THE IMPORTANCE OF HOUSEHOLD ENVIRONMENTS FOR EARLY LANGUAGE DEVELOPMENT OF HEAD START CHILDREN

by

Felicia Hurwitz

A dissertation submitted to the Faculty of the University of Delaware in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Education

Winter 2020

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ACKNOWLEDGMENTS

I am very grateful to my committee for their continued support for my dissertation project. Dr. Adrian Pasquarella, Dr. Allison Karpyn, and Dr. Shannon Monahan each provided valuable time to review my work and thoughtfully provided feedback throughout the time I conducted this dissertation project. All committee members challenged my thinking early on which significantly improved the overall conceptual framework and analytic approach used in this work. I wish to give an extra thank you to my dissertation chair, Dr. Henry May. Dr. May allowed me to join his research group in my third year as a doctoral student, and he supported my research interests to the fullest extent enabling this dissertation to come to its completion.

I would also like to thank my colleagues at Mathematica. They provided much needed support, advice, and encouragement while I completed the requirements of my doctoral program. I am very grateful that so many of them took an interest in my quest to obtain my doctorate degree.

Additionally, I would also like to thank my family, especially my husband, Andrew Hurwitz and my cockapoo, Tucker. Without their love, support, and understanding I would not have made it through this doctoral program.

I am especially grateful to the U.S. Department of Health and Human Services, Administration for Children and Families (ACF) for originally funding FACES 2014, to Mathematica for collecting and preparing FACES 2014 data, and to Research Connections for maintaining FACES 2014 data. ACF, Mathematica, and Research

Connections bear no responsibility for analysis and interpretation of the data used in this dissertation.

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ABSTRACT

This dissertation explored literature from a variety of fields including sociology, economics, and child development to determine how household relationship structures and related features of the home environment may be associated with child language outcomes. Beyond household relationship structures, other key features of the home environment included developmental supports available at home, environmental stress in the home, and cultural differences among preschool aged children. The literature reviewed in this dissertation provided the foundation for an analytic rationale which ultimately informed a series of empirical models employed to answer the study's research questions. Data from the Family and Child Experience Survey 2014 cohort were used to identify the associations between key features of the home environment and language outcomes among children enrolled in Head Start. Head Start is a federally funded program designed to provide services primarily to promote school readiness for young children who live in low income households and their families. Most children included in the sample were between three and five years of age. A series of single predictor and stepwise regression models were implemented which resulted in 112 statistical models developed to explore and understand the relationships between the home environment and early language assessment scores.

Findings provide key insights into the relationships between predictors within each feature of the home environment and child language outcomes at baseline and after the completion of one Head Start program year. Dual language learners were associated with substantially lower language assessment scores at baseline, but analyses on gain scores provides promising information about language growth for these children. Household sizes of three to five were associated with higher language

assessment scores at baseline for many children, and results suggest it may be beneficial for children to live in two-parent households (i.e., legally married *or* cohabitating). Results also show positive associations between developmental supports in the home and language outcomes while negative associations with language scores were observed for children in living poverty.

This study's results lay an important foundation for future research to further our understanding of the complexity of children's home environment and its effect on language development. Ultimately, this dissertation project serves as an important early step in understanding how key factors in the home environment may influence child language development in the earliest years and provides insights into mechanisms and potential supports that might help at-risk children served by Head Start.

Chapter 1

INTRODUCTION

Recent empirical evidence shows links between language skills in early childhood and academic achievement later in life (Artis, 2007; Sun & Li, 2011). Such research suggests a need to consider how language growth in early childhood could influence a child's potential academic performance in the future. Currently, there is increased attention on high stakes exams for elementary students in the United States (Layton, 2015) which makes understanding language development in early childhood especially important. Given the link between school readiness skills at kindergarten entry and later academic success, focusing on how to best promote early language development is especially critical. Only after we obtain a deeper understanding of the factors that influence language growth in the earliest years, can parents, educators, policymakers, and other important stakeholders make changes to provide important supports to improve the language development trajectory for the nation's youngest children. Such supports in early childhood to improve early language outcomes could influence a child's academic trajectory throughout their school years and beyond.

Social Justice Theory and Successful Predictors for Development

Children's experiences in early childhood vary, and environmental factors that are often beyond their control are linked to important developmental outcomes such as language. Understanding the mechanisms behind language success in early childhood among diverse groups of children can influence supports afforded to children in the future. Social justice theory (SJT) provides a lens for understanding observed differences

in achievement between students of differing race and socioeconomic statuses (Hage, Ring, & Lantz, 2011). One widely accepted version of SJT suggests that individuals from one race (i.e., White, non-Hispanic) and certain income strata (i.e., middle- and upper-income households) have benefits which are not shared by individuals from other groups. These benefits are quantifiable and result in dramatic differences among the different groups. Under a SJT framework, justice is understood as a mechanism to 'level the playing field' between these two groups through the use of public programs and policies (e.g., Havnes & Mogstad, 2015).

The achievement gap is an empirical phenomenon which is predicted by the SJT framework. The achievement gap, an idea first introduced in the Coleman Report (Coleman et. al., 1966) suggests that there are differences in academic success among particular groups of students (e.g., students from differing racial and socioeconomic backgrounds). This gap persists throughout a child's K-12 education experience and has consequences for both their pursuit of higher education and their future employment (e.g., Reardon, 2011). As alluded to earlier, SJT theorists would argue that the burden is on society to develop programs and policies which close this gap. Despite efforts to close the achievement gap among students in the United States (e.g., Valentino, 2018; Darling-Hammond, 2015), this gap remains (Hung et al., 2019; Valentino, 2018).

The achievement gap is often explained by the opportunity gap (e.g., Porter, 2007). The opportunity gap explores the idea that diverse groups of children have unequal opportunities to be successful based on the context in which they live. There are many illustrative examples of the opportunity gap. Some examples include students having the opportunity to study more rigorous curricula in school or students having access to computers in their schools. An early instantiation of the opportunity gap is the multi-million word gap which highlights the difference in terms of the number of words spoken to young children from different socioeconomic groups, which was first estimated

to be about 30-million words (Hart & Risley, 2003) and is now considered to be closer to four-million words (Gilkerson et al., 2017). Researchers currently disagree about the total number of words that make up this gap (Golinkoff et al., 2019), but nonetheless, the fact that more well-off children hear more words is important. This research suggests that children from low income socioeconomic groups will be spoken to with far fewer words than children from more privileged socioeconomic groups. This lack of language exposure for at-risk children has ramifications throughout their entire educational experience. Understanding the role of children's early language development in the context of their environment is critical for closing both the achievement and opportunity gaps (Hindman et al., 2016)

The Role of the Home Environment

Examining a child's home environment helps to understand what opportunities are afforded to that child. Early developmental researchers often work on identifying activities that take place within a child's home environment which impact children's language development. For example, much evidence links the need for adults to talk with children (e.g., Topping, Dekhinet & Zeedyk, 2013; Weisleder, & Fernald 2013) with language gains early on. Household conditions can influence the types of interactions, quality of interactions, and overall time spent in the home related to opportunities for children to build language (Rodriguez & Tamis-LeMonda, 2011). One household condition which previous research has shown influences children's language development is the compositional parental structure (Cooper et al., 2011).

For the purposes of this dissertation, household composition refers to the people living together in a household and the relationships among members within that household. For example, a child may live with one or both of their parents. A parent could be a biological parent, an adoptive parent, or a spouse or partner to the child's

biological or adoptive parent. It is important to note that the relationships between children and their parents can vary widely[1]. For instance, a child could live with two biological parents. The biological parent couple could be married or remain unmarried but happily cohabitating. Other people may live with a child within a household including other children (e.g., siblings) and adults (e.g., extended family or friends). As a result of living with siblings, younger children may also be exposed to talk from older children in the household. Recent work also differentiates the difference between the types of talk heard from adults and the talk heard from older children (Hoff, 2010). Taken together, this prior evidence supports the notion that the people within a household influence the opportunities to be exposed to language and the important experiences that promote language growth.

Parents are often faced with multiple demands including work, household chores, and older children. A popular theory, economic resource theory, suggests having two parents provides more resources to a household to meet the demands of life (e.g., Brown, 2004). Economic resource theory argues two parents have more resources at their disposal. As a result, one would expect that two-parent households would provide a more conducive environment for children's success. Existing evidence supports this economic resource theory. For example, recent work has shown links between children's academic success and living with two married parents (Brown, 2004). Further, Manning and Brown (2006) found children benefit from increased financial support when living with two cohabitating parents.

A second theory, known as the parent quality theory (Berger & McLanahan, 2015) suggests that high quality parenting might moderate the effects of low resources on academic achievement. This second theory suggests that the quality of the home

[1] For the purposes of this dissertation, parent refers to the child's primary caregiver(s).

environment and the composition of the household is ultimately what plays the most critical role in a child's ability to be successful. This theory would predict that the success of the child in the home environment is dependent upon the quality of the parenting in that environment and the composition of the parent structure. For example, a single parent with high quality parenting might be able to reduce the effect of having one less parent in the household because the present parent is invoking high quality parenting behaviors. In addition, a child might still have poor outcomes in a two-parent household if that household is of low parenting quality. This model also shows that children are sensitive to changes in composition since changes in composition also affect the quality of parenting in the home. Thus, widespread demographic shifts in household composition are an area of concern for early language researchers.

Recent trends in the United States show that household compositions are changing for children (Livingston, 2018). Many children live with different combinations of household members including married parents, single parents, unmarried and cohabitating parents, other adults (such as grandparents or multi-family households) and other children (including siblings and children from multi-family households). In fact, there are about four times as many unmarried parents today as there were in 1968, and the number of children living with unmarried dads has doubled since 1968. Approximately 25 percent of parents in the United States are unmarried. Within the households with unmarried parents, about 35 percent of those children are living with two parents that are cohabitating but not legally married. This suggests that even though children may not be living with two married parents, they still may be receiving the benefits (if any) of living in a two- parent household. These changes in household dynamics motivate the need to investigate the impacts of varying household compositions further as well as the need to adjust how data are collected, keeping these household composition trends in mind.

Although recognizing that different household compositions affect a child's language trajectory, equally important is to recognize that often these household compositions do not remain stable throughout a child's development. Recent work examining longitudinal data using data from the Early Childhood Longitudinal Study, 2010 Kindergarten Cohort (ECLS-K 2011) concluded that household disruption had negative impacts on children's language development (Hurwitz, Hurwitz, Wang, & May, 2016). Household disruption is defined as a change in parent composition. For example, a child may initially live in a two-parent household but then move into living in a one-parent household after a divorce. While this finding is not surprising, it does support the claim that the context of relationships within the home environment play a role in a child's ability to be successful with respect to language outcomes in the earliest years. The finding from this study also reflects the notion that children may be better off living in a single parent household as long as change does not occur thus supporting the theory that quality parenting can likely replace gains from the additional economic resources afforded to two-parent households.

Additional work has also looked closely at how household composition plays a role in language outcomes using a nationally representative sample of at-risk children. An analysis using data from the Family and Child Experiences Survey (FACES) 2009 cohort, a longitudinal data set of children in the Head Start program, showed children from married parent households show less growth with respect to language outcomes when compared to their peers living with unmarried parents (Hurwitz, Hurwitz, & May, 2017). This most recent finding goes against what one might expect from using the parent resource theory as a guide. While this finding could be explained by the parent quality theory, more work is needed to unpack potential reasons for children being worse off than their peers from married parent households.

Importantly, household relationships are impacted by other contextual factors in which household members exist. As a result, other features of the home environment must be considered when trying to understand household influences on early language development. Key environmental features in the home environment that can influence interactions between children and household members, and ultimately language development, include cultural differences which can often be measured through demographic characteristics, environmental stressors that impact parents such as living in poverty and parent depression, and developmental supports that are explicitly available to promote language development in young children in the home (e.g., through having and using books at home with children).

Key Considerations about Cultural Differences

Demographic characteristics of a family can show insights into opportunities for language development for children within a household. For example, households with adults that primarily speak Spanish will influence the amount of time a child is exposed to and talked with in English. Prior research has shown negative associations in English language performance for children living in primarily Spanish speaking households (e.g., August et al., 2015; Hoff et al., 2012) suggesting that the primary language spoken in the child's home plays an important role in English language development. Further, children from certain racial/ethnic backgrounds are more likely to be behind in language development than their peers from other backgrounds. Researchers have long documented African American, non-Hispanic and Hispanic children perform less well on academic assessments when they are compared to their White, non-Hispanic peers. For example, gaps in school readiness at kindergarten entry exist between African American, non-Hispanic and Hispanic children when compared to their peers from other backgrounds (e.g., Magnuson & Waldfogel, 2005).

Key Considerations about Environmental Stressors

Beyond cultural differences, environmental stressors for parents can play a role in the quality of interactions between parents and children. As a result, living with parents that are dealing with stressors must be considered when exploring the relationship between the home environment and child language development. Recent work showed the connection between parent depressive symptoms and language days in young children (Fredriksen et al., 2019). Evidence also exists that shows a connection between the stress of living in low socioeconomic conditions and language development in early childhood. For example, recent work connected the emotional stress of living in poverty and its impacts on early language development (Perkins, Finegood, & Swain, 2013).

Key Considerations about Developmental Supports

Finally, developmental supports specifically aimed at increasing language available within the home can help shape interactions between adults and children. When children are exposed to books and book sharing activities, the interactions between adults and children ultimately lead to important opportunities for children's language growth (e.g., Gilkerson, Richards, & Topping, 2017). The availability of books in the home and the time that adults spend engaging children in book sharing activities are associated with positive language outcomes in early development.

Early language development and connections to the home environment are complex. It is important to start investigating how elements of the home environment may be related to child language outcomes.

Research Questions

This dissertation will focus on understanding how the relationships within a child's household composition, and the environmental context in which those

relationships exist, play a role in shaping children's early language proficiency. Specifically, this work will explore how differences in the language proficiency of children served by a federal program (i.e., Head Start) might be related to certain household relationship structures and associated elements of their home environments. Three primary questions guide this dissertation project.

1. Using data from FACES 2014, which household relationship structures predict children's language proficiency?
2. Using data from FACES 2014, which other key environmental features predict children's language proficiency?
3. Using data from FACES 2014, how are features of the home environment (i.e., household relationship structures and other key environmental features) related to gains among children in Head Start over one program year?

To address this study's research questions, literature from the disciplines of child development, economics, and sociology will guide the construction of an analytic rationale. Next, a sequence of statistical analyses will be employed in an attempt to test the analytic rationale using a secondary data set containing a nationally representative sample of children in the Head Start program. The analytic models will seek to explore the connections between household relationships and the larger home environment in which household relationships exists and children's language proficiency at the beginning of the Head Start program year. Analyses on gain scores will be used to identify areas of growth for the children included in the sample. First, the analytic models will explore a child's household composition and its relationship to language proficiency among Head Start children. Next, other important features of the home environment will be explored including developmental supports within the home, environmental stressors, and cultural differences to see how these features might be associated with early language

proficiency. Finally, the analyses will seek to identify factors that explain why children living in certain household contexts experience faster or slower language development than their peers living in different relationship dynamics and environmental contexts.

Taken together, the statistical analyses employed in this work will inform the way researchers and other important stakeholders understand how household composition and the features of the home environment that play a role in household relationship dynamics might be associated with children's language trajectories in the earliest years, specifically for children enrolled in the Head Start program. The current work seeks to understand how the factors related to home environment can explain differences in language outcomes during a critical period of child development. Understanding how children acquire and grow language is very complex. This study's goal is to begin to identify the types of relationship compositions and home environments that might enhance or hinder language development to provide important insights into children that are from at-risk households and are receiving support from the Head Start program.

Chapter 2

LITERATURE REVEW

Importance of Early Language Growth

Early language development predicts reading ability by grade four. Reading ability has been shown to be a core competency necessary for academic success which is predicated on successful mastery of language early in development. Good, Simmons, and Kame'enui (2001) demonstrated that children who scored low on a commonly used measure to assess language growth struggled with reading tasks at grade four. Furthermore, reading "on grade level[2]" by grade four has been shown to be critical to later success as an adult. Research by Lesnick et al. (2010) links the ability to read on grade level by grade four with high school graduation suggesting that reading on grade level at grade four may actually be seen as a mitigation technique to reduce high school drop-outs. Many states have recognized these previously unknown consequences of not reading on grade level by grade four and have implemented intervention plans.

Key stakeholders in states across the nation have created campaigns such as the *Read by 4th* initiative in Philadelphia to increase the number of students prepared to read at grade level by grade three or four (Read by Fourth, 2019). Although useful for drawing attention to the importance of student's achieving grade level reading by grade four, part of the drawback for these campaigns is figuring out where to invest resources to ensure reading by grade level at grade four is achieved. Stakeholders involved in such campaigns have identified two strategic areas which must be answered to ensure

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2 National standards exist which set grade level expectations for all students in the United States (Bandeira de Mello, 2015).

resources are used most effectively: 1) determine which children are at greatest socio-environmental risk and 2) identify appropriate interventions which offer support.

Fortunately, research has identified supports that can improve chances of a student reading at grade level by grade four. Participation in book sharing activities is often viewed as an activity which can enhance language skills in the earliest years (e.g., Dowdell et al., 2019) and in turn increase a child's chance of reading on grade level. Having books alone is not enough. Simply having books in the home is not a solution because cultural practices of at-risk families may not include reading with their children. For example, recent research has found differences in book sharing behaviors among mother and child dyads from different cultural groups (Luo et al., 2014). As such, additional interventions within the home which encourage critical reading behaviors might be helpful to help at-risk families share books effectively (e.g., Davis et al., 2016). These arguments suggest that early language growth is highly dependent upon conditions set in the home environment early in development.

Exposure to Activities that Promote Language

Notably, researchers have spent much time investigating the activities that happen within a child's environment that can support optimal language development. For example, much evidence suggests the importance of talking with children (e.g., Golinkoff et al., 2015). Children are often exposed to different quality levels of language. For example, children living within high socioeconomic status households are exposed to rich language which is related to increased language scores on vocabulary assessments (Hoff, 2003). Further, children living with older siblings may be exposed to more talk, but child level talk is often less rich than adult level talk (Hoff, 2010). The amount of talk children hear in the home is often a result of the demands placed on parents. Families in lower socioeconomic environments often face additional financial stressors and have less

supports than families living in middle and upper level income households. As a result, parents from low socioeconomic backgrounds may have less resources to support their children's early developmental progress in language.

