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How Parents Matter: The Role of Mothers' Education and Parenting in Young Children's Development among Economically Disadvantaged Families

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Abstract

Parents play a crucial role in shaping the contexts within which young children develop, particularly in the early years of a child's life (Bornstein, 2002; Brooks-Gunn & Markman, 2005; Maccoby & Martin, 1983). Parenting is also one of the key pathways through which socioeconomic factors, such as maternal education, may impact young children (Conger & Donnellan, 2007). In addition, both parents and their children are embedded within multiple, dynamic environments that may shape the relationship found between parents and their children's development, such as mothers' and children's experiences in school.

Surprisingly, much of existing developmental research does not explicitly examine the associations between parents and their children as they exist within these dynamic educational contexts. For instance, a large body of correlational research has documented the strong associations between a mother's education level and her children's development, but we know little about the relationship between maternal education and children's development when a mother's education *changes* over the course of key developmental time points in her child's life. In addition, are the mechanisms that explain associations between maternal education and child development the same if a mother attains her highest level of education before her children are born versus while she is raising her children? In my two-study dissertation, I draw on ecological theories of development and utilize multiple data sets to quantitatively examine the role of mothers' parenting and educational attainment in young, low-income children's development as embedded within these dynamic contexts of education.

In my first study, I examined the associations between maternal education, parenting practices, and young children's cognitive, social, and behavioral development among low-

income families in the context of attending Head Start preschool for their first year. In this study, I used cohorts 2000-2009 of the Head Start Family and Child Experiences Survey (FACES) data and employed a classroom fixed effects analytic design to compare children to each other within the same classroom. This approach addresses the potential bias of parental selection into particular classrooms that vary in quality within center by netting out observed and unobserved, time-invariant characteristics of the child's classroom. Findings indicated that more positive parenting practices and greater levels of maternal education were significantly related to children's cognitive, but not behavioral or social, skills over the Head Start year, both when parental predictors were included separately or simultaneously in the analytic models. Results suggest that parenting and maternal education in the early years of a child's life before they enter preschool may play a significant role in children's later cognitive development, above and beyond the effects of Head Start preschool.

In my second study, I explored how *improvements* in maternal education are associated with both children's development (between the ages of 3 and 9 years old) and parental factors among a predominantly low-income sample of families in the Fragile Families and Child Wellbeing Study (FFCWS) longitudinal data set. I also examined how the main associations varied by key moderators, including maternal age, income, and marital status. To test these research questions, I employed an individual child fixed effects analytic design to hold constant time-invariant characteristics of the child and mother, addressing this key source of unobserved omitted variables bias. I found that approximately 15% of mothers improved their education between when their children were ages 3 to 9. Increases in maternal education from less than a high school degree to attaining a high school diploma/GED were related to lower rates of

children's internalizing behavior problems, and improvements to a certificate/AA were related to improved receptive language. No significant relationships were found between improvements in maternal education at any other level or for other child outcomes, nor with measures of parental mental health. However, improvements in maternal education from starting with a high school degree/GED to attaining a certificate/AA were related to reduced harshness and a higher likelihood of being employed. In addition, starting with a certificate/Associates' degree and completing a Bachelor's degree or higher was significantly associated with higher household income. Findings suggest that increases in maternal education among disadvantaged mothers may have important and positive associations with young children's behavioral and cognitive development. This is particularly true for mothers who start with low levels of education, suggesting that even among a sample of low-income families, the children of the most disadvantaged mothers may gain the most from improvements in maternal education.

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Dedication

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Chapter 1

Introduction

Before young children enter elementary school, those living in economic hardship demonstrate lower cognitive, social, and behavioral development compared to their more advantaged peers (P. M. Carneiro & Heckman, 2003; G. J. Duncan, Magnuson, & Votruba-Drzal, 2017; Entwisle & Alexander, 1993; Lee & Burkam, 2002). Gaps found in the early years persist and may grow wider as children progress through school (G. J. Duncan & Magnuson, 2011) and relate to differences in later academic achievement, well-being, and economic success in adulthood (G. J. Duncan, Ziol-Guest, & Kalil, 2010). In addition, children's neurological development is particularly susceptible to environmental influences and experiences during key critical periods in childhood (Knudsen, Heckman, Cameron, & Shonkoff, 2006). As a result, focusing on supporting children's development when children are young has been a primary focus for researchers and policy-makers concerned with addressing and preventing growing inequality between lower and higher-socioeconomic status children.

As young children spend a significant part of their early lives in close interactions with their parents, a sizable body of research has focused on understanding the role of parents in young children's development, as well as how interventions focusing on parents could help address early and persisting socioeconomic gaps in children's achievement. Indeed, theory and empirical research suggests that parental processes, such as parenting practices, play a crucial role in shaping the contexts within which young children develop, particularly in the early years of a child's life (Bornstein, 2002; Brooks-Gunn & Markman, 2005; Maccoby & Martin, 1983).

Parenting is also seen as one of the primary channels through which socioeconomic factors, such as maternal education, influence young children's development (Conger, Conger, & Martin, 2010; Kalil, 2015; Lugo-Gil & Tamis-LeMonda, 2008; Repetti, Taylor, & Seeman, 2002).

In addition, ecological theories of human development suggest that while direct, bidirectional interactions between parents and children are crucial for children's development, both parents and children are also embedded within multiple nested settings, such as the neighborhood or school (Bronfenbrenner & Morris, 1998). These settings also shape the contexts in which parent-child interactions take place, which in turn influences how parents shape young children's development. However, much of existing developmental research does not consider the role of parents in children's development while acknowledging parents' role in relation to these other dynamic, proximal environments. For instance, an increasing number of young children are attending early childhood education or child care, where they engage in interactions with their teachers and peers that influence their school readiness and socioemotional learning. However, these increasingly common preschool experiences are typically unaccounted for in research that considers the role of parents in the development of these same skills for children. In addition, a large portion of low-income mothers return to school themselves after starting a family, yet most research that explores the impact of maternal education on children's development has treated mothers' education as static, overlooking how the changing educational experiences of mothers may influence their parenting and children's development in ways that might differ compared to the impact of education attained before children were born.

Therefore, more research is needed to better understand the role of parents in children's development in relation to these other dynamic contexts. My dissertation seeks to explore the

associations between mothers' parenting and educational attainment and young, low-income children's development, as these relationships operate within the dynamic, proximal educational contexts of both mothers and children.

In the remainder of the introduction, I review the literature about two key parental predictors explored in this dissertation: parenting and maternal education. First, I describe key parenting practices and review the existing literature about the associations between parenting and children's outcomes. I then discuss existing evidence about how maternal education is related to key indicators of children's development, as well as the possible mechanisms that may explain these associations.

The Role of Parents in Young Children's Development

Parenting is defined by the practices and behaviors parents utilize to socialize children and guide their behaviors, as well as the quality of those practices (e.g., how nurturing/harsh or how developmentally appropriate parents are when they engage in parenting practices; (Darling & Steinberg, 1993; Teti, Cole, Cabrera, Goodman, & McLoyd, 2017). Parenting not only shapes daily parent-child interactions and the family environment in which children grow up, but is also related to the types of out-of-home experiences they select for their children (e.g., if and where their children attend preschool). Effective, high-quality parenting can be characterized by parents who (1) are warm, sensitive and responsive to their children's needs; (2) use appropriate control and disciplinary strategies; and (3) provide cognitively stimulating environments for their child (Brooks-Gunn & Markman, 2005; Chase-Lansdale & Pittman, 2002; Grolnick, 2002). Key parenting practices and indicators of the quality of those practices are described below, as well as how they are associated with children's development.

Warmth and control/harshness. Parental warmth is characterized by expressions of love, affection, nurturance, and acceptance towards the child. Parental controlling behaviors include the use of restrictions and limits placed on the child, as well as the consistent, strict enforcement of those demands in order to manage the child's behavior (Brooks-Gunn & Markman, 2005; Chase-Lansdale & Pittman, 2002; Webster-Stratton, 1998). Parents who exhibit appropriate control monitor children and enforce rules in a consistent, nonintrusive way, and engage in non-corporal, less harsh disciplinary methods to deal with misbehavior (Baumrind, 1966). Parental control is viewed as negative when parents utilize physical punishment and are harsh, restrictive, and inflexible with children, regardless of the particular circumstance (Grolnick, 2002).

Children whose parents are warm and supportive demonstrate greater cognitive, language, and social skills (Amato & Fowler, 2002; Landry, Smith, Swank, Assel, & Vellet, 2001; McGroder, 2000), as well as lower behavior problems (Shumow, Vandell, & Posner, 1998). Experimental evaluations targeting low-income, Head Start parents' behaviors have found improvements in parenting quality (i.e., lower scores on controlling, punitive parenting and higher scores on positive parent-child interactions and cognitive stimulation) and lower behavior problems in children (Reid, Webster-Stratton, & Beauchaine, 2001).

Results become more mixed when looking at the relation among child outcomes and parenting practices labeled as negative, including low warmth, high control/intrusiveness, and harsh verbal and/or physical discipline. Some studies show that these negative parenting practices relate to worse child outcomes across socioeconomic status and for both preschool and elementary-aged children, including higher child negativity and negative engagement with their

mother (Ispa et al., 2004), lower social adjustment in school (Shumow et al., 1998), and higher levels of problem behaviors (Spieker, Larson, Lewis, Keller, & Gilchrist, 1999). However, multiple studies with low-income samples have found that very high parental control and intrusiveness, when coupled with high warmth (termed "tough love" or "no nonsense parenting") are related to positive developmental outcomes for both young children and adolescents (Brody & Flor, 1998; Brooks-Gunn & Markman, 2005; McLoyd & Smith, 2002; Spieker et al., 1999). For example, in a sample of rural, predominantly low-income African American families, a combination of very high control and warmth positively predicted higher self-regulation and cognitive skills in a sample of 6- to 9-year-old children (Brody & Flor, 1998).

Cognitive stimulation and reading. Cognitive stimulation encompasses parents' provision of learning materials (e.g., books, technology, games), teaching behaviors, and the creation of a verbally stimulating environment in the home, all of which promote learning (Bradley, 2002; Bradley, Corwyn, McAdoo, & Coll, 2001). Young children whose parents engage them in greater cognitively stimulating interactions and activities consistently demonstrate higher academic achievement (Ansari & Gershoff, 2016; Crosnoe, Leventhal, Wirth, Pierce, & Pianta, 2010; Gershoff, Aber, Raver, & Lennon, 2007) and social skills (McGroder, 2000). Findings from a recent study using the Head Start FACES 2006 data suggest that increases in parental cognitive stimulation over the year related to increases in children's literacy and math skills, but no change was found for children's problem behaviors (Ansari & Gershoff, 2016). In a review of multiple parenting practices across diverse samples of children, parental cognitive stimulation was the most consistent predictor of children's receptive language

development, social skills, behavior problems, and academic achievement, compared to other parenting practices assessed (e.g., parental responsiveness; (Bradley et al., 2001).

Family literacy practices include the frequency of parent-child reading and story-telling, the strategies and questions used to engage the child in discussions about the stories to promote learning, and the number of books and other reading materials the child has access to in the home (Ansari, Purtell, & Gershoff, 2016; Miller, Farkas, Vandell, & Duncan, 2014). More frequent and higher quality literacy practices relate to greater cognitive skills in young children (Britto & Brooks-Gunn, 2001; Rodriguez et al., 2009). One study explored the role of the frequency of maternal reading on low-income children's cognitive development at ages 14, 24 and 36 months, finding that after controlling for maternal warmth, daily reading at all three time points related to higher language and cognitive development (Raikes et al., 2006).

Maternal Education and Young Children's Outcomes: Relationships and Mechanisms

Maternal education is one of the strongest and most consistent predictors of young children's development, influencing parenting practices and, more broadly, the multiple environments in which children live (Harding, Morris, & Hughes, 2015). Children of mothers with higher education have better health, higher cognitive functioning and academic achievement, and fewer socio-emotional and behavioral problems (G. J. Duncan, Kalil, & Ziol-Guest, 2013; Gennetian, Magnuson, & Morris, 2008; Kaushal, 2014; Nagin & Tremblay, 2001; Sektnan, McClelland, Acock, & Morrison, 2010). A smaller body of research exists that seeks to better address confounding factors and isolate the causal role of maternal education on children's development, as children and parents share other attributes (e.g., heritable cognitive endowments; socioeconomic characteristics like family income) that relate to both parents'

education attainment and children's outcomes. Studies attempt to control for these confounding characteristics through multiple means— for instance, by examining how increases in maternal education after children are born predict development (Harding, 2015; Magnuson, 2007); through instrumental variables analyses (P. Carneiro, Meghir, & Parey, 2013; Gennetian et al., 2008; Oreopoulos, Page, & Stevens, 2006); or through randomized control trial study designs (Quint, Bos, & Polit, 1997). This research broadly indicates that higher maternal education levels and increases in education relate to better outcomes for children.

A mother's level of education may influence children's development through a variety of pathways, and one of the most prominent pathways explored in research is mothers' parenting. Skills gained through more education translate to greater knowledge of and investments in child development (Becker & Tomes, 1994; Harding et al., 2015; Kalil, 2015). For instance, the family investment model suggests that higher maternal education levels relate to children's development through increases in employment opportunities and household income, which in turn relates to greater parental time and financial resources devoted to supporting children's development (Card, 1999; Guryan, Hurst, & Kearney, 2008; Kaushal, 2014; Oreopoulos & Salvanes, 2011). Maternal education level also positively predicts mothers' knowledge about child development, with higher-educated mothers investing in their children in more developmentally-appropriate ways compared to their lower-educated peers (Bianchi, Robinson, & Milke, 2006; Guryan et al., 2008; Kalil, Ryan, & Corey, 2012). For instance, more highly educated mothers engage in more frequent reading and language interactions with children (P. Carneiro et al., 2013; Hart & Risley, 1995; Huston & Aronson, 2005) and exhibit lower levels of harshness and physical discipline (Oreopoulos & Salvanes, 2011; Pinderhughes, Dodge, Zelli, Bates, & Pettit, 2000).

In addition to the investment of resources and engagement in appropriate parenting interactions, maternal education may relate to parenting through other pathways, including through impacts on mothers' stress and psychological well-being. The family stress (or process) model describes how lower socioeconomic status and education relates to less optimal parenting through greater economic hardship, more frequent and extreme experiences of psychological distress and poor mental health. Mothers with higher education may experience less strain related to economic hardship, which may then translate into more competent parenting.

Chapter 2

Study 1: The Role of Parenting and Maternal Education on Low-Income Children's Development in the Context of Attending Head Start Preschool

Almost half of all young children under age 6 in the U.S. currently grow up in low-income households (Jiang, Granja, & Koball, 2017). Before low-income children even enter school, they are more likely to demonstrate lower cognitive, social, and behavioral development compared to their higher income peers (P. M. Carneiro & Heckman, 2003; G. J. Duncan et al., 2017; Entwisle & Alexander, 1993; Lee & Burkam, 2002; Waldfogel & Washbrook, 2011). These early gaps in development persist and may grow wider as children progress through school, relating to deficits in later academic achievement, well-being, and economic success in adulthood (G. J. Duncan et al., 2010; Knudsen et al., 2006).

Parents[1] play a crucial role in children's well-being and development, particularly in the early years of a child's life when children spend much of their time interacting with and in the immediate care of their parents (Bornstein, 2002). As a result, understanding the early role of parents in young children's development is a primary focus for researchers and policymakers dedicated to fostering the healthy development of low-income children through supporting the economic self-sufficiency and well-being of their parents.

At the same time, an increasing number of low-income children are exposed to out-of-

[1] The terms "parent" and "parenting" are used in this study to refer to any adult who is the primary caregiver, including mothers, fathers, stepparents, foster parents, relatives, and close friends.

home, center-based early care and education. Approximately two thirds of 4-year-olds currently attend center-based preschool, which is more than double the number of children enrolled in the 1970s (Barnett, Carolan, Squires, & Brown, 2014).

The largest federally funded preschool program in the United States is Head Start, founded in 1965 as a part of President Lyndon B. Johnson's War on Poverty to support the learning and development of low-income children, as well as to provide supportive services for children and their families (Vinovskis, 2008). Head Start currently serves just under one third of all eligible 3- and 4-year-olds, or approximately 900,000 children (U.S. Department of Health and Human Services, 2015), and quasi-experimental and experimental studies have found that children's participation in Head Start is related to short-term gains in children's academic performance, language skills, and socio-behavioral adjustment (Puma, Bell, Cook, Heid, Shapiro, Broene, Jenkins, Fletcher, Quinn, & Friedman, 2010; Shager et al., 2013).

In sum, it is clear from existing (and predominantly separate) bodies of research that children's early experiences both with their parents and in preschool are significantly associated with their early development. However, it is less apparent if parents matter for subsequent gains in young children's development when children attend Head Start preschool for a year. Why might we care about understanding the influence of parents— including early parenting practices and mothers' education level— on children's developmental growth within the context of children attending early childhood education? One reason is derived from ecological theories of human development, which suggest that young children are embedded in multiple, nested environments, such as the home and preschool, and that these proximal environments overlap in ways that play a key role in children's development (Bronfenbrenner, 1986). As the trends in

young children's attendance of out-of-home early child care and education continues to rise, preschool has become an increasingly salient environment for children's development. Thus, in order to accurately understand the influence of parents on growth in children's cognitive, social, and behavioral outcomes, it is important to consider the broader contexts in which children develop, which not only contribute to directly shaping children's development, but also may affect how *other* environmental inputs influence children's development (Crosnoe et al., 2010). However, very few existing studies that explore the association between parental factors and young children's development have done so.

A second reason is related to concerns about spuriousness in outcomes when estimating the relationship between parents and children's outcomes in the early years of children's lives (G. J. Duncan, Magnuson, & Ludwig, 2004). Because much of the existing literature is correlational in nature, it is difficult to isolate the effect of parenting or maternal education on children's outcomes from other characteristics that might be related to both parents and children, such as shared genetic attributes or household income. For instance, it may be the case that parents who exhibit higher quality parenting or those with more education might also be highly motivated to be involved in their child's educational experience, such that they are able to place their child in a better classroom or advocate more effectively for resources to support their child's needs. In addition, recent research has shown that some classrooms within the same Head Start center may be more effective than others in promoting children's development (Bloom & Weiland, 2015; Karoly, Zellman, & Perlman, 2013) Sabol, Ross, & Frost, under review) and that variation in classroom quality within a center is significantly associated with children's developmental growth over the Head Start year. Therefore, if more competent parents have

children who are enrolled in higher quality classrooms, estimates between key parental characteristics (e.g., parenting quality and maternal education level) and children's development might inadvertently capture the influence of higher quality classrooms instead of the characteristics of parents themselves. Existing associative studies attempted to address issues of omitted variable bias by including observable classroom covariates in analyses. However, this approach fails to control for unobservable factors related to children or parents that might introduce bias in the estimate of parenting and maternal education on children's outcomes (G. J. Duncan et al., 2004). The present study employs a classroom fixed effects design to better account for potential bias caused by unobserved, time-invariant variables.

