>Parents Education: HS</td>
<td>0.013 **</td>
<td>0.006</td>
<td>0.007</td>
<td>0.007</td>
<td>0.008</td>
</tr>
<tr>
<td>Parents Ed: less than college degree</td>
<td>0.008</td>
<td>0.006</td>
<td>0.006</td>
<td>0.006</td>
<td>0.006</td>
</tr>
<tr>
<td>Severe money problems</td>
<td>0.003</td>
<td>0.003 **</td>
<td>0.003 **</td>
<td>0.001</td>
<td>0.001</td>
</tr>
<tr>
<td>Number of residences</td>
<td>0.001</td>
<td>0.001</td>
<td>0.001</td>
<td>0.000</td>
<td>0.000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Additional Family &amp; School Background</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
<th>Model 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>City</td>
<td>-0.016 **</td>
<td>-0.016 **</td>
<td>-0.012 **</td>
<td>-0.012 **</td>
<td></td>
</tr>
<tr>
<td>Rural</td>
<td>-0.005</td>
<td>-0.005</td>
<td>-0.005</td>
<td>-0.005</td>
<td></td>
</tr>
<tr>
<td>Full day kindergarten</td>
<td>-0.003</td>
<td>-0.003</td>
<td>-0.003</td>
<td>-0.003</td>
<td></td>
</tr>
<tr>
<td>Kindergarten majority students</td>
<td>0.009</td>
<td>0.009</td>
<td>0.007</td>
<td>0.007</td>
<td></td>
</tr>
<tr>
<td>Low height at kindergarten</td>
<td>-0.001</td>
<td>-0.001</td>
<td>0.000</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td>Low weight at kindergarten</td>
<td>0.033 **</td>
<td>0.033 **</td>
<td>0.013</td>
<td>0.012</td>
<td></td>
</tr>
<tr>
<td>Age at kindergarten entry</td>
<td>0.001 **</td>
<td>0.001 **</td>
<td>0.001</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td>First time kindergartner</td>
<td>-0.063 **</td>
<td>-0.063 **</td>
<td>-0.029 **</td>
<td>-0.027 **</td>
<td></td>
</tr>
<tr>
<td>Food insecure during kindergarten</td>
<td>-0.003</td>
<td>-0.003</td>
<td>-0.002</td>
<td>-0.002</td>
<td></td>
</tr>
<tr>
<td>Very food insecure during kindergarten</td>
<td>-0.013</td>
<td>-0.013</td>
<td>-0.011 **</td>
<td>-0.010</td>
<td></td>
</tr>
<tr>
<td>Public school</td>
<td>0.018 **</td>
<td>0.018 **</td>
<td>0.011 **</td>
<td>0.010 **</td>
<td></td>
</tr>
<tr>
<td>Northeast</td>
<td>0.042 **</td>
<td>0.042 **</td>
<td>0.030 **</td>
<td>0.029 **</td>
<td></td>
</tr>
<tr>
<td>Midwest</td>
<td>0.008</td>
<td>0.008</td>
<td>0.005</td>
<td>0.005</td>
<td></td>
</tr>
<tr>
<td>South</td>
<td>0.032 **</td>
<td>0.032 **</td>
<td>0.024 **</td>
<td>0.024 **</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pre-K Arrangements</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Relative-care 20 hrs/wk + 6 mo/yr</td>
<td>-0.003</td>
<td>-0.002</td>
<td>-0.002</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-relative care 20 hrs/wk + 6 mo/yr</td>
<td>-0.009</td>
<td>-0.005</td>
<td>-0.004</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Center-based 20 hrs/wk + 6 mo/yr</td>
<td>-0.003</td>
<td>-0.004</td>
<td>-0.003</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Head Start 20 hrs/wk + 6 mo/yr</td>
<td>-0.002</td>
<td>-0.002</td>
<td>-0.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multiple arrange, 20 hrs/wk + 6 mo/yr</td>
<td>0.007</td>
<td>0.005</td>
<td>0.004</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of pre-K arrangements</td>
<td>0.001</td>
<td>0.000</td>
<td>-0.001</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Disability Diagnosed Before K</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning disability diagnosed pre-K</td>
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**Source:** Early Childhood Longitudinal Study, Kindergarten Class of 1998-99.

**Notes:** **significant at p<0.05. Results weighted based on specifications from NCES.
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<td>Other Race</td>
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<tr>
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<tr>
<td>Born more than 2 weeks premature</td>
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<tr>
<td>Low birth weight</td>
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<td>Other parent</td>
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<td>Mom worked before K</td>
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<tr>
<td>First quintile SES</td>
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<td>Poverty</td>
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<td>Parents Education: HS</td>
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<td>Pre-K Arrangements</td>
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<td>Number of pre-K arrangements</td>
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<tr>
<td>Disability Diagnosed Before K</td>
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**Notes:** **significant at p<.05. Results weighted based on specifications from NCES.
Figure 1: Conceptual Model

Key early childhood care and education characteristics

Benefits of Early Childhood Education and Care

Consistency of care

Duration of care

Care setting

Permanent or Severe Developmental Disabilities

Social-Emotional Behavior

Cognitive Abilities

Family Factors – Environmental & Parental

Need for Special Education Services

IDEA Categories

a. Learning disability
b. Serious emotional disturbance
c. Speech Language impairment
d. Mental retardation
e. Blind/Visual impairment
f. Deaf/Hard of hearing
g. Health impairment
h. Physical impairment
i. Multiple impairments
j. Deaf/blind
k. Developmental delay
l. Autism
m. Traumatic brain injury

Covariates: basic demographic characteristics, socio-economic status, family income, parent’s education, stability of home environment, geographic location, kindergarten school characteristics, severity of disability, child birth information, care and education before age 4, etc.
BIBLIOGRAPHY


Congressional Research Service. (2013). The Individuals with Disabilities Education Act (IDEA), Part B: Key statutory and regulatory provisions.