Evidence points to the importance of early language development and linked deficits in early language development are related to later issues with grade level reading at grade four and beyond. However, the reasons for differences observed between socioeconomic groups are not fully understood. Why do low socioeconomic groups struggle with early language development and others do not? There is tremendous variation between performance of low socioeconomic status children, and a variety of factors could explain this trend (e.g., Sperry, Sperry, & Miller, 2018). For example, whether the child receives external developmental support from public programs such as through high quality childcare (e.g., from Head Start), the number of caregivers involved in that child's life, and the quality of the relationships experienced by that child could all influence outcomes for development. Thus, I turn to two popular phenomena in the social sciences known as the achievement gap and the opportunity gap using SJT as a lens to begin to understand these differences.

The *Why*: Using SJT as a Guide for Understanding the Gap in Language Performance

The achievement gap recognizes that children from lower socioeconomic groups are more likely to perform poorly in key academic areas throughout their schooling compared to their peers coming from higher socioeconomic backgrounds (Reardon, 2011). Researchers also argue that the achievement gap is in large part due to an opportunity gap (e.g., Porter 2007). This opportunity gap recognizes the idea that all children are not afforded the same opportunities to be successful simply because of their socioeconomic backgrounds. A child's demographic characteristics (e.g., their race or the socioeconomic status of their household) can put a child at greater risk for low achievement. The start of the achievement and opportunity gaps begin for children at the earliest stages of development (e.g., Burchinal et al., 2011).

Experts often refer to a word gap, more recently estimated to be about four million words (Gilkerson et al., 2017), to describe differences in opportunities for children to acquire and grow language (Hart & Risley, 2003). This multi-million word gap reflects the notion that children living in low-income families are spoken to less than their peers living in middle or upper socioeconomic households. The results could be due to a number of factors including increased stressors from limited economic resources, limited time to spend with children, and lack of knowledge about best practices to support child language development in the home. This word gap is an example of the opportunity gap. Children from low socioeconomic households have a decreased opportunity to expand their vocabulary.

Policymakers and educators among other key stakeholders are working together to close the opportunity gap. For example, programs and policies exist to provide more resources to at-risk families. The Head Start program offers supports to children and their families living in at-risk environments, such as families from low socioeconomic status backgrounds. The Head Start program aims to provide quality child care to children ages three and four across the United States. The Head Start Early Learning Outcomes Framework includes specific criteria to help programs increase opportunities for key developmental areas, including language growth (U.S. Department of Health and Human Services, 2015). In addition, Head Start programs offer supports for parents to directly help children implement strategies to improve key developmental outcomes as well as resources to help the parent (e.g., access to help receive supports from the state or local community or help securing a job among other adult supports). Despite existing policies and programs, a gap still exists among children from lower socioeconomic households with respect to early language development related skills compared to their peers from higher socioeconomic backgrounds. Stakeholders are now charged to continue to find ways to close the gaps that exist for the nation's youngest children. A closer look at the

dynamics involved in the home environment is an important place to identify additional areas in which programs can target supports for language development for children most at risk.

These two aforementioned gaps can provide insights into why there are differences in groups of children in terms of early language development. Further, they help to identify conditions in the home which can both limit and simultaneously benefit language development. This section suggests the home environment is the environment which needs further understanding in order to illuminate which structures of that environment are ultimately most beneficial for early language development.

Language Development More Broadly

Understanding children's language development requires a broader understanding of child development. Bronfenbrenner's ecological systems theory (Bronfenbrenner, 1992) provides a suitable framework for understanding this larger context. This theory conceptualizes five different layers within an ecology of development. These layers serve as influential figures on the child's development with each layer contributing a different part to the larger picture of development.

The innermost layer is the individual (i.e., the child). Following this layer is the microsystem which references direct social relationships for the child. Examples of social contacts within one's microsystem include, parents, siblings, teachers, neighbors, and friends. The next layer is the mesosystem which refers to the relationships among the people in one's microsystem. For example, the relationship among a child's parents will contribute to a child's overall development. The next layer is the exosystem. The exosytem includes environments that indirectly impact the child. For example, a parent's experiences in their workplace may indirectly impact the child. Following the exosystem is the macrosystem. The macrosystem embodies the cultural context of one's

environment. For example, a child's socioeconomic status would fit in the macrosystem layer. Finally, the chronosystem represents developmental changes as a function through time. The chronosystem includes the transitions that occur during a child's life. For example, a child with divorced parents may have transitioned from a two-parent household to a one-parent household. Although all five components of the system are important for understanding the development of the whole child, including their language, the first two layers are the most proximate for influencing language development. The microsystem describes the people that the child directly interacts with during their developmental years which has implications on the child's direct exposure to language and the activities that promote language growth. Importantly, the mesosystem includes the relationships among the people who spend time with the child. The relationships among people influence the experiences a child has, and ultimately, their exposure to opportunities to grow language (Gregory, Long, & Volk, 2004). The next section will take a closer look about how the people within a child's microsystem and the relationships within one's mesosystem are important as it specifically relates to a child's household environment.

Dual Language Learners and Language Development

Research suggests that there are differences in English language development among children that are monolingual English speakers and those that are considered to be dual language learners (i.e., children speak two or more languages). Galloway and Lesaux (2017) highlight that while there are some advantages for language development in the early years (e.g., with respect to phonemic awareness) among dual language learners, they are more likely to perform lower than their monolingual peers on English literacy achievement assessments in early grades. Importantly, the age in which children begin attending childcare and the amount of time children spend in childcare can be

helpful in propelling language development for dual language learners. Recent empirical evidence showed positive relationships between both the age in which children entered childcare and the amount of time they received services and receptive vocabulary outcomes (Yazejian et al., 2015). This research specifically focused on dual language learners from low socioeconomic backgrounds suggesting that the benefits for dual language learners living with limited resources may be especially important.

Recent work identified the role of Head Start and the home environment for dual language learners. Hindman and Wasik (2015) showed that the amount of specific languages (i.e., English or Spanish) children were exposed to while at home were related to language achievement in both English and Spanish over one year of Head Start. Further, the quality of how language was taught within Head Start classrooms predicted English vocabulary growth over the year of Head Start. Overall, this work suggests that time in Head Start may provide important contributions for dual language learners' English language development. Additionally, dual language learners may not lose skills in their home language as they grow English skills. For example, Durán, Roseth, & Hoffman (2010) found that Spanish instruction in preschool can help native Spanish speakers grow Spanish without sacrificing their English language development.

The Role of Parental Household Composition

Early environmental factors clearly demonstrate connections to early language development, and the home is a central component of the early learning environment (e.g., Rose, Ebert, & Weinert, 2018). Parents have the greatest responsibility for their children's development and therefore play the largest role in supporting children's growth in the home. Researchers have found connections between parent characteristics and academic achievement (e.g., Pace et al., 2017). One popular framework, *the economic resource framework* discusses the role that resources of the parent(s) have in

contributing to child outcomes (e.g., Brown, 2004). This framework posits that children coming from households with more resources are likely to experience increased opportunity. The theory also recognizes that the compositional structure is equally important alongside resources. In other words, agreement with how resources are allocated is just as important as the amount of resources.

The e*conomic resource theory* is guided by the notion that parent household size is directly related to the resources available within a household. Simply put, children living in two- parent households are more likely to have more resources at their disposal and are more likely to achieve academic success than their peers coming from households of lower resource availability or households where there is disagreement with respect to resource allocation. For example, single parents are more likely to have less economic resources at their disposal than two-parents working together to combine resources. Furthermore, stepparent households might have different practices in terms of their resource allocation for their children. Stepparents have different demands with respect to resource allocation since they are economically responsible first for their biological children and second, their stepchildren. Researchers who endorse this theory aim to disentangle the complex relationship between parent household composition and the subsequent effects on child outcomes.

Much evidence exists to highlight the role of healthy relationships for adults in children's successful development. For example, research shows the developmental benefits for children living with parents in healthy committed relationships (Brown, 2004; Harold & Leve, 2018). Children living in environments with two parents are connected to better outcomes, including those related to academic achievement. As a result, federal funding has been used to promote strong relationships among two-parents (e.g., Dion, 2005). In addition, recent work sought to understand the complexities of co-

parenting relationships through research with fathers enrolled in federally funded programs (Friend et. al., 2016).

Additionally, having a father figure has also been linked to developmental advantages for young children (e.g., Lamb, 2010). As a result, public programs have been dedicated specifically to promoting the presence of fathers in the lives of their young children during their earliest years. Researchers have taken an interest in examining such programs (e.g., Acevedo-Polakovich et al., 2017; Dion et al., 2018). For example, many Head Start programs are committed to helping to promote the importance of father involvement including activities specifically designed for fathers and children. Head Start recently produced a guide to fatherhood engagement (US Department of Health and Human Services, 2013).

Taken together, this suggests that there may be a benefit to having a second parent in the household. Public policy has invested resources in promoting strong family relationships among parents with young children. Not surprisingly, further work has explored these relationships as it relates to parenting practices and economic resources.

Berger and McLanahan (2015) found attenuated relationships between cognitive and social-emotional development in children and factors typically associated with differences in parental household size (e.g., parenting practices and economic resources). These researchers found that coming froma two married biological parent households as opposed to other composition household structures makes a unique contribution to a child's cognitive and social-emotional development. The work makes sense and is consistent with the economic resource framework. Two married biological parents have more resources and share a more consistent vision for how to utilize those resources than parents from other compositional structures.

A second popular framework known as *the parental quality framework* is also used to explain the observed outcomes of children (Berger & McLanahan, 2015). This

theory states that the quality of the relationship between the parents and the children serves as an important predictor for determining child outcomes. In other words, high quality parenting can mitigate the risk factors found in low resource environments or in environments where parents might be more susceptible to having different perspectives on resource allocation. This theory asserts that children coming from high quality households perform better than children coming from low quality households even after controlling for resources. An extension of the research conducted by Berger and McLanahan (2015) found that married stepparents who score high on a measure of parental quality benefit. In these cases, high-quality parenting serves as a protective factor for diminished gains in cognitive and social-emotional development of children. Further evidence of this framework is found by research conducted on household disruption.

Household disruption, defined as a change in the household composition (e.g., a child moves from a married parent household to a single parent household), has explored the role of parent household composition in situations where disruption occurs. Hurwitz, Hurwitz, Wang, and May (2016) explored the relationship between household disruption and early academic achievement and found negative relationships between disruption and early academic achievement—even if that meant children moved from two-parent households to one-parent households. Overall, this work suggests that disruption is not ideal leading to poor performance on academic outcomes. However, this work supports the theory of parental quality by showing evidence that children coming from two married parent households, even though those households have additional resources, may not be best as children can do better when transitioning to a single parent household suggesting that the higher quality of the new single parent household is better for the child than remaining in a household with two-parents (e.g., if those two-parents were engaging in conflict). In conclusion, this work suggests that having parents that engage in

high parent quality parenting behaviors can moderate other situations which influence outcomes for children.

The preceding section of this review has established several important facets. First, household composition is an important element in predicting child outcomes. Prior literature has demonstrated a benefit for children coming from two married biological parent households which is explained through the lens of the economic resource theory. Children coming from a variety of other parental household compositions including compositional structures which undergo disruption and that have positive associations with academic acheivement may be explained through the lens of the parental quality theory.

Although essential to the discussion and later analytic rationale presented in this project, household composition structures are changing rapidly given shifts in demographics and relationship trends (Livingston, 2018). More children find themselves in situations of unmarried parent households or single parent households. Thus, understanding how children who come from parental household composition structures in which children are more likely to perform less well on language outcomes compared to their peers living in other household composition structures is a logical next step.

Shifting Martial Trends and Unmarried Parent Households

A recent shift in marital trends in the United States has resulted in more children in environments of two unmarried parent households and single parent households (Livingston, 2018). In response to this shift in trends, recent research has sought to investigate whether or not children from married parent households are at an advantage compared to children from unmarried parent households. Research by Hurwitz, Hurwitz, and May (2017) found evidence that children from unmarried parent households experienced greater gains on language outcomes when compared to their peers from

married parent households. This finding diverged from the previously reviewed literature. Leveraging the longitudinal nature of the data, Hurwitz, Hurwitz, and May (2017) were able to confirm this trend diminished over time, however; this finding still provoked questions around why during the earliest years of development children from unmarried parent households appear to be performing better than their peers from married parent households. The authors did not have the appropriate data to answer whether these unmarried parent households were cohabitating two-parent households compared to single parent households.

More research is needed to understand why children living with unmarried parents experienced greater learning gains than their peers living with married parents. Investigation must occur to understand more about the various relationship dynamics that exist within unmarried parent households. It is possible, for example, that children living with unmarried parents are still living with two parents that are cohabitating but not legally married. Single parents may also be living with other adults such as grandparents or other family members that are able to support children at home. In addition, other children in the home (e.g., siblings) may contribute to young children's language exposure at home.

Environmental Stressors

Relationship dynamics among household members are influenced by stress. Empirical evidence negatively links parent stress and early language development. Limited financial resources are a large source of stress for many parents. The Family Stress Model (FSM) (Conger & Conger, 2008) is an important framework that describes the connection between stress, poverty, and parenting. The FSM framework suggests that hard financial conditions can impact parenting behaviors. Cassels and Evans (2017) suggest an apparent link between the FSM framework and parent stress. Additionally,

parent depressive symptoms have been negatively connected to early language development. Researchers have linked parent depressive symptoms to delays in child language development (e.g., Fredriksen et al., 2019).

The Role of Public Programs and Supports for Early Language Development

Since its founding in 1965, Head Start has been federally funded to serve the needs of at-risk preschool aged children and their families primarily of low socioeconomic backgrounds (Head Start Timeline, 2019). While specific program features can vary across localities, Head Start provides supports for school readiness through home-based and center-based child care settings, supports for child health, and supports for parents both with respect to parenting and their own personal goals. Early Head Start was introduced in 1994 to serve families of infants and toddlers who are in need. Early Head Start begins serving families before children are born through its supports for pregnant women. Together, both Early Head Start and Head Start programs are committed to preparing children for critical areas of school readiness including the support of language development. Recent empirical work has found positive associations between children who received services from Early Head Start *and* continued to attend preschool and language outcomes (Love et. al., 2013). This works suggests that receiving of Early Head Start combined with attending preschool (e.g., Head Start) may play a role in language outcomes for young children.

A Need for Analytic Testing

As described throughout this literature review, the household environment and its connection to child language success is particularly important for children who are living in low socioeconomic conditions. As a result, early language and its associations with language proficiency of children enrolled in the Head Start program are especially

important. More attention on how language development and the home environment may be connected for children that are served by Head Start will provide opportunities to consider for further investigation that may be used to ultimately improve certain supports to help at-risk children catch up to their peers with respect to language development. Conducting robust analytic procedures on an existing data set of children enrolled in Head Start can begin to make important connections between features of the home environment and language outcomes among Head Start children. The next section will begin with an analytic rationale used to inform analyses to respond to this dissertation project's research questions.

Chapter 3

METHODS

Research Questions

Three primary research questions guide the analytic methods employed for this work:

1. Using data from FACES 2014, which household relationship structures predict children's language proficiency?
2. Using data from FACES 2014, which other key environmental features predict children's language proficiency?
3. Using data from FACES 2014, how are features of the home environment (i.e., household relationship structures and other key environmental features) related to gains among children in Head Start over one program year?

Analytic Rationale

The literature described in the previous section supports an analytic rationale to test key environmental elements of the home environment for children enrolled in Head Start to answer this study's research questions. The primary feature of the home environment of interest in this study is household composition (i.e., the people who live with the focal child). People are the direct providers of verbal interaction. Verbal interaction is important to help children acquire language, and ultimately propel language development in young children. Table one describes the observable characteristics related to household composition that can be used to measure language proficiency.

Table 1 Analytic Rationale: Primary Home Environmental Feature of Interest

Key Feature of the Home Environment	Observable Characteristic*
Household composition	Parent relationship status**
Household composition	Siblings in household
Household composition	Grandparents in household
Household composition	Other adult relatives in household (e.g., aunts, uncles)
Household composition	Other adult non-relatives in household
Household composition	Total number in household

* All household composition observable characteristics are binary predictors.

**Parent relationship status includes single parents, married biological parents, married biological parent to step-parent, and cohabitating parents (two biological or biological with stepparent).

The literature reviewed suggests which contextual factors within the home environment likely contributes to household composition in two primary ways 1) which household members live in the house with the focal child and 2) opportunities for household members to engage in verbal interaction with the focal child. Table two describes the observable characteristics related to developmental supports, environmental stress, and cultural differences that can be examined in relation to language proficiency. Additionally, the table includes the more specific element that each environmental feature will be measured by for the purposes of this study.

Table 2 Analytic Rationale: Secondary Home Environmental Features of Interest

Key feature of the Home Environment	Measured by	Observable characteristic*
Developmental supports	Exposure to books	Number of books in the home
Developmental supports	Exposure to books	Number of book sharing sessions per week
Developmental supports	Exposure to books	Time spent book reading
Cultural differences	Demographic characteristics	Race/ethnicity
Cultural differences	Demographic characteristics	Dual language learner status**
Environmental Stress	Primary parent stress	Parent depression
Environmental stress	Primary parent stress	Poverty threshold status

*All secondary home environment observable characteristics are binary predictors with the exception of two continuous predictors: Number of books in the home and time spent book reading (i.e., minutes read to).
**Dual language learner status is a binary characteristic that represents whether children primarily speak English or another language at home.

Description of Data Source

After developing an analytic rationale, it is critical to test the elements described throughout the rationale. Statistical procedures are used to test elements of the rationale in a secondary data set. The first step for testing out important components of the rationale is to choose the data set. The choice of data source is primarily informed by the data elements available in the data set and how those data can be used to inform the study's primary research questions.

Since 1997, the Administration of Children and Families, Office of Head Start, has commissioned the Family and Child Experiences Survey (FACES). The goal of FACES is to provide researchers, educators, and policy makers with a thorough understanding of the experiences of the children and families which Head Start serves. This kind of data collection and subsequent research enables evidence-based conclusions

which facilitate program improvement and ultimately enrich the outcomes for children and families that are served by Head Start.

FACES 2014 includes a nationally representative sample of more than 2,000 children attending Head Start, representing 60 programs across the United States. Data from FACES 2014 contains new variables not previously collected during parent interviews in prior waves, including more information about household composition for children included in the sample. The description of the data that follows focuses only on the data that will be used for the purposes of this dissertation project.

Child language assessment data from direct child assessments collected in fall 2014 and again in spring 2015 were used to understand child language achievement. The following instruments were included as part of the receptive and expressive language assessment in both fall and spring:

- Peabody Picture Vocabulary Test–Fourth Edition (PPVT–4; Dunn et al. 2006) for all children
- Expressive One-Word Picture Vocabulary Test–4 (EOWPVT–4; Martin and Brownell 2010) for children assessed in English
- Expressive One-Word Picture Vocabulary Test –4: Spanish-Bilingual Edition (EOWPVT–4: SBE; Martin 2012) for children assessed in Spanish

Trained members of the research team administered child assessments to children using web-based computer assisted personal interviewing (CAPI) to guide the assessments. In fall 2014, child assessment data were collected for 94 percent of the children in the sample. In spring 2015, data were collected for 95 percent of the sample.