The Current Study

The current study addresses this gap in the literature by exploring the link between two key parental constructs that children experience *before* attending preschool — parenting practices and maternal education measured at baseline in the fall — and gains in preschooler's cognitive, behavioral, and social development by the spring, among a sample of families attending Head Start for their first year. To examine this research question, I take advantage of data from cohorts 2000-2009 of the Head Start Family and Child Experiences Survey (FACES), a nationally representative sample of families and Head Start preschools with rich measurement of child, parent, and classroom characteristics, as well as children's cognitive and behavior assessments over time. Specifically, I address the following research question:

> How are mothers' early <u>parenting practices</u> and <u>education level</u> that children are exposed to before attending preschool associated with gains in children's developmental outcomes over their first Head Start year?

I answer this question by employing a classroom fixed effect analytic approach, in which children who attended Head Start in the same classroom are compared to one another. On average, these classmates were exposed to the *same* teacher quality, type of instruction, class size, and all other classroom characteristics that did not change over the preschool year. Therefore, classroom fixed effects holds constant these characteristics in the model, as it is assumed that these time-constant classroom characteristics would not explain differences in children's outcomes at the end of the year. Although including classroom fixed effects does not control for classroom characteristics that *change* over the Head Start year within the same classroom, this approach addresses potential bias from unobserved characteristics that are related to both key parental constructs and children's outcomes. Thus, the inclusion of classroom fixed effects allows for stronger inferences to be made about the role of early parenting and maternal education that children experience *before* attending preschool on gains in children's development across their first Head Start year.

Method

Data

The current study utilizes data from four cohorts of the Head Start Family and Child Experiences Survey (FACES) study—2000, 2003, 2006 and 2009. The FACES study collects information on a nationally representative sample of Head Start centers, classrooms, teachers, children and their families in order to provide comprehensive information about programs and the families served within them (West, Tarullo, Aikens, Malone, & Carlson, 2011). Beginning in 1997 and continuing every three years, FACES selects a new cohort of nationally representative three- and four-year-old children who are newly entering Head Start and then subsequently

follows the children and families who remain in the study through the end of their kindergarten year. Therefore, children who enter at age 3 are followed for three years, and those who enter at age 4 are followed for two years. The 2000-2009 cohorts of FACES includes a full, original sample of 10,648 children.

FACES 2000-2009 utilized a multi-stage sampling process to select the Head Start grantee agencies, centers, classrooms and children that comprised their full sample. All centers across the 50 states and Washington D.C. were eligible for selection, with the exception of centers close to losing funding, those that served American Indian/Alaskan Natives or migrant/seasonal workers, and those that did not serve the FACES target child population (i.e., Early Head Start centers; (Malone et al., 2013; West et al., 2011). Each of the FACES 2000-2009 cohorts were selected in four stages. In the first through third stages, programs, centers, and classrooms were stratified on particular characteristics and then randomly sampled within strata with a probability proportional to size. In the fourth stage, children were sampled with an equal probability within classrooms (West, et al., 2011; Malone et al., 2013).

Sample

The final analytic sample for the current study includes 7,027 families in 1,372 classrooms from FACES cohorts 2000, 2003, 2006, and 2009. We excluded children who switched to a different classroom between the fall and spring assessments (n = 344), who did not have complete data for spring child outcomes and/or key parenting predictors (n = 1,179, and who were missing their spring classroom ID number (n = 770), as these data are required to identify children who remained in the same classroom all year. To prevent further reduction of the sample size, missing data for demographic characteristics and child baseline assessments

were imputed in fifty complete datasets using multiple imputation through chained equations in Stata 13.1 (StataCorp, 2013) were conducted on imputed datasets.

We conducted an attrition analysis using weighted t-tests. The analytic sample of children (*n* = 7,027) is somewhat lower risk in terms of demographic characteristics and baseline performance compared to the sample of children who were dropped from the current study (*n* = 2,288). In the analytic study, children have lower behavior problems and greater social and cognitive skills at baseline compared to children who were excluded from the study. In addition, children in the analytic sample are older (49 versus 45 months) and fewer attended Early Head Start (10% versus 12%), fewer parents have less than a high school degree (34% versus 38%), and more parents are single in the analytic sample (49% versus 42%). Additionally, more households speak English (78% versus 74%) in the analytic sample, compared to dropped cases.

Baseline descriptive statistics for the final analytic sample are presented in Table 1. Children are evenly split on gender and approximately one third are black, one third Hispanic, and just less than one third are white. The average age of children entering for the first time in Head Start is 4 years (48 months), and about 10% of these children attended Early Head Start prior to enrollment. The majority of parents in the analytic sample are female with an average age of 29 years. Sixty-two percent of mothers in the sample are single, about half are employed, and approximately one third have not completed a high school degree or GED. In addition, 25% of mothers were born outside of the U.S. On average, two adults (SD=0.92) and 3 children under 18 years (SD=1.25) live in the household, and approximately 22% of families speak a language other than English in the home. Average annual income for a household is about $20,030. Children scored below average on all three cognitive measures compared to other children their

same age (83.89 for PPVT; 94.25 for Letter-Word; and 88.57 for Applied Problems), yet demonstrated average social skills and behavior problems compared to the full FACES sample (scores 15.59 and 5.14, respectively).

Measures

Parenting. ***Warmth and control.*** Parental warmth and control were measured using a subgroup of 13 items from the 91-item Child Rearing Practices Report (CRPR; (Block, 1965). Parents were presented with the following question and asked to rate how much each statement is like them on a scale of 1 to 5 (1=not at all; 5=exactly). Examples of items include "*I have little to no difficulty sticking to my rules"* and *"My child and I have warm intimate moments together."* Based on the coding procedure conducted in the Head Start Impact Study using identical items (Puma, Bell, Cook, Heid, Shapiro, Broene, Jenkins, Fletcher, Quinn, Friedman, et al., 2010), two indicators were created to represent parental warmth and control. "Warmth" is an average of 4 items, including *"I am easygoing and relaxed with my child"* and *"I make sure my child knows I appreciate what he/she tries to accomplish"* (α= 0.57; range 3-20). "Control" is an average of 5 items, such as *"I control my child by warning him/her of bad things that could happen"* and *"I teach that misbehavior will always be punished"* (α=0.59; range 4-25). Scores were not created for an individual if more than 20% of items were missing.

Cognitive stimulation. Parental cognitive stimulation was assessed using items from the Home Observation for Measurement of the Environment Short Form (HOME-SF; (Bradley et al., 2001). The 11-item composite developed for this study matches cognitive stimulation composites used in similar studies with comparable data sets, such as the Head Stat Impact Study and the FACES 2006 data (Ansari & Gershoff, 2016; Ansari et al., 2016; Harding et al., 2015; Miller et

al., 2014). Parents reported on how often they engaged in stimulating activities with their child in the past week (1=yes, 0=no), such as "*taught child letters, words, or numbers*" and "*worked on arts and crafts with him/her*". Items were combined in a weighted sum score. The index was not created if more than 20% of items were missing.

Literacy practices. Parental literacy practices were operationalized in the current study using a single item from the Home Observation for Measurement of the Environment Short Form (HOME-SF). Parents reported on if they "read to child three or more times per week" (1=yes, 0=no; (Bradley et al., 2001). The use of single item to represent parental literacy practices is in line with Ansari, Purtell & Gershoff (2016), who used a similar item from the Head Start Impact Study data. Furthermore, this single item was selected instead of combing it with the following two additional literacy-related items ("on days when child is read to, it's for an average of 30 minutes or more" and "in the past week, someone told child a story") because when each of the three items were separately entered into the model to predict children's outcomes, only "reads to child three or more times per week" showed a significant relationship. This suggests that this single item may be driving the relationship found when the 3-item composite was entered into the model.

Child outcomes. To determine children's level of English proficiency, all children were given the Pre-LAS 2000 language screener at each time point (Pre-LAS 2000; (S. E. Duncan & DeAvila, 1998). Children from non-English speaking homes who did not pass the screener were either assessed in Spanish or given a shorter direct assessment (for those who did not qualify to be assessed in English or Spanish). In all models, a dummy variable was included to indicate children's English proficiency at baseline.

Cognitive skills. Children's emergent literacy, language, and math skills were directly assessed in the fall and spring of their first Head Start year. Emergent math and pre-literacy skills were measured using the Woodcock Johnson Test of Achievement- Third Edition for English-speaking children (WJ-III; Woodcock, McGrew, Mather, & Schrank, 2001) and the Bateria III Woodcock-Munoz for Spanish-speaking children who did not pass the English language screener (WM-III; (R. W. Woodcock, Munoz-Sandoval, McGrew, Mather, & Schrank, 2004). The Applied Problems subtest assessed children's ability to analyze and solve practical problems using basic math skills, such as addition, subtraction, and counting. This assessment shows good internal reliability (α=.86-.94), as reported by publishers. The Letter-Word identification subtest assessed children's emergent language skills, in which children were asked to identify isolated letters and words (α=.97-.98).

To assess children's receptive vocabulary, all children were tested using the Peabody Picture Vocabulary Test- 4th edition (PPVT-IV; (L.M. Dunn, Dunn, & Dunn, 2006). For those Spanish-speaking children who did not pass the Pre-LAS 2000 language screener, they were also given the PPVT in Spanish: Test de Vocabulario de Imagines Peabody (TVIP; (L. M. Dunn, Lugo, & Dunn, 1997). In both measures, children are shown four pictures and asked to point to which picture best represents a word said aloud by the assessor. The standard scores are used in the current paper. TVIP scores were used for children who did not pass the language screener.

Social skills and problem behaviors. Children's social skills and problem behaviors were assessed by teacher report. For social skills, teachers completed items from the Social Skills Rating System (SSRS; (Elliott, Gresham, Freeman, & McCloskey, 1988), indicating how often each child engaged in cooperative behaviors, such as following directions and complimenting

classmates. Teachers rated the extent to which each item was characteristic of the child on a scale from 0 (never) to 2 (very often), with an internal reliability of .82-.94. A sum of these scores was created to indicate overall cooperative behavior on a scale from 0-24, with higher scores representing more frequent cooperative behavior.

The Behavior Problems Index (BPI; (Peterson & Zill, 1986) was used to assess the frequency of each child's negative behaviors in the classroom. Teachers responded to questions about the occurrence of aggressive behavior (e.g., starting fights), hyperactive behavior (e.g., appearing restless), and withdrawn behavior (e.g., appearing unhappy) on a scale of 0 (never) to 2 (very often). Internal consistency for this measure was .88-.89. All items were summed to create an overall indicator of problem behaviors in the classroom (range of 0-24), with higher values on this scale are indicative of more frequent problem behaviors.

Background demographic characteristics. All child and family covariates were collected in the baseline parent survey in fall of their first year in Head Start. In the current study, we include all covariates listed in the Head Start Impact Study (U.S. Department of Health and Human Services, 2010a), as well as multiple additional covariates hypothesized to relate to my key parental predictors and children's development.

Child covariates include age (months), race (dummy codes for black, Hispanic and other; white is omitted), and gender (0=female, 1=male). In addition, we control for the number of months between the fall and spring assessments, if child was assessed in English at baseline (0=Spanish, 1=English), and if child was enrolled in Early Head Start (0=no, 1=yes). Not all of the FACES cohorts 2000-2009 included information about if child is enrolled in full or half-day

Head Start or the age group the child was placed in upon enrollment (3 or 4-year-old cohort), so we are not able to control for these variables in the analytic models.

Parent and family covariates include age (years), gender (0=female, 1=male), relationship to child (dummy codes for adopted/bio father and grandmother; adopted/bio mother is omitted), whether both biological/adoptive/step parents live in the home (0=no, 1=yes), mother's employment (0=not employed, 1=employed), mother's country of birth (0=non-U.S., 1=U.S.), mother's marital status (0=not married, 1=married), mother's age at the birth of first child (years), household income, number of adults and children in the household, and the language spoken at home (0=English, 1=Non-English).

Analytic Approach

To explore the relationship between parenting, maternal education, and gains in children's cognitive, behavioral, and social outcomes in the context of attending Head Start preschool for their first year, I estimate three separate models employing ordinary least-squares (OLS) regression with lagged dependent variables and classroom-level fixed effects. By including classroom fixed effects, in which a dummy indicator is included for each classroom, children's outcomes in the spring are estimated while holding constant all measured and unmeasured, time-invariant classroom-level influences, such as classroom quality and parents' nonrandom selection into centers and classrooms. This approach nets out potential bias resulting from characteristics of the classroom that are constant over the Head Start year. The inclusion of lagged dependent variables addresses unmeasured, time-invariant differences in children that are present in the fall score (Chase-Lansdale et al., 2003; G. J. Duncan et al., 2004). Below is the full

equation, where separate aspects of the equation are run for each of the 3 models, as explained below:

$$Y_{icj,t+1} = \beta_0 + \beta_1 Parenting_{it} + \beta_2 MaternalEd_{it} + \alpha ChildPretest_{icjt} + \sigma X_{it} + \theta_c + \varepsilon_{icj,t+1}$$

In the first model (Model A), I regress individual child *i's* outcome (*Y*) in the spring (time *t+1*) in classroom *c* in Head Start center *j* on the four parenting measures (*Parenting*) assessed in the fall (time *t*), classroom fixed effects (θ_c), children's pretest scores measured in the fall (*ChildPretest*), and a vector of child and family characteristics (*X*). Finally, an error term is included, which captures other factors that may be correlated with parenting and related to child's outcomes (ε; e.g. measurement error).

The second model (Model B) is the same as the first, except that children's outcomes in the spring are regressed on three dummies representing maternal education level assessed in the fall (time *t*), with "less than high school" level is omitted: (1) High school diploma or GED; (2) Some college/vocational certificate/Associate's degree; or (3) Bachelor's degree. The indicator for "less than high school" is omitted.

The third model (Model C) is run exactly as in the equation above. It is similar to the first two models, but instead of separately examining the influence of parenting and maternal education on children's outcomes, I simultaneously include all four measures of parenting and all three maternal education levels in the model.

Each of the three models are estimated in two ways. First, I regress each parental predictor on each child outcome without including covariates or fixed effects (Appendix Tables A1 and A2). Second, I run the same regressions, but simultaneously add in all covariates and classroom fixed effects to predict each child outcome (Tables 3 and 4).

All models are estimated using clustered standard errors due to the nested sampling structure of children within classrooms. All parenting predictors and child outcomes are standardized, so coefficients may be interpreted as effect sizes. Parenting measures and children's social skills and behavior problems standardized to the respective FACES cohort with a mean of 0 and a standard deviation (SD) of 1. Children's emergent literacy, language, and math skill assessments were normed to a nationally representative sample of children in their age group and already standardized in each FACES cohort with a mean of 0 and SD of 1.

A longitudinal classroom-level weight is included in all regression models, which was created by the researchers who collected the FACES data by taking the inverse of the probability of being selected into the sample. The weight adjusts for the probability of selection into the study sample, eligibility and acceptance rates among those selected to participate, and for attrition from the study between the fall and spring of the children's first year in Head Start. The classroom-level weight is used rather than a child-level weight due to the inclusion of the classroom-level fixed effects. Therefore, the results of this study are nationally representative at the classroom level of all 3 and 4 year old children who attended their first year of Head Start preschool during the years of the study.

Results

Variation in Parental Predictors

One potential limitation of employing classroom fixed effects is that there may not be sufficient variability in parenting or maternal education between children within the same classroom. Table 2 presents the extent to which the key parental measures vary within-classroom versus across-classroom. A decomposition of the variance into within-classroom and across-classroom demonstrates that 63% (cognitive stimulation), 62% (reading), 63% (warmth), and 62% (controlling behavior) of the total variance of each parenting predictor, respectively, is accounted for within classrooms, as compared to between classrooms in the adjusted model. We found a similar pattern for maternal education, with 63% (less than high school), 63% (high school/GED), 61% (AA/some college), and 60% (BA or higher) of the total variance of each level of maternal education is accounted for within-classroom. Therefore, sufficient within-classroom variation exists in parental predictors, which support the use of classroom fixed effects analyses in the current study.

Relation between Parenting, Maternal Education, and Children's Outcomes

Tables 3 and 4 presents the results of the main analyses, in which we examined the association between parenting and maternal education at baseline and children's cognitive, social and behavioral skills at the end of the Head Start year in the spring. All results are weighted and include covariates and classroom fixed effects (see Appendix Tables A1 and A2 for unconditional results). All continuous predictors and child outcome variables are standardized so that coefficients may be interpreted as effect sizes.

Each column in Tables 3 and 4 represents a separate model, differentiated by how parental predictors were entered into the regression. In Column A, only the set of parenting predictors were included in the regression for each child outcome. In Column B, only the set of indicators for maternal education level were included in the regression for each child outcome. In Column C, both sets of parenting and maternal education level predictors were simultaneously included in the model.

When only the set of parenting predictors were entered into the model with covariates and classroom fixed effects (see each "Column A"), results demonstrate that the parenting practices children experience in the fall of Head Start significantly predict gains in children's development at the end of their first preschool year. Specifically, a one unit increase in parental cognitive stimulation is marginally associated with a .03 and .02 standard deviation greater score on emergent math skills and positive social skills, respectively. Children of parents who read to them three or more times a week demonstrated between a .02-.04 standard deviation higher score on all cognitive assessments, compared to children with parents who read to them less than 3 times/week. Parental warmth significantly predicted gains in children's emergent math skills (effect size d =.04) and marginally predicted lower problem behaviors (d = -.02) at the end of the Head Start year, above and beyond the other parenting measures. Parental control only marginally predicted gains in children's math skills by spring (d= -.03).

When examining the relationship between maternal education level and children's development (see each "Column B"), maternal education significantly predicted gains in children's development at the end of their first year in Head Start, with effect sizes that were slightly larger than those found for the parenting predictors. Notably, the higher the level of

maternal education, the larger the gains in children's outcomes by the end of children's Head Start year. Compared to having less than a high school degree, mothers with a high school degree or GED have children who scored between .06-.09 of a standard deviation higher on language (PPVT), literacy (Letter Word ID), and emergent math skills (Applied Problems) assessments. Parents with an Associate's degree or some college, compared to those with less than a high school degree, have children who scored between .10- .15 of a standard deviation higher on all cognitive assessments. Finally, parents with a Bachelor's degree or higher, compared to those with less than a high school degree, have children who scored between .19- .24 of a standard deviation higher on all cognitive assessments. Notably, there is no significant relationship between maternal education level and changes in children's positive social skills or problem behaviors, except that children of mothers who have a high school degree or GED demonstrate .05 of a standard deviation reduction in problem behaviors compared to those with less than a high school degree; however, this relationship is only marginally significant. Although maternal education level is not significantly related to changes in children's pro-social skills or problem behaviors, the relationships are in the expected direction.

When all parenting and maternal education level predictors are simultaneously entered into the model, similar relationships are found for children's spring outcomes as when each set of predictors is entered separately. The only difference is that the magnitude of effect sizes attenuate slightly when all predictors are entered in the model together. For instance, when entered with only parenting predictors, a one-unit increase in parental cognitive stimulation is related to a .03 standard deviation increase in children's emergent math; this effect size decreases by .01 of a standard deviation when all parental predictors are entered together. Findings

demonstrate that above and beyond parenting practices, maternal education level significantly predicts children's cognitive development in the spring.

Discussion

The current study examined the role of early parenting practices and maternal level of education in young, low-income children's development over their first year attending Head Start. Weighted, classroom fixed effect analyses demonstrated that higher baseline parenting practices (including cognitive stimulation, reading frequency, warmth, and control) and greater levels of maternal education (as compared to having less than a high school degree) were significantly related to gains in children's development over the Head Start year, particularly for children's cognitive skills of language, literacy, and math. Baseline parental predictors were only marginally related to children's pro-social skills and problem behaviors in the spring. When parenting and maternal education variables were simultaneously included in the model, the statistical significance of associations between parental predictors and children's outcomes did not change compared to when predictors were entered individually, suggesting both maternal education and parenting practices are both significantly related to children's skills at the end of their first Head Start year.

When examining the relationship between the set of baseline parenting practices and gains in children's development, we found that children whose parents read to them 3 or more times per week showed greater language, literacy, and math skills at the end of the Head Start year, above and beyond all other parenting practices and time-invariant Head Start classroom characteristics. This finding is consistent with research that has demonstrated the significant role of reading frequency on cognitive outcomes among low-income children (Hoff, 2003; Rodriguez

et al., 2009; Scarborough & Dobrich, 1994), and extends existing literature by confirming the importance of parents' early reading practices for gains in children's development among those in Head Start preschool for their first year. Somewhat surprisingly, parental cognitive stimulation was not related to children's language or literacy at the end of the Head Start year, and was only marginally related to children's math skills, when all covariates and classroom fixed effects were included in the model. Most prior developmental literature finds consistent associations between parental cognitive stimulation and children's language, literacy, and math skills (e.g., (Ansari & Gershoff, 2016; Bradley et al., 2001; Melhuish et al., 2008; Miller et al., 2014). One explanation for this discrepancy may lie in differences between studies in how the composite for cognitive stimulation was constructed. Most existing literature incorporates the assessment of parental "reading frequency" in the measure of cognitive stimulation, whereas in the current study, reading frequency is tested as a standalone item. If reading frequency is a predominant driver of the relationship between parental cognitive stimulation and children's cognitive outcomes in much of the previous literature, it would make sense that a different relationship would be found compared to testing reading frequency on its own.

Regarding maternal level of education, in comparison to children of mothers with less than a high school degree (approximately 35% of the analytic sample), mothers with a higher level of education had children who demonstrated higher scores in all three cognitive assessments by the spring, with the strongest relationship found for literacy outcomes. These effect sizes range from .06-.24 of a standard deviation, which is similar in magnitude to the impact of Head Start participation on children's language, literacy, and math skills after one year in the program (Puma, Bell, Cook, Heid, Shapiro, Broene, Jenkins, Fletcher, Quinn, & Friedman,

2010). Importantly, the higher the level of maternal education at baseline, the larger the scores on children's cognitive assessments by the end of their first Head Start year.

Findings for maternal education are in line with a large body of literature that documents a strong association between maternal education level assessed at one point in time and young children's development, particularly for children's cognitive outcomes (G. J. Duncan, Magnuson, & Votruba-Drzal, 2015; Harding et al., 2015; Kaushal, 2014; Reardon, 2011; Sektnan et al., 2010). The current study expands this literature, suggesting that this relationship holds and predicts subsequent gains in children's development above and beyond parenting practices and time-invariant Head Start classroom characteristics over the course of children's first year in Head Start preschool. Alternately, a small body of research finds associations between higher maternal education and lower behavior problems, whereas the current study did not. This difference may be partially explained by the fact that some of the existing research is conducted with children at older developmental periods (e.g. elementary school children; (P. Carneiro et al., 2013)), where parents may utilize the knowledge and skills gained through education in ways that may more directly influence children's outcomes when they're older, such as helping with homework. Moreover, most existing studies only explore this relationship using bivariate, unconditional models, where it is likely that omitted variables were driving the relationship between maternal education level and children's problem behaviors (e.g., (Briggs-Gowan, Carter, Skuban, & Horwitz, 2001).

Importantly, this is the first study to my knowledge to employ classroom fixed effects to explore the role of early parenting practices and maternal level of education in young children's development in the context of children attending early childhood education. The inclusion of

classroom fixed effects allowed for all time-constant preschool and classroom characteristics to be held constant, reducing the potential bias that would be introduced in the estimate of parental characteristics on children's early development. As such, this study contributes to developmental research by allowing for a stronger causal inference to be made about the role of key, early parental factors on low-income children's outcomes within the context of attending preschool.

Notably, while effect sizes for the relationship between parenting practices and children's outcomes were all in the expected positive direction, they ranged from 2-4% of a standard deviation, which is relatively small compared to much of the existing literature (e.g., (Hoff, Laursen, Tardif, & Bornstein, 2002; Suizzo & Stapleton, 2007). However, these effect sizes are in line with existing research that uses the Head Start FACES data to examine parenting and children's outcomes (e.g., (Ansari & Gershoff, 2016). Moreover, the effect sizes in the current study may be smaller because of the large number and types of covariates included in the study, due to the richness of the FACES data. Finally, it is important to note that the effect sizes represent children's cognitive and behavioral outcomes in the spring after holding constant children's baseline scores assessed in the fall, so they reflect changes in children's outcomes between the fall and spring of children's first Head Start year. On average, the time between fall and spring assessments was approximately seven months. Thus, in this context, it is less surprising that effect sizes are smaller than what we see in existing literature, particularly given the relatively short time period between assessments and because they were assessed during a time when children were exposed to Head Start preschool. Because early cognitive skills are critical in predicting later academic outcomes (G. J. Duncan, Gennetian, & Morris, 2007), even a

small relationship between parenting and children's outcomes during their first Head Start year may still be relevant to their later academic success.

The current study is not without limitations. First, I am not able to confirm that all forms of bias caused by omitted variables have been eliminated. Although employing classroom fixed effects accounts for unobserved, time-invariant characteristics of the classroom, as compared to only including observable covariates in regression models, fixed effects analyses cannot account for unobserved characteristics that changed over the Head Start year. In addition, all parenting indicators in this study are derived from parents' self-report measures, and thus, may be subject to measurement error and parents' own biases in reporting. Also, this study conceptualized maternal education as a static measure assessed at the start of children's first year in Head Start preschool. However, a significant portion of low-income mothers increase their education after they start a family, so utilizing a static measure does not necessarily capture the reality of mothers' educational experiences or how those experiences may affect children's development (Augustine, 2016; Perna, Fester, & Walsh, 2010). Unfortunately, it was not possible to examine changes in maternal education in the current study, as this characteristic was only assessed once at baseline in the FACES data.

Although findings are small, results elucidate important associations between early parenting practices and mothers' level of education and gains in children's cognitive development, above and beyond Head Start. Findings suggest that future research should explore how supporting key parental behaviors and skills through programs or policies targeted in children's early years may be an effective approach to fostering the development of young, children who attend Head Start.

In terms of supporting parenting practices, programs like the Nurse-Family Partnership (NFP) provide in-home visits by nurses to first time pregnant, low-income mothers, encouraging healthy behaviors during pregnancy and providing training and support for childcare from birth to age two. Experimental results show moderate impacts on the provision of cognitive stimulation, responsivity, and the quality of the home environment (Olds, 2002; Olds, Henderson, & Kitzman, 1994; Olds et al., 2002). However, many parenting courses are offered through preschool programs that enroll children when they are around 3 or 4 years old (Magnuson & Schindler, 2016), which makes it more difficult to reach parents when children are even younger and before they enroll in Head Start.

The Early Head Start (EHS) is one program that provides comprehensive care for predominantly low-income families of children under 3 years old, as well as supportive services for parents, including case management and parenting classes. Findings from the evaluation of Early Head Start suggest that when children were 3 years of age, parents whose children were enrolled in EHS before their first birthday demonstrated greater positive parenting (e.g., emotional support and cognitive stimulation) and lower negative parenting (e.g., less hostile parenting and punitive disciplinary strategies), as compared to families assigned to the control group (Love et al., 2002). Thus, EHS may be a promising platform through which parents can access effective parenting programs and improve parenting practices when children are young. However in 2016, EHS was only funded to provide services to 6% of the eligible population of children under 3 years of age (“National Head Start Fact Sheets,” 2016). Increasing the enrollment capacity of EHS may be one policy approach for reaching parents of very young children before they enter Head Start preschool.

Findings also suggest that maternal level of education in the early years of a child's life matters for later development in the context of Head Start preschool. Supporting parents' educational attainment before having children or in the early years of children's lives may be an important focus for programs and policies. Unlike research on maternal *employment* after the transition to motherhood, there is little existing research that explores the impact of mothers' return to school, particularly when children are under 3 years old. To my knowledge, two existing studies explore this topic. (Rosenzweig & Wolpin, 1994) employed sibling fixed effects and found that an increase in a mother's total years of education within the first three years of their child's life was positively related to children's reading and math scores between ages 5 and 8. In addition, Magnuson and colleagues (2009) found that an increase in maternal education when children were between 2 and 3 years old predicted improvements in children's literacy and language. Experimental and quasi-experimental studies using samples with slightly older children are promising, suggesting that children of mothers who increase their education when children are in Head Start (e.g., (Harding, 2015) or when their children are of preschool-age (e.g., (Gennetian et al., 2008; Magnuson, 2003) demonstrate higher cognitive development one to two years later. Thus, existing evidence with children just below or just above age of 3 suggests the promise of supporting mothers' educational pursuits when children are very young.

Chapter 3

Study 2: Changes in Maternal Education and Disadvantaged Children's Language, Social, and Behavioral Development

Maternal education is one of the strongest and most consistent predictors of young children's development. Children of mothers with higher education, measured in years completed or by degrees/certifications attained, demonstrate greater cognitive functioning, early academic performance, and lower behavioral problems (Bradley & Corwyn, 2002; G. J. Duncan et al., 2015). Yet, most existing research treats education as a static characteristic (for an exception, see (Magnuson, 2007). As a result, there is a considerable amount to be learned about the effects of changes in maternal education on child wellbeing.

Demographic shifts over the past several decades suggest a significant portion of parents return to school after having children, with around 25% of the undergraduate population made up of parents (Perna et al., 2010). Increases in education are particularly common among mothers, and especially so for mothers who are economically disadvantaged (Goldrick-Rab & Sorensen, 2010). For instance, estimates from a national sample of predominantly low-income families suggest that at least 40% of mothers returned to school at least once within five years of their child's birth (MacGregor, 2009). Given these patterns, it is crucial to understand if, for whom, and under what circumstances *changes* in mothers' own education relate to their children's development.

Multiple theories suggest why improvements in maternal education after starting a family may impact children's development. Two key theoretical frameworks—the family investment model (Becker & Tomes, 1994) and the family stress model (Conger & Donnellan, 2007)—

propose that improvements in maternal education influence children through changes in parents that are proximally and distally related to children's development. Changes that are proximal to children's development include adjustments in the direct interactions between parents and their children (e.g., the quality of parenting practices; investment of resources in children's development, such as in books and tutoring). More distal changes include shifts in family resources (e.g., mothers' income and employment) and maternal psychological well-being (e.g., parental stress and maternal depression), both of which are associated with direct parenting practices and children's development. Both theories suggest that increases in socioeconomic factors, like maternal education, are associated with changes in these parental outcomes, which then relate to improvements in children's wellbeing and development. Empirical evidence consistently finds support for these theories when examining how the socioeconomic indicator of *income* relates to parental outcomes and children's development (e.g., (Gershoff et al., 2007; Linver, Brooks-Gunn, & Kohen, 2002), but few studies have explored how another key socioeconomic indicator, maternal education, is associated with a broad set of factors, including parenting, parental mental health and wellbeing, and family resources.

In the present study, I employ OLS multivariate regressions with individual fixed effects to examine the association between changes in maternal education and children's language, social, and behavioral development. I take advantage of a large-scale dataset of racially diverse, predominantly low-income parents— the Fragile Families and Child Wellbeing Study (FFCWS)— which tracks maternal education, parenting, and child wellbeing over time. I measure improvements in maternal education as gains to the subsequent "level" of education (e.g., from less than high school to completing a high school degree). This approach allows me to

assess how mothers' improvements in education may affect children differentially depending on her initial level of education. Finally, to further explore the underlying parental processes that may explain the role of gains in maternal education in children's early development, I conduct exploratory analyses examining how improvements in maternal education when children are young relate to parenting (i.e., warmth and harshness), parental wellbeing (i.e., parental stress and maternal depression), and family resources (i.e., income and employment).

Changes in Maternal Education and Child Outcomes: Why Study This Now?

Extensive research focuses on the relationship between maternal education and children's outcomes (G. J. Duncan et al., 2015; Kaushal, 2014; Mulligan, McCarroll, Flanagan, & Potter, 2014; Phillips, 2011; Sirin, 2005). This large body of work typically employs cross-sectional designs that measure maternal education at one point in time and predict related levels of children's cognitive and behavioral skills between mothers who have a higher level of education and those who have lower education. Overall, these studies generally find that static level of maternal education is one of the strongest and most consistent predictors of young children's development (Harding et al., 2015; M. I. Jackson, Kiernan, & McLanahan, 2017).

Importantly, most existing studies do not assess the relationship between *gains* in mothers' level or years of education and children's development, potentially overlooking key sources of variation since a significant portion of parents return to school after having children (Augustine, 2016; Perna et al., 2010). Increases in parents' education attendance are driven by mothers, with over 75% of parents enrolled in college are women (Gault, Reichlin, Reynolds, & Froehner, 2014; Goldrick-Rab & Sorensen, 2010) Moreover, mothers with young children are

more likely to return to school, in comparison to women with older children or no children at all (Cook & King, 2004).

Studies of descriptive trends suggest that disadvantaged mothers are among the most likely group of parents to seek more education after starting a family (Goldrick-Rab & Sorensen, 2010; MacGregor, 2009; Rich & Kim, 1999). For instance, Augustine (2016) explored trends among mothers in the nationally representative National Longitudinal Survey of Youth (NLSY), finding that while 17% of mothers in the study pursued additional education after having children, rates were much higher (43%) among disadvantaged mothers in the sample who had low baseline education at the birth of their first child. In addition, Augustine found that disadvantaged mothers completed additional education (mostly by earning a high school degree), and were more likely than more advantaged mothers to do so within the first 5 years of her child's life. Thus, trends suggest the relevance of examining improvements in maternal education and how these improvements may relate to young children's development, especially for disadvantaged mothers who are most likely to increase their education and for whom these changes might have the greatest impact.

Why might we think that improvements in maternal education after starting a family would be associated with changes in children's development among disadvantaged families? Two key theoretical frameworks— the family investment model and the family stress/process model— propose that improvements in maternal education influence children through changes in parents' resources and human capital, which ultimately affects parental processes such as the quality of parenting practices and parents' resource investments in their children.

First, the family investment theory suggests that parents who have more resources are more likely to prioritize and invest in their children's development. This investment is characterized by engagement in higher-quality parenting practices and behaviors to support children's growth. For example, more highly educated mothers more frequently interact with their children in cognitively stimulating ways, as well as invest more in learning materials and experiences, such as supplementary tutoring for their children (Bradley & Corwyn, 2002; Conger et al., 2010; Mayer, 1997). Mothers with higher education are also found to be more involved in their children's schooling (Crosnoe & Kalil, 2010; Domina & Roksa, 2012).

Although the family investment theory focuses on greater financial resources as the main catalyst of parental investments, Conger and Donnellan (2007) suggest that parental education also fits well within the family investment theory and likely influences parental investments in a similar way. Indeed, existing evidence suggests that maternal education is related to possessing greater knowledge about and investing in children's development, including devoting more time to parenting in developmentally appropriate ways (e.g., (Bornstein & Bradley, 2003; Kalil et al., 2012). Moreover, a large economic literature suggests a strong causal link between education and earnings (Card, 1999), which would allow parents with higher education to invest more financial resources in children's growth. Thus, when mothers *increase* their education, this gain may lead to greater financial and parenting resources devoted to children's development.

Second, improvements in maternal education may change parenting practices through more indirect pathways, including through impacts on parental stress and psychological well-being. The family stress (or process) model describes how lower education, employment, and income may lead to greater economic hardship and more frequent and extreme experiences of

psychological distress, ultimately resulting in less optimal parenting (Conger & Donnellan, 2007; Jackson, Brooks-Gunn, Huang, & Glassman, 2000; Linver et al., 2002; Yeung, Linver, & Brooks–Gunn, 2002). Therefore, to the extent that increases in maternal education improve financial stability, improve self-efficacy, and reduce associated stress, improvements in education may translate into more competent parenting. However, if the process of attaining higher education brings on increased strain as parents balance school, employment, and child-rearing, improvements in maternal education may produce increased stress, worse mental health, and subsequent degradations in parenting quality (Carney-Crompton & Tan, 2002; Chase-Lansdale & Brooks-Gunn, 2014). For instance, recent research by (Augustine, Prickett, & Negraia, 2018) suggests that low-income mothers who are enrolled in college report feeling time-constrained, less happy, and greater fatigue when engaged in child-rearing activities. Existing research is sparse and not yet clear for mothers who are enrolled in lower levels of education, such as high school or a vocational program. Overall, the family stress pathway suggests that mothers' pursuits to improve her education may have positive and/or negative consequences on her well-being, mental health, and parenting quality.