As mentioned earlier, one of the changes made in FACES 2014 was to collect more information about household composition and the relationships among household members as part of the information gleaned from parents of children enrolled in the

study. The data containing household level information was obtained during a parent interview. Parent survey data were collected via web or computer-assisted interviewing, depending on the parent preference. When possible, parent responses came from the parent that spends the most time with the child. In fall 2014, the parent survey response rate was 93 percent. All predictors used in the analytic models came from the parent survey data.

FACES 2014 serves as a promising tool to investigate how various relationships in a household might be associated with language proficiency and development. For example, FACES 2014 data includes variables describing whether children are living with parents that are in a relationship without being married or living with other adults (e.g., grandparents). The current work seeks to understand how the factors related to household composition might be associated with differences in language outcomes among children in this critical period of development. Additionally, this work explores three other critical areas related to a child's home environment and language development. These areas include developmental supports, environmental stress, and cultural differences.

Acquisition of FACES 2014 Data

Once the data source for investigation is selected, the next step is to acquire the data set. The Inter-University Consortium for Political and Social Research (ICPSR) maintains a variety of de-identified data sets for researchers to use to inform analytic work. ICPSR houses the data set for the FACES 2014 study. A user agreement was completed and ICPSR agreed to make the data available for this work. Included were data files as well as materials to inform use of the data, including a comprehensive user's guide. Researchers at Mathematica designed and conducted the data collection for FACES 2014. Experts at Mathematica were consulted to understand further details

surrounding the data included in FACES 2014. Finally, the University of Delaware's Institutional Review Board (IRB) reviewed plans for this research. This research was approved with exempt status (i.e., without the need for IRB review since the data are anonymized and there is no further involvement of human subjects data collection).

Statistical Models

Several statistical models were implemented across multiple phases of analysis. Data were analyzed using IBM SPSS Statistics 26.

Model 1 was used for phases one and two.

$$Y_i = \beta_0 + \beta_1(X_i) + \varepsilon_i$$

Y_i = The language score at baseline for individual 'i'

β_0 = Average language score at baseline

$\beta_1(X_i)$ = The relationship between predictor *X* and baseline language scores

ε_i = Error term at baseline for individual 'i'

Model 2 was used for phase three.

$$Y_i = \beta_0 + \beta_{1p}(X_{pi}) + \beta_2(R_i) + \beta_3(EHS_i) + \varepsilon_i$$

NOTE: X =1 if household characteristic exists, 0 if not; A subset from the full set of P predictors (i.e., X_p) was included using stepwise regression.

Y_i = The language score at baseline for individual 'i'

β_0 = Average language score at baseline

$\beta_{1p}(X_{pi})$ = The relationship between predictor X_p and baseline language scores

$\beta_2(R_i)$ = The relationship between race and baseline language scores

$\beta_3(EHS_i)$ = The relationship between participation in Early Head Start and baseline language scores

ε_i = Error term at baseline for individual 'i'

Model 3 was used for phase four.

$$Y_i = \beta_0 + \beta_{1p}(X_{pi}) + \beta_2(R_i) + \beta_3(EHS_i) + \varepsilon_i$$

NOTE: X =1 if household characteristic exists, 0 if not; A subset from the full set of P predictors (i.e., X_p) was included using stepwise regression.

Y_i = The gain score for individual 'i' after one year of Head Start

β_0 = Average gain score after one year of Head Start

$\beta_{1p}(X_{pi})$ = The relationship between predictor X_p and gain scores after one year of Head Start

$\beta_2(R_i)$ = The relationship between race and gain scores after one year of Head Start

$\beta_3(EHS_i)$ = The relationship between participation in Early Head Start and gain scores after one year of Head Start

ε_i = Error term for gain score of individual 'i'

The first two phases of the analytic approach focus on the primary adult influences in a child's early life – parents. In phase one, the first statistical model (see Model 1 equation) attempted to determine whether Head Start children in the FACES 2014 living with married parents perform less well on language assessments than their peers living in unmarried parent households. Parent marital status was collected one time during FACES 2014. Data were coded such that each child was assigned to a married parent household or unmarried parent household without considering variations of unmarried parent living situations (e.g., living with two unmarried parents). The goal of this phase was to understand whether having legally married parents is a factor in early language success.

In phase two, the first statistical model (see Model 1 equation) was used for each additional predictor available in the FACES 2014 dataset related to household

composition. The goal of phase two was to examine the various relationships and household compositions that predict child language development beyond whether parents were legally married or unmarried. Critical factors included in this model are: 1) whether parents are married, unmarried and single, both parents living with child (but unmarried and cohabitating), one parent living with the child while cohabitating with a non-parent; 2) the number of adults (other than those in a parent role) living in the household including grandparents, family members, or friends; and 3) the number of other children in the household. These are among predictors that were tested separately which allowed for comparisons of coefficients for each individual predictor as an indicator of how it relates to child language proficiency.

Phase two also explored predictors related to other key areas of the model including environmental stress, cultural differences, and developmental supports. Table three describes all predictors tested for each construct of interest. These environmental factors provide important context for which the relationships within a household exist and ultimately provide or limit opportunities for quality verbal interaction among children and other household members in the home.

During phase three, a new model was employed (see Model 2 equation) which included all predictors from phases one and two in a single analysis. Using a stepwise regression, predictors were identified that most significantly predicted child language proficiency. Stepwise regression allows for the researcher to explore how all the predictors together predict the outcome variable, to identify potential confounders, and to select a subset of predictors for inclusion in a final model based on the strength of their prediction of the outcome variable. Two criteria were followed to determine whether a predictor was added or deleted from the model during each phase of the stepwise regression analytic procedure. During each step, only one predictor was either added or deleted from the model. A predictor was required to achieve a significance value of .05

or less to be added to the model. A predictor was dropped from the model if its p-value was equal to or greater than 0.10 after a new variable was added to the model. Forward selection identified the most significant coefficient (i.e., smallest p-value) as the predictor to be added to the model in each step of the analysis. This process continued until changes to the predictors in the model no longer met either of the two significance criteria defined above.

The final phase (i.e., phase four) explored the effects after children received one program year of Head Start. Stepwise regression models on gain scores were conducted (see Model 3). Analyses excluded predictors whenever sample sizes did not meet a minimum threshold of children. At least two children had to be included for a predictor to be deemed large enough to conduct analytic procedures.

Table four provides a summary of how each phase of analysis maps back to the study's primary research questions. Phase one directly responds to research question one, phase two directly responds to research questions one and two, phase three provides more insights into research questions one (i.e., through including predictors related to household composition) and two (i.e., through including predictors related to developmental supports, environmental stress, and cultural differences) respectively. Phase four directly responds to research question three to understand how gains in language over the program year might be related to each feature of the home environment.

Table 3 Regression Models Employed in the Analytic Plan

Model Number	Outcome Variable	Predictor	Key Feature of the Home Environment
1	Expressive vocabulary	Parent relationship status*	Household composition
2	Receptive vocabulary	Parent relationship status*	Household composition
3	Expressive vocabulary	Children in household	Household composition
4	Receptive vocabulary	Children in household	Household composition
5	Expressive vocabulary	Grandparents in household	Household composition
6	Receptive vocabulary	Grandparents in household	Household composition
7	Expressive vocabulary	Other adults in household	Household composition
8	Receptive vocabulary	Other adults in household	Household composition
9	Expressive vocabulary	Total number in household	Household composition
10	Receptive vocabulary	Total number in household	Household composition
11	Expressive vocabulary	Number of books in the home	Developmental Supports
12	Receptive vocabulary	Number of books in the home	Developmental Supports
13	Expressive vocabulary	Time spent book reading	Developmental Supports
14	Receptive vocabulary	Time spent book reading	Developmental Supports
15	Expressive vocabulary	Race/ethnicity	Cultural Differences
16	Receptive vocabulary	Race/ethnicity	Cultural Differences
17	Expressive vocabulary	Primary language spoken at home***	Cultural Differences
18	Receptive vocabulary	Primary language spoken at home	Cultural Differences
19	Expressive vocabulary	Received Early Head Start	Cultural Differences
20	Receptive vocabulary	Received Early Head Start	Cultural Differences
21	Expressive vocabulary	Parent depression	Environmental Stress
22	Receptive vocabulary	Parent depression	Environmental stress
23	Expressive vocabulary	Poverty status	Environmental Stress
24	Receptive vocabulary	Poverty status	Environmental stress

*Parent relationship status includes several binary predictors representing different parent relationship types.
**Time spent book reading includes measures of both minutes reported per session and overall sessions reported per week.
***Primary language spoken at home is used as a proxy to identify dual language learners for this work.

Table 4 Phases of Analyses by Research Questions

Analytic Phase	Model Number	Research Question Addressed
1	1	1, 2
2	1	2
3	2	1, 2
4	3	3

Language Proficiency and Language Outcomes of Interests

All children in the FACES 2014 sample were assessed using English receptive vocabulary and English and/or Spanish expressive vocabulary. No tests of Spanish receptive vocabulary were provided. More details about child assessment language paths are described in the next section of this chapter (i.e., Child Assessment Language Paths). Dual language learners included all children that reported primarily speaking a language other than English at home.[3] Children that were proficient in Spanish were either tested on expressive vocabulary in Spanish only (i.e., children were deemed monolingual Spanish) or English and Spanish (i.e., children were deemed proficient in both English and Spanish). Dual language learners that spoke languages other than English and Spanish at home were only assessed in English for tests of expressive vocabulary.

Child Assessment Language Paths

Analytic models were employed to reflect the nature in which data were collected for monolingual Spanish children and dual language learners. Children were screened for their language capabilities at the beginning of the child assessment. The screener determined the assessment path children would take. For the test of receptive vocabulary,

[3] While there may be other possible definitions of dual language learners, this study chose to align its definition with Aikens et. al., (2017).

all children were given the PPVT assessment in English regardless of their proficiency with the English language—meaning children who did not pass the English screener were still assessed using the English version of the PPVT. As such, the analytic models employed provide two sets of results: one for all children, regardless of language status, and another excluding those children who were identified as monolingual Spanish speakers (i.e., those that were assessed with a test administered in English, despite not passing an English screening test). For expressive vocabulary, different tests were administered to those that passed the English screener (i.e., children deemed proficient[4] to be assessed in English) and those that were determined to be proficient in Spanish. Children deemed proficient in English were assessed using the EOWPVT-4 (referred to EOW—English in the remaining sections of this dissertation). Children deemed proficient in Spanish were assessed using the EOWPVT-4: SBE (referred to EOW—Spanish) in the remaining sections of this dissertation). These two tests of expressive vocabulary are not equivalent and have not been linked or equated; therefore, their scores cannot be compared. As a result, the analytic phases described above present language assessment outcomes for four subsets of the FACES sample:

- English language receptive vocabulary for all children
- English language receptive vocabulary for children identified as being proficient in English and excluding children who were identified as monolingual Spanish
- Expressive vocabulary in English for children identified as being proficient in English and excluding children who were identified as monolingual Spanish

[4] This dissertation project uses *language proficiency* to describe language assessment outcomes (e.g., children that passed the English screener are described as children being proficient enough to be assessed in English).

- Expressive vocabulary in Spanish for children identified as being proficient in Spanish

Chapter 4

RESULTS

This next section provides the analytic findings from the statistical procedures. The section begins with a presentation of descriptive statistics to better understand the population present in the data set. Following this section is the presentation of each regression model procedure. As described earlier in the methods section, three distinct regression procedures were explored. The inferential analytic sections are broken down by each of the four outcome types.

Tables five through seven present descriptive count statistics for the gender, age, and race/ethnicity of focal children. Gender is split evenly between males and females. There is an almost even spread of children between the ages of 36 to 62 months with the largest group of children being 49 to 54 months of age. The three largest racial/ethnic groups of children in the datas et were identified as Hispanic/Latino (i.e., 41.2%), and African American non-Hispanic (i.e., 25.3%), and White, non-Hispanic (i.e., 24.4%). Combined, these three groups account for over 90 percent of the children in the data set. For all analyses, race categories were coded into the following categories: 1) White, non-Hispanic, 2) African American, non-Hispanic, 3) Hispanic/Latino, and 4) Other (all remaining race categories, including those who identify as multi-racial or bi-racial, were combined into one category given the limited number of children in these race categories). Table eight provides counts of children that passed the language screener (i.e., deemed proficient in English) in the fall and again in the spring. Tables nine and ten present information about household sizes of focal children. Table nine shows the demographic characteristics of focal children by household size. Table ten shows the household members that live with focal children by household size. Tables 11 and 12 present descriptive statistics for additional predictors used throughout analytic models.

The histograms in Figures 1 through 3 present the distributions of test scores at the beginning of the Head Start program year. The mean value for the PPVT is 88.83 and the standard deviation is 16.21 (see Figure 1). EOW—English scores at the beginning of the Head Start program year have a mean value of 93.68 with a standard deviation of 17.61 (see Figure 2). EOW-Spanish scores at the beginning of the Head Start year have a mean value of 98.03 and a standard deviation of 15.35 (see Figure 3).

Descriptive Statistics

Table 5 Gender of Focal Child

Gender	Count	Percentage
Male	1,060	50.4
Female	1,045	49.6
Total	2,105	100

Table 6 Age in Months of Focal Child

Months of age	Count	Percentage
30 to 35	36	1.7
36 to 42	489	23.2
43 to 48	497	23.6
49 to 54	596	28.3
55 to 62	487	23.1
Total	2,105	100

Table 7 Race/Ethnicity of Focal Child

Race/Ethnicity	Count	Percentage
White, non-Hispanic	513	24.4
African American, Non-Hispanic	532	25.3
Hispanic/Latino	865	41.2
American Indian or Alaska Native, Non-Hispanic	48	2.3
Asian or Pacific Islander, Non-Hispanic	17	0.80
Multi-Racial/Bi-Racial, Non-Hispanic	111	5.2
Other Race, Non-Hispanic	15	0.7
Total	2,101	100

Table 8 Language Screener Results

Time Point	Count Passed Screener*	Total Administered**
Fall	1,923***	2,333
Spring	183****	325

*Children proficient in English;
**Only a subset of children repeated the screener in the spring;
***268 children that passed the English screener in the fall were considered to be DLL;
****124 children that passed the English screener in the spring were considered to be DLL.

Table 9 Demographic Characteristics of Household Size

			Percent of Household Size				
House-hold size	**Total percent of sample**	**Total focal children**	**White, non-Hispanic**	**Hispanic**	**African American, Non-Hispanic**	**Other race***	**DLL**
2	10.8%	206	20.5%	30.7%	39.0%	9.8%	12.6%
3	21.1%	403	27.5%	32.0%	32.0%	8.4%	16.1%
4	28.0%	534	28.5%	41.3%	22.9%	7.3%	29.0%
5	21.4%	408	24.5%	48.3%	18.9%	8.3%	29.4%
6	10.4%	198	21.7%	48.5%	17.7%	12.1%	33.3%
7	4.6%	88	22.7%	43.2%	27.3%	6.8%	31.8%
8	2.0%	38	15.8%	55.3%	13.2%	15.8%	34.2%
9	0.9%	18	11.1%	50.0%	22.2%	16.7%	27.8%
10	0.5%	10	20.0%	40.0%	10.0%	30.0%	20.0%
11	0.3%	5	20.0%	20.0%	20.0%	40.0%	20.0%
12	0.1%	1	0.0%	0.0%	100.0%	0.0%	0.0%

*Other race includes American Indian or Alaska Native, Asian or Pacific Islander, Multi-Racial/Bi-Racial, Non-Hispanic, and other race)

Table 10 Relationship of Household Members to Focal Child

			Relationship to Child								
House-hold size	Total percent of sample	Total focal children	Mother	Father	Parent's partner	Step-parent	Grand-parent	Sibling	Other adult (relative)	Other adult (non-relative)	Foster parent
2	10.8%	206	180	18	0	0	7	0	0	1	0
3	21.1%	403	363	106	8	14	79	219	12	4	0
4	28.0%	534	510	312	14	21	90	606	36	6	3
5	21.4%	408	382	248	8	26	108	776	69	6	3
6	10.4%	198	187	132	4	5	77	485	82	9	2
7	4.6%	88	79	53	4	7	42	266	59	15	3
8	2.0%	38	36	26	1	2	19	132	44	2	0
9	0.9%	18	16	15	0	0	12	60	27	5	2
10	0.5%	10	7	7	0	1	6	48	21	0	0
11	0.3%	5	5	2	0	0	9	7	27	0	0
12	0.1%	1	0	1	0	1	0	9	0	0	0

Table 11 Descriptive Statistics for Additional Predictors Used in Analyses

Independent Variable	Count	Percent	Total	Construct
Primary caregiver is married	657	34.6	1901	Household Composition
Primary caregiver spouse or partner lives in household	1003	74.4	1346	Household Composition
Two people live in household	206	8.4	1909	Household Composition
Three to five people live in household	1345	70.5	1909	Household Composition
Six to seven people live in household	286	15.0	1909	Household Composition
Eight or more people live in household	72	3.8	1909	Household Composition
Grandparent(s) live in household	316	16.6	1909	Household Composition
Sibling(s) live in household	1410	73.9	1909	Household Composition
Stepparent lives in household	116	6.1	1909	Household Composition
Other relative(s) live in household	191	10.0	1909	Household Composition
Non-relative(s) live in household	30	1.6	1909	Household Composition
Focal child is DLL*	541	25.7	2104	Cultural Differences
Focal child participated in Early Head Start	707	34.0	2078	Cultural Differences
Focal child is read to 3+ times per week	1489	78.0	1908	Developmental Supports
Focal child lives in poverty	1303	68.3	1909	Environmental Stress
Caregiver self -reports depression	788	42.3	1865	Environmental Stress

*Dual language learners are defined as children who are primarily exposed to a language other than English at home. A small subset (i.e., 47 children in the fall and 49 children in the spring) received the EOW—Spanish but reported primarily speaking English at home).