Exploring Potential Mechanisms: Parental Characteristics and Family Resources

As suggested by the family investment and family stress theories, there are numerous parental factors that may link improvements in disadvantaged mothers' education and young children's cognitive, social, and behavioral development. In both theories, socioeconomic indicators, like income or education, operate through different pathways to ultimately influence interactions between parents and their children. As described briefly above, evidence suggests that mothers with a higher education level (measured at one point in time) provide more

cognitively stimulating home environments for their children through more frequent and complex language interactions (Hart & Risley, 1995; Hoff, 2003, 2006)). These mothers also are more likely to be more involved in their child's schooling (Crosnoe & Kalil, 2010). Mothers with higher education also have been found to spend more time with their children, even after controlling for employment status (Guryan et al., 2008; Hsin & Felfe, 2014). Further, evidence suggests that this time is invested more efficiently and based on children's developmental needs (Kalil et al., 2012).

Parenting quality may also vary based on changes in maternal education. There is mixed evidence about the association between maternal education and warmth, with studies either finding no relation (Brooks-Gunn, Klebanov, & Liaw, 1995) or a positive and significant association (Klebanov, Brooks-Gunn, & Duncan, 1994). Evidence is more consistent regarding maternal harshness, with higher levels of education relating to lower harshness among diverse samples of families with young children (Oreopoulos & Salvanes, 2011; Pinderhughes et al., 2000). In addition, mothers with more education are increasingly likely to obtain higher-quality jobs and earn higher wages (Card, 1999; Dearing, Berry, & Zaslow, 2008), augmenting the financial resources available for their children to promote development.

Research that examines how *changes* in maternal education relate to parenting and family resources has found that improvements in a mothers' total years of education (with or without degree/certificate attainment) relates to higher emotional support and warmth, and greater provision of learning materials and cognitive stimulation (Domina & Roksa, 2012; Magnuson, 2007; Magnuson, Sexton, Davis-Kean, & Huston, 2009). No significant relationship was found between increases in maternal education and income-to-needs ratio (Magnuson, 2007). The

current study extends existing literature by replicating exploratory analyses with select parenting outcomes (warmth and harshness), and exploring the relationship between improvements in maternal education and additional parental factors that are aligned with the family investment and family stress models, but have not yet been explored in the literature: parental stress, mental health, and factors related to a family's material resources (e.g., household income; maternal employment).

The Relationship between Changes in Maternal Education and Children's Outcomes

A small, growing body of empirical research explores the relationship between changes in maternal education and children's development. These studies operationalize "gains" in education in two primary ways, including an indicator for whether or not mothers increased their education to a higher level (Harding, 2015; Magnuson et al., 2009), or as the number of months or years of completed schooling (Carneiro et al., 2013; Gennetian et al., 2008; Magnuson, 2007; Oreopoulos et al., 2006). In addition, existing research has explored different domains of children's outcomes (e.g., cognitive and behavioral skills; (Harding, 2015) across a range of developmental time periods, including early childhood and adolescence (e.g., Carneiro et al., 2013; Magnuson, 2007).

Children's cognitive development and school readiness are among the most common child outcomes explored, with findings that suggest an overall positive association between gains in maternal education and young children's cognitive outcomes, including emergent language, literacy, and math skills (Gennetian et al., 2008; Harding, 2015; Magnuson, 2003; Magnuson et al., 2009). There is mixed evidence on changes in maternal education and children's behavioral development. In one study, children demonstrated worse externalizing (but not internalizing)

behavioral problems in first grade when mothers improved their education between their children's preschool and kindergarten years (Harding, 2015). Moreover, externalizing behavior was significantly worse for children with mothers with less than a college degree at baseline. Among a sample of older children ages 7–8 and 12–14 in the National Longitudinal Survey of Youth (NLSY) data, Carneiro and colleagues (2013) used instrumental variables analysis based on variation in state schooling costs to examine the role of improvements in maternal education and children's behavior problems. The researchers found that education improvements were significantly related to lower behavioral problems for children in both age groups.

Studies that explore the relationships between gains in maternal education and children's development among predominantly low-income families suggest that variation in maternal education improvements exists *within* a sample of disadvantaged families. For instance, Gennetian and colleagues (2008) examined this relationship using instrumental variables analyses, exploiting the random assignment of mothers on welfare to either a work-focused or education-focused training or a control group, as part of a Job Opportunity and Basic Skills Training (JOBS) program. Their findings indicated that six months of a mother's participation in education-focused training led to small average increases in her child's school readiness (an effect size of approximately 0.18 of a standard deviation) when children were ages 3-5 years. Harding's (2015) quasi-experimental work using propensity score matching suggested that low-income mothers' attainment of a higher education level between children's entry into Head Start preschool and the end of kindergarten was associated with improved children's literacy and mathematics outcomes by the end of first grade. However, this gain was also associated with

worse externalizing behavior, which was stronger for mothers who started with less than a college degree.

In addition, research that examined more nationally representative samples explored if and to what extent gains in maternal education on children's development vary by low baseline education. Some studies find significant associations only at the low end of the education distribution, while others find that while these associations exist on average across the education distribution, they are stronger at the lower end (Black, Devereux, & Salvanes, 2005; Harding, 2015; Holmlund, Lindahl, & Plug, 2011; Magnuson, 2007; Magnuson et al., 2009; Pronzato, 2012). For instance, Magnuson (2007) utilized the longitudinal NLSY data to explore whether an increase in mothers' total years of completed education related to children's math and reading scores when children were between ages 6-12. She found that a one-year increase in maternal education predicted children's academic skills, but only among children with young mothers who had a high school degree or less, and only for those mothers who increased their education while children were younger (ages 6-8).

Thus, this evidence suggests that changes in educational level for mothers who start with lower levels of education may be most important for child wellbeing. The present study extends existing literature by exploring these relationships in a predominantly low-income sample, with the goal of further understanding how variation in improvements in education level *within* a sample of disadvantaged families relates to children's development. I utilize the longitudinal Fragile Families and Child Wellbeing Study (FFCWS) data, which is particularly appropriate for exploring this question, as it contains a large proportion of unmarried and low-income mothers.

In addition, the Fragile Families data provides the opportunity to explore key characteristics of mothers that may moderate the associations between maternal increases in education after they start a family and their children's outcomes. Because the FFCWS purposefully oversampled low-income and unwed mothers, I am able to explore how factors that are more frequently found among disadvantaged families, as well as related to children's outcomes, may shape these relationships. For instance, even among a sample of disadvantaged families, there is variability in household income (Gershoff et al., 2007), which may have important consequences for how increases in maternal *education* when children are young influence children's development. It may be that mothers with more financial resources can afford higher quality child care for their children while they attend school, buffering potential negative consequences of returning to school (e.g., higher maternal stress). In addition to income, marital status may influence how increases in maternal education relate to children's development (MacGregor, 2009). Mothers who are married may live in households with more financial stability, or they may have access to higher social support from spouses, which may allow mothers to devote more time and energy to their educational pursuits, translating into positive influences on children's development.

I also test a third moderator of the relationship between increases in completed level of maternal education and children's development: mothers' age. Given that older mothers who complete higher levels of education when children are between ages 3 and 9 are likely different than those who are younger and complete more education, this may be an important variation to highlight. For instance, older mothers may be at a point in their lives when they are more

financially stable, compared to younger mothers. However, younger mothers may have more access to informal, affordable child care through their parents or other relatives.

Methodological Challenges

Another central reason to explore the role of *improvements* in maternal education, instead of considering education as a static construct, are the methodological challenges involved in isolating the causal effect of maternal education on children's outcomes. The key issue involves separating the effect of maternal education from that of other characteristics associated with both education and children's outcomes, an issue known as omitted variable bias (Gennetian et al., 2008). If these related characteristics are left unaddressed, the effect of maternal education on children's outcomes may actually be driven by those characteristics, not maternal education. For instance, a large body of correlational research examines how static level of maternal education relates to children's development by comparing mothers with higher education to those with lower education and estimating the average differences in children's development between those groups of mothers (G. J. Duncan et al., 2015). However, there may be a number of unmeasured factors that may differ between high and low-educated mothers that are also related to both attaining a higher level of education and to better children's outcomes. A prime example that commonly plagues cross-sectional studies are the heritable cognitive endowments shared by a mother and biological child. Without including these characteristics in the study, it is unclear if observed associations exist solely because both mother's educational attainment and her children's development are both driven by heritable abilities or motivation, or if maternal education level is also playing a causal role in influencing her children's development.

In the current study, I employ individual fixed effects and examine changes in maternal education and children's outcomes over time to better address the challenge of omitted variable bias. Individual fixed effects models compare mothers and children to themselves over time, so both measured and unmeasured characteristics that do not change during this time period are held constant, including shared genetic abilities between a mother and child, as well as other time-invariant characteristics of both a mother and child that may pose additional threats to internal validity, such as gender or race/ethnicity. Unfortunately, this approach does not allow address bias that might be introduced from unmeasured, time-*varying* characteristics. Thus, individual fixed effects reduces certain key forms of bias, allowing for stronger causal inference to be made, although does not address all forms of possible bias.

Moreover, because I am comparing mothers and children to themselves via individual fixed effect analyses, I avoid another form of omitted variable bias—selection bias— that occurs when comparing *between* mothers who did and did not decide to pursue more education after starting a family. For instance, it is likely that there are multiple factors that influence a mother to return to school after having children (e.g., having lower income, higher self-efficacy). If these factors are not held constant, then it may be that difference in those unmeasured factors between mothers that are driving differences in children's outcomes, rather than the difference in maternal education attainment itself. By employing individual fixed effects, I only compare the same mother to herself over time, thus avoiding issues of selection that arise when comparing between mothers that not only differ in education level, but may also differ on other characteristics related to her own education and children's development.

The Current Study

This study replicates and builds on the current literature to examine the extent to which improvements in maternal education attainment, characterized by three education levels— high school diploma/GED, certificate/Associate's degree, or a Bachelor's degree or higher— is associated with concurrent changes in children's language, social, and behavioral development across six years when children are 3 to 9 years old. A second set of exploratory analyses are conducted to study how improvements in maternal education when children are young relate to parental characteristics (e.g., warmth, parental stress, maternal depression) and family resources (e.g., income and maternal employment), which may be potential mechanisms that explain the associations between maternal education and children's development. I explore this question among a sample of predominantly low-income families who participated in the Fragile Families and Child Wellbeing Study (FFCWS). More specifically, I ask the following research questions:

1. What is the relationship between mothers' completion of a higher level of education and children's academic, social, and behavioral outcomes between ages 3 to 9 years?
    a. Are these relationships moderated by maternal age, income, and marital status?
2. What is the relationship between completing a higher level of education and measures of parenting practices, parental well-being and mental health, and family resources, between child ages 3 to 9 years?

The current study extends the literature in 3 key ways. First, the inclusion of individual fixed effects holds constant time-variant characteristics (e.g., genetic endowments), reducing key forms of omitted variable bias that afflict correlational research of maternal education and children's development. Second, this study contributes to a growing body of research that

examines variation in maternal education and children's outcomes among disadvantaged families in particular, as at-risk mothers are among the group of parents that return to school at the highest rates and are the target of policy intervention to promote family wellbeing and close gaps in children's development. Third, most research examining gains in maternal education has focused on children's cognitive outcomes (for an exception, see Harding, 2015), so the current study builds on prior work to examine impacts on children's social and behavioral skills.

Method

Sample

This study draws on data from the Fragile Families and Child Wellbeing study (FFCWS), which followed a cohort of approximately 4,900 children born between 1998 and 2000 in 20 large U.S. cities with populations over 200,000 individuals (Reichman, Teitler, Garfinkel, & McLanahan, 2001). Biological mothers were recruited to participate in the study in the hospital within 48 hours after their children's birth. They were first interviewed in the hospital when the child was born (wave 1) and subsequently when the child was 1, 3, 5, and 9 years old (waves 2-5, respectively). FFCWS intentionally oversampled socioeconomically disadvantaged families and non-marital births. African American and Hispanic mothers are overrepresented in the sample, as well. In addition to collecting mother and father surveys, a supplementary in-home module was administered to a subsample of families when children were 3, 5, and 9 years old (waves 3-5). The in-home assessments included observations of parenting and the home environment, direct assessments of children's cognitive and language skills, and maternal-report of children's social and behavioral skills. Across the full study, minimal attrition was observed,

as 88% of mothers were re-interviewed at wave 3, 87% at wave 4, and 76% at wave 5 (Pilkauskas, Currie, & Garfinkel, 2012). Those who attrited from the full sample were more disadvantaged, compared to those who remained in the study (e.g., lower income-to-needs ratio; more likely to have less than high school degree; (Pilkauskas et al., 2012).

Because child assessments and parenting data were collected only for the subsample of families who participated in the in-home supplemental data collection (waves 3-5), only data from waves 3 to 5 are used in the current study, and wave 3 is considered the baseline time point. The final analytic sample was restricted to the subsample of families who participated in the in-home data collection, and to those who were non-missing on (1) maternal education data for all waves 1-5, (2) all key child outcomes across waves 3-5, and (3) all parent outcomes of interest across waves 3-5. The final analytic sample for the current study is n=712 families, or 14% of the full Fragile Families sample. This proportion of the full study matches closely to the percentage of families included in other key studies on this topic once similar restrictions were applied (e.g., approximately 13% of the full NLSY sample was included in the final analytic sample in (Magnuson, 2007). Sensitivity checks were conducted to examine if findings differed based on sample restriction criteria and are reported in the results section below.

Baseline descriptive statistics for the final analytic sample are presented in Table 5, suggesting that children are evenly split on gender, almost exclusively live with their mothers for "most of the time" (99%), and two thirds of children attend some form on non-parental child care. The mothers in the analytic sample are about 28 years old on average and approximately two thirds are black, about 20% are Hispanic, and about 20% are white. Two thirds of mothers are employed at baseline, a quarter are married to the child's biological father, and only 4% of

mothers were born outside of the U.S. On average, two adults (SD=0.77) and two children under 18 years (SD=1.26) live in the household with an average income of about $34,000. In terms of baseline level of education, approximately a quarter of mothers have not completed a high school degree or GED, a third have a high school/GED degree, and about one third have a certificate/Associate's degree. Children demonstrated average baseline language skills compared to other children their same age (raw score mean of 26.19, SD=14.26; 0.05 standard deviations above the mean), as well as average social skills and behavior problems in reference to the full Fragile Families sample. Finally, mothers in the analytic sample demonstrated average levels of parenting, parental stress, and depression, in reference to the full study sample.

T-test comparisons between baseline characteristics of the final analytic sample and excluded cases are shown in Appendix Table A3. In the analytic sample, as compared to excluded cases, both children and mothers are slightly younger (35 vs. 36 months, and 27.5 vs. 28 years, respectively), more children live with their mother for most of the time (99% vs. 97%,), there is a higher percentage of African American families (58% vs. 46%) and a lower percentage of Hispanic families (18% vs. 29%), and more mothers were born in the U.S. (4% vs. 19%). In terms of key socioeconomic indicators, mothers in the analytic sample have slightly higher levels of education, with fewer mothers who have not completed high school by baseline (24% vs. 31%), and more mothers who are employed (61% vs. 55%). There was no difference between the two groups of mothers on average household income. In addition, fewer mothers in the analytic sample were married to the child's biological father at baseline (28% vs. 33%) and there were fewer adults present in the household (1.92 vs. 2.08). Finally, in terms of assessments of child and parental outcome measures at baseline, children in the analytic sample demonstrated higher

externalizing behavior (13.91 vs. 13.07) and mothers had higher cognitive aptitude (6.99 vs. 6.70) and warmth (4.47 vs. 4.29).

Measures

Maternal education level. Information about mothers' educational experiences was collected at every wave of the Fragile Families study. At wave 1 when the focal child was born, mothers were asked about their highest completed level of education, which was then collapsed into 9 categories ranging from "no formal schooling" to "graduate or professional school." In each subsequent wave of data collection, mothers were asked to report:

a) If they completed any education programs since the previous interview wave? (Yes/No)
b) If yes, which education program(s)/degree(s) did they complete?

For the second question (b), mothers were provided with a list of options and were instructed to select *all relevant schooling experiences* they had completed since the previous wave (e.g., high school, some college, vocational certificate, LPN/RN, Bachelor's degree, etc.)[2]. Responses on these two questions were used to generate a categorical education variable that reflected a mother's highest level of completed education at each wave.

For the purposes of the main analysis, the categorical education measure was recoded into a series of three dummy indicators that each equal 1 during a given interview wave if a mother has a high school/GED or higher, a certificate/AA or higher, or a Bachelor's degree or

[2] Mothers were also able to select from 5 different training-level education programs, including "ESL program", "program to improve reading," "program to learn job skills", and "program to help get a job", and "job corps". Because these types of training programs are ambiguous in the average amount of time it requires to complete them, and because they do not typically result in workforce-valued credential, these 5 types of additional education were not included in the categorical education measure of mothers' highest level of education at each wave.

higher (and 0 otherwise). For example, all three education dummy indicators get coded as a 1 for mothers whose highest level of education is reported in a given wave as "college (4 year)" or "graduate of professional school." Next, for those mothers who reported their highest level of education as "vocational, tech, trade," "business or secretarial school," "junior/community college (2 year)," or "nursing school," they receive a value of 1 on the indicator for "Certificate/AA or higher" and on "High school/GED or higher," but a 0 on the indicator for "Bachelor's degree or higher." For this second education dummy, I also ran a specification check in which I included mothers (e.g., coded as a 1) who reported achieving "some college" as their highest level of education. Much of the existing literature combines the completion of "some college" with other levels of education that take a similar amount of time to complete (e.g., certificate program or a 2-year community college), so this specification check will allow the comparison of the current results to the existing literature.

For the third education dummy, mothers who have completed "high school" or an "ABE or GED program" are coded as a 1 on the indicator for "High school/GED or higher," and a 0 on the other two indicators ("Certificate/AA or higher" and "Bachelor's degree or higher"). Finally, all three education dummy indicators equal 0 for mothers whose highest level of education is less than high school in a given wave. Operationalizing education as a series of dummies coded in this way makes it possible to examine non-linear effects on young children's outcomes, in which mothers start at one particular level of education and move to the next highest level.

In addition, in order to compare to much of the existing literature that explores a linear relationship between increases in maternal education and child outcomes, I also created a continuous measure of education that represented mothers' highest number of years of completed

education at each wave. To create this measure, each categorical level was recoded into a "year" value that represented the typical number of years for which mothers would have been enrolled in education if they completed that level of education. These year-values were taken from existing literature (e.g., Magnuson et al., 2009). For instance, mothers were assigned "12 years" if they reported attaining a high school degree or GED, and were assigned "14 years" if they reported completing a vocational certificate or an Associate's degree. This measure is an approximation of the number of years it may have taken to complete that level of education, and for example, does not capture if mothers took 13 years instead of 12 years to actually complete their high school degree. The consequences of this coding constraint are discussed in the discussion section below.

Finally, I coded maternal education in a third form in order to examine the impact on children's development of mothers returning to school at all between when her child was ages 3 to 9, regardless of program level or degree completion. This binary variable was assigned a value of 1 if mothers reported completing additional education since the last interview and/or if she reported being enrolled in school at the time of the current interview. Once a mother reported that she has completed additional education and/or is currently enrolled in school at a particular interview wave, the dummy retained a value of 1 for all subsequent waves to indicate that the mother did return to school and increase her exposure to education at some point between when her child was ages 3 to 9.

Child outcomes. Information on child language, social, and behavioral skills was obtained from either direct assessment or mother-report during the supplementary in-home

interview at waves 3-5 (child ages 3, 5 and 9 years, respectively). All scores are standardized in analyses and can be interpreted as effect sizes in final table.

Receptive language skills. Children's language skills were directly assessed when children were ages 3, 5, and 9 years old (waves 3-5) using the Peabody Picture Vocabulary Test (PPVT-III;(Lloyd M. Dunn & Dunn, 1997). For this measure, children are shown four pictures on an "easel" book and asked to indicate, by pointing, which picture best represents a word said aloud by the assessor. PPVT standard scores will be used in analyses. The standard score of the PPVT-III has high reliability, with a Cronbach's alpha ranging from 0.96 to 0.97.

Pro-social skills. Children's social skills were assessed by mother-report using the Adaptive Social Behavior Inventory (ASBI; (Hogan, Scott, & Bauer, 1992) at age 3 (Wave 3), age 5 (Wave 4) and age 9 (Wave 5). This scale measures children's social competence and prosocial skills with children and adults. Nine items from the Express subscale are summed, with scores ranging from 0-18 ($\alpha = 0.72$). Examples of items include "he/she understands others feelings," "he/she is interested in many and different things" and "he/she plays games and talks to other children".

Behavior problems. Child externalizing and internalizing were assessed when children were ages 3, 5, and 9 years old (waves 3-5) through parent-report on the Child Behavior Checklist(Achenbach & Rescorla, 2001). The externalizing measure includes all items from the aggressive behavior and destructive behavior scales ($\alpha = 0.91$). Examples of items include "child destroys things that belong to his/her family or other children" and "child hurts animals or people without meaning to". The internalizing measure includes all items from the anxious/depressed

and withdrawn scales (α = 0.88). Examples of items include “child is nervous, high strung, or tense”, “child feels worthless/inferior”, and “child would rather be alone than with others”.

Parental characteristics and family resource outcomes.

Warmth and harshness. Warmth and harshness of the primary caregiver (typically the mother) were rated by in-home observers using the Warmth/Responsivity and Harshness subscales of the Home Observation for Measurement of the Environment (HOME) Inventory (Caldwell & Bradley, 1984) at age 3 and age 5 (waves 3 and 4, respectively). The HOME Inventory has been shown to be cross-culturally relevant (Bradley, 2004) and relevant and valid for socioeconomically diverse environments (Leventhal, Martin, & Brooks-Gunn, 2004) The measure of warmth was constructed by averaging six items for those mothers who are non-missing on all 6 items (α =.71). Item responses indicate whether the interviewer observed particular behaviors during caregiver-child interactions in the home (0=*no*, 1=*yes*), with a higher score indicating higher warmth, which suggests higher-quality parenting. An example of an item is “did the parent/provider spontaneously vocalized to the child at least twice?”. The measure of harshness was constructed by averaging five binary items (α = 76) that assessed whether a parent or provider was observed engaging in an activity, such as “did the caregiver shout at the child?”. Higher scores indicate greater maternal harshness, which suggests lower-quality parenting.

Parenting stress. Perceived parenting stress was assessed at each wave using the following four items from the Aggravation in Parenting scale (Hofferth, Davis-Kean, Davis, & Finkelstein, 1997): “Being a parent is harder than I thought it would be,” “I often feel tired, worn out, or exhausted from raising a family,” “I feel trapped by my responsibilities as a parent,” and “I find that taking care of my child(ren) is much more work than pleasure.” Mothers responded

using a 4-point Likert scale (1 =*strongly disagree*, 4 =*strongly agree*). Items are coded such that higher scores reflect higher stress. A total mean score was created for those non-missing on all four items (α =.63).

Maternal depression. Maternal depression was assessed using the Composite International Diagnostic Interview (CIDI) Short Form, developed for the National Health Interview Survey (Kessler, Andrews, Mroczek, Ustun, & Wittchen, 1998). Mothers were asked if they had feelings of depression or were unable to enjoy things they normally would during the past year. Those who experienced at least one of these two conditions most of the day, every day for a two-week period, were then asked questions about depressive symptoms (e.g., about losing interest in things, feeling tired, or feeling worthless). Mothers who agreed with three or more of these questions were considered to have major depressive disorder (MDD; yes=1, no=0).

Family resources. Two measures that reflect families' material resources— household income and maternal employment status— are included. Household income is assessed by maternal report of the household total income in the past year. Maternal employment status assessed by maternal report regarding if she worked for pay in the past week (yes=1, no=0).

Family, parent, and child covariates. Several time-varying demographic covariates will be included from waves 3, 4 and 5. These variables were selected due to their correlations with maternal education and children's outcomes and to match closely to those included in key studies examining maternal education and young children's development (e.g., Magnuson, 2007; Harding 2015). The covariates included are those that are not hypothesized to change in response to improvements in maternal education: child age (months), maternal age (years), marital status to biological father (0=no, 1=yes), the number of children in the home, the number of adults in

the home, and an indicator that the child lives with the mother most of the time (note that removing these time-varying covariates from analyses does not change the results).

Analytic Approach

To explore the relationship between improvements in maternal education and concurrent changes in child and parent outcomes, I employ ordinary least-squares (OLS) regressions with mother-level individual fixed effects. By including individual fixed effects, I compare differences within an individual mother-child dyad over time, which holds constant both observed and unobserved, time-invariant characteristics of the child and mother that may be related to both improvements in maternal education level and changes in children's outcomes. While this approach addresses potential bias from characteristics that remain constant over time that are also correlated with increases in maternal education and children's development (e.g., heritable cognitive ability; motivation), it does not address bias that could be introduced from omitted, time-varying characteristics (e.g., number of adults in the household). To minimize this latter source of bias, I adjust for a set of theoretically driven, time-varying covariates of family, parent, and child characteristics that are not hypothesized to change in response to increases in maternal education. This provides greater confidence that changes in children's outcomes over time are due to improvements in maternal education, rather than changes in omitted characteristics that are related to both maternal education and children's outcomes of interest. Again, covariates that remain static over time (e.g., child gender, race/ethnicity) are not included as controls in the current study because they automatically drop out of model due to the inclusion individual fixed effects. In all analyses, increases in mothers' education that occurred during the

first (between child ages 3 and 5) and/or second (between child ages 5 and 9) time period of the study are utilized to predict concurrent changes in children's outcomes.

In the primary functional form of the model, maternal education is included as a set of three dummies, which represent mothers' level of educational attainment at each wave: (1) HS/GED or higher, (2) Certificate/AA or higher, or (3) Bachelor's degree or higher. I use the following regression model to estimate this relationship:

$$(1)\ Y_{it} = \beta_0 + \beta_1(HSorMore)_{it} + \beta_2\,(CertificateAAorMore)_{it} + \beta_3(BAorMore)_{it} + \sigma X_{it} + \theta_i + \mu_t + \varepsilon_{it}$$

In this model, individual child *i's* outcome (*Y*) at time *t* is modeled as a function of maternal education level (entered as dummies; HSorMore, CertificateAAorMore, and BAorMore) at time *t*, a vector of observed time-varying child and family characteristics (X_{it}), mother-level fixed effects (θ), wave fixed effects at time *t* to account for any factors that change over time yet are constant across individuals (μ), and an error term (ε).

By including the predictor variable as a set of dummies that represent different levels of education, I allow for there to be a non-constant or non-linear marginal effect of progressing to each additional level of education on children's outcomes. In other words, I allow for the effect of a jump between different levels of education to have a different association with children's development, as one could imagine the effect of attaining a high school diploma on a particular child outcome may be different than the effect of completing a Bachelor's degree on that child outcome. The main parameters of interest are β_1, β_2, and β_3. An example of how one would interpret the coefficient on each dummy when all indicators are included in the model is as

follows: the coefficient on the "HS/GED or more" dummy (β_1) is the effect of moving from less than a high school degree (the level prior) to a high school degree on the child outcome of interest. The coefficient on the "Certificate/AA or more" dummy (β_2) the "BA or more" dummy (β_3) are interpreted similarly.

In addition, two alternative specifications of the maternal education variable were tested. In the first alternative specification, the highest level of maternal education was coded as a single continuous measure that represents the highest number of years of education a mother has completed at each wave. By including the predictor variable as a continuous measure, I tested if there is a constant, linear effect of each additional year of education on children's outcomes, regardless of where mothers start in the education distribution at baseline. The coefficient on this variable can be interpreted as the effect of a one-year increase in maternal education on the child outcome of interest. A continuous education variable of months or years of completed schooling was utilized in multiple existing studies in this literature (e.g., Gennetian et al., 2008; Magnuson, 2003; Magnuson, 2007), so I tested a continuous variable here for comparison.

In the second alternative specification of the maternal education variable, I examined the impact on children's development if a mother returned to school at all between when her child was ages 3 to 9 (1=yes, 0=no). The binary variable is assigned a value of 1 if mothers reported completing additional education since the last interview and/or if she reports being enrolled in school at the time of the current interview. Once a mother reported that she completed additional education and/or was currently enrolled in school at a particular interview wave, the indicator dummy retained a value of 1 for all subsequent waves.

To determine whether the associations between changes in maternal education and children's outcomes were stronger based on differing parent characteristics, I ran the primary regression model (Equation 1) by separating the sample into different subgroups (e.g., younger versus older mothers). Three baseline moderators were tested: maternal age (sample divided at the median value), household income (sample divided at the median value), and marital status to child's biological father (sample divided by mother's report of status- yes/no).

To explore the relationship between changes in mothers' level of education and parenting practices, parental characteristics, and family resources, I estimated Equation 1 above, where the only difference is that Y_{it} represents each parental characteristic or family resource of child *i's* mother at time *t.* These estimates allow me to explore parenting practices and family resources as possible mechanisms through which changes in maternal education level might relate to children's development.

All models included clustered standard errors at the individual level due to the likelihood that observations of each measure were correlated within individuals over time. All parenting predictors and child outcomes were standardized, so coefficients may be interpreted as effect sizes. To prevent further reduction of the sample size, missing data for demographic covariates were imputed in fifty complete datasets using multiple imputation through chained equations in Stata 13.1 (StataCorp, 2013). Findings using both unimputed and imputed data are described in the Results section below.

For all analyses, I tested the sensitivity of the results to different approaches for specifying the analytic sample and/or handling missing data. First, I examined if results differed when I employed a less-restrictive education variable in analyses. Instead of dropping

observations if mothers did not report their education for one or more waves, the more inclusive education variable retained cases if mothers reported their education level at wave 1, replacing any missing education data in subsequent waves with the previous wave's education level (note that missing education data was replaced as long as mothers were interviewed in that wave). Second, I examined if findings were sensitive to different sample exclusion criteria. Instead of restricting to families who were non-missing on the education predictor and all child and parent outcomes of interest, I only restricted to cases that were non-missing on the education variable, allowing the sample to bounce based on child and parental outcomes. Both sets of sensitivity checks were assessed using unimputed and imputed outcomes to test the robustness of the findings if outcomes are imputed. Comparisons are discussed in the results section.

Results

Preliminary Analysis: Increases in Maternal Education

Before addressing the main analytic question, I first explored the changes in maternal education within my sample. Approximately 15% of mothers (n=104) reported increasing their education when their children were between ages 3 and 9. This percentage of mothers who increased their education closely matches that found in other key studies examining a similar research question using different data sets (e.g., 16%; Harding, 2015; Magnuson, 2007). More specifically, approximately 6% (n=45) of mothers in the analytic sample reported completing more education from child age 3 to child age 5 and about 9% (n=61) of mothers attained an additional education from child age 5 to child age 9. Note that these numbers are not mutually exclusive, as two mothers increased their education level during both time periods of the study.

Approximately 28% of mothers who increased their education started with less than a high school degree/GED at baseline (child age 3), with 16% of those mothers attaining a high school degree and 77% attaining a certificate/Associate's degree as their highest level of education by the time their children were 9 years old[3]. Most of the mothers out of those who increased their education started with a high school degree/GED (approximately 62%). Ninety-seven percent of those mothers attained a certificate/Associate's degree as their highest level of education, while two graduated with a Bachelor's degree or greater. Finally, 10% of mothers began with some a certificate/Associate's degree at baseline and attained a Bachelor's degree or greater. These numbers suggest that there is adequate variation in maternal education level from child age 3 to 9 to examine the relationships between changes in maternal education, parenting, and children's cognitive, social and behavioral skills.

Baseline characteristics were compared using t-tests between mothers who increased their education (n=104) and those who did not (n=608) in the final analytic sample. Mothers who improved their education had lower household income (approximately $22,000 vs. $36,000, $p<.05$), a lower proportion were married to their child's biological father (13% vs 30%, $p<.05$),

[3] Note that totals do not add to n=31 because two of the mothers attained a high school degree between child ages 3 and 5, and then subsequently attained a certificate/AA between child ages 5 and 9. Thus, mothers' highest level of education is a certificate/AA, so they are only included in the percentage describing "certificate/AA" (77%, n=24) in order to not double-count. Moreover, mothers who started with "less than high school" and ultimately achieved "certificate/AA" by the time children were 9 years old also likely completed their high school degree/GED at some point during the two time periods of the current study, but this completion may not get captured in the survey data if the mother did not complete the high school degree by the interview date at the end of wave 4 (when children were 5 years old). If she completed both levels during the period between child ages 5 and 9, only the "certificate/AA" level would be captured by the education variable because the latter is a *higher level* than the high school degree/GED.

and they were more likely to be younger (25 vs. 28, p<.05) than mothers who did not. In addition, the focal child in the study was more likely to be male (61% vs. 51%, p<.05). Regarding baseline education, there was no difference in the proportion of mothers who started with *less than* a high school degree at baseline. However, mothers who increased their education were much more likely to start with high school degree/GED (59% vs. 26%, p<.05) and less likely to start with a certificate/Associate's degree (12% vs. 35%, p<.05) or a Bachelor's degree or higher (0% vs 16%, p<.05) at baseline. Finally, mothers who increased their education were marginally more likely to be born in the U.S. (99% vs. 95%, p<.07), as well as have children with marginally lower positive social skills (15.0 vs. 15.5, p<.09).

Associations between Increases in Maternal Education and Children's Development

For the first main research question, I explored the associations between improvements in maternal education level and changes in children's language, social, and behavioral skills over a 6-year time period when children were ages 3 to 9 (see Table 6). Each column in Table 6 represents a separate individual fixed effects regression model, and all outcomes were standardized such that coefficients may be interpreted as effect sizes. This model was tested with and without covariates and resulted in identical findings, so models without covariates were not displayed in the table or discussed below.

In Table 6, findings demonstrated that gains in maternal education were related to children's internalizing behavior, but only for mothers who improve their education at the low end of the education distribution. Specifically, children of mothers who have less than a high school education and then go on to complete high school/GED at some point during the study period show concurrent reductions in internalizing behavior problems by 0.41 of a standard

deviation ($p<.01$). There was no additional benefit to children's internalizing behavior problems of mothers achieving higher levels of education, including from starting with a high school degree to attaining certification/Associate's degree, or from starting with a certification/Associate's degree to graduating with a Bachelor's degree or higher. In addition, children whose mothers completed a certificate or AA degree demonstrated higher receptive language scores (effect size = 0.18, $p<.075$). When "some college" was included among the possible levels of education mothers may attain, findings in which completing a certificate or AA degree predicted gains in children's receptive language scores were no longer significant (see Appendix Table A4). Finally, no significant relationship was found between improvements of maternal education (to any level) and children's prosocial skills or externalizing behavior when either including or not including "some college" as an attainable education level.

Two alternative specifications of the maternal education variable were also tested. First, the model was tested using the continuous measure of total years of maternal education. No significant associations were found between a one-unit increase in years of maternal education and any child outcome (see Appendix Table A5). Additionally, no significant associations were found between improvements in maternal education and children's outcomes when maternal education was represented by a binary dummy indicating if the mother returned to school at all (either completed more education and/or enrolled in school) between child ages 3 to 9 (see Appendix Table A6).

Moderation by maternal age. Results from analyses with the subgroup of children born to younger mothers (mean = 23 years, range: 16-27 years) versus older mothers (mean=33 years; range: 28-50 years) demonstrates a marginally significant association between gains in maternal

education and lower children's receptive language skills (displayed in Table 7). Specifically for older mothers, the attainment of a high school diploma/GED was associated with a 0.58 standard deviation ($p<.10$) reduction in children's receptive language skills, but no significant association between maternal education and children's receptive language skills for younger mothers who attained the same level of education. There were no other differences in children's outcomes based on maternal age.

Moderation by household income. Results from analyses with the subgroup of children in households with lower income (mean=11,251.46, SD=6,921.186; range: 0-24,000) versus higher income (mean=60,946.94, SD=51,450.09; range: 24,028-999,999) are displayed in Table 8. For children in the lower income subgroup only, findings suggest a significant association between gains in maternal education to a certificate or Associate's degree, higher child receptive language skills, and lower externalizing behaviors (0.36 standard deviations ($p<.05$), and -.39 standard deviations ($p<.05$). However, for those families in the lower subgroup whose mother achieved a Bachelor's degree or higher, children demonstrated lower receptive language skills (-1.02 standard deviations, $p<.001$), but improved externalizing behavior (-.47 standard deviations, $p<.001$). For children in the higher income subgroup only, improvements in maternal education from a high school degree/GED to a certificate/Associate's degree was related to a .37 standard deviation increase ($p<.05$) in positive behavior.

Moderation by marital status. Analyses were conducted to test the difference in the relationship between gains in maternal education and children's development based on if mothers are married to the child's biological father or not (see Table 9). Specifically for mothers who are not married to their child's father, the attainment of a certificate/Associate's degree was

associated with a 0.22 standard deviation ($p<.10$) improvement in children's positive behavior. For married mothers only, the attainment of a certificate/Associate's degree was associated with a 0.69 standard deviation ($p<.05$) improvement in children's receptive language skills.