Table 12 Descriptive Statistics for Continuous Variables Used in Analyses

Independent Variable	Count	Mean	Std. Deviation	Min	Max	Construct
Number of books in focal child's home	1900	31.92	38.01	0	300	Developmental Supports
Number of minutes focal child is read to	1903	20.80	12.70	0	120	Developmental Supports

Figure 1 Histogram of PPVT Pretest Scores

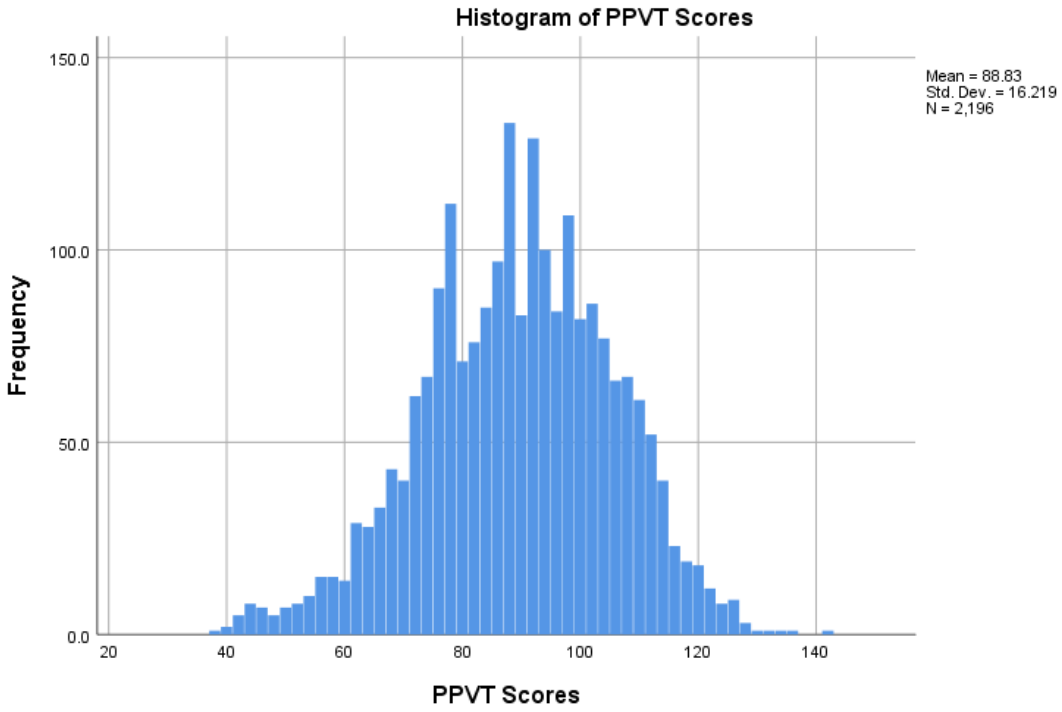


Figure 2 Histogram of EOW-English Pretest Scores

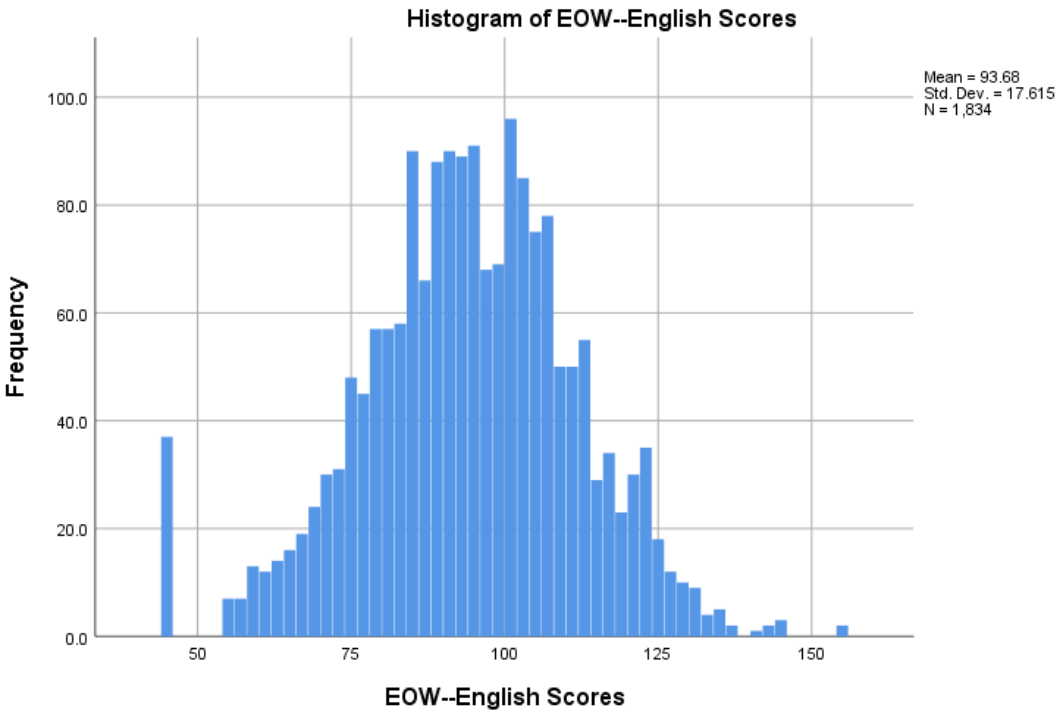
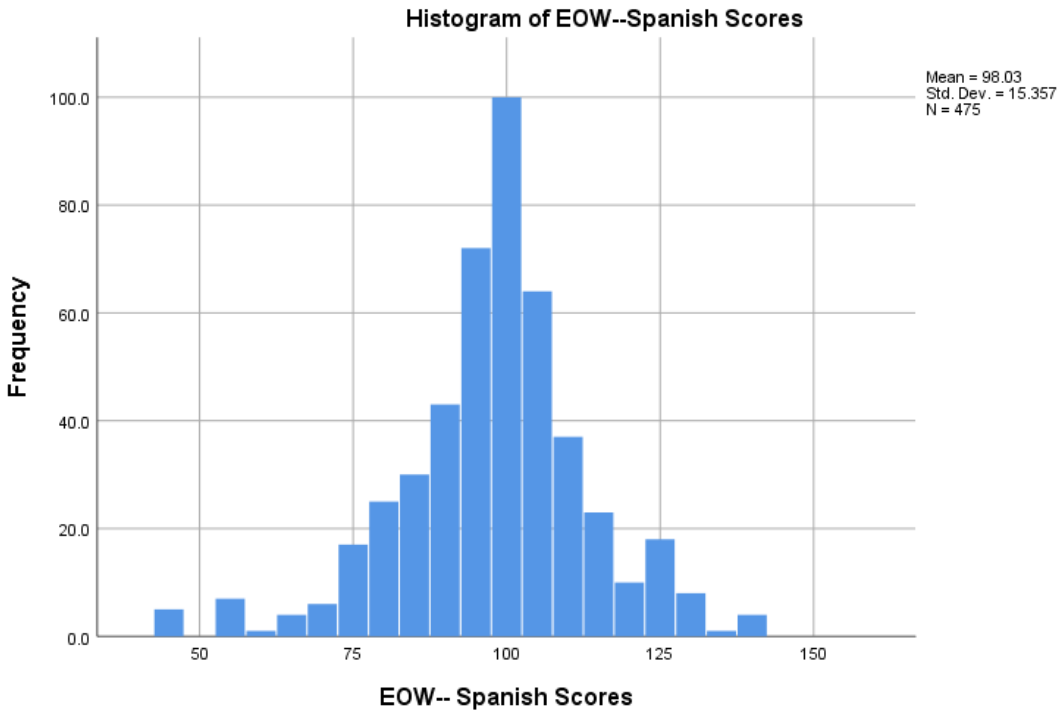


Figure 3 Histogram of EOW-Spanish Pretest Scores



Inferential Models

A total of 112 individual statistical models were estimated to understand the contribution of multiple independent variables on the outcomes of interest. In order to appropriately organize the presentation of these models, the section is structured into four distinct subsections. These subsections are organized by both outcome variable and population of interest. The first subsection presents inferential models for the outcome variable PPVT including the entire eligible sample of children. The second subsection also reports outcomes for the PPVT but excludes children who did not pass the English screener and were identified as monolingual Spanish children. The third subsection reports outcomes on the EOW for children that passed the English screener. The fourth subsection reports outcomes on the EOW for monolingual Spanish children.

Each subsection is then further broken down by the type of regression procedure used. The first type of regression procedure used in each subsection is direct entry single predictor regression models. Twenty-two distinct models are presented in each subsection to understand the sole contribution of the specified independent variable. The second type of regression procedure used is a stepwise regression. Three distinct stepwise regression models are presented with each model controlling for demographic characteristics. Two-way interactions were also included in each stepwise regression model to explore possible interactions (i.e., differences in effects) between predictors and demographic characteristics. Finally, the third type of regression procedure provided in each subsection is a stepwise regression on gains scores. The purpose of this third type of regression model was to understand whether participation in a Head Start program year is associated with child language growth, after demographic characteristics are controlled. The gain score models also included two-way interactions, as were used in the stepwise regression models using baseline data. Summary tables are used throughout to appropriately aggregate and display the results. Standardized effect sizes are calculated by dividing raw

regression coefficients by the standard deviation of the outcome variable. The Cohen's *d* effect sizes were used to inform interpretation (Cohen, 1988). Coefficients reaching .2 were considered to have small effects, coefficients reaching .5 were considered to have medium effects, and coefficients reaching .8 were considered to have large effects.

Section I. Outcome variable is baseline PPVT and population is inclusive of all children.

The first section includes all children who completed the PPVT at fall before the start of the Head Start program year. This population includes all children regardless of whether they passed the English screener and regardless of whether they were identified as monolingual Spanish children.

Table 13 below presents single predictor regression values for the independent variables of interest. The single predictor regression models reveal statistically significant results for the primary caregiver's spouse living in the same household as the focal child. The effect size for the primary caregiver's spouse living in the household is trivial and not significant. A statistically significant coefficient is also present for children living in household sizes of three to five people, six to seven people, and eight or more people. Results show that children living in households of three to five have slightly higher scores and the effect size is small. Alternatively, children living in larger households have slightly lower scores and the effect size is small. Focal children with siblings living in their household exhibit slightly lower scores and although the coefficient is significant, the effect size is trivial. A stepparent in the household and nonrelatives in the household are also associated with higher scores, although the result for nonrelatives is not significant. The effect size for stepparents in the household reaches the threshold to be considered a small effect size. Focal children who have other relatives living in their household have slightly lower scores, with a significant coefficient that reaches the threshold for a small effect size.

Dual language learners have significantly lower PPVT scores, and the effect size is large. Children from White, non-Hispanic and Other race groups have higher scores, while Hispanic children have significantly lower PPVT scores. The effect size for White,

non-Hispanic and Hispanic children is considered a medium effect size whereas the effect size for Other race children is considered a small effect size.

Table 13 Single Predictor Models for Baseline PPVT Inclusive of All Children

Independent Variable	β	Std. Error	Std. Dev.	Effect Size	Construct
Primary caregiver is married	.026	.850	16.474	0.002	Household Composition
Primary caregiver spouse/partner lives in household	2.44*	1.09	16.438	0.15	Household Composition
Two people live in household	2.169	1.23	16.250	0.13	Household Composition
Three to five people live in household	2.176*	0.858	16.250	0.13	Household Composition
Six to seven people live in household	-3.585**	1.102	16.250	-0.22	Household Composition
Eight or more people live in household	-6.592**	2.13	16.250	-0.406	Household Composition
Grandparent(s) live in household	-.098	1.06	16.250	-0.006	Household Composition
Sibling(s) live in household	-1.75*	.893	16.250	-0.11	Household Composition
Stepparent or primary caregiver's partner lives in household	3.48*	1.63	16.250	0.21	Household Composition
Other relative(s) live in household	-3.52**	1.32	16.250	-0.22	Household Composition
Non-relative(s) live in household	2.69	3.09	16.250	0.17	Household Composition
Focal child is DLL	-15.42***	.829	16.388	-0.94	Cultural Differences
Focal child is Hispanic	-9.13***	.751	16.346	0.56	Cultural Differences
Focal child is White	11.34***	.824	16.346	0.69	Cultural Differences
Focal child is African American	-1.63	.849	16.346	0.10	Cultural Differences
Focal child race is other	3.54**	1.29	16.346	0.22	Cultural Differences
Focal child participated in Early Head Start	-.371	.800	16.351	-0.02	Cultural Differences
Number of books in focal child's home	.125***	.010	16.265	0.008	Developmental Supports
Focal child is read to 3+ times per week	6.09***	.948	16.253	0.37	Developmental Supports
Number of minutes focal child is read to	.054	.031	16.237	0.003	Developmental Supports
Focal child lives in poverty	-3.67***	.838	16.250	-0.23	Environmental Stress
Caregiver self -reports depression	1.69*	.805	16.242	0.10	Environmental Stress

* p-value < 0.05; **p-value < 0.01; ***p-value < 0.001.

When a child has access to books in their household, they experience a small yet significant increase in scores, but the effect size is trivial. For children who participate in three or more reading sessions with their primary caregiver, an increase in scores is observed and the value is highly significant. The resulting effect size for this coefficient is considered to be a small effect size. Finally, living in poverty is associated with significantly lower PPVT scores, with an effect size that reaches the threshold to be considered a small effect size.

Tables 14 through 16 below present results for stepwise regression models for the independent variables of interest. Table 14 shows results for the stepwise regression model for the outcome baseline PPVT inclusive of all children for the household composition construct. The results show six models were selected all where dual language learners are predicted to have lower PPVT scores. These results are highly significant across all models at $p < 0.001$. Further, the resulting effect size values for all models are considered to be large. On the other hand, Hispanic children are predicted to have substantially lower scores on the PPVT ($p < 0.001$). All other effect sizes across models two through six are considered to be small for this outcome variable. Children who come from households with three to five people show an association with higher PPVT scores that is significant at the $p < 0.01$ threshold in model two and $p<.001$ in the remaining models. Children with a primary caregiver living in the household also shows an association with higher PPVT scores that is significant at the $p < 0.001$ and $p < 0.01$ respectively. Dual language learners that are living with six to seven household members have higher PPVT scores that is significant at the $p < 0.01$ level. Finally, children who are African American, non-Hispanic and are living with three to five household members show an association with lower PPVT scores, significant at the $p < 0.05$ threshold. The effect size for this value is considered to be trivial but is approaching a small effect. These results are mostly in line with the earlier presented single predictor regression

models. These association models continue to build on the theme that dual language learners have lower scores on the PPVT, while being of White, non-Hispanic race, and living with three to five household members are associated with higher scores at baseline. Interestingly, being a dual language learner and living with six to seven household members (i.e., an interaction term) is associated with higher scores despite the negative associations for each of these predictors on their own in the single predictor models. Finally, being African American, non-Hispanic while living with three to five household members (i.e., an interaction term) is associated with lower scores showing that the positive associations with PPVT scores observed for living with three to five household members does not hold for African American, non-Hispanic children.

Table 14 Household Composition Stepwise Regression Models for Baseline PPVT Inclusive of All Children

Independent Variable	1 β (ES)	2 β (ES)	3 β (ES)	4 β (ES)	5 β (ES)	6 β (ES)
Focal child is DLL	-16.102*** (-.976)	-13.557*** (-0.821)	-13.494*** (-0.818)	-14.078*** (-0.853)	-15.636*** (-0.947)	-16.560*** (-1.003)
Focal child is White, non-Hispanic		7.153*** (0.433)	6.935*** (0.42)	6.398*** (0.388)	6.344*** (0.384)	5.424*** (0.329)
Three to five people live in household			3.416** (0.207)	3.607*** (0.219)	5.321*** (0.322)	6.088*** (0.369)
Primary caregiver spouse or partner lives in household				3.581*** (0.217)	3.645*** (0.221)	3.283** (0.199)
Focal child is DLL x six to seven people live in household					6.878** (0.417)	7.481** (0.453)
Focal child is African American, non-Hispanic x three to five people live in household						-2.999* (-0.182)

SD for outcome = 16.503 * p-value < 0.05; **p-value < 0.01; ***p-value < 0.001. Other household composition variables were excluded from model estimates.

Table 15 shows results for the stepwise regression model for the outcome baseline PPVT inclusive of all children for the developmental supports construct. The results show six models were selected where dual language learners are associated with performing lower on their PPVT scores. These results are highly significant across all models at $p < 0.001$. Further, the resulting effect size values for the dual language learner variable in all models are considered to be large. Additionally, five models reveal positive associations with PPVT scores and the number of children's books available in the household at $p < 0.001$, but the effect sizes are considered to be trivial. White, non-Hispanic children also show highly significant associations with PPVT scores at $p < 0.001$ with small effect sizes. Focal children that are categorized in the Other race category and that are read to three or more times per week (i.e., an interaction term) also see highly significant positive associations with scores on the PPVT ($p < 0.001$) with small effect sizes across all models. Similarly, Hispanic children that are read to three or more times per week (i.e., an interaction term) also have higher PPVT scores ($p < 0.01$) with a small effect size observed across all models. Finally, dual language learners who have a number of books available at home have higher PPVT scores ($p < 0.05$), but the effect size is trivial. These association models continue to build on the theme that dual language learners perform lower on the PPVT at the beginning of the Head Start program year while being of White, non-Hispanic race is associated with higher scores at baseline. Additionally, access to and time with developmental supports that increase children's exposure to books provide opportunities for language development combined with being Hispanic, Other race, or being a dual language learner and are associated with higher scores at baseline, suggesting that access to materials may be particularly beneficial for certain groups of children.

Table 15 Developmental Supports Stepwise Regression Models for Baseline PPVT Inclusive of All Children

Independent Variable	1 β (ES)	2 β (ES)	3 β (ES)	4 β (ES)	5 β (ES)	6 β (ES)
Focal child is DLL	-15.870*** (-0.975)	-13.930*** (-0.856)	-12.526*** (-0.769)	-12.166*** (-0.747)	-13.264*** (-0.815)	-15.597*** (-0.958)
Number of books available in household		0.094*** (0.006)	0.075*** (0.005)	0.071*** (0.004)	0.067*** (0.004)	0.060*** (0.004)
Focal Child is White, non-Hispanic			5.739*** (0.353)	6.462*** (0.397)	7.595*** (0.467)	7.647*** (0.470)
Focal child is read to 3+ times per week x focal child race is other				5.121*** (0.315)	6.305*** (0.387)	6.282*** (0.386)
Focal child is read to 3+ times per week x focal child is Hispanic					3.044** (0.187)	2.909** (0.179)
Number of books available in household x focal child is DLL						0.137** (0.008)

SD for outcome = 16.280 * p-value < 0.05; **p-value < 0.01; ***p-value < 0.001. Other developmental supports variables were excluded from model estimates.