Potential Mechanisms: Associations between Increases in Maternal Education, Parental Characteristics, and Family Resources.

There are multiple pathways through which improvements in maternal education may be associated with children's development via family and parental processes. Informed by the family investment and family stress models, exploratory analyses were conducted to examine whether select parental mechanisms may be plausible pathways: parenting practices (warmth and harshness), maternal well-being (parent-related stress and maternal depression), and factors related to families' material resources (maternal employment status and household income).

Table 10 displays the results of these exploratory analyses, where each column represents a separate regression model that included covariates and individual fixed effects. Findings suggested that improvements in maternal education from starting with a certificate/AA degree to completing a Bachelor's degree or higher is associated with a marginally significant improvement in household income by approximately $16,600 ($p<.06$). In addition, the attainment of a certificate/AA degree is associated with a 0.25 standard deviation decrease in parental harshness ($p<.09$), as well as a greater likelihood of maternal employment (odds ratio = .12; $p<.08$). No other significant associations were found between gains in maternal education to any level and concurrent changes in parenting-related stress or maternal depression.

When "some college" was included among the possible levels of education that mothers may attain, findings were similar to Table 10 in that the attainment of a Bachelor's degree or

higher is related to an approximately $16,600 improvement in household income. However, no other significant associations were found between gains in maternal education to any level and concurrent changes in parenting practices, parental stress, maternal depression, or maternal employment status (see Appendix Table A7).

Two alternative specifications of the maternal education variable were also tested. First, the model was tested using the continuous measure of years of maternal education. No significant associations were found between a one-unit increase in years of maternal education and any parental outcome, except for greater household income by approximately $1500 ($p<0.053$; see Appendix Table A8). In the second specification when maternal education was represented by a binary dummy indicating if the mother returned to school at all (either completed more education and/or enrolled in school) between child ages 3 to 9, mothers who returned to school demonstrated a lower likelihood of being employed (effect size = -.48; see Appendix Table A9).

Sensitivity Analyses

Two sets of OLS regression analyses were conducted to test the sensitivity of the primary results against different approaches for handling missing data and specifying the analytic sample. First, I examined if results differed when using the more inclusive education variable in analyses. When restricting to cases who were nonmissing on child outcomes, parental outcomes, and this more inclusive education variable (n=726), results were consistent with the primary results.

Second, I examined if findings were sensitive to different sample exclusion criteria. Instead of restricting to cases who are non-missing on all three sets of variables (e.g., the education predictor, child outcomes, and parental outcomes), I only restrict to cases that are non-

missing on the education variable (n=2965). I ran two versions of this robustness check: (a) allowing the sample to bounce based on missing data for child and parental outcomes, and (b) imputing missing data for child and parental outcomes. Findings for both specifications (a) and (b) are identical to main analyses, with the exception that children of mothers who attain a high school degree also demonstrate marginally significantly lower language skills (-0.18 of a standard deviation, SE=0.09, for both (a) and (b)).

Discussion

The current study explored the extent to which improvements in maternal education attainment were associated with concurrent changes in children's language, social, and behavioral development between ages 3 to 9 among a sample of predominantly disadvantaged families. I also examined the association between mothers' educational improvements and changes in a host of parental characteristics during those six years, including parenting quality, parental stress, maternal depression, employment, and income. Findings suggest that children of mothers who started with less than a high school degree and attained a high school diploma/GED demonstrated lower internalizing behavior problems, and children whose mothers started with a high school diploma/GED and attained a certificate or AA degree demonstrated higher receptive language scores. Among parental outcomes, mothers who improved their education by completing a certificate or AA degree also demonstrated lower harsh parenting and a greater likelihood of being employed. Moreover, improvements in maternal education from having a certificate/Associates' degree to completing a Bachelor's degree or higher was significantly associated with higher household income. When "some college" was included among the possible levels of education that mothers may attain, certain findings were similar to the main

specification (i.e., children displayed reductions in internalizing behavior problems if their mother attained a high school degree or GED between children's ages 3 to 9 years). However, no significant relationships were found between improvements in maternal education at any level and any other child outcomes, nor with measures of parenting quality or parental mental health.

In the final analytic sample, approximately 15% of mothers in the final sample returned to school and increased their education over this time period, with 90% of those mothers starting with a high school degree or less at baseline. Overall, mothers who increased their level of education were moderately more disadvantaged than mothers who did not improve their education, as the former were younger, had lower income and education, and were less likely to be married to their child's biological father at baseline. In similar research with a more advantaged sample of mothers in the NICHD Study of Early Child Care and Youth Development, Magnuson and colleagues (2009) also found that mothers who increased their education were more disadvantaged. The current extends these findings to suggest that even among a sample of predominantly low-income families found in the Fragile Families study, the mothers who increased their education were particularly disadvantaged. It is also important to note that mothers did not differ on other key characteristics at baseline that might relate to both attaining more education and children's development, allowing for increased confidence that estimates were not biased based on differences in these factors (e.g., employment status, how many adults and children are in the home, parenting quality).

Using individual child fixed effects, the main finding of the study suggests that improvements in mothers education, from starting with less than a high school degree to attaining a high school diploma/GED, is associated with lower child internalizing behavior

problems. In addition, children of mothers who started with a high school degree/GED and attained a certificate/AA demonstrated gains in receptive language skills. Thus, significant associations between gains in maternal education and children's development were only observed for mothers who started at the low end of the education distribution (i.e., high school degree or less). This pattern of nonlinear associations, with the strongest (or only) results found for mothers at the lower end of the education spectrum, matches a larger body of existing research that examines associations among representative samples in the U.S. (Magnuson, 2007; Magnuson et al., 2009), representative samples in other westernized counties (e.g., Norway; (Black et al., 2005; Pronzato, 2012), and among samples solely comprised of disadvantaged families (Gennetian et al., 2008; Harding, 2015). Magnuson (2007) hypothesized this may be because mothers who start with higher levels of education are already providing higher quality environments, so an increase in education may not significantly improve mothers' parenting behaviors or family resources to impact their children's development during the time frame under study. In addition, mothers with low education are likely more disadvantaged in other ways, compared to mothers who have higher education at baseline. Thus, even a seemingly inconsequential improvement in disadvantaged mothers' education may be meaningful for her child's development. Indeed, in the current study, mothers who start with a high school degree or less are more disadvantaged than mothers who start at higher levels of education and increase their education (e.g., two-thirds of mothers were living under 50% of the poverty line, about half were employed, and none were married to their child's biological father).

Evidence from the moderation analyses also suggest that findings are mainly observed for more disadvantaged mothers at the low end of the education distribution. For instance, when

examining moderation by household income, most associations were found only for mothers with lower income, suggesting that among a broader sample of low-income mothers, it is those with even fewer financial resources who have children who do better in language and behavior problems. Again, it may be that these children have more to gain from improvements in their mothers' education.

In addition, young children's internalizing behavior was the only *behavioral* outcome of children found to be significantly related to increases in maternal education, which is in contrast to findings from the only other existing study that explored how *improvements* in maternal education were related to changes in young children's problem behaviors (Harding, 2015). In this study of disadvantaged families, improvements in maternal education that occurred between children's preschool to kindergarten year were associated with worse externalizing behaviors by the end of children's first grade year. No significant changes in internalizing behaviors were observed. The discrepancy between studies may be explained by the timing of the measurements. Harding (2015) explored 1-year lagged effects on children's behavior, whereas the current study explored the concurrent association between increases in maternal education and children's behavior. It may be that more time is needed to observe impacts on children's externalizing behavior after mothers increase their education, whereas associations may be more immediately observed and short-lived for internalizing behaviors. Also, Harding (2015) examined these changes in maternal education when children were 3 and 4 years old, whereas children in the current study are anywhere between the ages of 3 and 9 when their mothers increased their education. Therefore, it may be that particular behaviors may be more susceptible to the influence of changes in maternal education when children are very young versus in elementary

school, or vice versa. Indeed, this is the case for cognitive outcomes, which seem to be affected at younger rather than older ages (e.g., Magnuson, 2007). The current study could not explore whether the average effects differed by child age due to the small sample size. This is a crucial next step for future research exploring improvements in maternal education and children's problem behaviors, particularly among samples of disadvantaged families, who are both more likely to return to school with low baseline levels of education and more likely to have children who demonstrate higher behavioral problems (Huaqing Qi & Kaiser, 2003), as compared to more advantaged families.

In the current study, the association between gains in maternal education, children's internalizing behavior and receptive language skills appear to be better modeled as a non-linear threshold effect—where the effect of moving from one level of education to the next is allowed to differ based on where mothers start on the education distribution— than as a continuous measure of education or as an indicator of returning to school. This model suggests that for disadvantaged mothers in the current sample, there is no association between increases in maternal education on children's internalizing behavior beyond attaining a high school degree. It was surprising to find a lack of significant associations when using the continuous education variable in analyses, as this is inconsistent with other existing research (e.g., Gennetian et al., 2008; Magnuson, 2007). No other research has examined increases in maternal education as non-linear thresholds, so it is not possible to make direct comparisons. However, it may be that no significant associations were found between the continuous measure of education and children's internalizing behavior or receptive language skills because this measure averages together the

levels of education that do and do not matter for children's internalizing behavior (as found in Table 6), and there may not be enough power in the model to detect the relationships that matter.

What might be special about completing a high school degree/GED, specifically, for concurrent reductions in young children's internalizing behaviors? No evidence was found to suggest achieving a high school degree/GED was related to mechanisms related to improved family resources, including maternal employment status or income level. These findings are aligned with research that finds that a high school degree or GED does not confer a large advantage in mothers' employment and income prospects in today's economy (Heckman & LaFontaine, 2006). This is also consistent with studies that examined pathways hypothesized by the family investment model, finding that changes in income and related shifts in parenting were more strongly associated with children's cognitive outcomes, compared to children's behavioral problems (Gershoff et al., 2007; Linver et al., 2002; Yeung et al., 2002).

In addition, no evidence was found to suggest that achieving a high school degree/GED was related to changes in parental mental health, stress, or parenting quality. This is in contrast to previous research that has found that associations between improvements in maternal socioeconomic indicators and children's behavior were mediated by reductions in parent's stress and improvements in the quality of parenting (Linver et al., 2002; Yeung et al., 2002). While any further explanations are unavoidably speculative, it still may be that findings are supported by the family stress model, but just not in the ways that were measured in the Fragile Families study. Graduating with a high school degree or GED is necessary to pursue additional higher levels of education, so completing this level may provide mothers with a greater sense of self-efficacy or accomplishment, or improve mothers' educational motivation and aspirations

(Schuller, Brassett-Grundy, Green, Hammond, & Preston, 2002), which may lead to other beneficial or promotive parental behaviors not assessed in the current study. In addition, graduating with a high school degree may reduce psychological distress associated with not having a similar level of credentials as their peers (Zachry, 2005) or the minimum level of education to attain meaningful employment or higher-level education. Finally, achieving a high school degree possibly may take a shorter amount of time and/or may be less cognitively taxing than achieving high levels of education, such as some college, a vocational certificate, or an Associate's degree. Thus, we may observe significant and concurrent associations with children's reduced internalizing behavior problems because low costs, coupled with some benefits, may result in a net positive outcome for mothers who achieve a high school degree/GED. Measures of self-efficacy, self-esteem, educational aspirations/beliefs, and psychological distress were not measured in the Fragile Families study, suggesting future studies should utilize alternate data sets to explore this set of parental processes.

Improvements in maternal education were associated with concurrent changes in children's language skills (i.e., receptive vocabulary) only when mothers increased to the certificate/AA degree-level, although in the moderation analyses, children of older mothers who attained a high school degree did demonstrate lower language scores. This finding is in line with existing literature, which consistently finds significant and positive associations between increases in maternal education and children's language skills or skills closely associated with language development (e.g., school readiness, reading recognition; Gennetian et al., 2008; Harding, 2015; Magnuson, 2007; Magnuson et al., 2009). As described above, improvements in children's cognitive and language development are more typically associated with the types of

parenting behaviors more influenced by improvements in income (e.g., investments in learning materials, tutoring; Linver et al., 2002). Although no changes in household income were found, the likelihood of mothers being employed increased for those who increased their education level to the certificate/AA-level, suggesting maternal employment may have had an influence on family resources that were not captured in the current study.

While findings do not directly speak to whether policies or interventions to improve maternal education would improve children's behavior and language skills, results suggest that supporting education for disadvantaged mothers, the primary target of policy efforts to foster children's wellbeing, is a potential pathway toward supporting children's development. Specifically, providing supports for young mothers to complete their high school degree of GED certification quickly and seamlessly may be both inexpensive and light-touch, yet may yield significant, short-term benefits for young children. While policies and programs strive for longer-term benefits for children, short-term impacts on behavior may make it possible for children to engage with their environments in ways that make other longer-term improvements more achievable.

Limitations and Future Directions

The current study has important limitations to consider. First, although employing an individual fixed effects design addresses potential bias from time-invariant factors, it does not address bias that results from time-varying characteristics that are both associated with increases in maternal education and children's development. Certain time-varying covariates that were not hypothesized to change due to increases in maternal education were included in all analyses to attempt to further reduce this potential bias (e.g., mother and child age; number of children in the

home). However, factors that are time-varying and may also have been influenced by changes in maternal education (e.g., income; marital status) could not be included in analyses because this would effectively control for a portion of the effect of changes in maternal education on children's outcomes. However, when included in the models, results remained the same.

Second, the categorical variable of mothers' highest level of education at each wave does not differentiate between the effects of the different *types* of education degrees/certificates mothers could attain because it collapses multiple types of education together into a single category (e.g., high school diploma and GED; vocational certificate and an Associate's degrees). Although different types of education credentials are combined because they are similar on important characteristics (e.g., length of time to complete; the benefits they confer), and are thus assumed to have the same impact on children's development, this is still an assumption that should be tested. Moreover, collapsing together these different types of education into a single education "level" may wash out the unique effects that one of those types of education may have on children's development. For instance, it may be that attaining an Associate's degree is positively related to children's language scores, but when averaged with the nonsignificant effects of similar levels of education (e.g., vocational certificate), the significant effects may get diluted, causing that broader category to appear unrelated to children's development. While current sample size is too small to separate out these levels and still have enough power to detect effects, future research should consider whether different types of degrees or certificates are more or less likely to be associated with young, disadvantaged children's development.

In addition, the continuous version of the education variable is limited in what it may tell us in the current study. Based on available survey questions about education in the Fragile

Families data, it is not possible to know the precise number of months or years mothers were enrolled in school. Fragile Families asks if a mother is currently enrolled in school and if yes, what they are enrolled in, but they do not ask the start-and-stop dates of those enrollment periods. Instead, the continuous version of maternal education was created by assigning each category the average amount of years it takes to complete up to that level of education, based numbers used in similar research (e.g., Magnuson et al., 2009). This may inaccurately estimate (and likely underestimates) the number of years of education mothers have experienced, which may influence how maternal education is associated with children's outcomes. Some existing research suggests the importance of considering the total amount of time mothers spend enrolled in school on parenting practices, in addition to degree completion. (Alamuddin, 2015) finds that mothers who have accumulated more total years of postsecondary education experiences have higher quality parenting practices that promote children's development, above and beyond degree attainment. Future research should seek to replicate this work to further explore child development and the nuances of mothers' educational experiences beyond degree completion, particularly for low-income mothers, who are more likely to accrue years of exposure in postsecondary education without degree completion than their higher-income peers (Institute for Higher Education Policy, 2010a; Jenkins & Rodriguez, 2013).

In addition, it is unclear at what point between interview waves a mother increased her education, as well as the exact duration of time it took to complete that level of education. For instance, a mother may have completed her high school degree only days before she participated in the interview, where she also reported on other factors included in the current paper, such as her employment, income, and parenting practices. Alternately, another mother may have

completed her highest education level earlier in that study wave, so there may have been more of a lag between her report about her education and other family characteristics between one wave and the next. Thus, the amount of time between maternal reports of education and data collection of child and parent outcomes may play a role in the current findings, but I am unable to account for this variation do to data constraints.

Finally, the external validity of the sample is limited. While individual-level fixed effects increase internal validity by controlling for all time-constant characteristics that may explain why some mothers gained more education and some did not, this reduces the external validity of the current study, since I am only estimating this relationship for mothers who chose to pursue more education and not a broader portion of mothers in the sample. The former mothers may not necessarily be the same as women who would be prompted to increase their education due to an intervention or policy. In addition, it is important to note that the categorical measure of education does not capture changes in education for mothers who may have achieved more *years* of education without attaining the higher degree or level, or for mothers who do attain a degree, but the degree does not *bump up* mothers to the next highest level of education (e.g., mothers who have an AA and complete an additional certificate). Rather, it only reflects increases in mothers' education when she completes the next highest level of education. These mothers did not contribute to the estimate and were treated as if they did not change their education. Again, while this does not reflect any error, it does limit the generalizability of the findings only to mothers who increased their education to the next highest *level*.

Although limitations exist, the current study makes a number of important contributions that extend prior research. The inclusion of individual fixed effects holds constant time-variant

characteristics (e.g. genetic endowments), reducing key forms of omitted variable bias that plague most existing correlational research studies of maternal education and children's development. Second, little existing research examines variation in maternal education and children's outcomes. This is particularly true for disadvantaged families, even though at-risk mothers are among the groups of parents most likely to return to school and a frequent target of policy intervention to promote family wellbeing and close gaps in children's development. Third, most research examining gains in maternal education has focused on children's cognitive outcomes (for an exception, see Harding, 2015), so the current study builds on prior work to examine impacts on children's behavioral problems. Finally, this is the first study among those that explore *changes* in maternal to test if non-linear, non-constant associations exist across multiple levels of the education distribution. This contribution may help guide practitioners and policy-makers in deciding at what point of the education trajectory resources should be invested in order to support mothers and, in turn, young children's development.

Chapter 4

Conclusion

The two studies presented in this dissertation sought to explore how key parental factors— parenting practices and maternal education— shape young children's development among disadvantaged families by situating these processes within the broader, dynamic contexts of both mothers' and children's educational experiences. Ecological theories of development emphasize connections among multiple contexts and settings in children's lives, but few existing studies explicitly consider these contexts when examining the associations between parents and children's development. This dissertation addresses this important gap.

The first study used classroom fixed effects methods to examine how early parenting practices and maternal level of education relate to young, low-income children's development above and beyond the role of the Head Start classroom. This study acknowledged how, in addition to spending time in the care of their parents, an increasing number of children are consistently exposed to out-of-home early education. It is important to consider these overlapping environments of care, because in addition to the home environment and parents, classrooms are a salient developmental context for young children that predict children's outcomes in and of themselves, as well as may influence how parents' own wellbeing and parenting are associated with children's development. The second study built on the knowledge that many low-income mothers improve their educational attainment after becoming mothers. In this study, I used person-level fixed effects to examine if and how these improvements in maternal education were associated with children's language skills and behavioral development among a group of young, disadvantaged children. I also examined how parenting, parental

mental health, and family resources may help to explain those associations by examining the relationship between these parental factors and improvements in maternal education.

While both studies explored the importance of parents and maternal education for children's development among a similar sample of low-income families, findings differed in key ways. In the first study, mothers' static level of maternal education was measured before children attended Head Start preschool for their first year. Findings suggested that a mother's level of education was significantly related to positive gains in all three cognitive outcomes (receptive language, emergent literacy, and emergent math skills), but was not related to changes in children's prosocial skills or problem behaviors. In addition, every level of maternal education was significantly associated with each of the three cognitive outcomes, and the *higher* mothers' education level was at baseline, the stronger the relationship was to children's cognitive development. Alternately in the second study, gains in maternal education level were most consistently associated with children's problem behavior, although for mothers who increased their education to a certificate/AA, gains in children's receptive language skills were also observed. In addition, it was gains in education by mothers who started at the *lower end* of the educational distribution (with a high school degree or less at baseline), and not the higher end, that were significantly related to children's development.

Therefore, findings in studies 1 and 2 differ in multiple ways, including how maternal education in study 1 appears to matter more consistently and across all education levels for child development than in study 2. When taken together, findings elucidate aligned concepts that may serve to explain these differences, as well as point out critical points to consider when trying to better understand the role of maternal education on children's development. Both studies suggest

the importance of thinking about maternal education as multi-dimensional construct and suggest how operationalizing and measuring education in different ways can tell us unique, yet complementary things about the relationship to children's outcomes. The first study explored maternal education level that was assessed at only one time point and completed before children entered preschool and at least one year prior to assessments of children's spring outcomes, whereas the second study explored maternal education as a change that occurred at some point between children's preschool and early elementary school years. By assessing maternal education level at a single time and prior to child assessments, more time existed for maternal education to both directly impact children's development, as well as indirectly have an effect through influencing other characteristics in the environment known to predict children's skills, such as maternal income. For instance, as suggested by the family investment model, existing empirical literature demonstrates that greater, static levels of maternal education predict higher family income, which in turn relates to improved children's development (particularly in the cognitive domains). Thus, is it possible that the static measure of maternal education in the first dissertation study captured a more cumulative, longer-term impact of education on children's development than the changes in education captured in the second study. This longer-term impact (versus concurrent impacts assessed in study 2) may be why in study 1, every level of education was related to every cognitive outcome and why many child outcomes were significantly related to maternal education, especially children's cognitive development. There was more time for the benefits of each level of education to have an impact on children's development. Moreover, it may be that pursing additional education and doing so after children have already reached preschool-age, as assessed in study 2, may result in short-term stresses and

negative changes (e.g., reductions in finances, increased stress in balancing school and home life). For instance, employed mothers may reduce their work hours accommodate their additional educational coursework, potentially reducing their income during this time period. Thus, positive changes in parental characteristics due to gains in maternal education may be temporarily offset by short-term stressors and/or reductions in resources, resulting in fewer significant positive impacts on both parental and child outcomes. Finally, the fewer significant results found in study 2 may be due to the concurrent measurement between changes in maternal education and in children's outcomes, as there may not have been enough time for improvements in maternal education to have a direct impact on children's development or influence factors that indirectly effect children's outcomes, such as income or employment. Therefore, examining maternal education as static or as improvements demonstrates how it is possible to capture different nuances and characteristics of mothers' education, as well as the different processes through which maternal education may impact children's development. It is essential for future research to think critically about how maternal education is best measured and operationalized to answer different research questions about maternal education and children's development.

In addition, when both studies are taken together, the current dissertation elucidates the importance of considering the "linked lives" of parents and their children, as suggested by the life course theory of development (Elder, 1998). This key tenet of the life course theory proposes that parents' and children's wellbeing and development are intricately connected, and that the experiences of one individual are shared with the other due to this mutual connection. This framing has implications for how researchers may think about crafting research questions and data collection efforts to better capture how parent-child relationships unfold within and are

affected by multiple contexts. For instance, multiple experimental research studies of adult education or workforce programs explore education and occupational attainment among low-income mothers, but only very few explore impacts on parents' outcomes that are more proximal to children's development (e.g., parenting practices) or on children's outcomes themselves (Furstenberg, 2011; Magnuson et al., 2009). This was the case even when the underlying motivation for some of these programs was to improve the well-being and reduce poverty of adults *with children.* By more explicitly considering (and in turn, designing studies to test) how changes in parents lives may be connected to their children's development, and vice versa, we can better understand and support families.

Indeed, considering the linked lives of parents and their children is critical for developing effective programs and policies that seek to foster family well-being. Policies have typically focused on supporting low-income parents' self-sufficiency or disadvantaged children's development with siloed, separate approaches, yet it may be that simultaneously providing supports for children and their parents is most effective for improving family wellbeing, economic self-sufficiency, and ultimately reducing socioeconomic gaps in achievement between low-income families and their more advantaged counterparts (Chase-Lansdale & Brooks-Gunn, 2014). Recent research that has taken this to heart suggests that programs that primarily focus on fostering children's development and parents' caregiving, such as early childhood education programs, may be an effective platform for supporting and improving *parents'* educational attainment (Chase-Lansdale & Brooks-Gunn, 2014; Sommer et al., 2012). Momentum has been gaining for two-generation programs that offer career-pathway education and workforce training to parents of children enrolled in high-quality preschool, which simultaneously fosters the

growth of both generations as an approach to thwarting the intergenerational transmission of poverty (referred to as “Two-Generation 2.0” programs; Chase-Lansdale & Brooks-Gunn, 2014). Recent findings suggest that mothers’ first year of participation in a “Two-Generation 2.0” program in Tulsa, OK, predicted both greater maternal post-secondary certificate attainment and higher children’s attendance in Head Start that year, compared to the control group (Chase-Lansdale et al., 2017).

In sum, this dissertation research sought to further our understanding of the associations between mothers’ parenting and educational attainment and young, low-income children’s development, particularly as these relationships operate within the dynamic educational contexts of both mothers and children. Understanding these processes among disadvantaged families may provide insight into how best to support mothers and their children in order to foster the healthy development and reduce disparities found between them and their more advantaged peers.

Tables

Table 1

Baseline, unimputed descriptive statistics of children and families in the final analytic sample (FACES 2000-2009 data)

	FACES 2000-2009			
	N	M (SD) / %	Min	Max
Child Characteristics				
Boy (%)	7030	50		
Race (%)	7018			
White		28		
Black		31		
Hispanic		33		
Other		8		
Age (months)	6881	48.59 (6.41)		
Participated in Early Head Start (%)	6994	10		
Program Type (%) ***(not including 2003)*	5,441			
Full-day		51		
Half-day		49		
Passed language screener (%)	6903	86		
Parent, Family and Household Characteristics				
Mother Age (years)	6979	28.81 (5.93)		
Maternal Education	7030			
Less than a High School/GED		35		
High School/GED		35		
AA/some college/vocational certification		25		
BA or higher		5		
Mother currently employed	6938	53		
Age at birth of first child	6972	20.63 (4.29)		
Annual Income	6923	20,030.74 (13,955.9)		
Poverty Status	6920	63		
Number of adults in the house	7027	1.99 (0.92)		
Number of children in the house	7026	2.58 (1.25)		
Married Households (%)	7005	38		
Both mom and dad live in home	7027	47		
Non-English spoken at home (%)	7026	22		
Mother born outside the U.S. (%)	7022	25		

Baseline Parenting				
Cognitive Stimulation	7030	9.36 (1.63)	1	11
Reading 3x or more per week (0/1)	7030	73	0	1
Parental Warmth	7030	17.30 (2.10)	7	20
Parental Control	7030	22.53 (2.90)	7	30
Baseline Child Performance				
Time between child assessments (months)	6874	5.89 (0.89)		
PPVT (standard score) [a]	6694	83.89 (16.41)	20	144
W-J: Letter-Word (standard score) [a]	5779	94.25 (14.48)	61	178
W-J: Applied Problems (standard score) [a]	5741	88.57 (15.72)	23	147
SSRS: Social Skills Score (0-24) [b]	6917	15.59 (4.65)	0	24
Problem Behaviors: Total score (0-24) [b]	6914	5.14 (5.00)	0	33

Note. Cell entries are unimputed, weighted mean values at baseline (fall of preschool year) with standard deviations listed in parentheses next to the mean when appropriate. Sample varies due to missing data for individual variables.
[a] Standardized against the national norm based on children's age group
[b] Not standardized for ease of interpretation.

Table 2

Variance decomposition for each indicator of parenting and maternal education level (n = 7,027 children in 1,372 classrooms)

			Unadjusted values			Adjusted Values		
Parental Indicators	Mean or percentage	Range	Total variance	Within-classroom variance	Proportion of total variance within classrooms	Total variance	Within-classroom variance	Proportion of total variance within classrooms
Parenting								
(1) Cognitive stimulation	9.37	1-11	2.49	1.54	61.69	2.40	1.51	62.82
(2) Reading 3+ times/week	74%	0-1	0.69	0.43	61.58	0.68	0.42	62.11
(3) Warmth	17.28	7-20	3.22	2.07	64.28	3.20	2.03	63.44
(4) Control	22.52	7-30	4.51	2.87	63.64	4.37	2.72	62.24
Maternal Education Level								
(5) Less than high school	35%	0-1	0.74	0.45	60.81	0.70	0.44	62.86
(6) High school/GED	35%	0-1	0.74	0.47	63.51	0.72	0.45	62.50
(7) AA/some college	25%	0-1	0.67	0.42	62.69	0.66	0.40	60.60
(8) BA or higher	5%	0-1	0.35	0.22	62.86	0.35	0.21	60.00

Note. Each coefficient represents a separate model. Each model is weighted and estimated using classroom fixed effects. Adjusted values include imputed child and family covariates. The mean and variance decomposition are based on a regression with each parenting variable as an outcome and classroom fixed effects.

Table 3

Relation among parenting practices and maternal education level (fall) and children's cognitive outcomes (spring); covariates and fixed effects included

	PPVT			Letter Word ID			Applied Problems		
	(A)	(B)	(C)	(A)	(B)	(C)	(A)	(B)	(C)
Cognitive Stimulation	0.02		0.01	0.01		0.01	0.03^{+}		0.02^{+}
Reading	0.02*		0.02*	0.04**		0.04**	0.04*		0.03*
Warmth	0.01		0.00	-0.00		-0.00	0.04**		0.04**
Control	-0.01		-0.01	0.01		0.01	-0.03^{+}		-0.03^{+}
HS/GED		0.06*	0.05*		0.09**	0.09**		0.07*	0.06*
AA/Some Cert/Voc tech		0.10**	0.09**		0.15**	0.14**		0.11**	0.10**
BA+		0.19**	0.18**		0.24**	0.23**		0.21**	0.20**
Constant	-0.15 (0.148)	-0.14 (0.147)	-0.13 (0.147)	0.61** (0.217)	0.63** (0.216)	0.65** (0.217)	0.43^{+} (0.222)	0.44* (0.221)	0.46* (0.222)
Observations	7,027	7,027	7,027	7,027	7,027	7,027	7,027	7,027	7,027
# classrooms	1,372	1,372	1,372	1,372	1,372	1,372	1,372	1,372	1,372

Note. Each column represents a separate model: (A) Parenting only, (B) Maternal education only, and (C) Both parenting and maternal education. Cell entries are based on weighted values with imputed covariates. Robust standard errors in parentheses; All child outcomes are standardized with a mean of 0 and a standard deviation of 1 (PPVT, Letter Word, and Applied Problems scores are standardized against the national norm based on children's age group).

$^{+}$ $p<0.1$, * $p<0.05$, ** $p<0.01$

Table 4

Relation among parenting practices and maternal education level (fall) and children's behavioral outcomes (spring); covariates and fixed effects included

	Social Skills			Problem Behaviors		
	(A)	(B)	(C)	(A)	(B)	(C)
Cognitive Stimulation	0.02^{+}		0.02^{+}	-0.01		-0.01
Reading	-0.01		-0.01	-0.00		-0.00
Warmth	0.01		0.01	-0.02^{+}		-0.02^{+}
Control	-0.01		-0.00	0.01		0.01
HS/GED		0.04	0.04		-0.05^{+}	-0.04^{+}
AA/Some Cert/Voc tech		0.03	0.03		-0.02	-0.02
BA+		0.06	0.06		-0.08	-0.08
Constant	-0.74*	-0.74*	-0.73*	0.22	0.21	0.22
	(0.175)	(0.177)	(0.176)	(0.156)	(0.156)	(0.156)
Observations	7,027	7,027	7,027	7,027	7,027	7,027
# classrooms	1,372	1,372	1,372	1,372	1,372	1,372

Note.. Each column represents a separate model: (A) Parenting only, (B) Maternal education only, and (C) Both parenting and maternal education. Cell entries are based on weighted values with imputed covariates. Robust standard errors in parentheses; All child outcomes are standardized with a mean of 0 and a standard deviation of 1 (PPVT, Letter Word, and Applied Problems scores are standardized against the national norm based on children's age group).

$^{+}$ p<0.1, * p<0.05, ** p<0.01

Table 5

Baseline, unimputed descriptive statistics of children and families in the final analytic sample (FFCWS data; n=712)

	N	M (SD) / %
Child Characteristics		
Boy (%) [a]	712	53
Age (months)	712	34.96 (1.90)
Attended any non-parental care (%)	712	62
Child lives with mom most of the time	712	99
Parent, Family and Household Characteristics		
Maternal Age (years)	712	27.52 (5.89)
Maternal Race/Ethnicity [a]	709	
White		21
Black		58
Hispanic		18
Other		3
Maternal Education [a]	712	
Less than a High School		24
High School/GED		31
AA/some college/vocational cert		32
BA or higher		13
Mother currently employed	712	61
Household Income	712	34,250.42 (35,246.79)
Poverty Status	712	
0-49%		23
50-99%		20
100-199%		23
200%-299%		15
300%+		19
Number of adults in the house	712	1.92 (0.77)
Number of children in the house	712	2.35 (1.26)
Married to bio father (%)	712	28
Mother born outside the U.S. (%)	711	4
Maternal cognitive aptitude (0-15)	712	6.99 (2.50)
Baseline Child Performance		
Language (PPVT, 0-80)	712	26.19 (14.26)

Positive Behavior (ASBI, 0-18)	712	15.41 (2.53)
Problem Behavior (CBCL)		
Internalizing Behavior (0-35)	712	8.02 (5.61)
Externalizing Behavior (0-42)	712	13.91 (7.90)
Baseline Parental Characteristics		
Warmth (0-5)	712	4.47 (1.06)
Harshness (0-5)	712	0.50 (1.04)
Parental Stress (4-16)	712	9.06 (2.64)
Maternal depression (%)	712	21

Notes. Cell entries are unimputed mean values at baseline (wave 3) with standard deviations listed in parentheses next to the mean when appropriate. Sample varies due to missing data for individual variables.

[a] Values taken from wave 1 because it was the only time assessed in the study

Table 6

Associations between improvements in maternal education and changes in children's cognitive, social, and behavioral outcomes between when children are ages 3 to 9 years old

	Receptive Language	Positive Behavior	Internalizing Behavior	Externalizing Behavior
HS/GED or higher	-0.21 (0.186)	-0.04 (0.181)	-0.37** (0.190)	-0.06 (0.184)
Certificate/AA or higher	0.18* (0.103)	0.20 (0.121)	0.01 (0.127)	-0.14 (0.118)
Bachelor's or higher	-0.10 (0.177)	0.01 (0.244)	-0.07 (0.259)	-0.18 (0.170)
Constant	0.58 (1.526)	-1.25 (2.071)	0.33 (1.845)	1.21 (1.914)
N	712	712	712	712
Total observations	2130	2130	2130	2130
R-squared	0.025	0.011	0.008	0.006
Fixed effect	Y	Y	Y	Y
Covariates	Y	Y	Y	Y

Note. Each column represents a separate regression model with imputed covariates (mother age, child age, number of adults and number of children in home, marital status to bio father, child lives with mother most of the time (0,1)). The table displays standardized coefficients with robust standard errors in parentheses.
* p<0.1, ** p<0.05, *** p<0.01

Table 7

Subgroup: Maternal age at baseline; Associations between improvements in maternal education and changes in child outcomes between when children are ages 3 to 9 years old

	Receptive Language		Positive Behavior		Internalizing Behavior		Externalizing Behavior	
	(A) Younger [a]	(B) Older [b]	(A) Younger	(B) Older	(A) Younger	(B) Older	(A) Younger	(B) Older
HS/GED or higher	-0.10 (0.215)	-0.58* (0.312)	0.00 (0.208)	-0.30 (0.319)	-0.36 (0.229)	-0.38 (0.319)	0.02 (0.225)	-0.30 (0.264)
Certificate/AA or higher	0.16 (0.105)	0.31 (0.307)	0.15 (0.132)	0.36 (0.303)	0.06 (0.149)	0.12 (0.221)	-0.14 (0.145)	0.01 (0.151)
Bachelor's or higher	-0.29 (0.211)	0.20 (0.282)	-0.15 (0.276)	0.21 (0.422)	0.04 (0.389)	-0.15 (0.321)	-0.11 (0.260)	-0.18 (0.174)
Constant	-0.47 (1.675)	2.51 (2.932)	-0.47 (2.077)	2.31 (4.264)	1.17 (2.089)	-2.12 (3.167)	2.33 (2.137)	-1.59 (3.476)
N	421	291	421	291	421	291	421	291
Total Obs	1,260	870	1,260	870	1,260	870	1,260	870
R-squared	0.029	0.040	0.022	0.011	0.028	0.022	0.012	0.016
Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y
Covariates	Y	Y	Y	Y	Y	Y	Y	Y

Note. Each column represents a separate regression model with imputed covariates (mother age, child age, number of adults and number of children in the home, marital status to bio father, child lives with mother most of the time (0,1)). The table displays standardized coefficients with robust standard errors in parentheses.