Table 16 shows results for the stepwise regression model for the outcome baseline PPVT inclusive of all children for the environmental stress construct. The results show four models were selected all where dual language learners are associated with performing lower on their PPVT scores. These results are highly significant across all models at $p < 0.001$, and the resulting effect sizes across models are considered to be large. Three models showed that White, non-Hispanic children are associated with having higher PPVT scores. These results are highly significant across all of the models at $p < 0.001$. These model coefficients show effect sizes which are considered to reach the small effect size threshold. Additionally, focal children that are African American, non-Hispanic and are living in poverty (i.e., an interaction term) are predicted to have lower PPVT scores. The coefficients are statistically significant at $p < 0.001$ with a small effect size and $p < 0.01$ with an effect size that is approaching the small effect size threshold respectively. Finally, children who are Other race show positive associations with PPVT scores in one of the models at $p < 0.01$. The effect size for this coefficient is considered to be small. These results are not surprising and are in line with the earlier presented single predictor regression models. These association models continue to build on the theme that dual language learners have lower scores on the PPVT. Additionally, children who are White, non-Hispanic or who are categorized as race being Other are associated with higher PPVT scores while children who are African American, non-Hispanic and are living in poverty have lower scores at the beginning of the Head Start program year.

Table 16 Environmental Stress Stepwise Regression Models for Baseline PPVT Inclusive of All Children

Independent Variable	1 β (ES)	2 β (ES)	3 β (ES)	4 β (ES)
Focal child is DLL	-15.796*** (-0.970)	-13.313*** (-0.818)	-14.646*** (-0.900)	-13.981*** (-0.859)
Focal child is White, non-Hispanic		7.853*** (0.482)	6.412*** (0.394)	7.268*** (0.446)
Focal child is African American, non-Hispanic x focal child lives in poverty			-3.963*** (-0.243)	-3.636** (-0.191)
Focal child race is other				3.636** (0.223)

SD for outcome = 16.279 * p-value < 0.05; **p-value < 0.01; ***p-value < 0.001. Other environmental stress variables were excluded from model estimates.

Tables 17 through 19 presents a summary of the stepwise regression models for each of the three constructs, with the outcome variable in all three models being gain score values for the independent variables of interest. Table 17 shows results for the stepwise regression model for gain scores on PPVT inclusive of all children for the household composition construct. The results show three models were selected all where dual language learners who live with three to five people (i.e., an interaction term) are making larger gains on the PPVT. These results are significant across all of the models at $p < 0.01$. These model coefficients show effect sizes which are considered to reach the small effect size threshold. Two of the stepwise regression models on the gain scores reveal that focal children who participated in Early Head Start and also live with three to five household members (i.e., an interaction term) experience smaller gains during one year of Head Start; however, the effect size for both models is considered to be trivial. Finally, one model revealed that White, non-Hispanic children that are living with their primary caregiver's spouse or partner (i.e., an interaction term) also experience smaller gains during one year of Head Start. The effect size is considered to be trivial. Overall, the analysis of the gain scores helps to develop a picture regarding the benefits of household sizes for certain groups of children. Whereas dual language learners were more likely to have lower language assessment scores at baseline, those that are also living with three to five household members are making greater gains over one Head Start program year than dual language learners living in other household sizes. Additionally, children who received Early Head Start services and are living with households of three to five people are making less gains over the year than those children who participated in Early Head Start and are living in other household sizes. Similarly, White, non-Hispanic children that are not living with their primary caregiver's spouse or partner are making greater gains than White non-Hispanic children that are living in households that do not include a parent's spouse or partner. Together, these results

suggest that time spent in one program year of Head Start may support growth at different rates given different household compositions and relationship structures.

Table 17 Household Composition Stepwise Regression Models for Gain Scores on PPVT Inclusive of All Children

Independent Variable	1 β (ES)	2 β (ES)	3 β (ES)
Focal child is DLL x three to five people live in household	2.902** (0.256)	3.214*** (0.283)	2.762** (0.244)
Focal child participated in EHS x three to five people live in household		-2.057* (0.017)	-2.144* (0.013)
Focal child is White, non-Hispanic x primary caregiver spouse or partner lives in household			-1.891* (-0.167)

SD for outcome = 11.343
* p-value < 0.05; **p-value < 0.01; ***p-value < 0.001. Other household composition variables were excluded from model estimates.

Table 18 shows results for the stepwise regression model for gain scores on PPVT inclusive of all children for the developmental supports construct. Three models emerge which show that dual language learners who live in households of three to five people (i.e., an interaction term) are associated with higher PPVT gain scores. All coefficients are significant at $p < 0.01$ and the associated effect sizes are considered to be small. Two models emerge which indicates having books in the focal child's household is associated with lower PPVT gain scores, both significant at $p < 0.01$. The coefficients are very small, and the resulting effect sizes are trivial. Additionally, one model shows that White, non-Hispanic children who have caregivers that spent time reading at home with them are also associated with smaller gains on the PPVT after one Head Start program year

compared to White, non-Hispanic children who report spending less time reading at home suggesting that Head Start may be closing the gap for children who spend less time reading with their parents.

Table 18 Developmental Supports Stepwise Regression Models for Gain Scores on PPVT Inclusive of All Children

Independent Variable	1 β (ES)	2 β (ES)
Number of books available in household	-0.026** (-0.002)	-0.021* (-0.002)
Reported time child read to x Focal child is White, non-Hispanic		-0.055* (0.046)

SD for outcome = 11.905 * p-value < 0.05; **p-value < 0.01; ***p-value < 0.001. Other developmental supports variables were excluded from model estimates.

Table 19 shows results for the stepwise regression model for gain scores on PPVT inclusive of all children for the environmental stress construct. One main model emerges which indicates being White, non-Hispanic and living in poverty (i.e., an interaction term) is associated with lower PPVT gain scores. The coefficient is significant ($p < 0.001$), but the effect size does not quite reach the small threshold. This result suggests that White, non-Hispanic children living in poverty are making smaller gains with respect to their PPVT scores than their White, non-Hispanic counterparts who are living with more resources in their households despite additional supports from the year of Head Start.

Table 19 Environmental Stress Stepwise Regression Models for Gain Scores on PPVT Inclusive of All Children

Independent Variable	1 β	SD	ES
Focal child is White, non-Hispanic x focal child lives in poverty	-2.194**	11.807	-0.186

* p-value < 0.05; **p-value < 0.01; ***p-value < 0.001. Other environmental stress variables were excluded from model estimates.

Section II. Outcome variable is baseline PPVT and population is exclusive of monolingual Spanish speaking children.

The second section includes all children who completed the PPVT in fall at the beginning of the Head Start year but excludes those children who did not pass the English language screener and were classified as monolingual Spanish speaking only children. Therefore, these analyses include children who were assessed in English after having passed the English language screener.

Table 20 below presents single predictor regression values for the independent variables of interest. Similar to the observation seen regarding the first outcome variable, focal children whose primary caregiver's spouse or partner lives in the household are predicted to have higher PPVT scores significant at $p < 0.01$. The effect size for this coefficient is considered to be small.

A statistically significant coefficient is also present for children living in all household sizes. Children living in households of two and three to five are associated with scoring higher on the PPVT and the effect sizes are considered to be trivial and approaching small, respectively. Results show that children living in households of three to five have slightly higher scores and the effect size is small. Alternatively, children living in larger households have slightly lower scores and the effect size for the coefficient is considered to be small. For focal children who have a stepparent living in the household, they have higher PPVT scores, which is significant at $p < 0.05$. The effect size for this value is considered a small effect size. Dual language learners have significantly lower PPVT scores, and the effect size is medium. Similar to what was observed for the prior outcome variable, White, non-Hispanic and Other race focal children have higher PPVT scores whereas Hispanic and African American, non-Hispanic children have lower scores. The result is highly significant at $p < 0.001$ for all race categories except the Other race. For Hispanic and African American, non-Hispanic

children the coefficient is considered a small effect size but for White, non-Hispanic children the result is considered to be a medium effect size. For every fourteen books in the focal child's household, higher PPVT scores are observed and although this increase is highly significant, $p < 0.001$ the resulting coefficient is considered a trivial effect size. Similar to the previously reported model, children who have their primary caregiver read to them three or more times per week have higher PPVT scores, which is highly significant at $p < 0.001$. The effect size is considered to be a small effect size. Lastly, similar to the previously model, living in poverty is associated with lower PPVT scores and the coefficient is significant at $p < 0.001$, but the effect size is considered to be trivial.

Table 20 Single Predictor Models for Baseline PPVT Excluding Monolingual Spanish Children

Independent Variable	β	Std. Error	SD	ES	Construct
Primary caregiver is married	.865	.823	15.113	0.06	Household Composition
Primary caregiver spouse/ partner lives in household	3.27**	1.03	14.857	0.22	Household Composition
Two people live in household	0.284**	1.153	14.921	0.019	Household Composition
Three to five people live in household	2.93***	0.818	14.921	0.196	Household Composition
Six to seven people live in household	-3.567**	1.064	14.921	-0.239	Household Composition
Eight or more people live in household	-6.202**	2.08	14.921	-0.416	Household Composition
Grandparent(s) live in household	-.617	1.01	14.921	-0.04	Household Composition
Sibling(s) live in household	-.920	.850	14.921	-0.06	Household Composition
Stepparent or primary caregiver's partner lives in household	4.27**	1.56	14.921	0.29	Household Composition
Other relative(s) live in household	-2.44	1.30	14.921	-0.16	Household Composition
Non-relative(s) live in household	.627	2.84	14.921	0.04	Household Composition
Focal child is DLL	-10.20***	0.954	15.033	-0.679	Cultural Differences
Focal child is Hispanic	-4.71***	.768	15.041	-0.31	Cultural Differences
Focal child is White	9.05***	.780	15.041	0.60	Cultural Differences
Focal child is African American	-4.54***	.789	15.041	-0.30	Cultural Differences
Focal child race is other	1.71	1.21	15.041	0.11	Cultural Differences
Focal child participated in Early Head Start	-.505	.769	15.036	-0.03	Cultural Differences
Number of books in focal child's home	.098***	.009	14.920	0.007	Developmental Supports
Focal child is read to 3+ times per week	5.11***	.928	14.923	0.34	Developmental Supports
Number of minutes focal child is read to	.022	.029	14.898	0.001	Developmental Supports
Focal child lives in poverty	-3.35***	.798	14.921	-0.22	Environmental Stress
Caregiver self -reports depression	.870	.769	14.915	0.06	Environmental Stress

* p-value < 0.05; **p-value < 0.01; ***p-value < 0.001.

Tables 21 through 23 below present results for stepwise regression models for baseline receptive vocabulary for children who passed the English screener. Table 21 shows results for the stepwise regression model for the outcome baseline PPVT exclusive of those children who did not pass the English screener and were identified as monolingual Spanish. The reported stepwise regression is for the household composition construct. Similar to the results that were inclusive of all children, the results show six models were selected all where dual language learners are predicted to have lower PPVT scores. These results are highly significant across all models at $p < 0.001$. Further, the resulting effect sizes are medium for two models and small for the remaining four models. On the other hand, White, non-Hispanic children are predicted to have substantially higher scores on the PPVT ($p < 0.001$). The resulting effect sizes are considered to be small for all models. Children who come from households with three to five people show an association with higher PPVT scores that are highly significant at $p < 0.001$ in all models. The effect size is small across all models. Also consistent with PPVT scores for all children, children with a primary caregiver living in the household show an association with higher PPVT scores that is significant at the $p < 0.001$ and $p < 0.01$ respectively. Children who are African American, non-Hispanic and are living with three to five household members are predicted to have lower PPVT scores, significant at the $p < 0.01$ threshold. The effect size for both of these models is considered to be small. Finally, one model reveals that dual language learners that are living with six to seven household members have higher PPVT scores that is significant at the $p < 0.05$ level. The effect size for this coefficient is considered to be small. These results are mostly in line with the earlier presented single predictor regression models and very closely align with results that were inclusive of all children in the sample. These association models continue to build on the theme that dual language learners have lower scores on the PPVT, while being of White, non-Hispanic race, and living with three to five household

members are associated with higher scores at baseline. These results also continue to support that being African American, non-Hispanic while living with three to five household members (i.e., an interaction term) is associated with lower scores showing that the positive associations with PPVT scores observed for living with three to five household members does not hold for African American, non-Hispanic children. Similarly, being a dual language learner and living with six to seven household members (i.e., an interaction term) is associated with higher scores despite the negative associations for each of these predictors on their own in the single predictor models.

Table 21 Household Composition Stepwise Regression Models for Baseline PPVT Excluding Monolingual Spanish Children

Independent Variable	1 β (ES)	2 β (ES)	3 β (ES)	4 β (ES)	5 β (ES)	6 β (ES)
Focal child is DLL	-10.649*** (-0.715)	-8.294*** (-.056)	-8.097*** (-0.543)	-8.730*** (-.585)	-9.631*** (-0.646)	-11.104*** (-0.745)
Focal child is White, non-Hispanic		6.730*** (0.452)	6.457*** (0.433)	5.928*** (0.398)	4.794*** (0.322)	4.660*** (0.313)
Three to five people live in household			4.343*** (0.291)	4.473*** (0.3)	5.314*** (0.357)	6.470*** (0.434)
Primary caregiver spouse or partner lives in household				3.611*** (0.242)	3.087** (0.207)	3.156** (0.212)
Focal child is African America, non-Hispanic x three to five people live in household					-3.667** (-0.246)	-3.993** (-0.268)
Focal child is DLL x six to seven people live in household						5.595* (0.375)

SD for outcome = 14.904 * p-value < 0.05; **p-value < 0.01; ***p-value < 0.001. Other household composition variables were excluded from model estimates.

Table 22 below shows the results for the stepwise regression model for the outcome baseline PPVT exclusive of those children who did not pass the English screener and were identified as monolingual Spanish speaking children. The reported stepwise regression is for the developmental supports construct. The results show six models were selected all where White, non-Hispanic children are associated with higher PPVT scores. These results are highly significant across all models at $p < 0.001$. The resulting effect sizes are considered to medium for two models and small for the remaining four models. Similar to the results reported for all children, dual language learners are associated with performing lower on their PPVT scores. These results are highly significant across all models at $p < 0.001$. Further, the resulting effect size values for the dual language learner variable in all models are considered to be medium. Additionally, four models reveal that the number of books available at home (i.e., children are more likely to have increased PPVT scores for every 39 books reported) is associated with higher PPVT scores at baseline. While the coefficients are highly significant ($p < 0.001$), the effect sizes are considered to be trivial. Three models were selected which reveal that the reported time spent reading for African American, non-Hispanic children is associated with lower PPVT scores at baseline (i.e., African American children with lower baseline scores tend to experience more time being read to). While the coefficients are highly significant ($p < 0.001$), the effect sizes are considered to be trivial. Additionally, two models reveal that focal children who are read to three or more times per week are predicted to perform better on the PPVT. The coefficients are both significant at $p < 0.01$ with effect sizes that are considered to be small. Finally, focal children that are categorized in Other race category and that are read to for a specified number of minutes (i.e., an interaction term) also see highly significant positive associations with scores on the PPVT ($p < 0.05$), the but the effect size is considered to be trivial.

These association models continue to build on the theme that dual language learners perform lower on the PPVT at the beginning of the Head Start program year while being of White, non-Hispanic race is associated with higher scores at baseline. Additionally, access to and time with developmental supports that increase children's exposure to books provide opportunities for language development combined with being categorized as Other race are associated with higher scores at baseline, suggesting that access to materials may be particularly beneficial for certain groups of children. This may not be true for all groups, as spending time reading combined with being African American, non-Hispanic is associated with lower scores; however, it is not clear whether time spent reading causes lower scores, or lower scores lead to more time spent reading.

Table 22 Developmental Supports Stepwise Regression Models for Baseline PPVT Excluding Monolingual Spanish Children

Independent Variable	1 β (ES)	2 β (ES)	3 β (ES)	4 β (ES)	5 β (ES)	6 β (ES)
Focal child is White, non-Hispanic	8.926*** (0.629)	7.323*** (0.516)	5.606*** (0.395)	4.367*** (0.308)	4.207*** (0.296)	4.805*** (0.339)
Focal child is DLL		-8.152*** (-0.574)	-7.40*** (-0.521)	-8.554*** (-0.603)	-8.616*** (-0.607)	-8.298*** (-0.585)
Number of books available in household			0.068*** (0.005)	0.066*** (0.005)	0.060*** (0.004)	0.058*** (0.004)
Reported time focal child read to x focal child is African American, non-Hispanic				-0.116*** (-0.008)	-0.115*** (-0.008)	-0.10** (-0.007)
Focal child is read to 3+ times per week					3.009** (0.212)	2.915** (0.205)
Reported time focal child read to x focal child is Other race						0.110* (0.008)

SD for outcome = 14.912 * p-value < 0.05; **p-value < 0.01; ***p-value < 0.001. Other developmental supports variables were excluded from model estimates.

Table 23 below shows the results for the stepwise regression model for the outcome baseline PPVT exclusive of those children who did not pass the English screener and were identified as monolingual Spanish speaking children. The reported stepwise regression is for the environmental stress construct. The results show four models selected all where White, non-Hispanic children are associated with higher PPVT scores. These results are highly significant across all models at $p < 0.001$. The resulting effect sizes are considered to medium across two models and small across the remaining two models. The results show three models were selected all where dual language learners are associated with performing lower on their PPVT scores. These results are highly significant across all models at $p < 0.001$, and the resulting effect sizes across models are considered to be medium. Additionally, two models reveal that African American, non-Hispanic children are associated with lower PPVT scores at baseline ($p < 0.001$) and the effect sizes are considered to be small. Additionally, focal children that are living in poverty are associated with having lower PPVT scores ($p < 0.05$), but the effect size is considered to be trivial.

The stepwise regression models exclusive of monolingual Spanish speaking children who did not pass the English screener reveal a story somewhat similar to the prior stepwise regression models where monolingual Spanish speaking children were included. Commonalities demonstrate that at baseline, dual language learners perform lower on the PPVT across constructs. Household compositions of three to five people are associated with higher scores while larger household sizes tend to be associated with lower scores. With respect to developmental supports, results show that time with and availability of books may have different benefits for children in different groups. In the environmental stress construct, being in poverty persists as a detriment to scores although an interaction with African American, non-Hispanic children was only present when all

children were included. Overall there is strong consistency across stage 1 and stage 2 results.

Table 23 Environmental Stress Stepwise Regression Models for Baseline PPVT Excluding Monolingual Spanish Children

Independent Variable	1 β (ES)	2 β (ES)	3 β (ES)	4 β (ES)
Focal child is White, non-Hispanic	9.123*** (0.611)	7.555*** (0.506)	5.321*** (0.356)	5.186*** (0.347)
Focal child is DLL		-8.003*** (-0.536)	-9.952*** (-0.666)	-9.756*** (-0.653)
Focal child is African American, non-Hispanic			-4.450*** (-0.298)	-4.338*** (-0.298)
Focal child lives in poverty				-1.70** (-0.114)

SD for outcome = 14.938 * p-value < 0.05; **p-value < 0.01; ***p-value < 0.001. Other environmental stress variables were excluded from model estimates.