[a] "Younger" subgroup = age range 16-27 years (mean 23 years)
[b] "Older" subgroup = age range 28-50 (mean 33 years); 75% of "older" subgroup sample are between 28-36 years old; 95% are between 28-42
* p<0.1, ** p<0.05, *** p<0.01

Table 8

Subgroup: Household income at baseline; Associations between improvements in maternal education and changes in child outcomes between when children are ages 3 to 9 years old

	Receptive Language		Positive Behavior		Internalizing Behavior		Externalizing Behavior	
	(A) Lower [a]	(B) Higher [b]	(A) Lower	(B) Higher	(A) Lower	(B) Higher	(A) Lower	(B) Higher
HS/GED or higher	-0.24 (0.247)	-0.24 (0.281)	0.27 (0.211)	-0.42 (0.334)	-0.23 (0.227)	-0.42 (0.337)	0.11 (0.226)	-0.38 (0.270)
Certificate/AA or higher	0.36** (0.174)	0.07 (0.125)	-0.02 (0.155)	0.37** (0.170)	-0.04 (0.169)	0.06 (0.182)	-0.39** (0.174)	0.02 (0.158)
Bachelor's or higher	-1.02*** (0.112)	-0.03 (0.173)	0.08 (0.157)	-0.03 (0.275)	0.06 (0.122)	-0.13 (0.283)	-0.47*** (0.136)	-0.16 (0.184)
Constant	-0.58 (2.661)	1.36 (1.871)	-1.38 (3.915)	-1.05 (2.368)	-1.99 (3.093)	1.68 (2.269)	-2.14 (3.514)	3.12 (2.182)
N	237	475	237	475	237	475	237	475
Total Obs	707	1,423	707	1,423	707	1,423	707	1,423
R-squared	0.034	0.028	0.023	0.017	0.024	0.008	0.020	0.009
Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y
Covariates	Y	Y	Y	Y	Y	Y	Y	Y

Note. Each column represents a separate regression model with imputed covariates (mother age, child age, number of adults and number of children in the home, marital status to bio father, child lives with mother most of the time (0,1)). The table displays standardized coefficients with robust standard errors in parentheses.

[a] “Lower” subgroup = range $0-24,000 (mean= 11,251.46, SD=6,921.186)
[b] “Older” subgroup = range $24,028 - $999,999 (mean=60,946.94, SD=51,450.09)
* p<0.1, ** p<0.05, *** p<0.01

Table 9

Subgroup: Marital status to child's biological father at baseline; Associations between improvements in maternal education and changes in child outcomes between when children are ages 3 to 9 years old

	Receptive Language		Positive Behavior		Internalizing Behavior		Externalizing Behavior	
	(A) Married	(B) Not Married	(A) Married	(B) Not Married	(A) Married	(B) Not Married	(A) Married	(B) Not Married
HS/GED or higher	-	-0.14 (0.187)	-	-0.06 (0.183)	-	-0.31 (0.191)	-	-0.07 (0.187)
Certificate/AA or higher	0.69** (0.313)	0.15 (0.106)	0.07 (0.303)	0.22* (0.129)	0.47 (0.302)	-0.01 (0.134)	-0.17 (0.322)	-0.13 (0.128)
Bachelor's or higher	-0.19 (0.154)	-0.25 (0.483)	-0.20 (0.239)	0.56 (0.443)	-0.35 (0.267)	0.16 (0.647)	-0.27 (0.202)	-0.05 (0.157)
Constant	-0.48 (3.232)	0.41 (1.722)	4.04 (4.003)	-2.73 (2.390)	-0.19 (3.723)	0.28 (2.110)	4.44 (3.707)	0.48 (2.219)
N	197	515	197	515	197	515	197	515
R-squared	0.060	0.024	0.025	0.016	0.033	0.014	0.029	0.006
Total Obs	589	1,541	589	1,541	589	1,541	589	1,541
Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y
Covariates	Y	Y	Y	Y	Y	Y	Y	Y

Note. Each column represents a separate regression model with imputed covariates (mother age, child age, number of adults and number of children in the home, marital status to bio father, child lives with mother most of the time (0,1)). The table displays standardized coefficients with robust standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01

Table 10

Associations between improvements in maternal education and changes in parental factors between when children are ages 3 to 9 years old

	Parental Warmth	Parental Harshness	Parental Stress	Maternal Depression	Maternal Employment [a]	Household Income
HS/GED or higher	-0.28 (0.298)	0.24 (0.268)	-0.00 (0.177)	-0.08 (0.055)	-0.10 (0.112)	-3,264.47 (3,671.448)
Certificate/AA or higher	0.13 (0.162)	-0.25* (0.149)	0.04 (0.105)	0.00 (0.042)	0.12* (0.066)	4,095.93 (3,027.186)
Bachelor's or higher	-0.29 (0.222)	-0.23 (0.216)	-0.16 (0.181)	-0.00 (0.078)	-0.08 (0.133)	16,154.54* (8,546.284)
Constant	0.80 (2.482)	2.90 (2.609)	-0.71 (1.723)	-0.59 (0.692)	0.91 (1.005)	43,113.47 (50,656.831)
N	712	712	712	712	712	712
Total Obs	2,121	2,120	2,130	2,125	2,130	2,128
R-squared	0.016	0.011	0.007	0.015	0.008	0.106
FE	Y	Y	Y	Y	Y	Y
Covariates	Y	Y	Y	Y	Y	Y

Note. Each column represents a separate regression model with imputed covariates (mother age, child age, number of adults and number of children in home, marital status to bio father, child lives with mother most of the time (0,1)). The table displays standardized coefficients (exception: income is unstandardized) with robust standard errors in parentheses. [a] Employment status (0,1) should be interpreted as an odds ratio.
* p<0.1, ** p<0.05, *** p<0.01

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Appendix

Table A1

Relation among parenting practices and maternal education level (fall) and children's cognitive outcomes (spring); no covariates or fixed effects

	PPVT			Letter Word ID			Applied Problems		
	(A)	(B)	(C)	(A)	(B)	(C)	(A)	(B)	(C)
Cognitive Stimulation	0.04***		0.03***	0.03**		0.02	0.05***		0.04***
Reading	0.07***		0.06***	0.07***		0.06***	0.08***		0.07***
Warmth	0.01		0.01	-0.01		-0.01	0.03**		0.03*
Control	-0.02**		-0.02*	0.00		0.01	-0.03**		-0.03**
HS/GED		0.13***	0.11***		0.13***	0.12***		0.16***	0.14***
AA/Some Cert/Voc tech		0.20***	0.18***		0.20***	0.17***		0.23***	0.19***
BA+		0.31***	0.28***		0.39***	0.37***		0.37***	0.33***
Constant	0.04***	-0.07***	-0.05**	-0.00	-0.12**	-0.11**	0.03**	-0.10**	-0.08**
	(0.013)	(0.022)	(0.021)	(0.016)	(0.024)	(0.024)	(0.013)	(0.020)	(0.020)
Observations	7,027	7,027	7,027	7,027	7,027	7,027	7,027	7,027	7,027
# classrooms	1,372	1,372	1,372	1,372	1,372	1,372	1,372	1,372	1,372

Notes. Each column represents a separate model: (A) Parenting only, (B) Maternal education only, and (C) Both parenting and maternal education. Cell entries are based on weighted values with imputed covariates. Robust standard errors in parentheses. All child outcomes are standardized with a mean of 0 and a standard deviation of 1 (PPVT, Letter Word, and Applied Problems scores are standardized against the national norm based on children's age group).
*p<0.1, **p<0.05, ***p<0.01

Table A2

Relation among parenting practices and maternal education level (fall) and children's behavioral outcomes (spring); no covariates or fixed effects

	Social Skills			Problem Behaviors		
	(A)	(B)	(C)	(A)	(B)	(C)
Cognitive Stimulation	0.00		0.00	-0.00		-0.01
Reading	0.01		0.01	-0.00		-0.00
Warmth	-0.01		-0.01	-0.01		-0.01
Control	-0.01		-0.01	0.02		0.02
HS/GED		0.01	0.00		0.01	0.01
AA/Some Cert/Voc tech		-0.03	-0.04		0.05*	0.06*
BA+		0.02	0.02		-0.05	-0.04
Constant	0.02	0.03	0.03	-0.01	-0.03	-0.03
	(0.017)	(0.023)	(0.023)	(0.016)	(0.021)	(0.021)
Observations	7,027	7,027	7,027	7,027	7,027	7,027
# classrooms	1,372	1,372	1,372	1,372	1,372	1,372

Notes. Each column represents a separate model: (A) Parenting only, (B) Maternal education only, and (C) Both parenting and maternal education. Cell entries are based on weighted values with imputed covariates. Robust standard errors in parentheses. All child outcomes are standardized with a mean of 0 and a standard deviation of 1 (PPVT, Letter Word, and Applied Problems scores are standardized against the national norm based on children's age group).
*p<0.1, **p<0.05, *** p<0.01

Table A3

Comparisons between baseline descriptive statistics of families included in the analytic sample and families who were excluded

	Analytic Sample (n=712)		**Excluded cases (n=4,186)**	
	N	M (SD) / %	N	M (SD) / %
Child Characteristics				
Boy (%) [a]	712	53	4185	52
Age (months)	712	34.96 (1.90)	3519	35.94 (2.67)**
Attended any non-parental care (%)	712	62	3453	59
Child lives with mom most of the time	712	99	3519	97**
Parent, Family and Household Characteristics				
Maternal Age (years)	712	27.52 (5.89)	3518	28.35 (6.09)**
Maternal Race/Ethnicity [a]	709		4177	
White		21		21
Black		58		46**
Hispanic		18		29**
Other		3		4
Maternal Education [a]	712		4180	
Less than a High School		24		31**
High School/GED		31		28.5
AA/some college/vocational cert		32		28.5
BA or higher		13		12
Mother currently employed	712	61	3504	55**
Household Income	712	34,250.42 (35,246.79)	3519	35,901.32 (45,614.16)
Poverty Status	712		3519	
0-49%		23		23
50-99%		20		19
100-199%		23		26
200%-299%		15		13
300%+		19		19
Number of adults in the house (1-9)	712	1.92 (0.77)	3499	2.08 (0.94)**
Number of children in the house (0-10)	712	2.35 (1.26)	3499	2.29 (1.36)
Married to bio father (%)	712	28	3515	33**
Mother born outside the U.S. (%)	711	4	4174	19**

Maternal cognitive aptitude (0-15)	712	6.99 (2.50)	1258	6.70 (2.69)**
Baseline Child Performance				
Language (PPVT, 0-80[b]; 0-85[c])	712	26.19 (14.26)	1656	26.55 (15.15)
Positive Behavior (ASBI, 0-18[b]; 3-18[c])	712	15.41 (2.53)	2053	15.39 (2.67)
Problem Behavior (CBCL)				
Internalizing Behavior (0-35[b]; 0-36[c])	712	8.02 (5.61)	1987	8.16 (5.71)
Externalizing Behavior (0-42[b]; 0-41[c])	712	13.91 (7.90)	2001	13.07 (7.59)**
Baseline Parental Characteristics				
Warmth (0-5[b, c])	712	4.47 (1.06)	1331	4.29 (1.16)**
Harshness (0-5[b, c])	712	0.50 (1.04)	1326	0.48 (1.05)
Parental Stress (4-16[b, c])	712	9.06 (2.64)	2380	9.01 (2.71)
Maternal depression (%)	712	21	3509	20

Note. Cell entries are unimputed mean values at wave 3 with standard deviations listed in parentheses next to the mean when appropriate. Sample varies due to missing data for individual variables. T-tests compare between the two samples (** $p<.05$).

[a] Values taken from wave 1 because it was the only time assessed in the study

[b] Range of scores for those in final analytic sample (first column)

[c] Range of scores for those dropped from final analytic sample (second column)

Table A4

Associations between improvements in maternal education (including "some college") and changes in children's cognitive, social, and behavioral outcomes between when children are ages 3 to 9 years old

	Receptive Language	Positive Behavior	Internalizing Behavior	Externalizing Behavior
HS/GED or higher	-0.16 (0.186)	-0.03 (0.179)	-0.41** (0.189)	-0.12 (0.184)
Some College/ Certificate/AA or higher	0.14 (0.103)	0.17 (0.116)	0.05 (0.123)	-0.07 (0.118)
Bachelor's or higher	-0.12 (0.176)	0.02 (0.244)	-0.09 (0.269)	-0.19 (0.177)
Constant	0.62 (1.527)	-1.25 (2.079)	0.17 (1.837)	1.10 (1.919)
N	712	712	712	712
Total observations	2128	2128	2128	2128
R-squared	0.028	0.011	0.013	0.008
Fixed effect	Y	Y	Y	Y
Covariates	Y	Y	Y	Y

Note. Each column represents a separate regression model with imputed covariates (mother age, child age, number of adults and number of children in home, marital status to bio father, child lives with mother most of the time (0,1)). The table displays standardized coefficients with robust standard errors in parentheses.
*p<0.1, **p<0.05, *** p<0.01

Table A5

Associations between improvements in maternal education (continuous variable) and changes in children's development between when children are ages 3 to 9 years old

	Receptive Language	Positive Behavior	Internalizing Behavior	Externalizing Behavior
Years of completed school	0.03 (0.031)	0.05 (0.031)	-0.05 (0.037)	-0.04 (0.031)
Constant	0.27 (1.582)	-1.75 (2.082)	0.52 (1.908)	1.48 (1.948)
N	712	712	712	712
R-squared	0.027	0.011	0.009	0.006
Observations	2,128	2,128	2,128	2,128
FE	Y	Y	Y	Y
Covariates	Y	Y	Y	Y

Note. Each column represents a separate regression model with imputed covariates (mother age, child age, number of adults and number of children in home, marital status to bio father, child lives with mother most of the time (0,1)). The table displays standardized coefficients with robust standard errors in parentheses.
*p<0.1, **p<0.05, *** p<0.01

Table A6

Associations between improvements in maternal education (assessed as a binary variable for if a mother returned to school at any point between when children are age 3 to 9) and changes in children's development

	Receptive Language	Positive Behavior	Internalizing Behavior	Externalizing Behavior
Returned to school (Y/N)	0.04 (0.059)	-0.01 (0.068)	0.00 (0.070)	0.03 (0.066)
Constant	0.60 (1.525)	-1.05 (2.078)	0.04 (1.841)	0.98 (1.894)
N	712	712	712	712
R-squared	0.022	0.009	0.005	0.004
Observations	2,130	2,130	2,130	2,130
FE	Y	Y	Y	Y
Covariates	Y	Y	Y	Y

Note. Each column represents a separate regression model with imputed covariates (mother age, child age, number of adults and number of children in home, marital status to bio father, child lives with mother most of the time (0,1)). The table displays standardized coefficients with robust standard errors in parentheses.
*p<0.1, **p<0.05, *** p<0.01

Table A7

Associations between improvements in maternal education (including "some college") and changes in parental factors between when children are ages 3 to 9 old

	Parental Warmth	Parental Harshness	Parental Stress	Maternal Depression	Maternal Employment [a]	Household Income
HS/GED or higher	-0.26 (0.293)	0.22 (0.261)	-0.06 (0.174)	-0.00 (0.000)	-0.66 (0.577)	-2,255.16 (3,600.618)
Some College/Certificate/ AA or higher	0.11 (0.160)	-0.23 (0.145)	0.07 (0.100)	0.00 (0.000)	0.61 (0.398)	3,656.12 (2,990.253)
Bachelor's or higher	-0.29 (0.222)	-0.22 (0.221)	-0.16 (0.170)	-0.00 (0.000)	-0.87 (0.987)	16,609.48* (8,483.185)
Constant	0.93 (2.480)	2.70 (2.609)	-0.79 (1.728)	-0.00*** (0.000)	---	40,793.65 (50,370.604)
N	712	712	712	712	712	712
Total observations	2,120	2,118	2,128	2,128	2,128	2,128
R-squared	0.018	0.013	0.015	1.000	---	0.117
FE	Y	Y	Y	Y	Y	Y
Covariates	Y	Y	Y	Y	Y	Y

Note. Each column represents a separate regression model with imputed covariates (mother age, child age, number of adults and number of children in home, marital status to bio father, child lives with mother most of the time (0,1)). The table displays standardized coefficients with robust standard errors in parentheses.

[a] Employment status (0,1) should be interpreted as an odds ratio

*p<0.1, **p<0.05, *** p<0.01

Table A8

Associations between improvements in maternal education (continuous variable) and changes in parental factors between when children are ages 3 to 9 years old

	Parental Warmth	Parental Harshness	Parental Stress	Maternal Depression	Maternal Employment [a]	Household Income
Years of completed school	0.03 (0.038)	0.00 (0.035)	-0.02 (0.034)	0.01 (0.010)	0.03 (0.020)	1,563.74* (808.359)
Constant	0.35 (2.518)	2.62 (2.606)	-0.46 (1.805)	-0.63 (0.697)	0.60 (1.030)	24,285.73 (51,860.635)
N	712	712	712	712	712	712
R-squared	0.014	0.008	0.007	0.015	0.007	0.104
Observations	2,122	2,120	2,130	2,123	2,130	2,128
FE	Y	Y	Y	Y	Y	Y
Covariates	Y	Y	Y	Y	Y	Y

Note. Each column represents a separate regression model with imputed covariates (mother age, child age, number of adults and number of children in home, marital status to bio father, child lives with mother most of the time (0,1)). The table displays standardized coefficients with robust standard errors in parentheses (exception: income is unstandardized)
*p<0.1, **p<0.05, *** p<0.01

Table A9

Associations between improvements in maternal education (assessed as a binary variable for if a mother returned to school at any point between when children are age 3 to 9) and changes in parental factors

	Parental Warmth	Parental Harshness	Parental Stress	Maternal Depression	Maternal Employment [a]	Household Income
Returned to school (Y/N)	0.04 (0.079)	-0.10 (0.085)	0.00 (0.060)	0.02 (0.025)	-0.48** (0.230)	338.84 (1,743.792)
Constant	0.69 (2.492)	2.84 (2.606)	-0.68 (1.718)	-0.53 (0.694)	--- ---	45,596.18 (50,700.567)
N	712	712	712	712	712	712
R-squared	0.014	0.009	0.007	0.015	---	0.102
Observations	2,122	2,120	2,130	2,125	927	2,128
FE	Y	Y	Y	Y	Y	Y
Covariates	Y	Y	Y	Y	Y	Y

Note. Each column represents a separate regression model with imputed covariates (mother age, child age, number of adults and number of children in home, marital status to bio father, child lives with mother most of the time (0,1)). The table displays standardized coefficients with robust standard errors in parentheses.
*p<0.1, **p<0.05, *** p<0.01