Table 24 below shows the results for the stepwise regression model on the outcome PPVT gain scores after the Head Start program year exclusive of those children who did not pass the English screener and were identified as monolingual Spanish speaking children. The reported stepwise regression for the household composition construct shows one main model which indicates White, non-Hispanic children who are living with three to five people (i.e., an interaction term) are making fewer gains over the course of the program year compared to White, non-Hispanic children living in other household sizes. The coefficient is significant ($p < 0.05$). and the effect size is considered to be approaching small. The reported stepwise for the developmental supports construct also show that one main model emerges. This model indicates that having 39 or more books in the focal child's household combined with the focal child being White, non-Hispanic (i.e., an interaction term) is associated with smaller gains in PPVT scores, which is significant at $p < 0.01$. The coefficient small, and the resulting effect size is trivial. Finally, the reported stepwise regression for the environmental stress construct shows that one main model emerges. This model indicates that being White, non-Hispanic and living in poverty (i.e., an interaction term) is associated with smaller gain scores on the PPVT during the program year. This coefficient is significant at $p < .05$ and is considered to be approaching a small effect.

The results of the stepwise regressions for gain scores on the PPVT excluding monolingual Spanish children continues to show that the interaction between variables plays a role in children's language growth over the course of one year. White non-Hispanic children that are living in households of three to five people show less growth than White, non-Hispanic children in other household sizes. The same is true for White non-Hispanic children that have a specified number of books in their households compared to other White non-Hispanic children. Finally, White non-Hispanic children

living in poverty produce less gains on the PPVT than their White, non-Hispanic peers that are not living in poverty.

Table 24 Stepwise Regression Models for Models for Gain Scores on PPVT Excluding Monolingual Spanish Children

Independent Variable	1 β	SD	ES
Household Composition Model:			
White, non-Hispanic x three to five people live in household	-2.08*	11.429	-0.192
Developmental Supports Model:			
Number of books available in household x focal child is White, non-Hispanic	-0.26**	11.157	-0.023
Environmental Stress Model:			
Focal child is White, non-Hispanic x focal child lives in poverty	-1.977*	11.139	-0.177

* p-value < 0.05; **p-value < 0.01; ***p-value < 0.001. Other household composition, developmental supports, and environmental stress variables were excluded from model estimates.

Section III. Outcome variable is EOW—English and population is exclusive of children identified as monolingual Spanish.

The analyses for this third section include only those children who completed the EOW—English. Table 25 below presents single predictor regression values for the independent variables of interest. The single predictor regression models reveal statistically significant results for the primary caregiver's spouse living in the same household as the focal child. The value is significant at $p < 0.01$. The resulting effect size is considered to be small for focal children whose primary caregiver's spouse or partner lives in the same household. A statistically significant coefficient is also present for children living in household sizes of three to five people, six to seven people, and eight or more people. Results show that children living in households of three to five have slightly higher scores and the effect size is trivial. Alternatively, children living in larger households have slightly lower scores. The coefficient for six to seven households is approaching small and the coefficient for living in households with eight or more people is considered to be small. A stepparent in the household and nonrelatives in the household also provide benefit although the result for nonrelatives is not significant. White, non-Hispanic children have increased EOW scores compared to Hispanic and African American, non-Hispanic children and the result is statistically significant at $p < 0.001$ for the White non-Hispanic children and African American, non-Hispanic variable. The result is not statistically significant for the Hispanic variable. The resulting effect size for both White, non-Hispanic children and African American, non-Hispanic is considered to be small. Participating in three or more reading sessions with the focal child is highly significant and associated with higher EOW scores at $p < 0.001$. Children with more books in their household have higher EOW scores, which is significant at the $p < 0.001$ threshold. Similar to previously reported single predictor regression models for the PPVT outcome the resulting effect size for having more books is considered trivial

whereas the resulting effect size for the children being read to three or more times per week is considered small. Also, similar to previous models, living in poverty is associated with lower EOW scores, with a highly significant value of $p < 0.001$. The resulting effect size is considered to be small.

Table 25 Single Predictor Models for Baseline EOW—English

Independent Variable	β	Std. Error	SD	ES	Construct
Primary caregiver is married	2.19	1.02*	17.429	0.13	Household Composition
Primary caregiver spouse or partner is lives in household	3.50**	1.27	17.458	0.20	Household Composition
Two people live in household	1.297	1.371	17.169	0.076	Household Composition
Three to five people live in household	2.218*	1.001	17.169	0.129	Household Composition
Six to seven people live in household	-3.240*	1.337	17.169	-0.189	Household Composition
Eight or more people live in household	-6.948**	2.516	17.169	-0.405	Household Composition
Grandparent(s) live in household	-.518	1.19	17.169	-0.03	Household Composition
Sibling(s) live in household	-1.37	1.01	17.169	-0.08	Household Composition
Stepparent or primary caregiver's partner lives in household	3.43	1.86	17.169	0.20	Household Composition
Other relative(s) live in household	-2.16	1.58	17.169	-0.13	Household Composition
Non-relative(s) live in household	.138	3.46	17.169	0.008	Household Composition
Focal child is DLL	-16.997	1.674	17.249	-0.985	Cultural Differences
Focal child is Hispanic	-1.66	1.04	17.260	-0.10	Cultural Differences
Focal child is White	7.78***	.925	17.260	0.45	Cultural Differences
Focal child is African American	-5.76***	.919	17.260	-0.33	Cultural Differences
Focal child race is other	-1.02	1.37	17.260	-0.06	Cultural Differences
Focal child participated in Early Head Start	-.577	.933	17.261	-0.03	Cultural Differences
Number of books available in household	.092***	.011	17.122	0.005	Developmental Supports
Focal child is read to 3+ times per week	6.37***	1.11	17.175	0.37	Developmental Supports
Number of minutes focal child is read to	.033	.035	17.167	0.002	Developmental Supports
Focal child lives in poverty	-4.49***	.957	17.169	-0.26	Environmental Stress
Caregiver self -reports depression	-.155	.930	17.146	-0.01	Environmental Stress

* p-value < 0.05; **p-value < 0.01; ***p-value < 0.001.

In general, these findings for the EOW—English are similar to what was observed for the PPVT. At the beginning of the Head Start program year, having your primary caregiver's spouse or partner living with you and living in households with three to five people are associated with higher scores. Being White, non-Hispanic is also associated with higher scores and materials and time spent with books are associated with higher scores. Finally, being a dual language learner and living in poverty are associated with lower EOW- English scores at baseline across outcomes.

Table 26 shows results for the stepwise regression model for the outcome EOW—English which is exclusive of those children who did not pass the English screener and were identified as monolingual Spanish. The reported stepwise regression is for the household composition construct. The results show five models were selected where dual language learners are associated with performing lower on the EOW. The coefficients are highly significant ($p < 0.001$) and the effect sizes are considered to be large. Four models emerge that show African American, non-Hispanic children are associated with lower EOW—English scores and the effect sizes are considered to be small. Additionally, three models emerge in which children living with three to five people are associated with higher EOW—English scores at baseline. The coefficients across all models are significant at $p < 0.01$, and the effect sizes are considered to be small. Additionally, focal children who are White, non-Hispanic and who live with their primary caregiver's spouse or partner (i.e., an interaction term) also show positive associations with baseline EOW—English scores. The coefficients for both models are significant at $p < 0.01$ and the effect sizes are both considered to be small. Finally, African American, non-Hispanic children living with married parents (i.e., an interaction term) are also predicted to have higher EOW—English scores at baseline. The coefficient is significant at $p < 0.05$, and the resulting effect size is considered to be small.

Table 26 Household Composition Stepwise Regression Models for Baseline EOW—English

Independent Variable	1 β (ES)	2 β (ES)	3 β (ES)	4 β (ES)	5 β (ES)
Focal child is DLL	-16.395*** (-0.934)	-17.056*** (-0.972)	-16.761*** (-0.955)	-15.709*** (-0.895)	-16.093*** (-0.917)
Focal child is African American, non-Hispanic		-6.684*** (-0.381)	-6.555*** (0.374)	-4.884*** (-0.278)	-6.310*** (0.360)
Three to five people live in household			4.562** (0.260)	4.481** (0.255)	4.598*** (0.262)
Focal child is White, non-Hispanic x primary caregiver spouse or partner lives in household				4.027** (0.229)	3.979** (0.227)
Focal child is African American, non-Hispanic x focal child has married parents					5.46* (0.311)

SD for outcome = 17.548 * p-value < 0.05; **p-value < 0.01; ***p-value < 0.001. Other household composition variables were excluded from model estimates.

Table 27 shows results for the stepwise regression model for the outcome EOW—English which is exclusive of those children who did not pass the English screener and were identified as monolingual Spanish. The reported stepwise regression is for the developmental supports construct. The results show six models were selected all where dual language learners are associated with performing lower on their PPVT scores. These results are highly significant across all models at $p < 0.001$. Further, the resulting effect size values for the dual language learner variable in all models are considered to be large. The results show three models were selected where for every 41 books in the focal child's household a small increase in the EOW—English score is observed. This result is highly significant at $p < 0.001$ but the resulting effect size is considered to be trivial. Additionally, four models emerged where African American, non-Hispanic children are associated with lower EOW—English scores. The coefficients are highly significant across all four models at $p < 0.001$, and the associated effect sizes are considered to be small. Additionally, two models emerged in which focal children that were read to three or more time per week were associated with higher scores on the EOW—English at $p < 0.05$, and the associated effect sizes are approaching the small threshold. Finally, dual language learners who have a number of books available at home have higher PPVT scores ($p < 0.05$), but the effect size is trivial. These association models continue to build on the theme that dual language learners perform lower on the language outcome assessments at the beginning of the Head Start program year. Additionally, access to and time with developmental supports that increase children's exposure to books are associated with higher scores, and importantly, interactions play a role for the number of books available to dual language learners.

Table 27 Developmental Supports Stepwise Regression Models for Baseline EOW—English

Independent Variable	1 β (ES)	2 β (ES)	3 β (ES)	4 β (ES)	5 β (ES)	6 β (ES)
Focal child is DLL	-16.871*** (-0.979)	-15.278*** (-0.891)	-16.456*** (-0.960)	-16.317*** (-0.952)	-15.398*** (-0.897)	-18.116*** (-1.057)
Number of books available in household		0.088*** (0.005)	0.004*** (0.072)	0.064*** (0.004)	0.059*** (0.003)	0.055*** (0.003)
Focal child is African American, non-Hispanic			-5.183*** (-0.302)	-4.897*** (-0.286)	-3.422** (-.20)	-3.467** (-0.202)
Focal child is read to 3+ times per week				4.056*** (0.237)	3.940*** (0.230)	3.870*** (0.226)
Focal child is White, non-Hispanic					3.177** (0.185)	3.186** (0.186)
Number of books available in household x focal child is DLL						0.129* (0.008)

SD for outcome = 17.142 * p-value < 0.05; **p-value < 0.01; ***p-value < 0.001. Other developmental supports variables were excluded from model estimates.

Table 28 shows results for the stepwise regression model for the outcome EOW—English which is exclusive of those children who did not pass the English screener and were identified as monolingual Spanish. The reported stepwise regression is for the environmental stress construct. The results show five models were selected where DLL children scored lower on the EOW—English at baseline. The coefficients are all highly significant at $p < 0.001$ and the effect sizes are considered to be large. Being African American, non-Hispanic while also living in poverty (i.e., an interaction term) is also associated with lower EOW—English scores. The coefficients for all four models are highly significant at $p < 0.001$. The effect size for the coefficient is to be small. Alternatively, children who are White, non-Hispanic are predicted to have higher EOW—English scores. The coefficients for all three models are also highly significant at $p < 0.001$, and the associated effect sizes are considered to be small. Focal children that are classified as Other race and who live with a depressed primary caregiver (i.e., an interaction term) are associated with higher EOW—English scores at the beginning of the Head Start program year. The coefficients for these models are both significant at $p < 0.01$ with small effect sizes. Being in poverty persists as an issue in this stepwise regression as with children who live in poverty showing lower EOW—English scores which is significant at $p < 0.05$, but the effect size for the coefficient is considered to be trivial.

Table 28 Environmental Stress Stepwise Regression Models for Baseline EOW—English

Independent Variable	1 β (ES)	2 β (ES)	3 β (ES)	4 β (ES)	5 β (ES)
Focal child is DLL	-16.293*** (-0.949)	-17.415*** (-1.014)	-15.028*** (-0.928)	-15.843*** (-0.923)	-15.570*** (-0.907)
Focal child is African American, non-Hispanic x focal child lives in poverty		-7.624*** (-0.444)	-5.505*** (-0.321)	-4.874*** (-0.284)	-3.701** (-0.216)
Focal child is White, non-Hispanic			4.682*** (0.273)	5.314*** (0.309)	5.541*** (0.323)
Focal child race is other x focal child caregiver self -reports depression				5.885** (0.343)	6.171** (0.359)
Focal child lives in poverty					-2.30* (-0.124)

SD for outcome = 17.173 * p-value < 0.05; **p-value < 0.01; ***p-value < 0.001. Other environmental stress variables were excluded from model estimates.

Consistent with other outcomes reported, the stepwise regression models reveal that dual language learners are associated with lower scores for all model constructs at baseline for the outcome EOW—English. Additionally, African American, non-Hispanic children show lower EOW—English scores at baseline in both the household composition and developmental supports constructs while the combination of being African American, non-Hispanic and living in poverty is associated with lower scores on the environmental supports construct. Other themes continue to emerge which show that household sizes of three to five and having books in the household are associated with positive scores at baseline while living in poverty is associated with lower scores although interactions (and lack thereof) vary across constructs and models.

Tables 29 through 31 present results from stepwise regression models performed on gain scores for the EOW—English indicating observed associations after the program year of Head Start. Table 29 shows results for the stepwise regression model for the outcome gain scores of the EOW—English which is exclusive of those children who did not pass the English screener and were identified as monolingual Spanish. The reported stepwise regression is for the household composition construct. Three models emerge in which focal children who participated in Early Head Start and are also living with a spouse or partner (i.e., an interaction term) are making smaller gains over the year with respect to the EOW—English compared to children who received Early Head Start but are not living with a parent's spouse or partner. The coefficients are all significant at $p < 0.05$ and the effect sizes are considered to be small. Additionally, White, non-Hispanic children who are living with a stepparent (i.e., an interaction term) are making smaller gains over the program year than White non-Hispanic children who are not living with stepparents. The coefficients are significant at $p < 0.05$, and the effect sizes reach the threshold for small. Alternatively, one model emerged that showed dual language learners living with three to five people in the household (i.e., an interaction term) are

making greater gains with respect to their EOW—English scores compared to dual language learners living in other household sizes.

Table 29 Household Composition Stepwise Regression Models for Gain Scores on EOW—English

Independent Variable	1 β (ES)	2 β (ES)	3 β (ES)
Focal child participated in EHS x primary caregiver spouse or partner lives in household	-2.802* (-0.220)	-2.894* (-0.227)	-3.111** (-0.244)
Focal child White, non-Hispanic x stepparent lives in household		-5.351* (-0.420)	-5.110* (-0.401)
Focal child is DLL x three to five people live in household			3.912* (0.307)

SD for outcome = 12.735 * p-value < 0.05; **p-value < 0.01; ***p-value < 0.001. Other household composition variables were excluded from model estimates

Table 30 shows results for the stepwise regression model for the outcome gain scores of the EOW—English which is exclusive of those children who did not pass the English screener and were identified as monolingual Spanish. The reported stepwise regression is for the developmental supports construct. One main model emerges in which dual language learners show significantly higher EOW—English gain scores at $p < 0.05$ with an effect size that is considered to be small.

Table 30 Developmental Supports Stepwise Regression Models for Gain Scores on EOW—English

Independent Variable	1 β	SD	ES
Focal child is DLL	2.805*	11.857	0.237

* p-value < 0.05; **p-value < 0.01; ***p-value < 0.001. Other developmental supports variables were excluded from model estimates.

Table 31 shows results for the stepwise regression model for the outcome gain scores of the EOW—English which is exclusive of those children who did not pass the English screener and were identified as monolingual Spanish. The reported stepwise regression is for the environmental stress construct. African American, non-Hispanic children who are living in poverty (i.e., an interaction term) are showing greater gains in EOW—English scores. At baseline, these children were associated with having lower scores, so these children may be slowly beginning to catch up during the Head Start program year. The coefficients are both significant at $p < 0.05$, but effect size is trivial. Finally, one model emerges in which dual language learners show greater EOW—English gain scores. The coefficient is significant at $p < 0.05$, and the effect size reaches the small threshold.

Table 31 Environmental Stress Stepwise Regression Models for Gain Scores on EOW—English

Independent Variable	1 β (ES)	2 β (ES)
Focal child is African American, non-Hispanic x focal child lives in poverty	1.622* (0.136)	1.753* (0.147)
Focal child is DLL		3.016* (0.253)

SD for outcome = 11.904 * p-value < 0.05; **p-value < 0.01; ***p-value < 0.001. Other environmental stress variables were excluded from model estimates.

The results of the stepwise regressions for gain scores on the EOW—English which is exclusive of those children who did not pass the English screener and were identified as monolingual Spanish continues to show that the interaction between variables plays a role in children's language growth over the course of one year. For the household composition construct dual language learners living in households of three to five people show greater gains on the EOW—English over the program year while dual language learners (i.e., without an interaction term) are associated with higher EOW—English gain scores for the developmental support and environmental stress constructs.

Section IV. Outcome variable is EOW—Spanish and population includes only children who completed the EOW in Spanish.

This fourth section presents the series of regression results for children who were identified as monolingual Spanish speakers. Table 32 below presents single predictor regression values for the independent variables of interest. The single predictor regression models reveal a similar story to the previous single predictor regression results but some unique elements emerge. The primary caregiver's spouse or partner living in the household with the focal child is associated with higher EOW—Spanish scores but the coefficient does not reach statistical significance. Only household sizes of three to five people show positive associations with EOW—Spanish scores while all other household sizes show negative associations. None of the coefficient reach statistical significance. Interestingly, having other relatives (for example, aunts and uncles) living in the same household as the focal child is associated with lower EOW—Spanish scores, and the coefficient is statistically significant at $p < 0.05$. The resulting effect size is considered to be a small effect size. A sizable effect is observed for having non-relatives live in the household, but this value is not statistically significant. Dual language learners are associated with lower EOW—Spanish scores at baseline, but the coefficient does not reach statistical significance. Unlike the other single predictor regression models, the race variables do not demonstrate any associations which reach a point of statistical significance. Consistent with prior models, for every 15 books a focal child has within his household, higher EOW—Spanish scores are observed, but the difference this time is not statistically significant. Also consistent with other models is the concept of using those books and thus, for children who are read to for at least three or more times per week, higher EOW—Spanish scores are observed, which is significant at $p < 0.05$. The resulting effect size is considered to be a small effect size. No other variables reach statistical significance in the single predictor regression models and although poverty is

associated with lower EOW—Spanish scores, as it is in the other single predictor regression models, the effects of living in poverty do not reach statistical significance.

Table 32 Single Predictor Models for Baseline EOW—Spanish

Independent Variable	β	Std. Error	SD	ES	Construct
Primary caregiver is married	.129	1.49	15.210	0.008	Household Composition
Primary caregiver spouse is lives in household	4.15	2.17	15.221	0.27	Household Composition
Two people live in household	-2.687	.797	15.465	-0.17	Household Composition
Three to five people live in household	1.892	1.717	15.465	0.122	Household Composition
Six to seven people live in household	-.745	1.938	15.465	-0.048	Household Composition
Eight or more people live in household	-3.889	3.947	15.465	-0.251	Household Composition
Grandparent(s) live in household	-1.38	2.61	15.465	-0.09	Household Composition
Sibling(s) live in household	.325	2.02	15.465	0.02	Household Composition
Stepparent or primary caregiver's partner lives in household	-.382	3.64	15.465	-0.02	Household Composition
Other relative(s) live in household	-4.67*	2.35	15.465	-0.30	Household Composition
Non-relative(s) live in household	17.40	8.93	15.465	1.13	Household Composition
Focal child is DLL	-.375	2.393	15.476	-0.242	Cultural Differences
Focal child is Hispanic	-1.44	8.97	15.476	-0.10	Cultural Differences
Focal child is White	1.44	8.97	15.476	0.10	Cultural Differences
Focal child is African American	NSS	NSS	NSS	NSS	Cultural Differences
Focal child race is other	NSS	NSS	NSS	NSS	Cultural Differences
Focal child participated in Early Head Start	1.342	1.599	15.592	0.086	Cultural Differences
Number of books in focal child's home	.054	.060	15.414	0.004	Developmental Supports
Focal child is read to 3+ times per week	5.55**	1.73	15.465	0.36	Developmental Supports
Number of minutes focal child is read to	.121	.083	15.465	0.008	Developmental Supports
Focal child lives in poverty	-.491	1.85	15.465	-0.03	Environmental Stress
Caregiver self -reports depression	-.959	1.71	15.372	-0.62	Environmental Stress

* p-value < 0.05; **p-value < 0.01; ***p-value < 0.001.

In general, these findings for the EOW- Spanish are similar to what was observed for the EOW—English and PPVT although there are a few notable differences. First, of interest is the result that not many predictors reached statistical significance in the household composition construct. Although a similar story emerged in terms of associations, there was an absence of statistical significance. Second the lack of an associated relationship regarding race is also of interest. Previous single predictor models showed strong positive associations for White, non-Hispanic children and negative associations for Hispanic children. Although the beta values presented here reflect a similar story, they do not reach statistical significance. The one consistent story which persists is the use of books. Focal children exhibit higher scores when books are used in the form of being read to at least three or more times per week. Simply having books in the household, in and of themselves, is not associated with higher scores. Finally of interest, although poverty is associated with lower scores, the coefficient for poverty did not reach statistical significance for this subsample.

Table 33 shows results for the stepwise regression model for the outcome baseline EOW—Spanish which includes all children identified as monolingual Spanish speakers who completed the EOW—Spanish across all constructs. The first reported stepwise regression is for the household composition construct. The results show only one model reached statistical significance. The variable non-relatives live in household, which is an indication that the focal child has individuals living in the household who are not their relatives, is associated with higher EOW—Spanish scores and reached significance at $p < 0.05$. The effect size is considered to be large. Also included in table 33 is the reported stepwise regression for the developmental supports construct. The results show one model was selected where the independent variable of the focal child being read to three or more times per week presented a statistically significant association for higher EOW—Spanish scores. The variable was significant at $p < 0.01$ and the resulting effect size is

considered to be a small effect size. Contrary to stepwise regression models for other outcomes, no interactions emerged in the stepwise regression models on EOW—Spanish scores. Finally, due to insufficient sample size requirements, no coefficient values were produced for the environmental stress construct.

Table 33 Stepwise Regression Models for Baseline EOW—Spanish

Independent Variable	1 β	SD	ES
Household Composition Model:			
Non-relative(s) live in household	17.469*	15.193	1.15
Developmental Supports Model:			
Focal child is read to 3+ times per week	5.418**	15.522	0.35
Environmental Stress Model:			
NSS	NSS	NSS	NSS

* p-value < 0.05; **p-value < 0.01; ***p-value < 0.001. Other household composition and developmental support variables were excluded from model estimates; NSS = Not Sufficient Sample.

The next series of tables presents results from stepwise regression models on the EOW—Spanish gain scores after one Head Start program year. Table 34 below presents stepwise regression values on the gain scores after one year of Head Start for the outcome variable EOW—Spanish for the environmental stress construct and the household composition construct. Due to insufficient sample size requirements, no coefficient values were produced.

Table 34 Household Composition Stepwise Regression Models for Gain Scores on EOW—Spanish

Independent Variable	1 β	SD	ES
NSS	NSS	NSS	NSS

* p-value < 0.05; **p-value < 0.01; ***p-value < 0.001; NSS = Not Sufficient Sample.

Table 35 below shows the results for the stepwise regression model on the outcome EOW—Spanish gain scores after one program year of Head Start. The reported stepwise regression is for the developmental supports construct. Two main models emerge. The first indicates that for every 13 books present in the household for children who are Hispanic (i.e., an interaction term), there is a small increase in EOW—Spanish scores, which is statistically significant at $p < 0.05$. The resulting effect size is trivial. The second model indicates that dual language learners that are read to three or more times per week (i.e., an interaction term) experience smaller gains in their EOW-Spanish scores. The result is statistically significant at $p < 0.05$ and reveals a small effect size.

Table 36 below presents stepwise regression values on the gain scores after one Head Start program year for the outcome variable EOW—Spanish under the

environmental stress construct. Due to insufficient sample size requirements, no coefficient values were produced.

Table 35 Developmental Supports Stepwise Regression Models for Gain Scores on EOW—Spanish

Independent Variable	1 β (ES)	2 β (ES)
Number of books available in household x focal child is Hispanic	0.118* (0.009)	0.141** (0.011)
Focal child is read to 3+ times per week x focal child is DLL		-3.792* (-0.289)

SD for outcome = 13.1036 * p-value < 0.05; **p-value < 0.01; ***p-value < 0.001. Other developmental supports variables were excluded from model estimates.

Table 36 Environmental Stress Stepwise Regression Models for Gain Scores on EOW—Spanish

Independent Variable	1 β	SD	ES
NSS	NSS	NSS	NSS

* p-value < 0.05; **p-value < 0.01; ***p-value < 0.001. NSS = Not Sufficient Sample.

Chapter 5

DISCUSSION

Stemming from the literature on early language development and the home environment, this dissertation focused on three primary goals. First, analytic methods were employed to explore how household relationship structures predict early language proficiency among children in the FACES 2014 sample (research question one). Household relationship structures are of particular interest as household members are the people that can engage with children and provide them with opportunities for verbal interaction at home. Second, analytic procedures explored other key features of the home environment that likely relate to both who is living in the household with children as well as the possible opportunities for verbal interaction at home. This set of analyses investigated how other key environmental features such as cultural differences, developmental supports, and environmental stressors can predict early language proficiency among children in the FACES 2014 sample (research question two). Finally, analyses were conducted to understand how key features of the home environment (i.e., household composition, cultural differences, developmental supports, and environmental stress) are related to gains in receptive and expressive vocabulary among children in the FACES 2014 sample over one year of the Head Start program (research question three). The ways in which this study's results provide information about children's language proficiency and development will be described in more detail throughout this section specifically as results relate to each key feature of the home environment beginning with household composition.

Household Composition

FACES 2014 data included important descriptive information regarding household members living with focal children, including the number of people who live

in each household as well as their relationships to children. Across outcomes (i.e., tests of receptive and expressive vocabulary) and groups of children (i.e., all children and exclusive of monolingual Spanish children), household sizes of three to five people show positive associations with language proficiency scores. Most children in the FACES sample that are living in these households are living with more than one adult (and for many children, more than one parent). Across single-predictor regression models, children living in two-parent households had significantly higher scores on language proficiency assessments. This result confirms findings in prior literature that two-parent households are associated with better language outcomes than one-parent households, but there is an important caveat. Parents may not need to be married for this benefit to be observed. For children in the FACES sample, there are no significant differences in language scores for children who live in married parent households compared to children living in unmarried, two-parent households. What appears to matter is the presence of both parents, or a parent and their spouse or partner. Thus, the parent relationship may not need to involve both of the child's biological parents. The presence of a stepparent or a parent's partner appear to produce similar benefits, as long as these individuals live within the same household as the focal child. This finding is very important given the wide variety of relationships and cohabitation patterns in modern society. For example, couples are more often choosing to happily cohabitate rather than enter a legal marriage.

The results on parent relationship dynamics also sheds important insights into how data are captured. When parents are simply asked to report information on legal marriage status, it can lead to information that may not be effectively reflecting the environments in which children are raised. Hurwitz, Hurwitz, & May (2017) found that children living in married parent households had lower language development scores when compared to their peers living with unmarried parents. However, that research was unable to investigate whether children living in unmarried parent households were still

living with parents in relationships. The results from this current work suggest there is much more to explore when trying to understand how parent relationship statuses relate to child language outcomes. If this dissertation explored only the legal marital status of parents of focal children, then the results might have failed to identify the association between parent relationship status and child language proficiency. But, with the availability of more detailed information about household members, the current project was able to show associations between living in two-parent households and early language proficiency.

Findings related to having siblings and grandparents in the household were not as prominent as initially expected based on the literature. Most children in the FACES sample are living with siblings, and the number of siblings in the household grows as household sizes increase. Having siblings is associated with lower scores across outcomes (i.e., tests of receptive and expressive vocabulary in English) and across groups of children (i.e., all children and excluding monolingual Spanish children) in single predictor models, although these findings are only significant for receptive vocabulary proficiency of all children. One possible explanation is that siblings can interfere with focal children's opportunities to directly talk with their parents. This aligns with prior research that suggests siblings can add complexities for language development in young children (Prime et al., 2014). Associations between living with grandparents and language outcomes were not prominent in any of the models. Although language outcome scores tended to be lower among children that live with grandparents, none reached significance and all associated effect sizes were trivial. Ultimately, given the lack of consistent significance and small effect sizes, interpretations of findings related to siblings and grandparents must be made with an abundance of caution for FACES 2014 children.

Analyses on gain scores revealed interesting insights into differences in how children increase their receptive and expressive vocabulary over the course of one Head Start program year. In tests of English receptive vocabulary for all children and tests of English expressive vocabulary for English proficient children, dual language learners living in households of three to five people (i.e., an interaction term) make greater gains than dual language learners living in other household sizes suggesting that the benefit of living in households of three to five people is particularly helpful for growth of dual language learners. Furthermore, children that participated in Early Head Start and are living in household sizes of three to five people (i.e., an interaction term) experience smaller gains in vocabulary scores than their peers who participated in Early Head Start but are living in other size households. Taken together, these findings suggest that living in certain household sizes is particularly promising for children that start the program year with the most room to grow while children that had prior support from Early Head Start are not receiving as much of a benefit from living with three to five people. The findings for dual language learners are particularly promising as there is evidence that the test score gap is slightly reduced during one year of Hear Start for these children living in certain household contexts. The findings related to Early Head Start might align with prior literature that suggests Early Head Start is particularly beneficial for improving parenting activities at home and opportunities for language exposure and interactions at home during a child's first few years (Roggman et al, 2016); thus, FACES 2014 children that received Early Head Start performed just as well on baseline vocabulary assessments compared to other children. These findings might be similar to recent empirical work that found positive associations with language assessments among children that were served by Early Head Start *and* continued to attend preschool (e.g., Head Start) after leaving the Early Head Start program (Love et al., 2013).

Developmental Supports

Developmental supports in the home environment can provide a window into the potential opportunities for verbal interaction among children and other members of their households. This study used children's exposure to books (i.e., the availability of books in the home and time spent with books at home) as a mechanism to explore associations with developmental supports and language outcomes. Across tests of both receptive and expressive vocabulary in English, having books available in the home and reading with children regularly is associated with better language assessment outcomes. Engaging in book sharing sessions throughout multiple timepoints each week is consistent with prior literature on the role of book sharing and language development (e.g., Raikes et al., 2006). This suggests that how adults spend *time* with their child over the course of the week is important.

Analyses of gain scores and factors related to developmental supports continue to reveal interesting insights into differences in how children grow receptive and expressive vocabulary over the course of one Head Start program year. In a test of English receptive vocabulary for all children, every 38 books reported in a child's home is associated with less language growth after one year. On the same test, for every 11.6 minutes read to, White, non-Hispanic children show smaller gains than their White, non-Hispanic peers who are not reporting reading for at least the same amount of time. Similarly, for every 36 books reported being available in homes, White non-Hispanic children are making smaller gains when monolingual Spanish children are excluded. Of course, the direction of causality is not clear; it may be the case that parents of children at greatest risk have been encouraged to read more with their children. Alternatively, it may be the case that parent book sharing with children becomes less important for a certain group of children (i.e., White, non-Hispanic) if children are engaging regularly in book sharing activities within their childcare setting. Prior research suggests that high quality childcare settings

promote positive attitudes towards books and include regular opportunities for children to engage with books (e.g., Zucker et al., 2013). Still another explanation for these counterintuitive results is response bias—parents of children at greatest risk may over-report their time spend reading or number of books.

Findings related to developmental supports and Spanish language proficiency were also of interest. Expressive vocabulary tests in Spanish at baseline highlight positive associations with reading three times per week at home. Over the course of the program year Hispanic children with more books available at home (i.e., an interaction term) show greater gains in Spanish expressive vocabulary compared to their Hispanic peers with fewer books at home. Is it possible these findings relate to recent research that showed connections between Spanish instruction and Spanish language development among dual language learners in Head Start (Durán,, Roseth, & & Hoffman, 2010) as the prevalence of book sharing at home may be analogous to receiving instruction in Spanish.

Environmental Stress

It is critical to explore how environmental stress in the home environment might connect with child language outcomes. This study measured environmental stress through mechanisms that likely influence the overall stress in the household (i.e., poverty status and parent depression) to explore associations with environmental stress and language outcomes. Environmental stressors, particularly those that increase stress to parents, is especially important to understand in the context of the FACES community since these children are considered to be living in at-risk households. The analyses of FACES 2014 data provide important information about the role external stressors might play in a child's receptive and expressive language development.

While most children enrolled in Head Start are considered to be of a low socioeconomic background, a subset of families included in the FACES 2014 sample are

classified as living in poverty. Living in poverty causes increased stress to parents and can impact the way parents interact with their children. Ultimately, such economic stress can limit the amount of time for, and quality of, verbal interactions between adults and children. For the purposes of this dissertation project, whether or not a family was classified as living in poverty was used as a way to understand external environmental stressors for parents. It is certainly not a new finding for the literature that living in poverty bestows tremendous detrimental effects for individuals. For the tests of English receptive and expressive language among children proficient in English, this finding seems to also hold. This finding is consistent with prior work that suggests that children born into poverty are less likely to meet school readiness goals (Roos, Wall-Wieler, & Lee, 2019) and work that suggests children living in poverty are more likely to be worse off with respect to child outcomes more broadly (e.g., Chaudry & Wimer, 2016). Positive results shed light on the role of one Head Start program year with respect to poverty and specific groups of children. For example, on a test of English expressive vocabulary, African American, non-Hispanic children that are living in poverty are gaining at higher rates than their African American, non-Hispanic peers that are not living in poverty, suggesting that time in Head Start is reducing the test score gap for African American, non-Hispanic children that are living in poverty. The same is not true for White, non-Hispanic children living in poverty on tests of English receptive vocabulary. After one program year of Head Start, White, non-Hispanic children living in poverty are gaining at slower rates than their White, non-Hispanic peers who are not living in poverty. Taken together, the findings on gain scores for African American, non-Hispanic children living in poverty and White, non-Hispanic children living in poverty suggest that supports from Head Start may be more helpful for certain groups of children living in poverty (i.e., African American, non-Hispanic children) than other children living in poverty.

Further, the findings for Head Start children considered to be living in poverty extend our knowledge on the variation between opportunities for a child's exposure to language from their parents, even among children that are considered to be living in low socioeconomic status households. For example, Schwabb & Lew-Williams (2016) report that a review of research on the exposure to child directed language is less effective for poorer children considered to be living in low socioeconomic households. This evidence suggests that children living with parents that are extremely stressed by limited finances are less likely to engage in high quality language exchanges with their children. The improvement for these African American, non-Hispanic children over one year of Head Start is promising and speaks to the possible impact that government-funded programmatic supports can have on the lives of children that are most in need.

Beyond stress caused by financial pressure, depression is a clear form of stress that parents can bring to the home environment. Prior research has shown that children who live with depressed parents tend to have less favorable outcomes (e.g., Ahun et al., 2017). Other evidence exists that maternal depression does not matter for language development for children in low socioeconomic status communities (Uche, Suzuki, & Rich, 2017). Interestingly, the analyses conducted in this project suggest that children who live with depressed parents may sometimes have higher language scores. There are many variables that confound this finding, which requires a cautious interpretation. Stepwise regression models on English expressive vocabulary scores suggest that it is the children that are classified as Other race and are living with depressed parents that are predicted to have higher scores than their Other race peers that are not living with depressed parents. It could be that parents of different racial/ethnic backgrounds report depression differently. Another possible interpretation of the positive associations between parent depression and language outcomes might suggest that parents who are aware of their depression are more likely to seek help and this could be the reason why

there is an observed increase in scores. The alternative interpretation could also be that these parents are not actually depressed in a clinical sense. FACES data included a short version of the Center for Epidemiologic Studies–Depression Scale (CES–D) (Radloff, 1977; Ross, Mirowsky, & Huber, 1983) as part of the parent interview. Data were based on self-report. Hence, it might be the case that parents reporting an affirmation for the question regarding their depression may not actually be depressed in a manner that would influence a child's expressive and receptive language performance. While the positive language associations for children living with depressed parents should be interpreted with an abundance of caution, these findings nonetheless serve as a strong rationale for continued research on parent depression and early language outcomes, particularly as outcomes may differ for children of different demographic backgrounds.

Cultural Differences

Cultural differences play an important role in the home environment and can provide important insights into the household characteristics that require the most support with respect to child language development. This dissertation project used demographics including race/ethnicity and whether children were considered to be dual language learners as a metric to look for possible associations between cultural differences and language assessment outcomes.

Some of this dissertation project's most interesting findings were related to dual language learners. Across tests of both English receptive vocabulary and English expressive vocabulary, dual language learners were more likely to have substantially lower language outcome scores at baseline than those children that were not identified as dual language learners. Results related to dual language learners were highly significant and many coefficients had large effect sizes. Negative associations between dual language learners and language outcomes at baseline held across model types (i.e., single

predictor and stepwise) and key constructs (e.g., household composition). The results related to dual language learners are consistent with prior literature that shows the relationship between being a dual language learner and having lower language outcome scores in early childhood (e.g., Galloway & Lesaux, 2017). Analyses on gain scores provided promising information about how spending time in Head Start might improve outcomes from dual language learners. For example, within the construct of developmental support, a test of English receptive vocabulary revealed that dual language learners make greater gains over the course of a Head Start program year than their monolingual peers. This is in line with other research that shows that time in Head Start can improve English language outcomes for dual language learners (Hindman & Wasik, 2015).

Both the opportunity and achievement gaps have received increased attention in recent years as there are clear differences in academic performance among children from certain racial and ethnic groups. This study's results confirm that children from certain racial and ethnic backgrounds (e.g., African American, non-Hispanic children) are more likely to have lower language assessment scores compared to their peers from other groups (e.g., White, non-Hispanic children). This finding is consistent with prior literature that suggests that African American, non Hispanic and Hispanic children are more likely to score lower on academic assessments than their White, non-Hispanic peers (Magnuson & Waldfogel, 2005). Throughout many of the statistical models run for this study, being White, non-Hispanic was associated with higher scores on tests of receptive and expressive vocabulary.

Across other key features of the home environment explored (i.e., household composition, developmental supports, and environmental stress), results from analyses that included interactions highlight differences among children of certain racial groups. For example, on a test of English expressive vocabulary, African American, non-

Hispanic children living with married parents are predicted to have better scores than their African American, non-Hispanic peers that are not living with married parents. This finding is consistent with other research that suggests having married parents is associated with language development (Artis 2007; Sun & Li, 2011) more broadly; however, other results did not highlight the potential positive associations for living with married parents among children from other racial/ethnic backgrounds.

Limitations

While the results of this study provide important information about Head Start Children, the home environment, and early child language development, there are still many limitations to this study.

This study used existing data to explore associations with key elements in the home environment and language outcomes of children enrolled in Head Start. While it can be advantageous to use existing data to answer important research questions, there are limitations when using secondary data. Most importantly, the analyses include only data that is available, thus it is not possible to design a data collection process that directly corresponds to the research questions. In this study, more detailed data on home environment and interactions between each person in the home and the focal child would have allowed more in-depth analyses.

Furthermore, the data used in this study lacked assessments at several time points (e.g., each language assessment was administered only twice and the parent survey was administered only once), and this could influence the results. For example, parent survey responses were only collected at one time point. As a result, it is impossible to look at whether key components of the home environment changed throughout the course of the Head Start program year. Household disruption (e.g., changes in parent relationship

status) is problematic for children's language development, and it would be particularly interesting to understand whether household disruption played any role in the results of the analysis on gain scores. Additionally, achievement data were available at only two time points. It would be beneficial to look at growth during children's time in the Head Start program using several assessment time points to produce a more precise trajectory of development and to better understand the benefits of the program on child language development.

Additionally, the way in which the data about the home environment were collected could also be problematic. Information about the child's home environment were collected through self-report of the parent most responsible for the child. The literature guiding this work suggests that verbal interaction is critical for language development in early childhood, but FACES 2014 data did not provide a measure of verbal interaction. Instead information children's parents reported was used to infer possible opportunities for verbal interaction. There could be inconsistencies in the ways in which parents report information. For example, parents were estimating from their memories the quantity of books in their homes and the amount of time spent reading with children. Home visits which include observations by a trained research team could provide more accurate, consistent, and comparable data across settings. Such home visits could better account for developmental supports that promote opportunities for high quality book sharing in the home (e.g., exact number of books in the home) and could also assess actual interactions between adults and children. For example, observation could provide important insights into the opportunities children have for verbal interaction within the home surrounding book sharing rather than using parent report to understand the frequency of such activities. Further, observations could provide more opportunities to understand how children and adults engage in verbal communication at home beyond those uses to explicitly promote language development. For example,

observations could be used to examine the quality of talk around daily activities such as during meal times. Further, observation data could provide more precise data around parenting quality with the focal child's home.

The way in which child assessment data were collected also produced limitations specifically as it relates to the tests used to assess expressive vocabulary. Two different tests were used for children that are proficient in English and those that are proficient in Spanish. The tests are different and do not allow pooling of data or comparison of results. Therefore, it is impossible to look at expressive vocabulary results for the entire sample. Similarly, receptive vocabulary was tested for all children regardless of their language proficiency. This test (i.e., the PPVT) was administered only in English and may limit the ability to thoroughly understand language development for children that are classified as monolingual Spanish. Further, this study was unable to explore relationships between the features of the home environment and Spanish receptive language proficiency.

Additionally, classroom instruction was beyond the scope of this current work. It is possible that the language used in classroom instruction might play a role in language proficiency and development, particularly for dual language learners. Future work might consider the potential implications that language in the classroom plays for dual language learners especially when conducting analytic procedures on gain scores. Further, this project was unable to test whether children's language delays or other disabilities might be associated with language outcomes. If available, information related to children's language abilities at baseline might be important to enhance our understanding of early language abilities for Head Start children.

Beyond the data itself, the analytic approach produced rich information about the possible associations between the child's home environment and early language growth but is limited in its ability to support causal inference. Results of analyses of baseline scores, at the start of the Head Start program year, support only descriptive

interpretation—they may identify groups of children who have higher or lower tests scores (i.e., they begin the Head Start program year with a relative advantage or disadvantage), but the results do not support strong conclusions about why those differences exist. The analyses conducted on gain scores are the only results in which any causal inference might be inferred; however, that support for causal inference is also limited. While the gain score analyses can support interpretations that quantify differences in the growth children experience while in Head Start, and thus are not subject to the same broad selection bias that may apply to the baseline analyses, there may still be unmeasured confounding factors that may account for the relationships observed between predictor variables and test score gains.

Implications

The results from this dissertation study provide important implications for the future. It is critical to recognize that the way in which children acquire and grow language is very complex as is exploring connections between language proficiency and the home environment. This study just scratches the surface of the complexities of early language and the home environment among Head Start children. As such, perhaps the most important implication for this work is the need for future research.

Results described throughout this dissertation suggest that future research should focus on three primary areas. First, future research should seek to employ methods that can support causal inference about the features of the home environment and child language development. This may be through the application of causal analytic techniques (e.g., propensity score matching) to additional existing datasets or through creating novel data collection efforts and research designs that include interventions targeting specific pathways implied from the literature that supported the analytic rationale for this study. Second, next steps might be to explore areas that were beyond the scope of this study. As an example, the empirical evidence suggests that role of a father figure may be important to children. A future study might focus on looking for possible connections between father figures and child language development rather than just focusing on parent relationship status within the household with the focal child as was done for this project. Further, new data sources should be identified or created to specifically measure verbal interaction at home (i.e., not relying on data that requires the researcher to make inferences about proxies for verbal interaction and parenting quality). Finally, associations between household composition, developmental supports, environmental characteristics, and cultural differences should be explored using a nationally representative sample of all children in the United States rather than just a limited sample of children living in at-risk households and participating in Head Start. The literature

driving the analytic rationale for this work also suggests that associations between language outcomes and the core environmental features (i.e., household composition, developmental supports, environmental stress, and cultural differences) should also play out for children living in household with more resources. These additional analyses would be especially interesting to compare how interactions between demographic characteristics and predictors that represent other constructs (e.g., parent relationship status within the household relationship construct) among children that live in other types of home environments (i.e., children who are not served by Head Start).

The analytic results found in this work lay a foundation for future work that could inform the way policies and programs are implemented to propel early language development among children who may be in need of additional supports. For example, this study's results suggest that more investigation should continue to explore the members of the child's household, beginning with parents and other adults. Given this study's results, additional research may suggest that programs that are designed to support healthy relationships should consider the importance of children living in a household with a parent in a relationship (i.e., not necessitating legal marriage).

Additional research might also build on the results found in this study related to environmental stress. For example, the results from this study suggest supports should also be provided to families living in poverty, even beyond those that are deemed to be living in low-socioeconomic status households. More research might build on findings from this project which suggest that children living in households that are defined as living in poverty appear to be at especially great risk with respect their language outcomes—significantly greater risk than for other children living in at-risk households. This study's results continue to provide evidence that suggests children with certain demographic characteristics are more likely to be behind their peers from other backgrounds. As a result, additional research should investigate how policies and

programs might continue to provide and improve supports to children from specific groups including dual language learners and African American, non-Hispanic children.

The findings on developmental supports that promote exposure to books provide the foundation for future research that might be used to guide the advice that policies and programs offer to parents of young children. This work suggests that parents should be encouraged to engage in book sharing activities multiple times per week. Further, exposure to language opportunities in childcare settings (e.g., Head Start) through opportunities to engage with books, may partly ameliorate inadequate book sharing and verbal interaction experiences for children in certain home environments.

Chapter 6

CONCLUSION

The goal of this dissertation project was to provide important insights into the possible associations between the home environment and early language proficiency among children enrolled in the Head Start program given the important connections between early language skills and later academic success. Using data from FACES 2014, this study sought to answer three primary research questions including:

1. Which household relationship structures predict children's language proficiency?

2. Which other key environmental features predict children's language proficiency?

3. How are features of the home environment (i.e., household composition, developmental supports, environmental stressors, and cultural differences) related to gains among children in Head Start over one program year?

First, this dissertation explored literature from a variety of fields including sociology, economics, and child development to build an analytic rationale for a series of statistical analytic procedures. The literature suggested that the key element of the home environment related to child language development is the opportunity for verbal interaction between the child and other household members who live in the home with the child. While the data used in the analyses for this study did not provide direct measures of verbal interaction at home, features of the home environment were explored based on their likely relationships to verbal interactions at home. Importantly, the

opportunities for verbal interaction within a household are provided by household members. As such, the analytic approach first investigated associations between household compositions (i.e., household members and their relationships to each other and the child) and language outcomes (i.e., measures of receptive and expressive vocabulary).

The literature guiding this project also provided information on other elements that likely impact the home environment and early language outcomes. As such, this study explored other important features that exist within the home environment to understand their possible connections to early language proficiency. Cultural differences measured by demographic characteristics, developmental supports measured by exposure to books at home, and environmental stressors measured by stressors to parents (i.e., parent depression and living in poverty) and each of their connections to child language assessment outcomes (i.e., measures of receptive and expressive vocabulary) were also explored.

The series of single predictor and stepwise regression models included 112 statistical models that sought to identify possible relationships between the home environment and early language assessment scores. Statistical procedures were applied to three outcomes across four distinct groups of children including 1) English receptive vocabulary for all children, 2) English receptive vocabulary excluding monolingual Spanish children, 3) English expressive vocabulary excluding monolingual Spanish children, and 4) Spanish receptive vocabulary for children proficient in Spanish. For each of these groups of children, single predictor models evaluated potential associations between one predictor (e.g., whether the child is living with siblings) and the language outcome (e.g., the child's fall receptive vocabulary assessment score). Next, for each group (e.g., English receptive vocabulary for all children), a series of stepwise regression models for each individual element of the home environment (i.e., household

composition, developmental supports, and environmental stress) and language outcomes (e.g., child's fall receptive vocabulary assessment score). Cultural differences (i.e., measures of demographic characteristics) were included in each of the stepwise regression models (i.e., household composition, developmental supports, and environmental stress) as a mechanism to control for differences among children's demographic characteristics. In addition, within the stepwise regression models for each construct, interaction terms were included to understand whether interactions between demographic characteristics and predictors (e.g., child is White, non-Hispanic *and* lives with three to five household members) were associated with language outcomes for children in the FACES 2014 sample. The goal of using stepwise regression was to explore how all the predictors together predicted the outcome variable, to identify potential confounders, and to select a subset of predictors for inclusion in a final model based on the strength of their prediction of each outcome variable. The final phase of the analyses repeated each of the stepwise regression models for each group (e.g., English receptive vocabulary for all children) using gain scores of each language assessment to evaluate growth over the Head Start program year.

Results provided important insights about the home environment and Head Start children's language outcomes. Some of this study's most prominent findings were related to dual language learners. Across outcomes and groups of children, dual language learners had significantly lower language assessment scores at baseline. Analyses on gain scores provided promising information about dual language learners. Stepwise regression models using gain scores on expressive vocabulary for English proficient children revealed that dual language learners were gaining at greater rates than their peers who were not deemed to be dual language learners when examining developmental supports and environmental stressors. Within household composition, dual language learners living in household sizes of three to five were making greater gains than their dual

language learner peers living in other household sizes. Taken together, these results suggest that the gap between dual language learners and other children is reduced during the Head Start program year.

Findings related to household size and parent relationships also provided interesting information about FACES 2014 children and language outcomes. Across outcomes, household sizes of three to five are associated with higher language assessment scores at baseline suggesting that living with three to five household members may be ideal for many children. Notably, African American, non-Hispanic children that live in household sizes of three to five see negative associations with tests of English receptive vocabulary at baseline suggesting that household sizes of three to five is not ideal for all groups of children. Tests of English receptive vocabulary also revealed positive associations with children who live in the same household as a parent's spouse or partner suggesting that having married parents may not be important. Rather, it may be beneficial for children to live in two-parent households (i.e., legally married *or* cohabitating). There are some important differences when it comes to parent relationships and tests of English expressive vocabulary. The benefits of living with a parent's spouse or partner seem to only persist for White, non-Hispanic children. Alternatively, African American, non-Hispanic children living with married parents are associated with higher English expressive vocabulary scores at baseline suggesting that having married parents may be more helpful for African American, non-Hispanic children than other groups of children.

Not surprisingly, results suggest that developmental supports (i.e., those supports that are measured by exposure to books at home) are associated with positive language outcomes across tests of receptive and expressive vocabulary. At baseline, tests of English receptive vocabulary for all children reveal positive associations with having books available at home while children show less gains over the course of one program

year. It could be that the impact of having books at home may not matter as much when books are available while the child is spending time in Head Start. Additionally, there are important results observed with respect to children of different demographic characteristics and English expressive vocabulary for English proficient children. White, non-Hispanic children are associated with higher scores while African, non-Hispanic children are associated with lower scores at baseline. These results suggest a substantial achievement gap exists among children enrolled in Head Start. Finally, results related to developmental supports also provide important information about children that are proficient in Spanish. At baseline, Spanish expressive vocabulary tests reveal positive associations with scores *and* children who are read to three or more times per week. Additionally, having books available at home combined with being Hispanic is associated with higher Spanish expressive vocabulary gain scores after one program year of Head Start.

Findings related to environmental stress were also of interest. Tests of English receptive vocabulary reveal that White, non-Hispanic children are associated with higher scores while African American, non-Hispanic children are associated with lower scores at baseline. These results provide another example that the achievement gap may exist among children enrolled in Head Start. Not surprisingly, negative associations between children living in poverty and English expressive vocabulary scores were observed. English expressive vocabulary outcomes provide promising insights into African American, non-Hispanic children living in poverty. At baseline, African American, non-Hispanic children who are also living in poverty show negative associations with English receptive vocabulary. At the end of the Head Start program year, these same children are gaining at higher rates than their African American, non-Hispanic peers who are living above the poverty line suggesting one year in Head Start slightly reduces the gap for African American, non-Hispanic children living in poverty. Overall, associations with

child language outcomes and living with a depressed parent were not as prominent as expected. Interestingly, positive associations between depressed parents of children categorized as Other race were observed on English expressive vocabulary scores at baseline. While these results seem surprising, they are nonetheless interesting and suggest that more investigation may be needed to understand how parent's report and cope with depression among different racial and ethnic backgrounds.

Overall, findings from this study provide important information about the home environment and language outcomes among children in the FACES 2014 sample, but more investigation is needed to fully understand how the home environment is related to child language development. Results must be interpreted with caution understanding that this study used an existing data set and primarily explored possible associations with features of the home environment and child language proficiency among children enrolled in Head Start. Only analyses conducted on gain scores produce support for causal inference and information about language development, and even then, with qualifications. Still, this study makes an important contribution to the field as it serves as a strong foundation for future research on how features of the home environment, specifically those related to household composition, developmental supports, environmental stress, and cultural differences, are related to early language outcomes for Head Start children. Ultimately, this dissertation project serves as an important early step in understanding how the home environment influences child language development in the earliest years and provides insights into mechanisms and potential supports that might help at risk children being served by Head Start.

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Appendix

IRB APPROVAL LETTER

Institutional Review Board
210H Hullihen Hall
Newark, DE 19716
Phone: 302-831-2137
Fax: 302-831-2828

DATE:	July 24, 2019
TO:	Felicia Hurwitz, MA
FROM:	University of Delaware IRB
STUDY TITLE:	[1468790-1] The Importance of Household Relationships for Early Language Development of Head Start Children
SUBMISSION TYPE:	New Project
ACTION:	DETERMINATION OF EXEMPT STATUS
EFFECTIVE DATE:	July 24, 2019
REVIEW CATEGORY:	Exemption category # *(4)*

Thank you for your New Project submission to the University of Delaware Institutional Review Board (UD IRB). According to the pertinent regulations, the UD IRB has determined this project is EXEMPT from most federal policy requirements for the protection of human subjects. The privacy of subjects and the confidentiality of participants must be safeguarded as prescribed in the reviewed protocol form.

This exempt determination is valid for the research study as described by the documents in this submission. Proposed revisions to previously approved procedures and documents that may affect this exempt determination must be reviewed and approved by this office prior to initiation. The UD amendment form must be used to request the review of changes that may substantially change the study design or data collected.

Unanticipated problems and serious adverse events involving risk to participants must be reported to this office in a timely fashion according with the UD requirements for reportable events.

A copy of this correspondence will be kept on file by our office. If you have any questions, please contact the UD IRB Office at (302) 831-2137 or via email at hsrb-research@udel.edu. Please include the study title and reference number in all correspondence with this office.